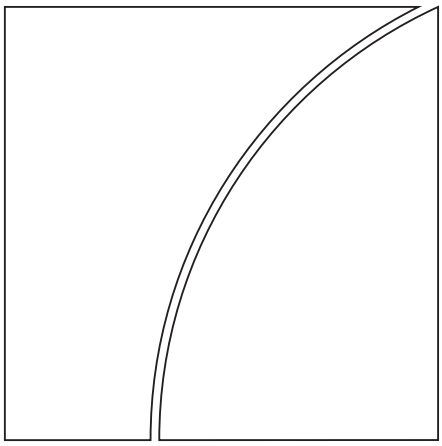
BANK FOR INTERNATIONAL SETTLEMENTS

Embargo

Not to be released before
12:30 pm Central European Summer Time
on Sunday 26 June 2016



86th Annual Report

1 April 2015–31 March 2016

Basel, 26 June 2016

This publication is available on the BIS website (www.bis.org/publ/arpdf/ar2016e.htm).

Also published in French, German, Italian and Spanish.

ISSN 1021-2477 (print)
ISSN 1682-7708 (online)

ISBN 978-92-9197-604-1 (print)
ISBN 978-92-9197-605-8 (online)

Contents

Graphs

Tables

The economic chapters of this Report went to press on 15–17 June 2016 using data available up to 30 May 2016.

Conventions used in the Annual Report

$	US dollar unless specified otherwise
mn	million
bn	billion (thousand million)
trn	trillion (thousand billion)
% pts	percentage points
bp	basis points
lhs, rhs	left-hand scale, right-hand scale
sa	seasonally adjusted
yoy	year on year
qoq	quarter on quarter
...	not available
.	not applicable
–	nil or negligible

Components may not sum to totals because of rounding.

The term "country" as used in this publication also covers territorial entities that are not states as understood by international law and practice but for which data are separately and independently maintained.

Country codes

AR	Argentina
AT	Austria
AU	Australia
BA	Bosnia and Herzegovina
BE	Belgium
BG	Bulgaria
BR	Brazil
CA	Canada
CH	Switzerland
CL	Chile
CN	China
CO	Colombia
CY	Republic of Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
DZ	Algeria
EA	euro area
EE	Estonia
ES	Spain
EU	European Union
FI	Finland
FR	France
GB	United Kingdom
GR	Greece
HK	Hong Kong SAR
HR	Croatia
HU	Hungary
ID	Indonesia
IE	Ireland
IL	Israel
IN	India
IS	Iceland
IT	Italy
JP	Japan
KR	Korea
LT	Lithuania
LU	Luxembourg
LV	Latvia
MK	Macedonia, FYR
MX	Mexico
MY	Malaysia
NL	Netherlands
NO	Norway
NZ	New Zealand
PE	Peru
PH	Philippines
PL	Poland
PT	Portugal
RO	Romania
RU	Russia
SA	Saudi Arabia
SE	Sweden
SG	Singapore
SI	Slovenia
SK	Slovakia
TH	Thailand
TR	Turkey
TW	Chinese Taipei
US	United States
ZA	South Africa

Advanced economies (AEs): Australia, Canada, Denmark, the euro area, Japan, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States.

Major AEs (G3): The euro area, Japan and the United States.

Other AEs: Australia, Canada, Denmark, New Zealand, Norway, Sweden, Switzerland and the United Kingdom.

Emerging market economies (EMEs): Argentina, Brazil, Chile, China, Chinese Taipei, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, the Philippines, Poland, Russia, Saudi Arabia, Singapore, South Africa, Thailand and Turkey.

Global: All AEs and EMEs, as listed.

Commodity exporters (countries whose average share of commodities in export revenues in 2005–14 exceeded 40%): Argentina, Australia, Brazil, Canada, Chile, Colombia, Indonesia, New Zealand, Norway, Peru, Russia, Saudi Arabia and South Africa.

Country aggregates used in graphs and tables may not cover all the countries listed, depending on data availability.

86th Annual Report

submitted to the Annual General Meeting
of the Bank for International Settlements
held in Basel on 26 June 2016

Ladies and Gentlemen,

It is my pleasure to submit to you the 86th Annual Report of the Bank for International Settlements for the financial year which ended on 31 March 2016.

The net profit for the year amounted to SDR 412.9 million, compared with SDR 542.9 million for the preceding year. Details of the results for the financial year 2015/16 may be found on pages 170–1 of this Report under "Financial activities and results".

The Board of Directors proposes, in application of Article 51 of the Bank's Statutes, that the present General Meeting apply the sum of SDR 120.0 million in payment of a dividend of SDR 215 per share, payable in any constituent currency of the SDR, or in Swiss francs.

The Board further recommends that SDR 14.6 million be transferred to the general reserve fund and the remainder – amounting to SDR 278.3 million – to the free reserve fund.

If these proposals are approved, the Bank's dividend for the financial year 2015/16 will be payable to shareholders on 30 June 2016.

Basel, 17 June 2016

JAIME CARUANA
General Manager

Overview of the economic chapters

Chapter I: When the future becomes today

Judged by standard benchmarks, the global economy is not doing as badly as the rhetoric sometimes suggests. Global growth continues to disappoint expectations but is in line with pre-crisis historical averages, and unemployment continues to decline. Less comforting is the longer-term context – a "risky trinity" of conditions: productivity growth that is unusually low, global debt levels that are historically high, and room for policy manoeuvre that is remarkably narrow. A key sign of these discomforting conditions is the persistence of exceptionally low interest rates, which have actually fallen further since last year.

The year under review saw the beginnings of a realignment in the forces driving global developments: partly in response to US monetary policy prospects, global liquidity conditions began to tighten and the US dollar appreciated; financial booms matured or even began to turn in some emerging market economies (EMEs); and commodity prices, especially the oil price, dropped further. However, global prices and capital flows partly reversed in the first half of this year even as underlying vulnerabilities remained.

There is an urgent need to rebalance policy in order to shift to a more robust and sustainable expansion. A key factor in the current predicament has been the inability to get to grips with hugely damaging financial booms and busts and the debt-fuelled growth model that this has spawned. It is essential to relieve monetary policy, which has been overburdened for far too long. This means completing financial reforms, judiciously using the available fiscal space while ensuring long-term sustainability; and, above all, this means stepping up structural reforms. These steps should be embedded in longer-term efforts to put in place an effective macro-financial stability framework better able to address the financial cycle. A firm long-term focus is essential. We badly need policies that we will not once again regret when the future becomes today.

Chapter II: Global financial markets: between uneasy calm and turbulence

Financial markets experienced alternating phases of calm and turbulence in the past year, as prices in core asset markets remained keenly sensitive to monetary policy developments. Investors also closely followed growing signs of economic weakness in the main EMEs, especially China. Bond yields in advanced economies continued to fall, in many cases to historical lows, while the share of outstanding government bonds trading at negative yields reached new records. Low yields reflected low term premia as well as a downward shift in expected future short-term interest rates. Investors turned to riskier market segments in a search for yield, thereby supporting asset prices despite already high valuations. Unease about such valuations, coupled with concerns about the global outlook and about the effectiveness of monetary policy in supporting growth, resulted in recurring sell-offs and bouts of volatility. Markets appeared vulnerable to a sharp reversal of high valuations. Some outsize bond price movements point to changes in market

liquidity, but lower leverage should support more robust market liquidity under stress. Financial markets also exhibited persistent market anomalies that spread further, such as a widening cross-currency basis and negative US dollar interest rate swap spreads. These anomalies partly reflected market-specific supply-demand imbalances, sometimes reinforced by the impact of central bank actions on hedging demand. They also reflected shifts in the behaviour of large dealer institutions, which are now less active in arbitraging the anomalies away.

Chapter III: The global economy: realignment under way?

Global growth of GDP per working age person slightly outpaced its historical average and unemployment rates generally fell in the year under review. Perceptions of economic conditions, however, were defined by further falls in commodity prices, large swings in exchange rates and lower than expected headline global growth. These developments hint at a realignment of economic and financial forces that have unfolded over many years. In EME commodity exporters, the downturn in the domestic financial cycle mostly compounded the fall in export prices and currency depreciations, with economic conditions becoming weaker. In general, tighter access to dollar borrowing amplified these developments. The anticipated rotation of growth failed to materialise, with activity in advanced economies not picking up as much as needed to offset slower EME growth, despite some upturn in domestic financial cycles in the advanced economies most affected by the Great Financial Crisis. Lower oil and other commodity prices have not yet triggered the expected fillip to growth in importers, possibly because some parts of the private sector are still nursing weak balance sheets. The scars of repeated financial booms and busts and debt accumulation also hang over global potential growth: factor misallocation appears to be holding back productivity, with debt overhang and uncertainty seemingly restraining investment.

Chapter IV: Monetary policy: more accommodation, less room

Monetary policy remained exceptionally accommodative as the room for manoeuvre shrank and the prospects for further delay in policy normalisation increased. Against the backdrop of diverging monetary policies among the major advanced economies, some central banks continued to supplement historically low policy rates with further expansion of their balance sheets. Inflation developments played a big role in policy decisions, as exchange rate swings and declines in commodity prices affected headline inflation. At the same time, central banks had to factor in the inflationary cross-currents coming from a mix of cyclical and secular drivers, with the latter continuing to keep a lid on underlying inflation. Central banks also had to grapple with concerns about the seemingly diminished effectiveness of monetary policy through domestic channels. Naturally, external channels took on greater prominence, but they also presented additional challenges to price and financial stability. More broadly, the evolving policy tensions between price and financial stability underscored the need to raise the prominence of financial stability considerations, both of a domestic and external nature, in current monetary policy frameworks. Further progress has been made in understanding the trade-offs and in operationalising such a framework.

Chapter V: Towards a financial stability-oriented fiscal policy

Fiscal policy should be an essential part of the post-crisis macro-financial stability framework. As history shows, banking crises wreak havoc with public finances. Growing fiscal risks, in turn, weaken the financial system: directly, by undermining deposit guarantees and by weakening banks' balance sheets through losses on their public debt holdings; and indirectly, by limiting the authorities' ability to stabilise the economy through countercyclical fiscal policy. The tight two-way link between banks and public finances also creates the potential for an adverse feedback loop, in which financial and sovereign risks reinforce each other. Moving away from the present favourable treatment of domestic public debt in capital regulation to one that reflects more accurately sovereign risk is important to weaken this loop. But, by itself, it is not sufficient. Maintaining or rebuilding a sound fiscal position is key. Building sufficient buffers in a financial boom creates the room to repair balance sheets and stimulate demand if a crisis occurs. A stronger countercyclical stance may also help contain excessive growth in credit and asset prices. But the most important contribution to crisis prevention may come from removing tax provisions that unduly incentivise debt over equity, leading to too much leverage and greater financial fragility.

Chapter VI: The financial sector: time to move on

The Basel III framework is nearing completion. In addition to finalising the remaining calibration decisions, consistent and thorough implementation is now key, alongside more rigorous supervision. With regulatory uncertainty receding, banks need to keep adjusting their business models to the new market environment. This includes addressing legacy problems, such as those related to non-performing loans – an adjustment that will have to take place in challenging macroeconomic conditions linked to low, or even negative, interest rates. Once financial sector repair is completed, safer and stronger banks will unambiguously contribute to a more resilient economy. At the same time, as risks continue to migrate from banks to non-bank intermediaries, additional prudential challenges arise. Key areas include insurance supervision and mutual fund regulation.

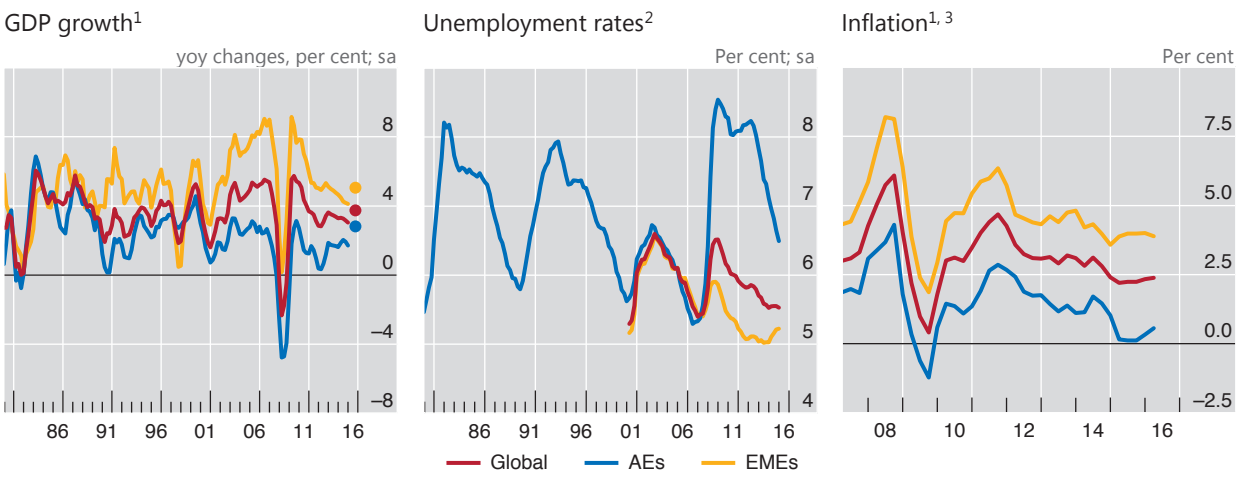
I. When the future becomes today

The global expansion continues. But the economy still conveys a sense of uneven and unfinished adjustment. Expectations have not been met, confidence has not been restored, and huge swings in exchange rates and commodity prices in the past year hint at the need for a fundamental realignment. How far removed are we from a robust and sustainable global expansion?

When put in perspective, standard metrics indicate that macroeconomic performance is not as dire as the rhetoric may sometimes suggest (Graph I.1). True, global growth forecasts have been revised downwards once more, as they consistently have been since the Great Financial Crisis. But growth rates are not that far away from historical averages, and in a number of significant cases they are above estimates of potential. In fact, once adjusted for demographic trends, growth per working age person is even slightly above long-run trends (Chapter III). Similarly, unemployment rates have generally declined and in many cases are close to historical norms or estimates of full employment. And although inflation is still below specific targets in large advanced economies, it may be regarded as broadly in line with notions of price stability. Indeed, the downbeat expression "ongoing recovery" does not do full justice to how far the global economy has come since the crisis.

Less comforting is the context in which those economic gauges are evolving and what they might tell us about the future. One could speak of a "risky trinity": productivity growth that is unusually low, casting a shadow over future improvements in living standards; global debt levels that are historically high, raising financial stability risks; and a room for policy manoeuvre that is remarkably narrow, leaving the global economy highly exposed.

The global economy is not as weak as the rhetoric suggests — Graph I.1



The dots in the left-hand panel indicate 1982–2007 averages.

[1] Weighted averages based on GDP and PPP exchange rates. [2] Weighted averages based on labour force levels; definitions may vary across countries. [3] Consumer prices.

Sources: IMF, *International Financial Statistics* and *World Economic Outlook*; Datastream; national data; BIS calculations.

As noted in last year's Annual Report, a highly visible and much debated sign of this discomfort has been exceptionally and persistently low interest rates. And they have fallen even further since then (Graph I.2, left-hand panel). Inflation-adjusted policy rates have edged deeper below zero, continuing the longest postwar period in negative territory. Moreover, the Bank of Japan has joined the ECB, Sveriges Riksbank, Danmarks Nationalbank and the Swiss National Bank in adopting negative nominal policy rates. And at the end of May, close to $8 trillion in sovereign debt, including at long maturities, was trading at negative yields – a new record (Graph I.2, right-hand panel).

These interest rates tell us many things. They tell us that market participants look to the future with a degree of apprehension; that despite huge central bank efforts post-crisis, inflation has remained stubbornly low and output growth disappointing; and that monetary policy has been overburdened for far too long. The contrast between global growth that is not far from historical averages and interest rates that are so low is particularly stark. That contrast is also reflected in signs of fragility in financial markets and of tensions in foreign exchange markets.

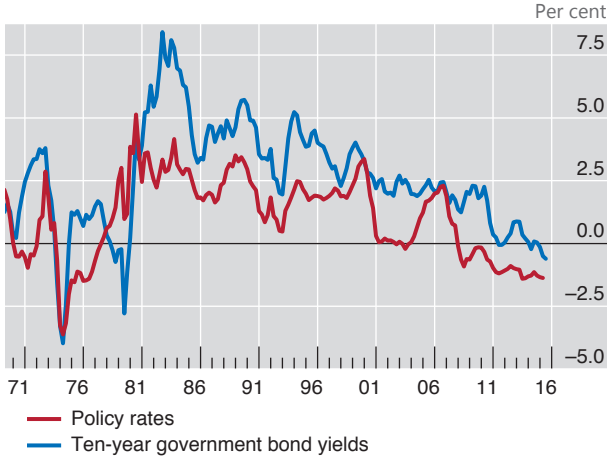
Interpreting the evolution of the global economy is fraught with difficulties, but it is necessary if we are to identify possible remedies. As we have in recent Annual Reports, we offer an interpretation using a lens that focuses on financial, global and medium-term aspects. We suggest that the current predicament in no small measure reflects the failure to get to grips with hugely costly financial booms and busts ("financial cycles"). These have left long-lasting economic scars and have made robust, balanced and sustainable global expansion hard to achieve – the hallmark of uneven recovery from a balance sheet recession. Debt has been acting as a political and social substitute for income growth for far too long.

This interpretation argues for an urgent rebalancing of policy to focus more on structural measures, on financial developments and on the medium term. A key element of this rebalancing would be a keener appreciation of the cumulative impact of policies on the stocks of debt, on the allocation of resources and on the room for policy manoeuvre. For it is this lack of appreciation that constrains

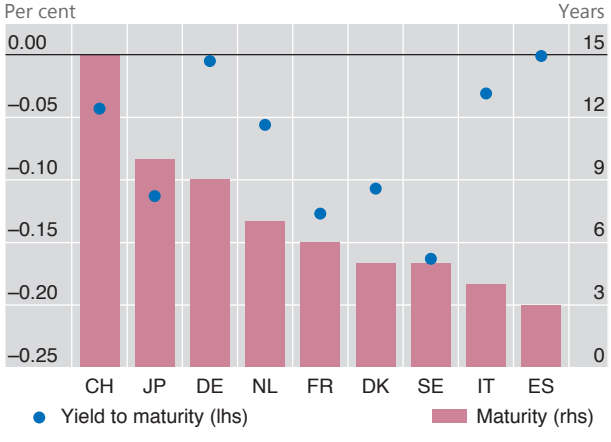
Interest rates remain exceptionally and persistently low

Graph I.2

G3 rates, inflation-adjusted[1]



Longest maturity of government bonds trading at negative yields[2]



[1] Weighted averages based on rolling GDP and PPP exchange rates; nominal policy rate (yield) less consumer price inflation excluding food and energy. [2] Bloomberg generic bonds; as at 27 May 2016.

Sources: Bloomberg; national data.

options when the future eventually becomes today. Intertemporal trade-offs are of the essence.

In this Annual Report, we update and further explore some of these themes and the tough analytical and policy challenges they raise. This chapter provides an overview of the issues. It looks first at the evolution of the global economy during the past year. It then digs deeper into some of the forces at play, putting the elements of needed macroeconomic realignments in a longer-term perspective and assessing the risks ahead. The chapter concludes with the resulting policy considerations.

The global economy: salient developments in the past year

By and large, the performance of the global economy in the year under review traced patterns seen in previous years, with signs of recurrent tension between macroeconomic developments and financial markets.

Global output again grew more slowly than expected, although at 3.2% in 2015 it was only slightly lower than in 2014 and not far from its 1982–2007 average (Chapter III). On balance, the projected rotation of growth from emerging market economies (EMEs) to advanced economies failed to materialise, as advanced economies did not strengthen enough to compensate for weakness in commodity-exporting EMEs. At the time of writing, consensus forecasts point to growth strengthening gradually in advanced economies and bouncing back more strongly in EMEs.

Labour markets proved more resilient. In most advanced economies, including all the largest jurisdictions, unemployment rates continued to decline. By the end of 2015, the aggregate rate was down to 6.5%, its level in 2008 before the bulk of its surge during the crisis. Even so, in some cases, unemployment remained uncomfortably high, notably in the euro area and among the young. The picture was more mixed in EMEs, with major weakness as well as some strength, but their aggregate unemployment rate edged up slightly.

This differential performance – improving employment but moderate output growth – points to weak productivity growth, the first element of the risky trinity (Graph I.3, left-hand panel). Productivity growth remained on the low side, continuing the long-term decline that had been visible at least in advanced economies and that had accelerated in those hit by the crisis.

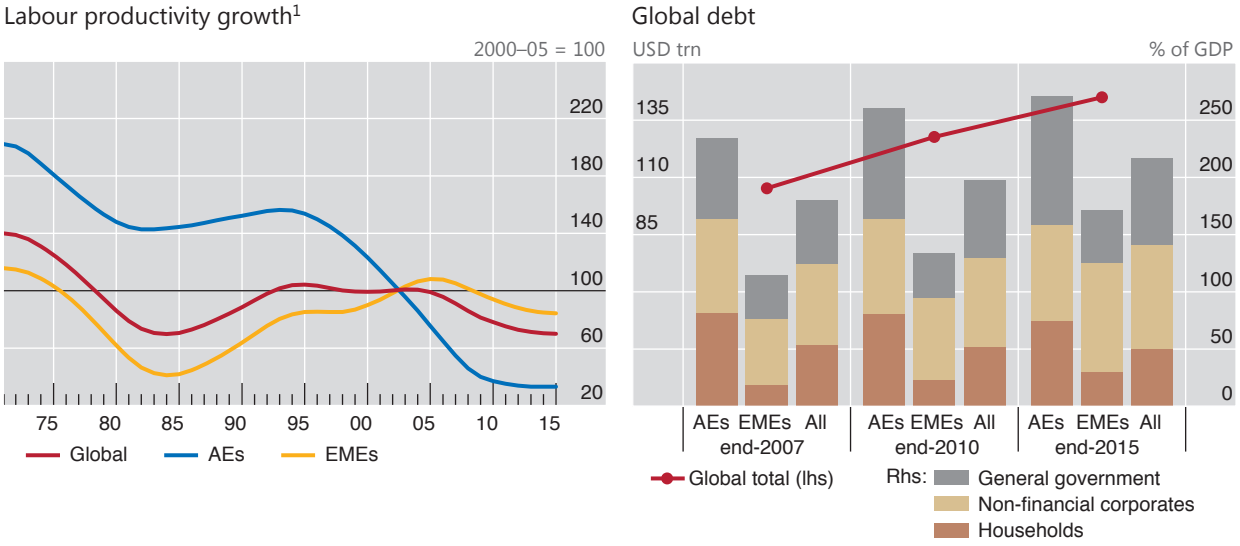
Inflation stayed generally subdued, except in some EMEs – notably in Latin America – that experienced sharp currency depreciations (Chapter IV). In the largest advanced economies that are home to international currencies, underlying (core) inflation, while remaining below targets, moved up even as headline rates remained considerably lower. Low inflation also prevailed in much of Asia and the Pacific and in smaller advanced economies.

Once more, a critical factor in these developments was the further drop in prices for commodities, especially oil. After some signs of a pickup during the first half of last year, oil prices resumed their plunge before recovering somewhat in recent months. The generalised drop in commodity prices helps explain growth patterns across commodity exporters and importers (Chapter III). The resultant contraction in commodity exporters was only partly offset by currency depreciations against the backdrop of an appreciating US dollar. Similarly, the commodity price declines shed light on the wedge that opened up between headline and core measures and on why the most uncomfortably high inflation rates went hand in hand with weak economic activity (Chapter IV).

In the background, debt in relation to GDP continued to increase globally – the second element of the risky trinity (Graph I.3, right-hand panel). In the advanced economies worst hit by the crisis, some welcome reduction or stabilisation in

Global debt continues to rise and productivity growth to decline

Graph I.3



[1] Hodrick-Prescott filter applied to the logarithm of annual labour productivity per person employed.

Sources: IMF, *World Economic Outlook*; OECD, *Economic Outlook*; The Conference Board, *Total Economy Database*; national data; BIS; BIS calculations.

private sector debt tended to be offset by a further rise in the public sector. Elsewhere, a further increase in private sector debt either accompanied that in the public sector or outweighed the decline in the latter.

The financial sector's performance was uneven (Chapter VI). In advanced economies, banks quickly adapted to the new regulatory requirements by further strengthening their capital base. Even so, non-performing loans remained very high in some euro area countries. Moreover, even where economic conditions were favourable, bank profitability was somewhat subdued. Worryingly, banks' credit ratings have continued to decline post-crisis, and price-to-book ratios still typically languish below 1. In the past year, insurance companies did not fare much better. In EMEs, with their generally more buoyant credit conditions, the banking picture looked stronger. That said, it deteriorated where financial cycles had turned.

Financial markets alternated phases of uneasy calm and turbulence (Chapter II). The proximate cause of the turbulence was anxiety about EME growth prospects, especially China's. A first bout of anxiety took hold in the third quarter and, after markets had regained their composure, a second appeared in early 2016 – one of the worst January sell-offs on record. This was followed by a briefer, if more intense, turbulent phase in February, when banks found themselves at the centre of the storm. Triggers included disappointing earnings announcements, regulatory uncertainty concerning the treatment of contingent convertible securities (CoCos) and, above all, worries about banks' profits linked to expectations of persistently lower interest rates following central bank moves. Thereafter, markets stabilised, notably boosting asset prices and capital flows to EMEs once more.

The alternation of calm and turbulence left a clear imprint on financial markets. By the end of the period, most equity markets were down even as price/earnings ratios remained rather high by historical standards. Credit spreads were considerably higher, especially in the energy sector and in many commodity-exporting countries. The US dollar had appreciated against most currencies. And long-term yields were plumbing new depths.

Against this backdrop, the room for macroeconomic policy manoeuvre narrowed further – the third element of the risky trinity. This applies most obviously to monetary policy (Chapter IV). True, the Federal Reserve began to raise the policy rate after having kept it effectively at zero for seven years. But it subsequently signalled that it would tighten more gradually than originally planned. At the same time, monetary policy eased further in other key jurisdictions through both lower interest rates and a further expansion in central bank balance sheets. The reduction in room for manoeuvre also applies to some extent to fiscal policy (Chapters III and V). With the fiscal stance in advanced economies turning, on balance, more neutral or supportive of economic activity in the short term, the process of long-term consolidation paused. In the meantime, fiscal positions weakened substantially in EMEs, especially commodity exporters.

The global economy: interpretation and risks

It is tempting to look at the global economy over time as a set of unrelated frames – or, in economists' parlance, as a series of unexpected shocks that buffet it about. But a more revealing approach may be to look at it as a movie, with clearly related scenes. As the plot unfolds, the players find that what they did in the early part of the movie inevitably constrains what they can reasonably do next – sometimes in ways they had not anticipated. Again, in economists' parlance, it is not just "shocks" but "stocks" – the underlying circumstances that have evolved – that matter. This suggested perspective may help to explain not only how we got here, but also what the future might have in store.[1] It is worth briefly reviewing the key features of the movie.

Interpretation: a movie

As argued in previous Annual Reports, the movie that best describes the current predicament of the global economy probably started many years back, even before the crisis struck. And, in many respects, we may not yet have stepped out of the long shadow of the crisis.

The crisis appears to have permanently reduced the *level* of output. Empirical evidence increasingly indicates that growth following financial crises may recover its previous long-term trend, but the output level typically does not. So, a permanent gap opens up between the pre-crisis and post-crisis trend of the output level (Chapter V). On this basis, given the almost unprecedented breadth and depth of the recent crisis, it would be unrealistic to think that output could regain its pre-crisis trend. Hence the persistent disappointing outcomes and gradual ratcheting down of *potential* output estimates.

All this would imply that, at least for a while, the crisis reduced the *growth* of potential output. The persistent and otherwise puzzling slowdown in productivity growth is consistent with this. There are many candidate explanations for the mechanisms at work. But a possibly underappreciated one is the legacy of the preceding outsize financial boom (Chapter III). Recent BIS research covering more than 20 advanced economies and 40 years suggests three conclusions: financial booms can undermine productivity growth as they occur; a good chunk of the erosion typically reflects the shift of labour to sectors with lower productivity

[1] See J Caruana, "Credit, commodities and currencies", speech at the London School of Economics, 5 February 2016; and C Borio, "The movie plays on: a lens for viewing the global economy", speech at the FT Debt Capital Markets Outlook, London, 10 February 2016.

growth; and, importantly, the impact of the misallocations that occur *during a boom* appears to be much larger and more persistent once a crisis follows.

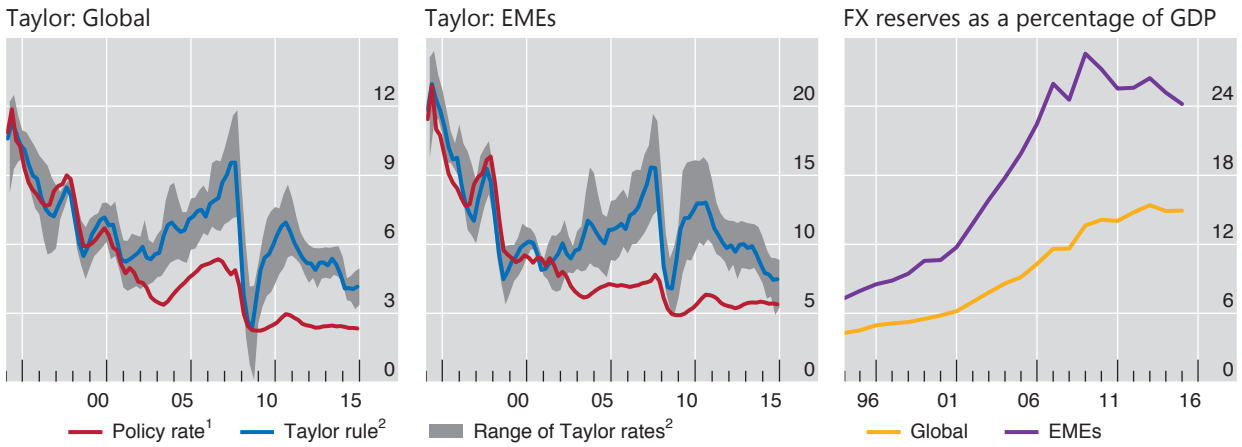
The corresponding effects on productivity growth can be substantial. Taking, say, a five-year boom and five post-crisis years together, the cumulative impact would amount to a loss of some 4 percentage points. Put differently, for the period 2008–13, the loss could equal about 0.5 percentage points per year for the advanced economies that saw a boom and bust. This roughly corresponds to their *actual* average productivity growth during the same window. The results suggest that, in addition to the well known debilitating effects of deficient aggregate demand, the impact of financial booms and busts on the *supply* side of the economy cannot be ignored.

In this movie, the policy response successfully stabilised the economy during the crisis, but as events unfolded, and the recovery proved weaker than expected, it was not sufficiently balanced. It paid too little attention to balance sheet repair and structural measures relative to traditional aggregate demand measures. In particular, monetary policy took the brunt of the burden even as its effectiveness was seriously challenged. After all, an impaired financial system made it harder for easing to gain traction, overindebted private sector agents retrenched, and monetary policy could do little to facilitate the needed rebalancing in the allocation of resources. As the authorities pushed harder on the accelerator, the room for manoeuvre progressively narrowed.

This had broader implications globally. For one, with domestic monetary policy channels seemingly becoming less effective, the exchange rate rose in prominence by default (Chapter IV). And resistance to unwelcome currency appreciation elsewhere helped spread exceptionally easy monetary conditions to the rest of the world, as traditional benchmarks attest (Graph I.4): easing induced easing. In addition, the exceptionally easy monetary stance in the countries with international currencies, especially the United States, directly boosted credit expansion elsewhere. From 2009

Unusually accommodative global monetary conditions

In per cent — Graph I.4



[1] Weighted averages based on 2005 GDP and PPP exchange rates. [2] Taylor rates are calculated as $i = r^* + \pi^* + 1.5(\pi - \pi^*) + 0.5y$, where π is inflation, y the output gap, π^* the inflation target and r^* the long-run real interest rate, here proxied by real trend output growth. Ranges are based on a variety of inflation/output gap combinations. π^* is set equal to the official inflation target/objective, and otherwise to the sample average or trend.

Sources: B Hofmann and B Bogdanova, "Taylor rules and monetary policy: a global 'Great Deviation'?", *BIS Quarterly Review*, September 2012, pp 37–49; IMF, *International Financial Statistics* and *World Economic Outlook*; Bloomberg; CEIC; Consensus Economics; Datastream; national data; BIS calculations.

to the third quarter of 2015, US dollar-denominated credit to non-banks outside the United States increased by more than 50%, to about $9.8 trillion; and to non-banks in EMEs, it doubled to some $3.3 trillion. Global liquidity surged as financing conditions in international markets eased (Chapter III).

In sum, we witnessed a rotation in financial booms and busts around the world after the crisis. The private sector in the advanced economies at the heart of the crisis slowly started to deleverage; elsewhere, especially but not only in EMEs, the private sector accelerated the pace of releveraging as it left behind the memory of the 1997–98 Asian crisis. Signs of unsustainable financial booms began to appear in EMEs in the form of strong increases in credit and property prices and, as in previous episodes, foreign currency borrowing. Currency appreciations failed to arrest the tide. In fact, as BIS research suggests, they may have even encouraged risk-taking, as they seemingly strengthened the balance sheet of foreign currency borrowers and induced lenders to grant more credit (the "risk-taking channel") (Chapters III and IV).

Crucially, the prices of commodities, especially oil, reinforced these developments – hence all the talk about a commodity "supercycle" (Chapter III). On the one hand, the strong growth of more energy-intensive EMEs drove prices higher. China, the marginal buyer of a wide swathe of commodities, played an outsize role as it embarked on a major fiscal and credit-fuelled expansion after the crisis, thereby reversing the sharp, crisis-induced drop in prices and giving the commodity boom a new lease of life. On the other hand, easy monetary and financial conditions boosted commodity prices further. And as prices soared, they reinforced the financial booms and easy external liquidity conditions for many commodity producers. The mutually reinforcing feedback gained momentum.

What we have been witnessing over the past year may be the beginning of a major, inevitable and needed realignment in which these various elements reverse course. Domestic financial cycles have been maturing or turning in a number of EMEs, not least China, and their growth has slowed. Commodity prices have fallen. More specifically, a combination of weaker consumption and more ample production has put further pressure on the oil price. In addition, actual and expected US monetary policy tightening against the backdrop of continued easing elsewhere has supported US dollar appreciation. This in turn has tightened financing conditions for those that borrowed heavily in the currency (Chapter III).

We have also seen that this realignment is neither smooth nor steady. Rather, it slows or accelerates as market expectations change. Indeed, since the financial market turbulence in early 2016, oil prices have recovered and the US dollar has lost some of the ground gained earlier. In some cases, these market shifts reflect shocks of a more political nature, such as uncertainties around the UK referendum on continued EU membership. But mostly they are in response to the same underlying forces that have been shaping the global economy for a long time: shifting expectations of monetary policy, the evolution of borrowing costs in major currencies, and further credit-fuelled stimulus in China. In the end, it is the stocks, and far less the shocks, that are driving the global adjustment.

Two factors stand out in this narrative: *debt* and the *cumulative impact of past decisions*.

Debt can help better explain what would otherwise appear as independent bolts from the blue (Chapter III). First, it sheds light on the EMEs' slowdown and on global growth patterns. Debt is at the heart of domestic financial cycles and of the tightening of financing conditions linked to foreign currency borrowing. This is most evident for commodity producers, especially oil exporters, who have seen their revenues and collateral strength collapse – hence the large holes in fiscal accounts and big investment cuts. And debt may be one reason why the boost to

consumption in oil-importing countries has been disappointing: households have been shoring up their balance sheets.

Second, debt provides clues about the currency movements in the past year and their impact on output. Foreign currency debt reinforces the pressure on domestic currencies to depreciate and hence on the funding currency, largely the US dollar, to appreciate. Chinese companies' sizeable repayments of US dollar debt are an obvious example. And empirical evidence suggests that high foreign currency debt weakens, and may even completely offset, the expansionary trade effect of depreciations (Chapter III).

Third, debt hints at one reason for the oil price weakness beyond the influence of more familiar factors. During the recent commodity boom, oil and gas companies borrowed heavily on the back of unusually easy financing conditions. Their bonds outstanding increased from $455 billion in 2006 to $1.4 trillion in 2014, or by 15% per year; and their syndicated loans rose from $600 billion to $1.6 trillion, 13% per year. Shale producers and EME state-owned oil companies accounted for much of the borrowing. As their financial condition deteriorated, they came under pressure to keep the spigots open to meet their debt service burdens and to hedge even more their dwindling revenues.

Finally, debt may even shed light on the puzzling slowdown in productivity growth. When used wisely, credit is a powerful driver of healthy economic growth. But as the previous evidence indicates, unchecked credit booms can be part of the problem and leave a long shadow after the bust, sapping productivity growth. In addition, debt overhangs depress investment, which weakens productivity further. In turn, weaker productivity makes it harder to sustain debt burdens, closing the loop.

The *cumulative impact of past decisions* is behind the narrowing room for policy manoeuvre. At any given time, the reduced set of options and political constraints make it tempting to seek to solve the problems by boosting aggregate demand regardless of means and circumstances. But untailored measures may risk wasting ammunition and fail to address the obstacles that hold back growth. If so, over time policy choices become increasingly constrained. And when tomorrow eventually becomes today, one may discover that short-term gains have brought long-term pain and worsened policy trade-offs. We return to this issue below.

Secular stagnation – or financial booms gone wrong?

This possible interpretation of the post-crisis global growth slowdown differs in key respects from one that has been gaining currency – secular stagnation. It suggests rather that the world is better regarded as having suffered a series of financial booms gone wrong. Consider, admittedly in a very stylised form, the main differences in the two views.

The most popular variant of the secular stagnation hypothesis posits that the world has been haunted by a structural deficiency in aggregate demand. This deficiency predates the crisis and is driven by a range of deep-seated factors, including population ageing, unequal income distribution and technological advances. In this view, the pre-crisis financial boom was the price to pay for having the economy run at potential. The key symptom of the malaise is the decline in real interest rates, short and long, which points to endemic disinflationary pressures.

In the hypothesis proposed here, the world has been haunted by an inability to restrain financial booms that, once gone wrong, cause long-lasting damage. The outsize and unsustainable financial boom that preceded the crisis masked and exacerbated the decline in productivity growth. And rather than being the price to pay for satisfactory economic performance, the boom contributed, at least in part, to its deterioration, both directly and owing to the subsequent policy response. The

key symptom of the malaise is the decline in real interest rates, short and long, alongside renewed signs of growing financial imbalances.

As discussed in detail in last year's Annual Report, the interpretation of exceptionally and persistently low interest rates is indeed critical. According to the secular stagnation view and prevailing perspectives more generally, these rates are a long-run equilibrium phenomenon – they are necessary to fill a global shortfall in demand that existed even before the crisis. In that view, the behaviour of inflation provides the key signal. According to the view proposed here, interest rates cannot be fully at equilibrium if they contribute to financial imbalances that, at some point, will cause serious economic damage. Likewise, inflation is a highly imperfect gauge of sustainable economic expansions, as became evident pre-crisis. This would especially be expected in a highly globalised world in which competitive forces and technology have eroded the pricing power of both producers and labour and have made the wage-price spirals of the past much less likely.

Adjudicating between these two hypotheses is exceedingly hard. One might make several points against the secular stagnation hypothesis, initially developed for the United States. It is not easily reconciled with that country's large, pre-crisis current account deficit – indicating that *domestic* demand actually *exceeded* output. The world in those years was seeing record growth rates and record low unemployment rates – not a sign of *global* demand shortfalls. Ageing populations also affect supply, not just demand – hence the prospect of lower growth unless productivity growth is raised. Finally, the decline in unemployment rates, in many cases to levels close to historical norms or estimates of full employment, is seemingly more indicative of supply constraints than of demand shortfalls.

But counterfactuals mean that empirical evidence cannot be conclusive, leaving the door open to contrasting interpretations. In this Report, we present several pieces of evidence consistent with the importance of financial booms and busts. We find that financial cycle proxies can help provide estimates of potential output and output gaps in real time – as events unfold – that are more accurate than those commonly used in policymaking based on traditional macroeconomic models and inflation (Chapter V). This finding dovetails with the well known weak empirical link between inflation and measures of domestic slack as well as with the previous evidence on the impact of credit booms on productivity growth. In Chapter IV, we also find that international supply chains can be a powerful mechanism through which global factors impinge on domestic inflation, regardless of domestic capacity constraints. And we find that variants of such financial cycle measures can help tease out estimates of equilibrium interest rates that are higher than commonly thought.

Importantly, *all* estimates of long-run equilibrium interest rates, be they short or long rates, are inevitably based on some implicit view about how the economy works. Simple historical averages assume that over the relevant period the prevailing interest rate is the "right" one. Those based on inflation assume that it is inflation that provides the key signal; those based on financial cycle indicators – as ours largely are – posit that it is financial variables that matter. The methodologies may differ in terms of the balance between allowing the data to drive the results and using a priori restrictions – weaker restrictions may provide more confidence. But invariably the resulting uncertainty is very high.

This uncertainty suggests that it might be imprudent to rely heavily on market signals as the basis for judgments about equilibrium and sustainability. There is no guarantee that over any period of time the joint behaviour of central banks, governments and market participants will result in market interest rates that are set at the right level, ie that are consistent with sustainable good economic performance (Chapter II). After all, given the huge uncertainty involved, how confident can we

be that the long-term outcome will be the desirable one? Might not interest rates, just like any other asset price, be misaligned for very long periods? Only time and events will tell.

Risks

The previous analysis points to a number of risks linked to the interaction between financial developments and the macroeconomy.

The first risk concerns the possible macroeconomic dislocations arising from the combination of two factors: tightening global liquidity and maturing domestic financial cycles. It is as if two waves with different frequencies merged to form a more powerful one. Signs that this process was taking hold appeared in the second half of 2015, when foreign currency borrowing peaked and conditions tightened for some borrowers, especially among commodity producers. After the turbulence at the beginning of 2016, however, external financial conditions generally eased, also taking the pressure off the turn in domestic financial cycles. And in China, the authorities provided yet another boost to total credit expansion in an attempt to stave off a drastic turn and smooth out the needed economic rebalancing towards domestic demand and services. As a result, tensions in EMEs have diminished, although the underlying vulnerabilities remain. Events often unfold in slow motion for a long time and then suddenly accelerate.

Since past crises, EMEs have taken strides to strengthen their economies and make them more resilient to external influences. Their macroeconomic frameworks are sounder; their financial infrastructures and regulatory arrangements are stronger; and flexible exchange rates coupled with large foreign exchange war chests enhance the room for policy manoeuvre. For instance, despite the worst recession on record, Brazil has not yet had an external crisis, in part thanks to its extensive use of foreign exchange reserves to insulate the corporate sector from losses. In addition, at least so far, the increase in loan losses has been contained. More generally, EMEs' foreign currency debt as a share of GDP is smaller than it was before previous financial crises.

Even so, prudence is called for. In some of these economies, the increase in domestic debt has been substantial and well beyond historical norms. The corporate sector has been very prominent, and it is there that the surge in foreign currency debt has concentrated even as profitability has declined to levels below those in advanced economies, notably in the commodities sector (Chapter III). While the reduction in that debt appears to have begun, most notably in China, poor data on currency mismatches make it hard to assess vulnerabilities. The growth of new market players, especially asset managers, could complicate the policy response to strains by changing the dynamics of distress and testing central banks' ability to provide liquidity support. In addition, EMEs' greater heft and tighter integration in the global economy indicate that the impact of any strains on the rest of the world would be bigger than in the past, through both financial and trade channels (Chapter III).

The second risk concerns the *persistence* of exceptionally low interest rates, increasingly negative even in nominal terms and in some cases even lower than what central banks expected. This risk has a long fuse, with the damage less immediately apparent and growing gradually over time. Such rates tend to depress risk premia and stretch asset valuations, making them more vulnerable to a reversal by encouraging financial risk-taking and raising their sensitivity to disappointing economic news (snapback risk) (Chapter II). They sap the strength of the financial system by eroding banks' net interest margins, raising insurance companies' return mismatches and greatly boosting the value of pension fund liabilities (Chapter VI).

And over time they can have a debilitating impact on the real economy. This effect occurs through the channels just discussed, including by weakening banks' lending capacity. But it also arises by encouraging the further build-up in debt and by no longer steering scarce resources to their most productive uses. In effect, the longer such exceptional conditions persist, the harder exit becomes. Negative *nominal* rates raise uncertainty further, especially when they reflect policy choices (see below).

The third risk concerns a loss of confidence in policymakers. The more time wears on, the more the gap between the public's expectations and reality weighs on their reputation. A case in point is monetary policy, which has been left to shoulder an overwhelming part of the burden of getting economies back on track. Once the crisis broke out, monetary policy proved essential in stabilising the financial system and in preventing it from causing a bigger collapse in economic activity. But despite extraordinary and prolonged measures, monetary policymakers have found it harder to push inflation back in line with objectives and to avoid disappointing gains in output. In the process, financial markets have grown increasingly dependent on central banks' support and the room for policy manoeuvre has narrowed. Should this situation be stretched to the point of shaking public confidence in policymaking, the consequences for financial markets and the economy could be serious. Worryingly, we saw the first real signs of this happening during the market turbulence in February.

The global economy: policy

The previous analysis contains useful clues about policy. Some relate to what policy should do now, not least an urgent rebalancing away from the excessive burden placed on monetary policy. Others relate to the frameworks' architecture. It may be helpful to take them in reverse order, so that one does not lose sight of the final destination when embarking on the journey.

Towards a macro-financial stability framework

The destination is a set of arrangements that systematically incorporate financial stability considerations into traditional macroeconomic analysis – what in the past we have termed a "macro-financial stability framework".[2] The framework is intended to more effectively tackle the financial booms and busts that cause so much economic damage. At a minimum, it would encompass prudential, monetary and fiscal policies with strong support from structural measures. Its key operational feature is that authorities would lean more deliberately against financial booms and less aggressively and, above all, less persistently against financial busts.

This more symmetrical policy over financial cycles could help moderate them and avoid the progressive loss of policy room that is arguably a serious shortcoming of current arrangements. One symptom of that loss is the relentless increase in the debt-to-GDP ratio, both private and public. Another is exceptionally low policy rates. While part of their decline in real terms surely reflects secular factors beyond policymakers' control, part probably also reflects policymakers' asymmetrical response, which can contribute to the build-up of financial imbalances and to their long-term costs for output and productivity. This raises the risk of a debt trap, whereby, as debt increases, it becomes harder to raise rates without causing damage.

[2] For the first use of the term, see the *75th Annual Report*. For a previous elaboration of some of the framework's features, see Chapter I in the *84th* and *85th Annual Reports*.

And it means that, *over sufficiently long horizons*, low interest rates become to some extent self-validating. Low rates in the past help shape the economic environment policymakers take as given when tomorrow becomes today. In this sense, low rates beget lower rates (see below).

How much progress has been made in prudential, fiscal and monetary policies?

Prudential policy

Prudential policy has made the biggest strides. The strategy has been to build arrangements with a strong systemic (macroprudential) orientation based on solid foundations. With the support of the international community, national authorities over the past year have taken further steps to set up or implement macroprudential frameworks designed mainly to strengthen resilience and to restrain the build-up of financial imbalances. While this is still a work in progress, the direction is clearly set.

In bank regulation, a priority in the current year is to finalise the Basel III framework. In doing so, it will be critical to ensure that the level of capital is commensurate with the underlying risks. As recent BIS research confirms, the public debate tends to underestimate the benefits of capital as the very foundation of lending and to overestimate its costs (Chapter VI). Across banks, higher capital goes hand in hand with lower funding costs and higher lending. Stronger banks lend more.

A question that has come to the fore in the period under review is the link between regulatory reforms and market liquidity (Chapters II and VI). In the past couple of years, sharp moves in the prices of the most liquid sovereign bonds in the world – US Treasuries and German bunds – have heightened concerns about the fragility of liquidity conditions. More generally, signs of lower secondary market liquidity in a number of fixed income markets and of smaller broker-dealer inventories have been linked to regulation-induced balance sheet costs and other restrictions. Evidence that financial institutions may be less willing than in the past to commit their balance sheets to the arbitraging of asset pricing relationships has pointed in the same direction (Chapter II).

Such claims must be assessed in a broad context, as changes in market liquidity dynamics have many sources. In the case of fixed income markets, for instance, the spread of electronic trading platforms and of algorithmic and high-frequency trading has played a key role. Likewise, the growth of the asset management industry has probably increased the net demand for liquidity services. And since the crisis, banks' management and shareholders have taken a much more critical view of the risk-return trade-off in the trading business. Even more importantly, liquidity was grossly underpriced pre-crisis, contributing to its evaporation under stress – such gross underpricing is a problem we definitely do not want to revive. The best structural safeguard against fair-weather liquidity and its damaging power is to avoid the illusion of permanent market liquidity and to improve the resilience of financial institutions. Stronger capital and liquidity standards are not part of the problem but an essential part of the solution. Stronger market-makers mean more robust market liquidity.

Fiscal policy

Fiscal policy is a critical missing element in a macro-financial stability framework. Financial stability generally, and financial cycles in particular, have hardly featured in fiscal policy design, whether for short-term macroeconomic objectives or long-term sustainability. Yet history indicates that financial crises can wreak havoc with fiscal positions; conversely, the design of fiscal policy can have a substantial impact on financial stability. And one should not underestimate the risk of a doom loop,

whereby weaknesses in public and private sector balance sheets feed into each other. That is why we devote a whole chapter to these issues (Chapter V).

Protecting the sovereign from financial stability risks requires that they be properly identified and mapped into fiscal positions. By hugely flattering the fiscal accounts, financial booms have all too often lulled the authorities into a false sense of security. Outsize and unsustainable booms artificially boost estimates of potential output, growth and sustainable tax revenues and mask the contingent liabilities linked with the public funds needed to support financial repair once a crisis erupts. We suggest ways in which better estimates of underlying fiscal positions can be produced and included in broader assessments of fiscal space.

Conversely, protecting the financial system from the sovereign has several dimensions. One is how to treat sovereign risks in prudential regulation and supervision. A critical issue is the treatment of credit risk, which is under revision in the Basel III framework. The paramount principle is that the prudential standard should be commensurate with the risk. This would also limit the danger of unlevelling the playing field between the private and public sectors, further weakening the growth engine. But the devil is in the details, and the sovereign poses multifaceted risks that give rise to trade-offs. For instance, the sovereign's ability to "print money" reduces, although does not eliminate, credit risk. But it may do so at the expense of inflation risk and, hence, interest rate and market risk. The balance sheet of the sovereign underpins an economy's soundness. One can run, but one cannot hide. Ultimately, there is no substitute for a sound fiscal position with enough policy space to avoid macroeconomic instability and support the financial system if the need arises.

One can then go a step further and think about how best to use fiscal policy more actively to mitigate financial stability risks. One possibility is to make it more countercyclical with respect to the financial cycle. Another, more structural approach is to reduce implicit guarantees, which may encourage risk-taking. Yet another is to use the tax code to restrict or eliminate the bias of debt over equity or to attenuate financial cycles (eg through time-varying taxes in the property market). Each of these complementary options raises well known and tricky implementation challenges. Some options have already been used. They all deserve further in-depth consideration.

Monetary policy

Monetary policy is at a crossroads. On the one hand, there is a growing recognition that it can contribute to financial instability by fuelling financial booms and risk-taking and that price stability does not guarantee financial stability. On the other hand, there is a reluctance to have it play a prominent role in preventing financial instability. The prevailing view is that it should be activated only if prudential policy – the first line of defence – does not prove up to the task. The development of macroprudential frameworks has provided an additional reason to adhere to this sort of "separation principle".

As we have in previous Annual Reports, we argue for a more prominent monetary policy role. It would be imprudent to rely exclusively on (macro)prudential measures. Financial cycles are too powerful – witness signs of a build-up of financial imbalances in a number of EMEs that have actively deployed such measures. And there is a certain tension in pressing on the accelerator and the brake at the same time, as policymakers would do if they, say, cut interest rates and simultaneously sought to offset their impact on financial stability by tightening prudential requirements. True, the relative reliance on monetary and macroprudential measures must depend on circumstances and country-specific features, not least the exchange rate and capital flows (Chapter IV). But the two sets of tools arguably

work best when they operate in the same direction. At a minimum, therefore, monetary frameworks should allow for the possibility of tightening policy even if near-term inflation appears under control.

This year we explore this reasoning further by considering in more detail the trade-offs involved in such a strategy (Chapter IV). Under what conditions do the costs of using monetary policy to lean against financial imbalances outweigh the benefits? The answer is not straightforward. But we suggest that some of the standard analyses may underestimate the potential benefits by underestimating the costs of financial instability and the capacity of monetary policy to influence it. In addition, there is a certain tendency to interpret "leaning" too narrowly. Accordingly, the central bank follows a "normal" inflation-oriented strategy most of the time and deviates from it only once signs of financial imbalances become evident. This raises the risk of doing too little too late or, worse, of being seen as precipitating the very outcome one is trying to avoid.

It may be more useful to think of a financial stability-oriented monetary policy as one that takes financial developments *systematically* into account during both good *and* bad times. The objective would be to keep the financial side of the economy on an even keel. Some preliminary findings suggest that by augmenting a standard policy rule with simple financial cycle proxies, it may be possible to mitigate financial booms and busts, with considerable long-run output gains. Such a strategy could also limit the decline in the long-run equilibrium or natural rate of interest – the "low rates beget lower rates" phenomenon.

Of course, the issues raise daunting analytical challenges. These findings are subject to a number of caveats and represent just one contribution to the debate. They do suggest, though, that it may be imprudent to implement a selective leaning policy. They also point to frameworks that allow sufficient flexibility not just when financial imbalances are well advanced but throughout the financial cycle, during both booms and busts. And they highlight how current decisions can constrain future policy options.

What to do now?

Our analysis suggests that different policies could have taken us to a better place. Trade-offs have deteriorated and policy options have narrowed. What, then, could be done now?

A key priority is to rebalance the policy mix away from monetary policy – a need the international policy community has now fully recognised. In doing so, though, it is essential to focus not only on the near-term issues but above all on the longer-term ones. But how? Consider, in turn, prudential, fiscal, monetary and structural policies.

For prudential policy the priority, in addition to completing the reforms, is twofold, depending on countries' specific circumstances. In crisis-hit countries, it is essential to finalise banks' balance sheet repair, which is still lagging in a number of jurisdictions, and restore the basis for sustained profitability. To maximise banks' internal resources, where appropriate, restrictions on dividend payments should not be ruled out. Critically, the process may require the support of fiscal policy as the public sector balance sheet is brought to bear on bank resolutions. Ensuring that banks have pristine balance sheets and are well capitalised is the best way to relieve pressure on other policies and improve their traction. Moreover, restoring the banking sector's long-term profitability also calls for eliminating excess capacity, a process for which tight supervision can be the catalyst.

In non-crisis-hit countries, where financial booms are more advanced or have turned, it is essential to strengthen defences against possible financial strains. The

authorities should continue to actively rely on macroprudential tools. And they should intensify supervisory vigilance to quickly identify and resolve any deterioration in asset quality.

For fiscal policy, the priority is to help strengthen the foundations for sustainable growth, avoiding destabilising debt dynamics. One mechanism is to improve the *quality* of public spending, which is already close to record highs in relation to GDP in many countries, notably by shifting the balance away from current transfers towards investment in both physical and human capital. A second mechanism is to support balance sheet repair. A third is to use fiscal space to complement structural reforms. A fourth is to judiciously carry out infrastructure investments, where needed and provided proper governance is in place. A final, key step is to reduce tax code distortions, including the bias towards debt.

In the process, it is important not to overestimate fiscal space. The long-term commitments linked to an ageing society loom large. Debt is generally at an all-time high in relation to income. And the additional buffers needed for financial stability risks can be sizeable (Chapter V). In some countries, the collapse of commodity prices has already revealed the lack of policy room; and in those where unsustainable financial booms are under way, this room may appear deceptively large. The prevailing exceptionally low interest rates should not be taken as a reliable guide to long-term decisions. They provide breathing space, but they will have to return to more normal levels. The risk of having monetary policy become subordinated to fiscal policy ("fiscal dominance") is very real.

For monetary policy, the key is to rebalance the evaluation of risks in the current global stance. The exceptionally accommodative policies in place are reaching their limits. The balance between benefits and costs has been deteriorating (Chapter IV). In some cases, market participants have begun to question whether further easing can be effective, not least as its impact on confidence is increasingly uncertain. Individual incremental steps become less compelling once the growing distance from normality comes into focus. Hence, accumulated risks and the need to regain monetary space could be assigned greater weight in policy decisions. In practice, and with due regard to country-specific circumstances, this means seizing available opportunities by paying greater attention to the costs of extreme policy settings and to the risks of normalising too late and too gradually. This is especially important for large jurisdictions with international currencies, as they set the tone for monetary policy in the rest of the world.

Such a policy shift relies on a number of prerequisites. First: a more critical evaluation of what monetary policy can credibly do. Second: full use of the flexibility in current frameworks to allow temporary but possibly persistent deviations of inflation from targets, depending on the factors behind the shortfall. Third: recognising the risk of overestimating both the costs of mildly falling prices and the likelihood of destabilising downward spirals. Fourth: a firm and steady hand – after so many years of exceptional accommodation and growing financial market dependence on central banks, the road ahead is bound to be bumpy. Last: a communication strategy that is consistent with the above and thus avoids the risk of talking down the economy. Given the road already travelled, the challenges involved are great, but they are not insurmountable.

The need to rebalance the policy mix puts a greater onus on structural policies. Their implementation, of course, faces serious political economy obstacles. In addition, they do not necessarily yield near-term results, although this depends on the specific measures and their impact on confidence. But they provide the surest way of removing impediments to growth, unlocking economies' potential and strengthening their resilience.

Unfortunately, in this area the gap between needs and achievements is especially large. The importance of structural policies has been clearly recognised – witness their salience in G20 deliberations. And so has the need to tailor them to country-specific conditions, beyond the familiar calls for flexibility in goods and labour markets and for fostering entrepreneurship and innovation. Yet the record on implementation so far has been very disappointing, with countries falling far short of their plans and aspirations. Redoubling efforts is essential.

In defence of central banking

The stakes in the required policy rebalancing are high – for the global economy, for market participants and governments, and, not least, for central banks. From its faltering initial steps in the 17th century, central banking has become indispensable to macroeconomic and financial stability. Its performance at the height of the crisis proved this once more. Independence, underpinned by transparency and accountability, allowed central banks to act with the determination needed to put the global economy back on the recovery path.

And yet the extraordinary burden placed on central banking since the crisis is generating growing strains. During the Great Moderation, markets and the public at large came to see central banks as all-powerful. Post-crisis, they have come to expect the central bank to manage the economy, restore full employment, ensure strong growth, preserve price stability and foolproof the financial system. But in fact, this is a tall order on which the central bank alone cannot deliver. The extraordinary measures taken to stimulate the global economy have sometimes tested the boundaries of the institution. As a consequence, risks to its reputation, perceived legitimacy and independence have been rising.

There is an urgent need to address these risks so that central banks can pursue monetary and financial stability effectively. A prerequisite is greater realism about what central banks can and cannot achieve. Without that, efforts are doomed to fail in the longer run. A complementary priority is safeguarding central banks' independence within a broader institutional framework that clearly distinguishes between the responsibilities of central banks and those of other policymakers. This has been fully recognised in the area of financial stability, hence the post-crisis stepped-up efforts to create structured arrangements to pursue this shared task. But it needs further thought in the area of traditional macroeconomic policy, where the line between monetary and fiscal measures has become increasingly blurred. Independence, backed by transparency and accountability, remains as critical as ever.

Conclusion

Judged by historical standards, the performance of the global economy in terms of output, employment and inflation has not been as weak as the rhetoric sometimes suggests. In fact, even the term "recovery" may not do full justice to its current state (Chapter III). But a shift to more robust, balanced and sustainable expansion is threatened by a "risky trinity": debt levels that are too high, productivity growth that is too low, and room for policy manoeuvre that is too narrow. The most conspicuous sign of this predicament is interest rates that continue to be persistently and exceptionally low and which, in fact, have fallen further in the period under review. The global economy cannot afford to rely any longer on the debt-fuelled growth model that has brought it to the current juncture.

A shift of gears requires an urgent rebalancing of the policy mix. Monetary policy has been overburdened for far too long. Prudential, fiscal and, above all, structural policies must come to the fore. In the process, however, it is essential to avoid the temptation to succumb to quick fixes or shortcuts. The measures must retain a firm long-run orientation. We need policies that we will not once again regret when the future becomes today.

II. Global financial markets: between uneasy calm and turbulence

In 2015 and 2016, financial markets experienced alternating phases of calm and turbulence. As in prior years, prices in core asset markets were keenly sensitive to monetary policy developments. Weaknesses in the main emerging market economies (EMEs), especially China, were again watched closely. Relative to a year earlier, by end-May 2016 equity prices were lower; credit spreads higher; the dollar had depreciated against most currencies; and bond yields were reaching new lows.

As bond yields fell to historical troughs in a number of countries, the share of outstanding government bonds trading at negative yields reached new records. Low yields reflected low term premia as well as a downward shift in expected future rates. In response, investors sought returns in riskier market segments, which supported asset prices. Standard metrics, such as nominal GDP growth in the case of bonds or historical price/earnings (P/E) ratios for equities, pointed to signs of overvaluation. Unease about such valuations, coupled with concerns about the global outlook for growth, resulted in recurring sell-offs and bouts of volatility. Markets appeared vulnerable to a sharp reversal of high valuations. Some outsize bond price movements point to changes in market liquidity, but lower leverage should support more robust liquidity under stress. At the same time, the persistence of low yields could worsen financial system weaknesses over the longer term, through a number of channels.

Persistent market anomalies spread further. Examples included a widening of the cross-currency basis and negative US dollar interest rate swap spreads. These anomalies partly reflected market-specific supply-demand imbalances, sometimes reinforced by central bank actions. They also resulted from shifts in the behaviour of large dealing institutions, which are now less active in arbitraging the anomalies away.

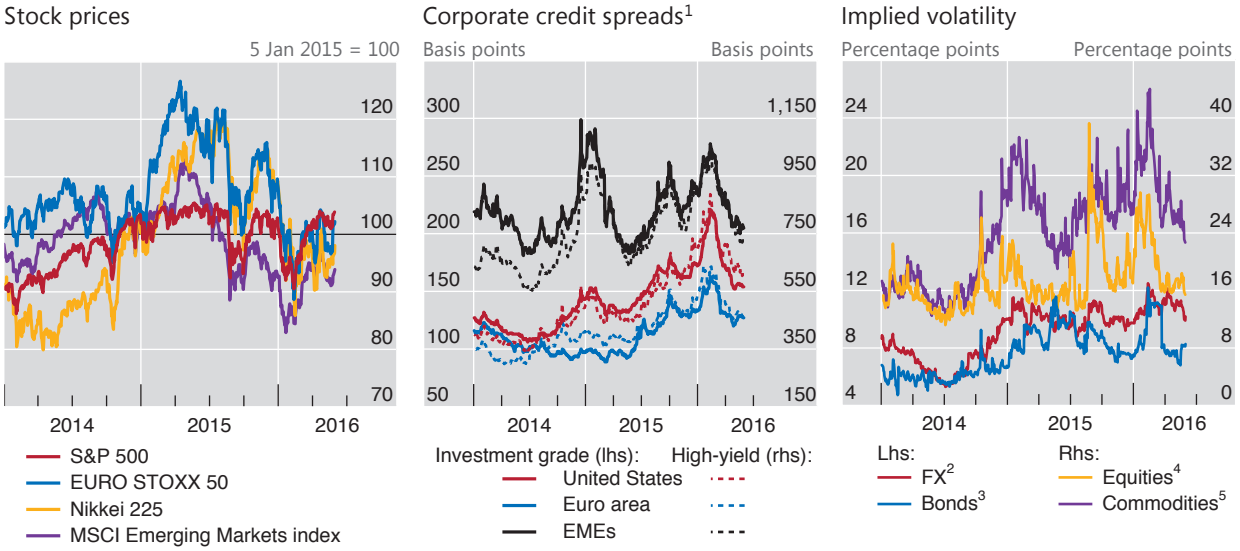
The first section reviews market developments during the past year. The second looks more closely at market valuations, with an emphasis on the role of very low nominal and real interest rates and market liquidity conditions in fixed income markets. The third explores the factors behind the emergence and persistence of certain market anomalies in recent years.

A year of alternating calm and turbulence

Markets experienced periodic bouts of turbulence in 2015 and the first half of 2016, which alternated with phases of uneasy calm. A common theme was the progressive downward revision to the global growth outlook, particularly for EMEs (Chapter III). As in previous years, markets were closely attuned to central bank decisions. But market participants' confidence in monetary policy's ability to steer the economy appeared to falter (Chapter IV). By May 2016, equity indices, commodity prices and advanced economy benchmark bond yields were below their levels of a year earlier, while both corporate and EME sovereign credit spreads were higher. Measures of volatility were stable or higher (Graph II.1). EME currencies, while recouping some of their losses, were in most cases weaker against the dollar compared with a year earlier.

Alternating calm and turbulence in markets

Graph II.1



[1] Option-adjusted spreads over government bonds. [2] JPMorgan VXY Global index, a turnover-weighted index of implied volatility (IV) of three-month at-the-money options on 23 USD currency pairs. [3] IV of at-the-money options on long-term bond futures of Germany, Japan, the United Kingdom and the United States; weighted average based on GDP and PPP exchange rates. [4] IV of S&P 500, EURO STOXX 50, FTSE 100 and Nikkei 225 indices; weighted average based on market capitalisation. [5] IV of at-the-money options on commodity futures contracts on oil, copper and gold; simple average.

Sources: Bank of America Merrill Lynch; Bloomberg; Datastream; BIS calculations.

The first episode of market turbulence started in the third quarter of 2015, when the growth prospects of a number of large advanced and emerging economies were downgraded. The spotlight shone especially brightly on China, which for several years had been seen as the global growth engine. A rapid rise in equity prices in the first half of the year, fuelled in part by heavy retail margin purchases, was reversed sharply over the summer (Graph II.2, left-hand panel). The Shanghai Shenzhen CSI 300 Index collapsed from a high of 5,354 on 8 June 2015 to 3,026 on 26 August, while the high-tech-oriented ChiNext board fell even more dramatically. In August, Chinese authorities altered their exchange rate mechanism, allowing the renminbi to depreciate sharply against the US dollar (centre panel). Such events shook confidence in China's ability to achieve a "soft landing" scenario after years of rapid credit-fuelled growth.

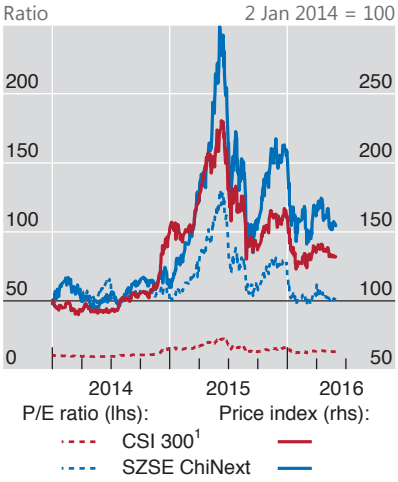
Concerns about China quickly spread to other economies and asset prices in August and early September. EME currencies weakened against the dollar (Graph II.2, right-hand panel) while the euro and yen strengthened. Equity prices plunged, particularly in EMEs (Graph II.1, left-hand panel). Credit spreads started to widen again (Graph II.1, centre panel). Volatility rose, especially for equities and commodities (Graph II.1, right-hand panel). The plunge in commodity prices weakened the economic prospects of commodity-exporting countries and of commodity-producing firms, some of them heavily leveraged and with a large weight in key equity and credit indices (Graph II.3).

Markets stabilised in October 2015, but in most cases did not recoup their summer losses. Continued strong data for the United States reinforced the expectation that the Federal Open Market Committee would at last tighten policy at its December meeting. The likelihood of divergent monetary policies between the United States, on the one hand, and the euro area and Japan, on the other, contributed to renewed dollar strength (Graph II.4). However, when the hike did

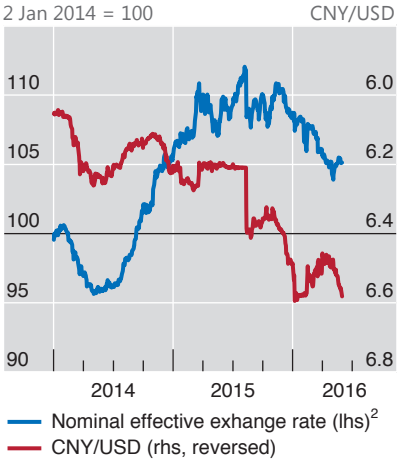
Chinese equities nosedive and renminbi depreciates

Graph II.2

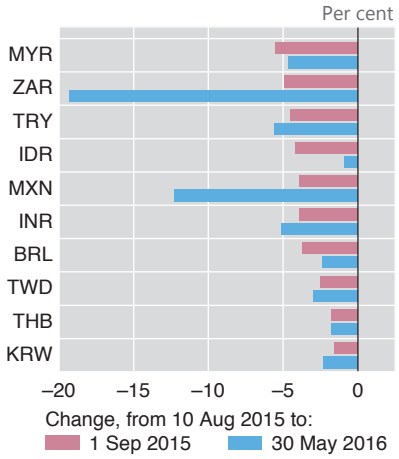
Stock market indices and valuations



Renminbi bilateral and effective exchange rates



EME exchange rate changes[3]



BRL = Brazilian real; IDR = Indonesian rupiah; INR = Indian rupee; KRW = Korean won; MXN = Mexican peso; MYR = Malaysian ringgit; THB = Thai baht; TRY =Turkish lira; TWD = New Taiwan dollar; ZAR = South African rand.

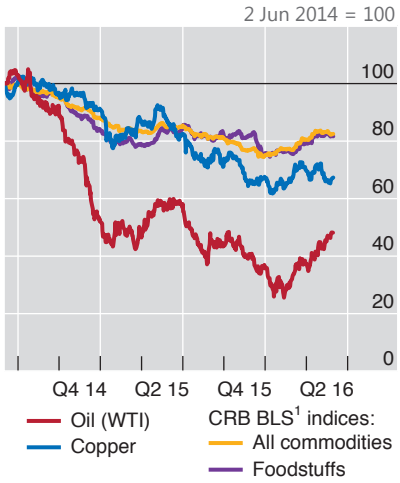
[1] Shanghai Shenzhen CSI 300 Index. [2] BIS nominal effective exchange rate broad index; a decline indicates a depreciation of the currency in trade-weighted terms. [3] US dollars per unit of local currency; a decline indicates a depreciation of the local currency.

Sources: Bloomberg; BIS; BIS calculations.

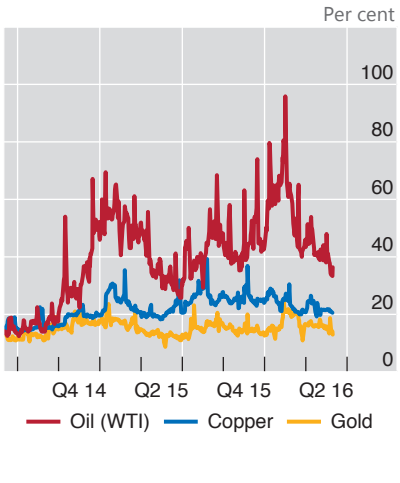
Commodity price rout continues and commodity producers suffer

Graph II.3

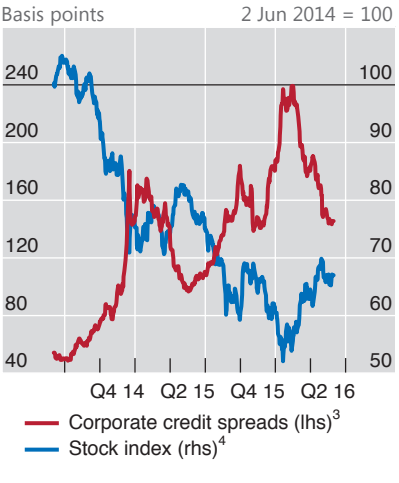
Commodity prices drop



Commodity implied volatility fluctuates[2]



Energy sector underperforms

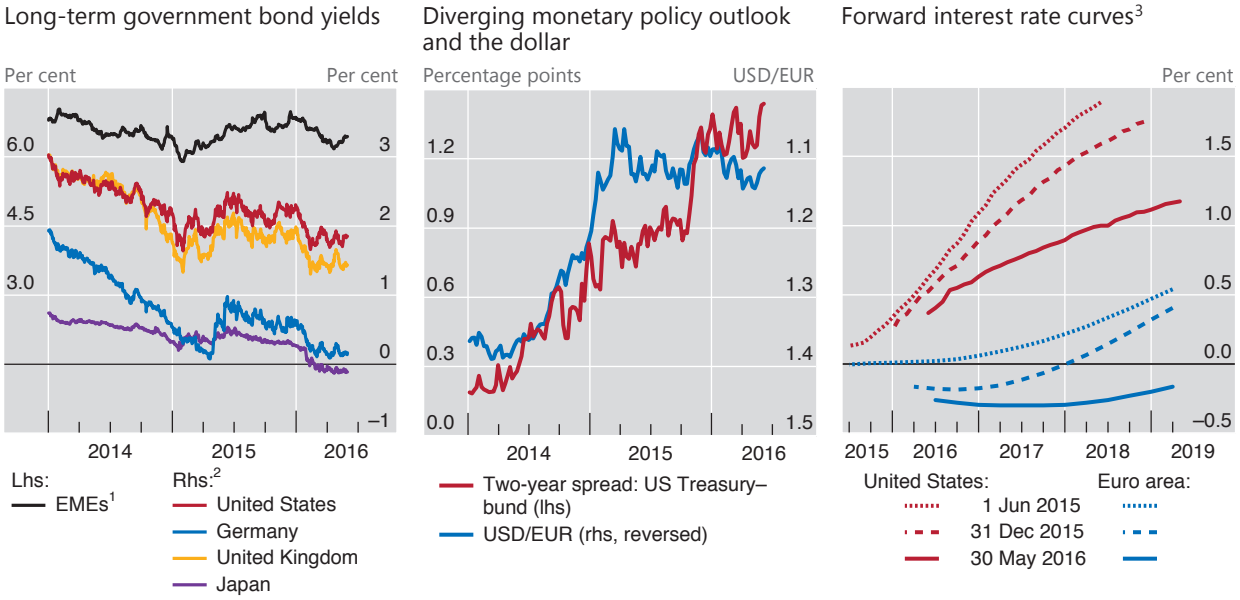


[1] Commodity Research Bureau – Bureau of Labor Statistics. [2] Implied volatility of at-the-money options on commodity futures contracts on oil, copper and gold. [3] Difference between the option-adjusted spreads of investment grade debt of energy sector corporates and the overall corporate sector; simple average of EMEs, the euro area and the United States. The EME energy sector index consists of both investment grade and high-yield debt. [4] Simple average of energy stock prices for EMEs and the euro area (MSCI equity indices), and the United States (S&P 500).

Sources: Bank of America Merrill Lynch; Bloomberg; Datastream.

Dollar stays strong as policy outlook continues to diverge

Graph II.4



[1] JPMorgan GBI-EM Broad Diversified Index, yield-to-maturity in local currency. [2] Ten-year government bond yields. [3] For the United States, 30-day federal funds rate futures; for the euro area, three-month Euribor futures.

Sources: Bloomberg; Datastream.

take place on 16 December, ending eight years of near zero nominal policy rates, markets took it in their stride, as the move had already been fully incorporated into expectations.

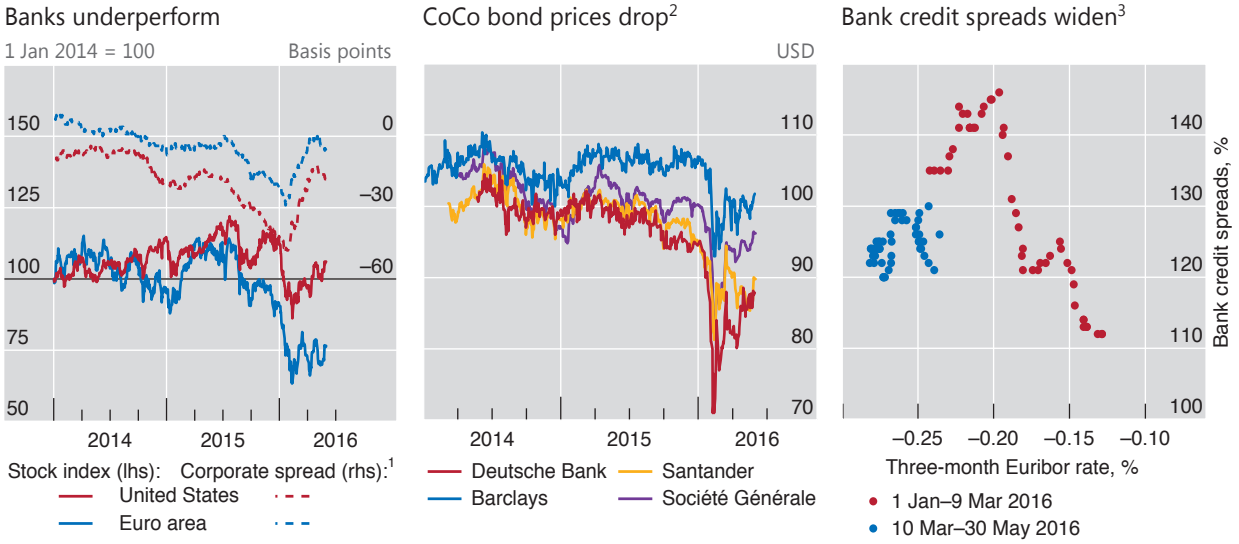
The new year nevertheless brought a second bout of turbulence. The triggering event was again economic news about China, as weak data signalled a sharper than anticipated growth slowdown. Moreover, the arrival of fresh data soon led to a downgrade in growth estimates for a number of other countries. From the start of the year to mid-February, commodity markets weakened, with oil prices falling below $30 per barrel, and major global equity indices dropping 10–20%. US high-yield spreads widened by almost 200 basis points over this period. The high-yield market was particularly vulnerable to turbulence since US energy producers had issued a large volume of lower-quality debt in recent years.

In January, banks came under particular pressure. Their credit spreads widened sharply and equity prices fell before partially recovering in the following months (Graph II.5, left-hand panel). Signs of stress were particularly evident in the pricing of European bank debt, with the prices of contingent convertible obligations (CoCos) diving precipitously (Graph II.5, centre panel). Clearly, investors were still learning about the risks associated with such relatively recent financial instruments. Bank profits, especially in Europe, were seen as coming under growing pressure as policy rates were cut further into negative territory and as an increasing proportion of European government bonds traded at negative yields (Chapter VI). Consistent with this development, ever deeper negative euro interbank rates initially went hand in hand with wider bank credit spreads (Graph II.5, right-hand panel). Bank credit spreads then partially recovered, following the ECB's announcement on 10 March of various policy measures, including the possibility for banks of borrowing from the ECB at its negative deposit rate under certain conditions.

Weaker growth led to expectations of a longer-lasting, and in some cases stronger, monetary policy stimulus. Government bond yields fell across the major

Banks under pressure

Graph II.5



[1] Yield difference between the investment grade debt of banking sector entities and the overall corporate sector for the United States and the euro area. [2] Perpetual bonds. [3] Euro area investment grade banking sector option-adjusted spreads.

Sources: Bank of America Merrill Lynch; Bloomberg; Markit; BIS calculations.

economies. The expected path of Federal Reserve tightening shifted downwards. Central banks explored new stimulus measures, including expanded asset purchases by the ECB and a shift to negative policy rates by the Bank of Japan (Box II.A). But whereas in the past these measures might have buoyed markets, in early 2016 they met with an indifferent or even negative response. While the end-January announcement by the Bank of Japan of negative rates led at first to a rebound in the Japanese stock market and a depreciation of the yen, Japanese banks' stock prices soon fell sharply and the yen strengthened as investors seemingly began questioning whether monetary policy would be able to successfully stimulate the economy.

The market episodes of July–September 2015 and January–February 2016 shared a number of common elements. Weaker global stock and credit markets, and weakness in EME bonds and currencies, pointed to "risk-off" behaviour on the part of investors and expectations of slower growth. Commodity prices weakened, especially oil prices, highlighting the important role of oil producers in global equity and credit indices.

Low-rate environment drives asset valuations

Government bond yields of advanced economies continued to fall during the period under review (Graph II.4, left-hand panel). By May 2016, medium- and long-term bond yields stood well below the already very low levels observed in June 2015, irrespective of whether monetary policy rates had been reduced (Germany, Japan, Sweden), left unchanged (Switzerland, UK) or raised (US) since then (Graph II.6, left-hand and centre panels). Moreover, having been given an upward jolt following the Bank of Japan's decision to move to negative rates, the stock of sovereign bonds trading at negative yields across the globe soared to new highs, reaching close to $8 trillion by end-May (Graph II.6, right-hand panel).

Box II.A

The transmission of negative policy rates: initial experience

Looking for additional tools to achieve their inflation or exchange rate targets, five central banks – Danmarks Nationalbank (DN), the European Central Bank (ECB), Sveriges Riksbank (RIX), the Swiss National Bank (SNB) and, more recently, the Bank of Japan (BoJ) – moved their policy rates below zero, traditionally seen as the lower bound for nominal interest rates in the presence of physical currency offering a zero nominal rate of return.

The experience to date suggests that modestly negative policy rates have been transmitted to money markets in much the same way as positive rates.① The pass-through to short-term money market rates has been persistent and the impact on trading volumes – already depressed by central banks' abundant and cheap supply of reserves – appears to have been small, in general. Problems with instruments designed with only positive nominal interest rates in mind, such as constant net asset value money market funds, have so far not materialised.

The introduction of negative policy rates also coincided with a decrease in longer-maturity and higher-risk yields. Isolating their impact precisely is not easy, though, owing to the simultaneous introduction or expansion of central bank asset purchase programmes.

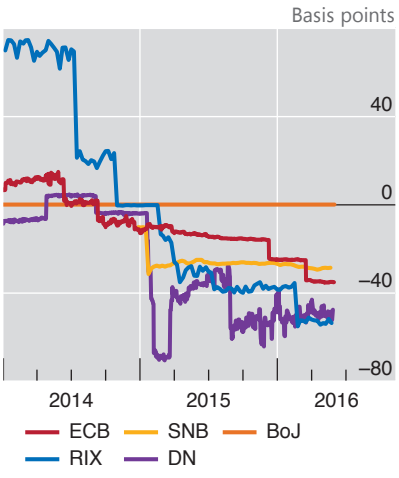
In contrast to what happened in money markets, the effect of negative policy rates on exchange rates was not uniform and in some cases coincided with bouts of volatility. After the introduction of negative policy rates, the DN, which maintains a nearly fixed exchange rate vis-à-vis the euro, saw the appreciation pressure on the krone subside. The SNB, after announcing in December 2014 that rates would be negative on some sight deposits, had to discontinue its exchange rate floor vis-à-vis the euro a month later. The SNB continued to accumulate foreign exchange reserves even after it further lowered the interest rate on sight deposit accounts to –75 bp. In Japan, the 2.8% depreciation of the yen vis-à-vis the US dollar upon announcement of negative policy rates proved transitory and was reversed in the following days.

While zero has not proved to be a technically binding lower bound for central bank policy rates, difficulties associated with their transmission to various parts of the financial system have become more apparent over time.

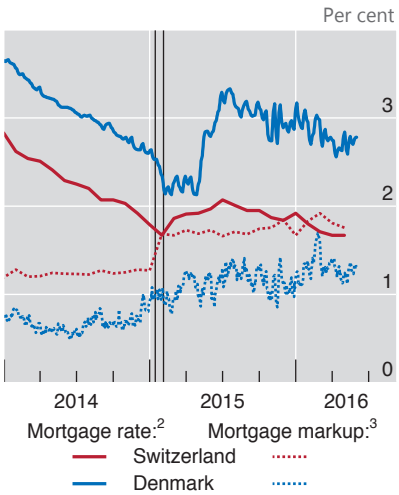
Negative policy rates: implementation and transmission

Graph II.A

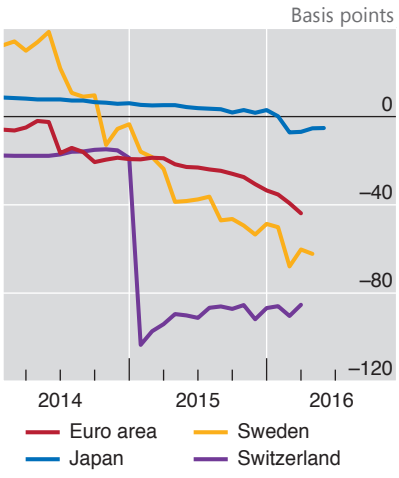
Average remuneration of central bank liabilities[1]



Uneven pass-through to borrowers



Banks' relative cost of funding[4]



BoJ = Bank of Japan; DN = Danmarks Nationalbank; ECB = European Central Bank; RIX = Sveriges Riksbank; SNB = Swiss National Bank.

The vertical lines in the centre panel indicate 15 January 2015 and 5 February 2015, the dates on which policy rates were lowered by 75 and 25 bp in Switzerland and Denmark, respectively.

[1] Average rate paid by central banks on non-cash liabilities weighted by the amounts in corresponding accounts and facilities. [2] Mortgage lending rates: for Switzerland, 10-year fixed rates for new businesses; for Denmark, average benchmark (30-year) long-term rate. [3] Mortgage rate minus interest rate swap rate. [4] Spread between the interbank lending rate (one-month Libor) and the household deposit rate (overnight or closest available maturity).

Sources: ECB; Bloomberg; Datastream; national data; BIS calculations.

In all jurisdictions, banks, motivated by deposit withdrawal concerns, have been reluctant to pass negative rates through to retail depositors. Partly to limit the resulting impact on their net interest margins, some central banks introduced exemption thresholds for negative remuneration, thereby limiting banks' average cost of holding central bank liabilities (Graph II.A, left-hand panel). Initially, there was also uncertainty as to how banks would treat their "wholesale" depositors, but some banks are now passing on the costs in the form of negative wholesale deposit rates. In some cases, banks have used exemption thresholds akin to those that central banks have applied to their reserves.

In Switzerland, banks adjusted selected lending rates, notably mortgage rates, upwards, even as the policy rate was lowered to –75 bp (Graph II.A, centre panel). The Swiss experience suggests that banks' ability to cope with the relatively high cost of retail deposit funding (Graph II.A, right-hand panel) without increasing lending rates will affect the technical room to keep interest rates in negative territory. This ability depends, among other factors, on the degree of competition in the banking sector and the share of retail deposits in banks' funding mix (Chapter VI).

In Denmark, where mortgage loans are mainly financed with pass-through bonds rather than deposits, mortgage rates fell alongside money market rates, although mortgage markups edged up throughout 2015 (Graph II.A, centre panel). Yet, as most Danish mortgages have adjustable rates, there was uncertainty about the tax treatment and the mechanics of dealing with negative mortgage bond coupons. Also, some investors, notably insurers, were unwilling or unable to buy negative cash flow securities, creating a demand for instruments with interest payments floored at zero.

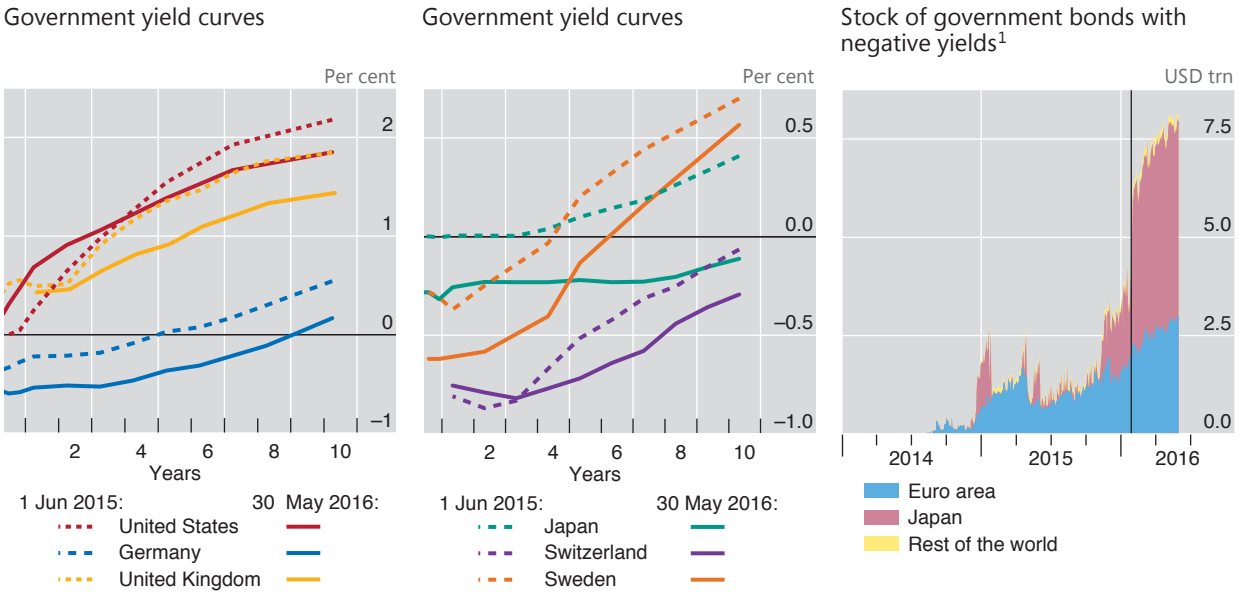
So far, negative policy rates have not led to an abnormal jump in the demand for cash. However, anecdotal evidence suggests that both financial and non-financial firms have started adapting to the new environment and are seeking to adopt innovations that would reduce the costs associated with physical currency use.

① See M Bech and A Malkhozov, "How have central banks implemented negative policy rates?", *BIS Quarterly Review*, March 2016, pp 31–44.

Such low levels of interest rates and yields are in most respects historically unprecedented. The near zero short-term interest rates seen in the United Kingdom and the United States today represent the lowest levels observed since the Great Depression, while current negative short-term rates in Germany and Japan are

Negative bond yields continue to spread

Graph II.6



[1] Analysis based on the constituents of the Bank of America Merrill Lynch World Sovereign index. The vertical line indicates 29 January 2016, the date on which the Bank of Japan announced its move to negative interest rates on reserves.

Sources: Bank of America Merrill Lynch; Bloomberg; BIS calculations.

unparalleled (Graph II.7, left-hand panel). Nominal 10-year bond yields, at between –0.1 and 1.8% for these four countries, are also at or near record lows (Graph II.7, centre panel). And while current 10-year real yields are not unprecedented when compared with ex post real yields since 1900, they are at levels not seen since the inflationary 1970s (Graph II.7, right-hand panel).

The historically low bond yields coincided with low estimated term premia. In fact, estimates indicate that a significant part of the decline in nominal and real bond yields in recent decades reflects a secular decline in term premia, which are also at historical troughs (Graph II.8, left-hand panel).

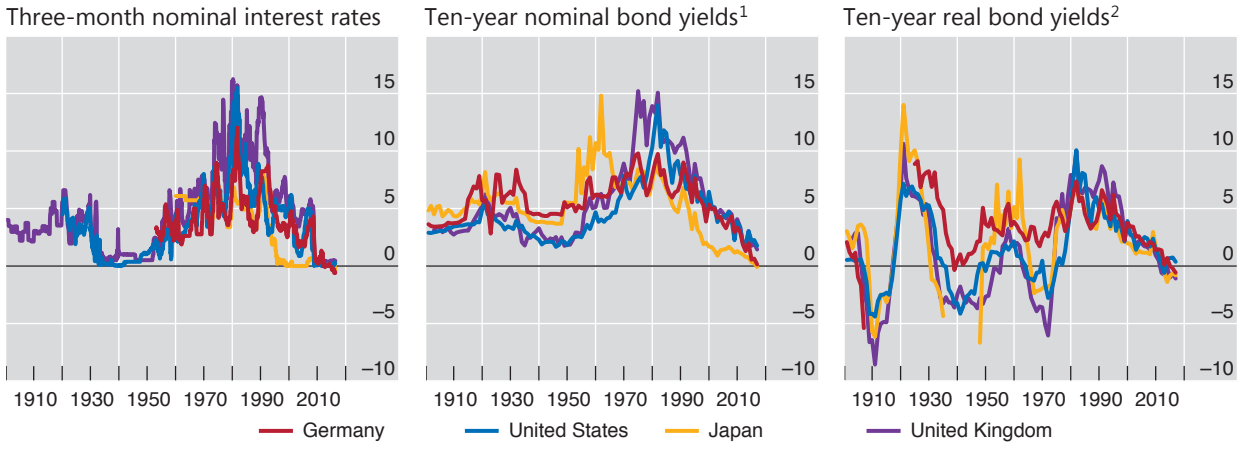
Sudden jumps in term premia led to sharp yield increases in the second quarter of 2015, in particular in the euro area (Graph II.8, centre panel). Euro area and US term premia estimates then stabilised before edging down again in the second half of the year. By contrast with historical experience, where US yield movements have tended to drive those in other currencies, US bond yields came under pressure when euro area bond yields fell, as investors chasing higher yields moved into US Treasuries. And during the turbulence of early 2016, a global flight to quality pushed down premia on government bonds further still.

Alongside term premia, expectations of future interest rates also played a role (Graph II.8, right-hand panel). Between May and December 2015, the expected average short-term interest rate in the United States over a 10-year period rose some 40 basis points. This rise came to a halt and was partly reversed in early 2016 as investors reassessed US monetary policy prospects. In the euro area, the expectations component played a smaller role but still contributed to lower yields.

Large-scale central bank purchases, possibly reinforced by financial institutions' behaviour, weighed heavily on yields. For example, by end-2015 the Eurosystem had increased its holdings of euro area government debt to almost 17%, while the Bank of Japan held around 32% of outstanding Japanese government bonds. Hedging by institutions such as pension funds and insurance companies may have further boosted demand for government securities. And banks increasingly

A historical perspective on record low interest rates and yields

In per cent — Graph II.7



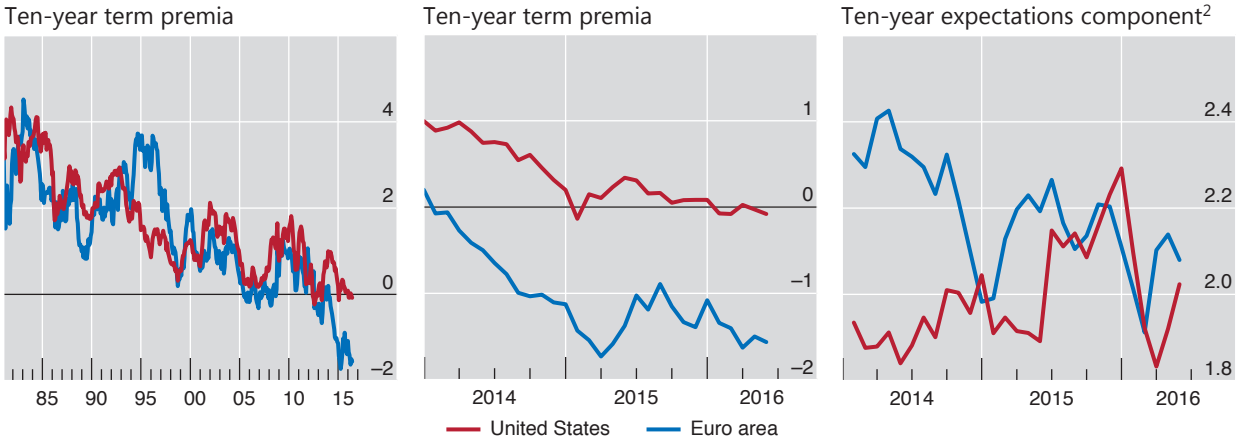
[1] The hyperinflationary years of 1922–23 are excluded for Germany. [2] The hyperinflationary episodes for Germany and Japan are not shown. Prior to 2006, nominal 10-year yields minus average inflation rates during the next 10 years; from 2006 onwards, 10-year index-linked bond yields.

Sources: Barclays; Bloomberg; Global Financial Data; national data; BIS calculations.

Term premia estimates continue to sink to unusually low levels[1]

In per cent

Graph II.8



[1] Decomposition of the 10-year nominal yield according to an estimated joint macroeconomic and term structure model; see P Hördahl and O Tristani, "Inflation risk premia in the euro area and the United States", *International Journal of Central Banking*, September 2014. Yields are expressed in zero coupon terms; for the euro area, French government bond data are used. [2] Difference between 10-year nominal zero coupon yield and 10-year estimated term premium.

Sources: Bloomberg; BIS calculations.

favoured sovereign bond holdings, in part owing to financial regulatory reforms, but also due to increased demand for collateral in financial transactions.

In this environment, some observers have asked whether government bonds in the main currencies might be overvalued. Although it is difficult to define overvaluation in the context of government bonds, various views have informed the debate. Some have argued that both the natural real rate of interest and, to a lesser extent, expected inflation have fallen substantially for the foreseeable future in a number of advanced economies (Chapter IV). Others have noted that economic growth, productivity, inflation and other macroeconomic fundamentals could well revert to their pre-crisis levels. Even disregarding term premia, this second line of argumentation would view current bond market valuations as overly rich.

Unusually low prevailing term premia are another piece of the puzzle. Bond prices would be overvalued if zero or negative term premia turned out to be unsustainable. True, term premia may not necessarily return to their pre-crisis levels: for instance, inflation may be viewed as less of a long-term threat than in previous years, or investors' risk aversion may have changed. That said, it seems unlikely that deeply negative term premia such as the ones estimated for the euro area can persist indefinitely. The question then becomes when, and how fast, premia will normalise.

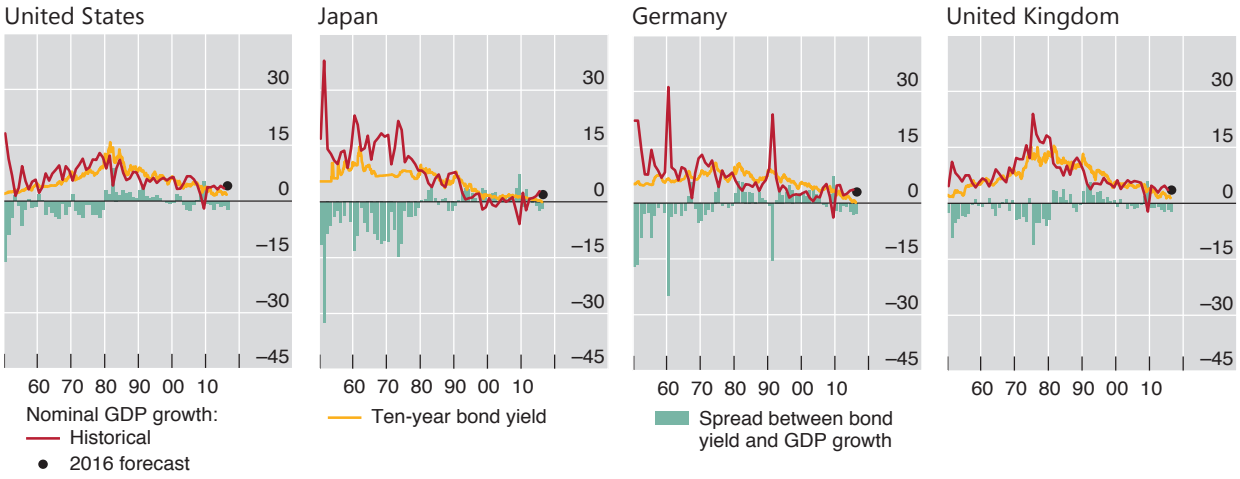
Comparing long-term bond yields with the evolution of nominal GDP suggests that yields are indeed currently on the low side. Over the past 65 years or so, the broad trends in nominal GDP growth and 10-year bond yields have lined up reasonably well across the United States, Japan, Germany and the United Kingdom (Graph II.9). Most likely, the real bond yields and expected inflation components of nominal yields have fluctuated in tandem with real GDP growth and inflation, respectively. Currently, bond yields are somewhat below nominal GDP growth in all four countries.

If, for whatever reason, bond yields are "too low", they could snap back at some point as market expectations adjust. The size and potential disruption of a reversal have less to do with the characteristics of day-to-day liquidity provision than with the incidence of forced sales and financial institutions' capacity to absorb the hit.

Ten-year bond yields sink below nominal GDP growth rates

In per cent

Graph II.9



Sources: OECD, *Economic Outlook*; Global Financial Data; BIS calculations.

Despite the higher frequency of large price moves in recent years, there is no convincing evidence of a structural decline in fixed income market liquidity (Box II.B). That said, there is no doubt that such liquidity will evaporate under stress, as it has always done in the past. Signs of liquidity illusion in the growing asset management industry suggest caution. At the same time, stronger bank balance sheets, lower broker-dealer leverage and better liquidity risk management should all support more robust liquidity and help contain any damage from periods of illiquidity (Chapter VI).

Alternatively, persistently low yields could end up having pernicious effects on the economy and become to some extent self-validating. By sapping banks' profitability and resilience, low yields may reduce banks' capacity to support the economy (Chapter VI). They may also distort financial and real economic decisions more generally, for instance by encouraging unproductive firms to maintain capacity or by inflating asset prices, thereby weakening productivity (Chapter III). And they may encourage further debt build-up, which could make it harder for the economy to withstand higher rates (Chapter IV).

Equity valuations have also come under scrutiny. As bond yields fell globally post-crisis, equity prices rose, pushing up valuation metrics such as P/E ratios. Stocks naturally became increasingly attractive relative to bonds while lower real interest rates boosted the discounted value of future corporate earnings. Partly as a result, cyclically adjusted P/E ratios in the United States and the United Kingdom have stood well above their historical averages in the past few years (Graph II.10, first two panels) – a possible sign of stretched valuations. The corresponding P/E ratio for Japan has been below average, but that average has arguably been inflated by the financial bubbles of the 1980s (Graph II.10, third panel). Moreover, the run-up of US equities in recent years has coincided with sharply higher leveraged positions (Graph II.10, last panel). And equity prices have also been supported by very strong share buybacks, particularly in the United States. The nervousness observed in global equity markets over the past year, with repeated sharp price corrections, hints at investors' unease with current valuations.

Corporate credit markets were subdued over the past year. Both investment grade and high-yield credit spreads were higher in May 2016 than a year before in

Liquidity in fixed income markets

Some observers pointed to market developments in 2015 and 2016 as evidence of a structural decline in market liquidity, particularly in fixed income markets. Large swings in some market segments were seen as evidence that relatively small changes in positions had the potential to lead to outsize price shifts. Explanations for the apparently different conditions varied: some argued that post-crisis regulation had hampered banks' ability to provide liquidity, while others pointed to the growing influence of complex trading strategies such as high-frequency trading (HFT). This box takes a closer look at whether, and in what ways, fixed income market liquidity may have evolved. Chapter VI discusses potential drivers and policy implications.

Market liquidity can be defined as "the ability to rapidly execute large financial transactions at low cost with limited price impact".① The concept's multifaceted nature suggests that liquidity should be measured by several indicators.

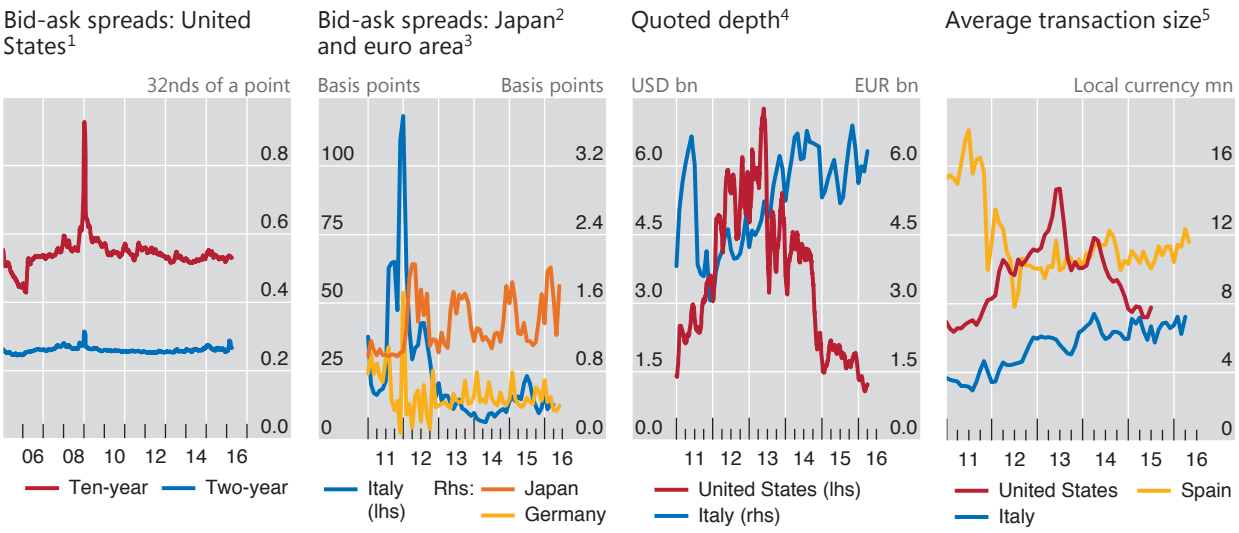
Most indicators do not show a significant structural decline of liquidity in fixed income markets, or indeed most other markets, in recent years. For one, bid-ask spreads, defined as the gaps between the prices at which dealers are willing to buy and sell securities, have been rather stable and tight in major sovereign bond markets (Graph II.B, first and second panels). By comparison, quoted depths (the amounts of securities available for trading at the best prices) and average transaction sizes have fallen in some markets, but are not unusually low by historical standards (Graph II.B, third and fourth panels).

What appears to have increased is the number of intense, and disorderly, but generally short-lived price movements. The "flash rally" of 15 October 2014, when the 10-year US Treasury yield fell by 20 bp and then rose by as much in a matter of minutes, is one such example. In other cases, adverse liquidity effects seemed to last longer. During the "bund tantrum" of May–June 2015, for example, uncertainties related to the ECB's asset purchase programme led to a sharp rise in government bond yields.② The 10-year German bund yield, in particular, rose from 8 bp on 20 April to 98 bp on 10 June (Graph II.4, left-hand panel).

Although the explanations for these sudden changes in market conditions vary, the increased role of market participants outside the traditional dealer community, such as principal trading firms (PTFs), is likely to have been a major factor.③ The shift in trading activity from dealers to PTFs reflects the increasing use of electronic trading

Bond market liquidity

Graph II.B



[1] Twenty-one-day moving averages of average daily bid-ask spreads in the inter-dealer market for on-the-run US Treasury notes; these spreads are reported in 32nds of a point, where a point equals 1% of par. [2] Ten-year Japanese government bonds. [3] For Italy, medium-term government bonds (BTPs); for Germany, 10-year government bonds. [4] Quoted depth at the top five levels of both sides of the order book; for the United States, 21-day moving averages of average daily depth of on-the-run two-year US Treasury notes; for Italy, monthly averages of medium- and long-term Italian government bonds (exhibited in MTS Cash). [5] Average transaction size for two-year US Treasury notes, a weighted average of all Italian sovereign bonds and Spanish public sector debt; three-month moving averages.

Sources: National central banks; Committee on the Global Financial System, "Fixed income market liquidity", *CGFS Papers*, no 55, January 2016.

platforms and the proliferation of trading algorithms in a number of key fixed income markets such as those for major sovereign bonds. PTFs, on the one hand, have contributed to reducing trading costs and supporting liquidity during normal market conditions. On the other hand, their complex and often opaque trading strategies have raised questions about risks to market stability, and have created challenges for regulators and supervisors.④

Overall, while stress events, such as the "flash rally" or the "bund tantrum", imposed costs on some participants, the system as a whole has continued to perform its primary functions – including price discovery, risk management and asset allocation – rather well. Indeed, the decline in dealers' risk tolerance and the improved pricing of risks, supported by the new regulatory environment, should bring the costs of liquidity provision more into line with the risks they generate for the financial system (Chapter VI).

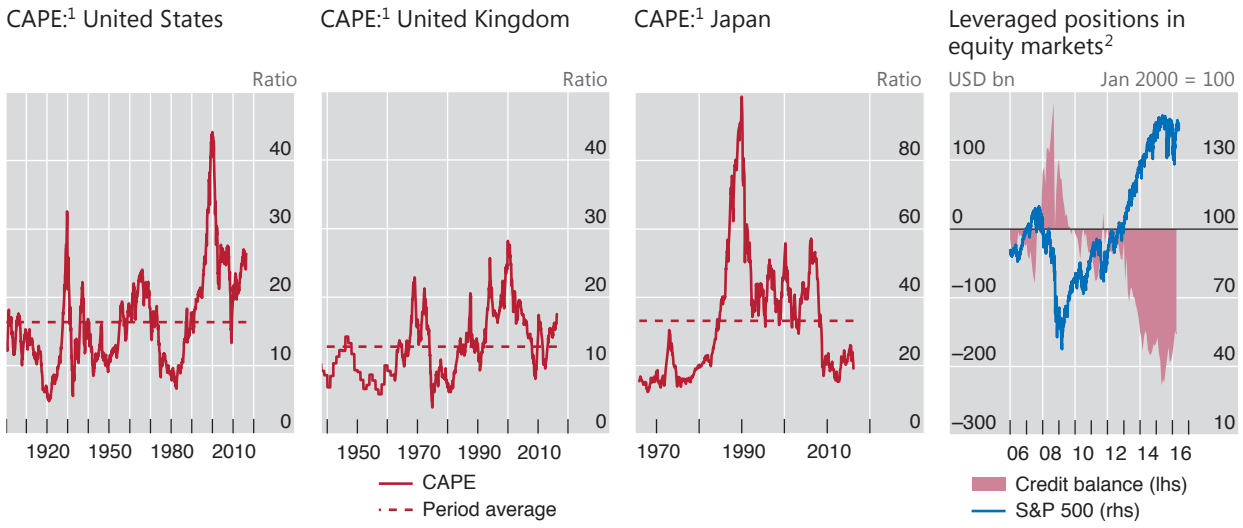
① This quotation is from Committee on the Global Financial System, "Fixed income market liquidity", *CGFS Papers*, no 55, January 2016. ② See R Riordan and A Schrimpf, "Volatility and evaporating liquidity during the bund tantrum", *BIS Quarterly Review*, September 2015, pp 10–11. ③ US Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, US Securities and Exchange Commission and US Commodity Futures Trading Commission, *Joint Staff Report: The US Treasury market on October 15, 2014*, 13 July 2015. ④ See M Bech, A Illes, U Lewrick and A Schrimpf, "Hanging up the phone – electronic trading in fixed income markets and its implications", *BIS Quarterly Review*, March 2016, pp 79–94.

the United States and the euro area as well as across EMEs (Graph II.1, centre panel), although euro area spreads benefited from expected ECB purchases of corporate bonds. In part, the general rise in spreads reflected the weakening economic outlook, and in particular the rapidly deteriorating creditworthiness of the energy sector (Graph II.3).

Signs of a turn in the default cycle helped widen corporate credit spreads. In the United States, the rise in the speculative grade default rate that had begun in early 2015 continued uninterrupted throughout the review period, and credit spreads followed upwards (Graph II.11, left-hand panel). For instance, according to Moody's estimates, having risen from 1.8% at the end of 2014 to 4.4% in April 2016, the default rate was projected to rise above 6% by the beginning of 2017. In Europe,

Elevated equity valuations

Graph II.10

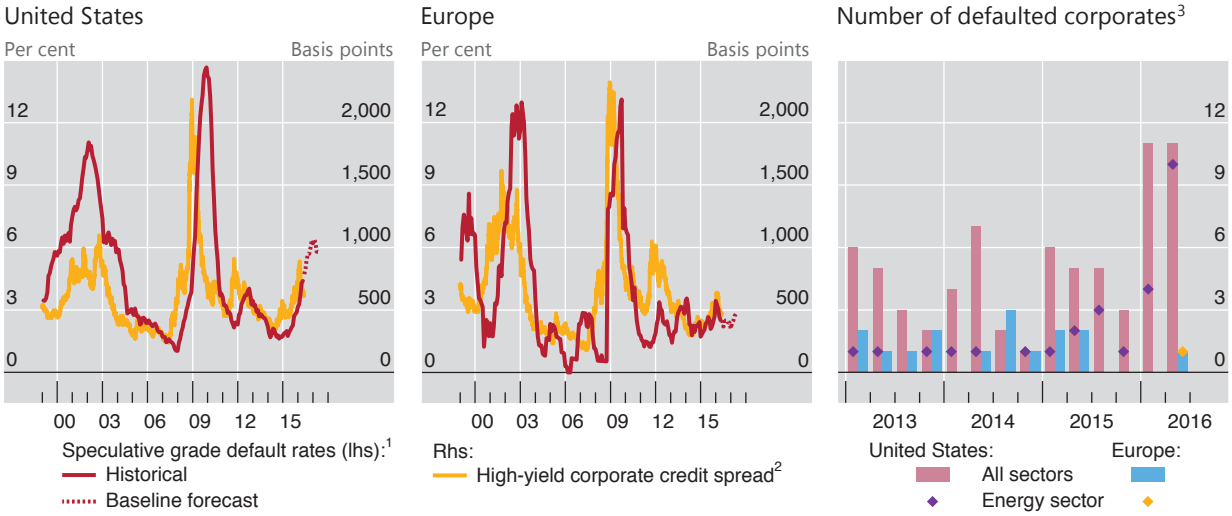


[1] CAPE = cyclically adjusted price/earnings ratio; calculated as the country's representative real equity price index divided by the 10-year trailing average of real earnings. [2] Credit balance is calculated as the sum of free credit cash accounts and credit balances in margin accounts minus margin debt.

Sources: R Shiller, www.econ.yale.edu/~shiller/data.htm; Datastream; Global Financial Data; New York Stock Exchange; BIS calculations.

Credit spreads rise as default cycle starts turning

Graph II.11



[1] Trailing 12-month issuer-weighted default rates. [2] Option-adjusted spreads over government bonds. [3] Corporates in default on all of their long-term debt obligations.

Sources: Bloomberg; Moody's; BIS calculations.

the speculative grade default rate also edged up in the past year, albeit less than in the United States (Graph II.11, centre panel). The sharper rise in the US default rate was due partly to the relatively stronger importance of the energy sector there: a greater number of corporate defaults in the United States occurred among energy firms than in Europe, where only one energy sector default has been recorded in the last three years (Graph II.11, right-hand panel).

Exchange rate developments also appear to have played a role in the pricing of credit risk. In periods during which the dollar strengthened strongly relative to the euro, US investment grade and high-yield spreads tended to rise sharply, and vice versa (Graph II.12, left-hand and centre panels). This pattern was evident among corporates in both the energy and non-energy sectors. Moreover, from 2015 onwards, with the euro relatively weak vis-à-vis the dollar, euro high-yield credit spreads tended to trade significantly below those in the United States (Graph II.12, right-hand panel). In the preceding years, before the dollar had strengthened appreciably, euro credit spreads had been instead close to or higher than their US counterparts. While the strong influence of oil producers on US credit spreads has played a role, the relationship is also present among non-energy firms.

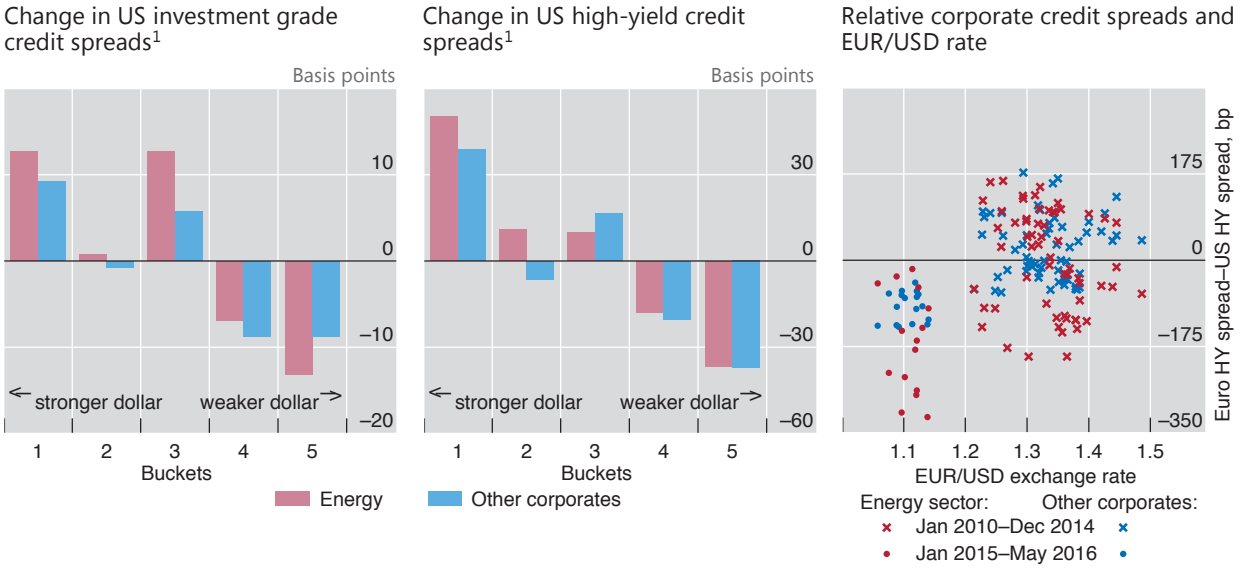
One possible explanation behind this pattern could be changing perceptions of the growth outlook – and hence of corporate credit quality – resulting from exchange rate swings. Similarly, a stronger dollar goes hand in hand with tighter US financial conditions (Chapter III). Another possibility is that easier monetary policy in the euro area tends to weaken the euro while at the same time inducing European investors to seek higher-yielding investments such as euro area corporate bonds.

Market anomalies spread

The years since the Great Financial Crisis have been marked by a number of anomalies in financial markets. Pricing relationships that in previous times would have been rapidly eliminated through arbitrage have instead proved surprisingly persistent.

Credit spreads react to the exchange rate

Graph II.12



[1] Average monthly credit spread changes, grouped into five "buckets" and sorted according to how much the dollar strengthened against the euro each month, based on end-of-month differences. The first (last) pair of bars show the spread changes corresponding to the 20% of months when the US dollar strengthened the most (least). The sample includes data from January 2010 to May 2016.

Sources: Bank of America Merrill Lynch; national data; BIS calculations.

Cross-currency basis swap spreads offer one example (Box II.C). Such spreads normally adjust to eliminate arbitrage opportunities between a forward position in a given currency and the same position as constructed by a foreign currency swap and a forward in a different currency. Indeed, this covered interest parity relationship is taken for granted in economics textbooks. The relationship broke down during the crisis, reflecting counterparty risk and funding liquidity shortages in certain currencies. Since the crisis, concerns about banks' credit quality and liquidity shortages have diminished – but the anomaly has persisted.

A second example is US dollar interest rate swaps (Graph II.13). Normally, the fixed rate offered on swaps against floating rate payments is a small, positive spread over US Treasury yields. After all, the counterparty credit risk of the banks involved in the transaction is somewhat higher than that of the US government. During the crisis, investors' flight to safety and growing counterparty risk concerns drove these spreads to high levels. But in 2010, and again in late 2015, the spreads were actually negative for US dollar swaps, while remaining positive for euro swaps (Graph II.13, left-hand panel).

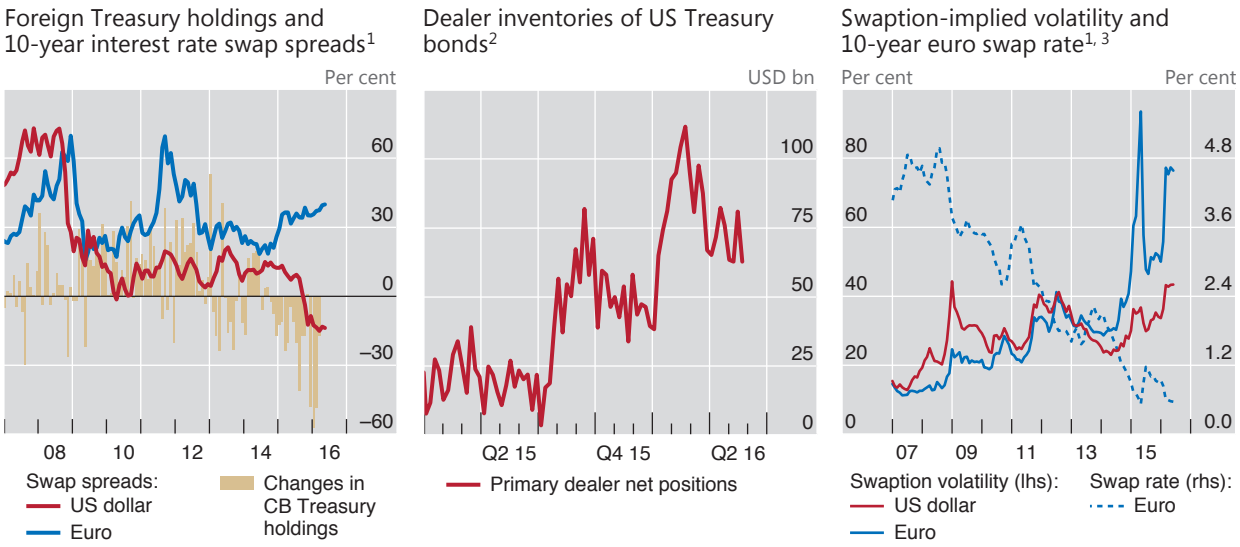
These anomalies reflect a combination of factors.

One set of factors relates to supply and demand conditions in underlying asset markets. For example, central banks' large-scale purchases of government securities represented a new and largely price-insensitive source of demand. The end of Fed purchases, reinforced by sales of Treasury bonds by some EME official reserve holders, may have created temporary excess supply that drove US bond yields above dollar swap rates. An indication of these conditions is that dealers' inventories of US Treasuries soared as they stepped in to meet the supply (Graph II.13, centre panel).

A second, related set of factors involves hedging demand. Shifts in the perceived likelihood and timing of higher US rates will shift US dollar borrowers' demand for receiving fixed rates via swaps. The same is true for those attempting to hedge currency risk via cross-currency basis swaps. In currency swap markets, given

Swap spreads, Treasury bond flows and interest rate hedging costs

Graph II.13



[1] Monthly averages of daily data. [2] Net positions of primary dealers in US Treasury bills and notes (excluding TIPS). [3] US dollar and euro two-year into 10-year European swaption-implied at-the-money volatility.

Sources: Federal Reserve Bank of New York; Bloomberg; Treasury International Capital (TIC) System; BIS calculations.

exceptionally low yields, there have been signs that large institutional investors boosted their investments abroad on a currency-hedged basis, putting strains on the corresponding instruments' prices. The footprints of hedging demand have also been visible in the implied volatility of swaptions (options to enter into swaps), which jumped (particularly in euros) in early 2015 (Graph II.13, right-hand panel).

A third factor relates to a reduced willingness or ability to arbitrage, an activity that requires both capital and funding, and is balance sheet-intensive. Large dealer banks play a central role in maintaining these arbitrage relationships, either through their own position-taking or by providing funding to others such as hedge funds. In response to the large losses incurred on their trading activities during the Great Financial Crisis, banks in many jurisdictions have reappraised the risk/return trade-off of their business lines, including proprietary trading and market-making. Moreover, structural reforms, such as the US Volcker rule, as well as bank capital and liquidity requirements, have been tightened to enhance bank resilience and induce a more accurate pricing of risks, reducing the scope for banks to tightly price away arbitrage opportunities (Chapter VI).[1]

[1] See L Andersen, D Duffie and Y Song, "Funding value adjustments", mimeo, 10 March 2016, who argue that well documented pricing "anomalies" in derivatives markets can be traced back to so-called funding value adjustments that incorporate the cost of funding the cash or collateral needed to enter or maintain unsecured derivatives positions – a reflection of more comprehensive collateralisation and wider bank funding spreads post-crisis.

Understanding the cross-currency basis: why does covered interest parity not hold?①

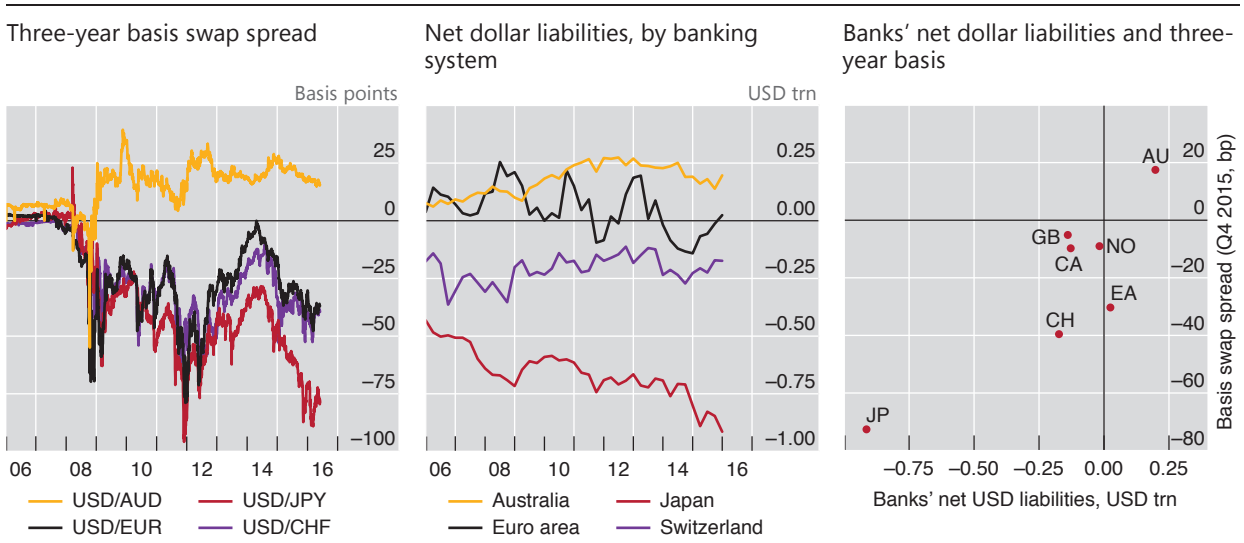
One of the most puzzling recent anomalies has been the re-emergence of the cross-currency basis (the basis) or, equivalently, the widespread violation of covered interest rate parity (CIP). With a non-zero basis, cross-currency swap counterparties face interest rates that do not match prevailing cash market rates, even though currency risk has been fully hedged: those borrowing dollars by swapping out of yen or euros pay much more than the prevailing US money market rates, while those swapping out of Australian dollars pay less (Graph II.C.1, left-hand panel).

As traditional thinking goes, this should open up an arbitrage opportunity, because those with access to both money markets, typically banks, can "collect the basis" by lending the currencies that command a premium in cross-currency swaps. Hence, in the past, CIP violations were confined to periods of market stress. During the turmoil of 2007–2012, the basis widened when banks that needed dollars lost access to wholesale funding owing to credit risk concerns and the withdrawal of US money market funds.② The basis then narrowed again when central banks provided US dollar funding and bank credit risk improved. However, since mid-2014, CIP deviations have re-emerged even as counterparty risks and wholesale funding strains have faded.③

How can this be? Such anomalies can persist when strong investor demand runs into the market's capacity to conduct arbitrage.④ The demand to raise US dollars in cross-currency funding markets stems largely from banks' own use of swaps to hedge foreign currency loans and bond holdings as part of their business models, and from institutional investors' desire to hedge their US dollar bonds. At the same time, limits to arbitrage appear to have arisen from banks' reduced ability or willingness to use their balance sheets to take the other side of the trades in the forward/swap markets, which would have kept the basis near zero. A difficulty in taking this framework to the data is that banks are involved at all stages: swapping out of home currencies to fund US dollar lending, hedging US dollar bond holdings, supplying US dollars via swaps to collect the basis, and simply making markets in currency swaps. Still, the available evidence is broadly consistent with it.

Dollar basis reflects banks' net dollar positions

Graph II.C.1



AUD = Australian dollar; CHF = Swiss franc; EUR = euro; JPY = yen; USD = US dollar.

Sources: Bloomberg; BIS consolidated international banking statistics (immediate borrower basis); BIS locational international banking statistics (nationality or reporting bank basis).

Drivers of supply-demand imbalances. First, banks' own demand to hold foreign currency assets on a hedged basis – or to fund domestic currency assets with hedged foreign currency – pushes the basis away from zero. In the yen and the euro, banks' funding of dollar assets *reinforces* the pressures on the basis stemming from institutional investors' hedging of dollar securities. Hence, Japanese and euro area banks pay up for dollar funding in the form of the basis. (This is exactly the opposite of an arbitrageur who collects that basis by supplying dollar funding via swaps.) In contrast, Australian banks raise foreign currency abroad to fund domestic currency mortgages, thus

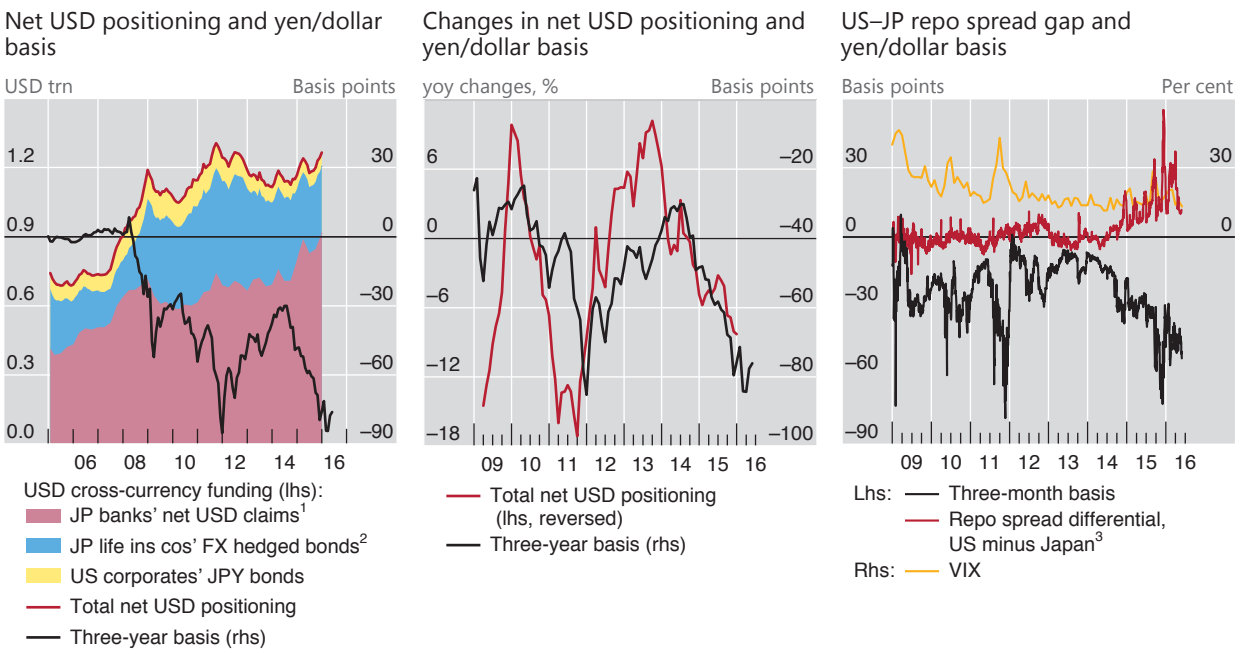
supplying US dollars via swaps to Australian institutional investors that need to borrow dollars to hedge their dollar bonds. As a result, some BIS reporting national banking systems have more on-balance sheet dollar liabilities than dollar assets, eg Australian banks, while others have more assets than liabilities, eg Japanese and Swiss banks (Graph II.C.1, centre panel). And indeed, the sign and size of BIS reporting banks' "dollar funding gaps" are closely associated with the sign and size of the respective basis against the US dollar (Graph II.C.1, right-hand panel).

Second, record high demand for swapping out of low-yielding euro and yen assets on the part of institutional investors and corporate bond issuers has increasingly put pressure on the basis. Term- and credit-spread compression in the euro area and Japan, spurred by central banks' asset purchases, has led institutional investors there to seek yield in US dollar bonds hedged back into euros or yen. Such spread compression has at the same time drawn US firms into issuing euro bonds (€220 billion outstanding in 2015), often to swap back into dollar liabilities, adding to the pressure. As a result, the cost of swapped US dollar funding has increased, widening the basis (Graph II.C.1, left-hand panel).

Limits to arbitrage. The record demand for dollar fund-raising via swaps has been met with global banks' reduced willingness to arbitrage. Before 2007–08, banks not only swapped currencies to meet their own business models' cash currency mismatches but also served as active arbitrageurs. They would keep the basis near zero by borrowing short-term in one currency, exchanging the funds in the currency market and lending the proceeds short-term, thereby offsetting a customer's forward position. Moreover, they also used these short-term operations to offset medium-term customer hedges. Post-crisis, however, shareholders and regulators have constrained operations that blow up balance sheets and entail mark-to-market risk as well as, depending on the underlying asset, a degree of credit risk. Another limit to arbitrage arises from slow-moving capital, as the capacity of other financial institutions, such as supranational bond issuers that can issue US dollar bonds (to then swap the dollars for other currencies to collect the basis), falls far short of closing the arbitrage opportunity.

Sources of demand for FX swaps, limits to arbitrage and yen/dollar basis

Graph II.C.2



[1] Difference between gross USD assets and liabilities of Japanese banks. [2] Japan life insurance companies' currency hedged bonds calculated by multiplying the hedge ratio reported by Barclays by the estimate of FX bond holdings from national data. [3] One-month spread differential; for the United States, repo rate minus federal funds rate; for Japan, repo rate minus call rate.

Sources: Bank of Japan; Japanese Ministry of Finance; The Life Insurance Association of Japan; Barclays FICC Research; Bloomberg; BIS international banking statistics and debt securities statistics.

A detailed example: yen/dollar basis. Yen/dollar is the most extreme and persistent basis of the major currencies. First, Japanese banks' overseas expansion (and the use of the US dollar as a vehicle currency to swap into higher-yielding regional currencies) has substantially increased their estimated dollar funding gap, defined as dollar assets in excess of on-balance sheet dollar liabilities (Graph II.C.2, left-hand panel). The Japanese banks' US dollar

funding gap has also been pushed up by the build-up of US dollar securities positions held for other investors in their trust accounts, with the portion hedged for currency risk putting further pressure on the basis. In this way, Japanese banks' business models reduce their capacity to serve as counterparties to non-bank hedgers in cross-currency markets and to arbitrage the basis. Adding to this, Japanese life insurers' search for yield overseas has led them to increase FX-hedged investments in US dollar-denominated bonds (with average hedge ratios of 60–70%). The associated upsurges in total demand for US dollars via swaps have been pushing out the yen/dollar basis (Graph II.C.2, left-hand and centre panels).

The role played by constraints on bank balance sheets in limiting arbitrage becomes visible in specific circumstances. First, because repo markets are an important source of arbitrage funding, the diverging repo spreads in US dollars and yen have made it increasingly costly to fund the CIP arbitrage involved in lending dollars against yen. This has led to a wider basis (Graph II.C.2, right-hand panel, rising red line and falling black line). Second, as reporting and regulatory ratios provided at quarter-end gained importance in 2014, repo spreads in dollar and yen money markets started to exhibit quarter-end jumps. In particular, counterparties in the US dollar money market became less willing to lend their dollars at quarter-ends. These spikes in the relative cost of dollars in repos drove down the swap basis at three-month and shorter maturities. Higher US dollar funding costs via shorter-term swaps at quarter-ends also put pressure on pricing of longer-maturity swaps, leading to more costly US dollar swap funding over the quarter.

① This box is based on C Borio, R McCauley, P McGuire and V Sushko, "Whatever happened to covered interest parity? Understanding the currency basis", forthcoming, 2016. ② See N Baba, F Packer and T Nagano, "The spillover of money market turbulence to FX swap and cross-currency swap markets", *BIS Quarterly Review*, March 2008, pp 73–86; L Goldberg, C Kennedy and J Miu, "Central bank dollar swap lines and overseas dollar funding costs", *Economic Policy Review*, May 2011, pp 3–20; and T Mancini-Griffoli and A Ranaldo, "Limits to arbitrage during the crisis: funding liquidity constraints and covered interest parity", *Working Papers on Finance*, no 1212, University of Sankt Gallen, 2012. ③ Nor have central banks drawn much on swaps to provide dollar funding to non-US banks; see https://apps.newyorkfed.org/markets/autorates/fxswap. ④ See the survey conducted by D Gromb and D Vayanos, "Limits to arbitrage", *Annual Review of Financial Economics*, vol 2, July 2010, pp 251–75.

III. The global economy: realignment under way?

The global economy continued to expand in the year under review, with unemployment generally falling and global growth of GDP per capita around its historical average. That said, sharp falls in commodity prices and their subsequent partial recovery, large exchange rate moves and lower than expected headline global GDP growth shaped perceptions. These developments are often seen as the confluence of unrelated negative shocks. But this triplet is, to an important extent, the result of an economic and financial process that has unfolded over many years.[1] Before reviewing these three developments and the realignment they represent, it is useful to take stock of their connections and the path taken to the current juncture.

The genesis of much of the latest developments lies in the boom years leading up to the Great Financial Crisis. Stable, low-inflation growth in the 2000s encouraged easy monetary and financial conditions in the major economies and ample global liquidity. Easy financing fuelled domestic financial booms in advanced economies, with credit and property prices soaring. Strong growth in emerging market economies (EMEs), particularly in China as it reformed and opened its economy, added to buoyant global demand. Resource-intensive industries in EMEs, including manufacturing and construction, expanded rapidly, pushing demand for commodities ever higher. The surge in commodity prices, and in commodity producers' exchange rates, encouraged ample and cheap international borrowing, in turn contributing to the vast investment in commodity production capacity.

The financial crisis brought only a brief pause to these dynamics. The onset of severe balance sheet recessions in the countries at the core of the crisis, prominently the United States and parts of Europe, led to highly expansionary monetary and fiscal policies not only in these economies, but also in those exposed to them through trade and financial channels, including China. The resulting demand boost triggered a resurgence in the commodity boom as resource-intensive industries expanded in key economies, supported by readily available finance. As the crisis-hit countries recovered only slowly from the balance sheet recession, highly expansionary monetary policy remained in place for an extended period even as fiscal policy tightened somewhat. The persistently easy global liquidity conditions induced spillovers to commodity exporters and other EMEs, boosting broad-based domestic financial booms in those countries.

More recently, the commodity "supercycle" has turned and global liquidity conditions have begun to tighten even as crisis-hit economies have continued to grow at a moderate pace. In the past year, weakness in construction and manufacturing slowed the growth of resource demand. This softer demand, coupled with supply expansion, ushered in further commodity price drops, with significant economic consequences. For some countries, maturing or turning domestic financial cycles coincided with tighter external financial conditions linked to an appreciating US dollar. Large exchange rate depreciations have the potential to cushion countries against external developments, but their beneficial effect can be offset by the corresponding tightening of financial conditions, as they boost the foreign currency debt burden. With EMEs accounting for a larger share of the global economy than ever before, their strains can have larger spillbacks on other economies.

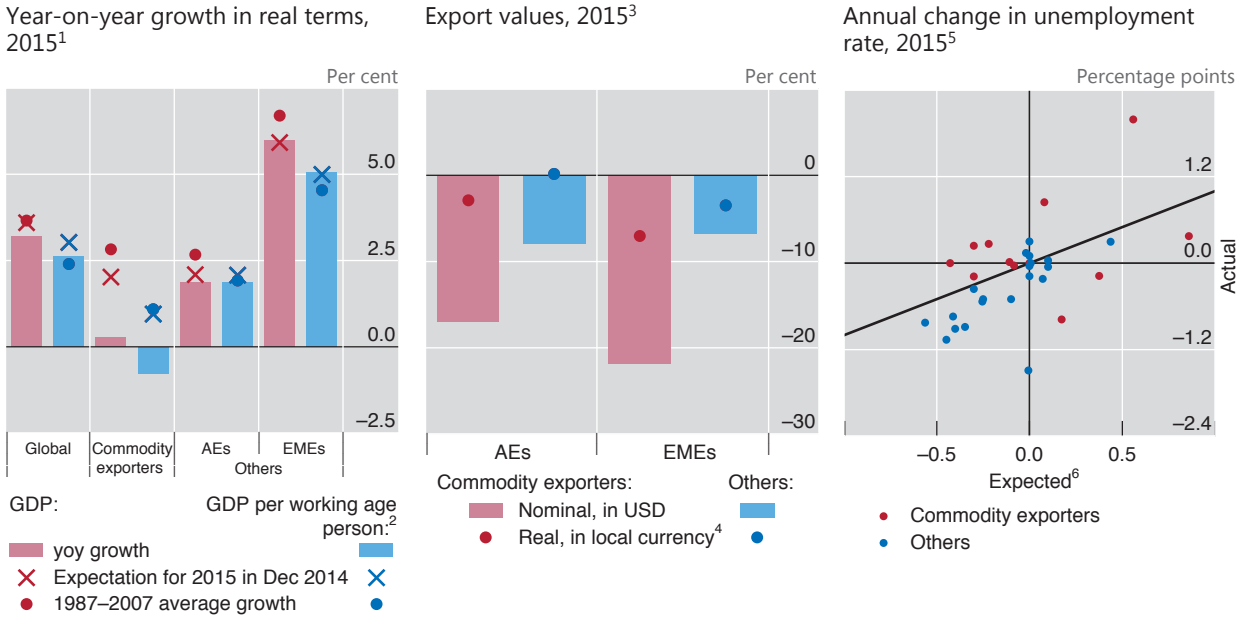
[1] See J Caruana, "Credit, commodities and currencies", lecture at the London School of Economics and Political Science, 5 February 2016.

This chapter reviews the lower than expected growth, commodity price falls and exchange rate moves in the context of the financial and real forces that delivered this triplet. The first section discusses growth in the global economy, countries' evolving financial cycles and the elusive realignment. While growth has been lower than expected, particularly in EME commodity exporters, the state of the economy appears much brighter based on growth adjusted for demographic change and labour market outcomes. The subsequent sections examine the commodity price falls – the proximate cause of lower growth in many commodity producers and EMEs – and the associated exchange rate moves. These two relative price changes can set the basis for more sustainable growth in the long run, but the short-run drag may be significant. The potential spillovers from EMEs are discussed next. While EMEs' increasing share of growth and trade means they are a greater source of spillovers through trade, financial spillovers largely still emanate from advanced economies. Notably, though, such financial spillovers can build up in EMEs, raising the potential for pernicious spillbacks to advanced economies. Finally, the chapter explores the causes and policy implications of slower structural growth. The slowing of working age population growth is weighing heavily on growth potential, but other headwinds from the shadows of financial booms should eventually recede. These headwinds make it all the more important to pursue policies that can deliver sustainable growth.

The missing rotation

Global growth in 2015 was lower than expected, and the near-term outlook weakened (Chapter II). Global GDP expanded by 3.2% in 2015, less than the 3.6%

Emerging market economies and commodity exporters slow, but others do well — Graph III.1



[1] Weighted averages based on rolling GDP and PPP exchange rates. [2] Working age population: 20–64 years. [3] Year-on-year change in exports of goods and services, weighted averages based on 2015 GDP and PPP exchange rates. [4] Deflated by CPI inflation. [5] For economies below (above) the black line, the change in the unemployment rate was better (worse) than expected. [6] As at October 2014.

Sources: IMF, *International Financial Statistics* and *World Economic Outlook*; United Nations, *World Population Prospects: The 2015 Revision*; Consensus Economics; Datastream; national data; BIS calculations.

expected as at December 2014, which would have been close to the 1987–2007 average (Graph III.1, left-hand panel). However, taking account of demographic forces, growth of GDP per working age person was actually slightly above its historical average. The anticipated rotation in growth, part of the broader realignment, failed to materialise as the slowdown in some EMEs, in particular commodity exporters, was not fully offset by a pickup in advanced economies. The financial cycle turned down in some economies adversely affected by these economic forces, but remained in an upswing in others (see Box III.A for a discussion of the measurement of the financial cycle). Growth in most economies was underpinned by domestic consumption.

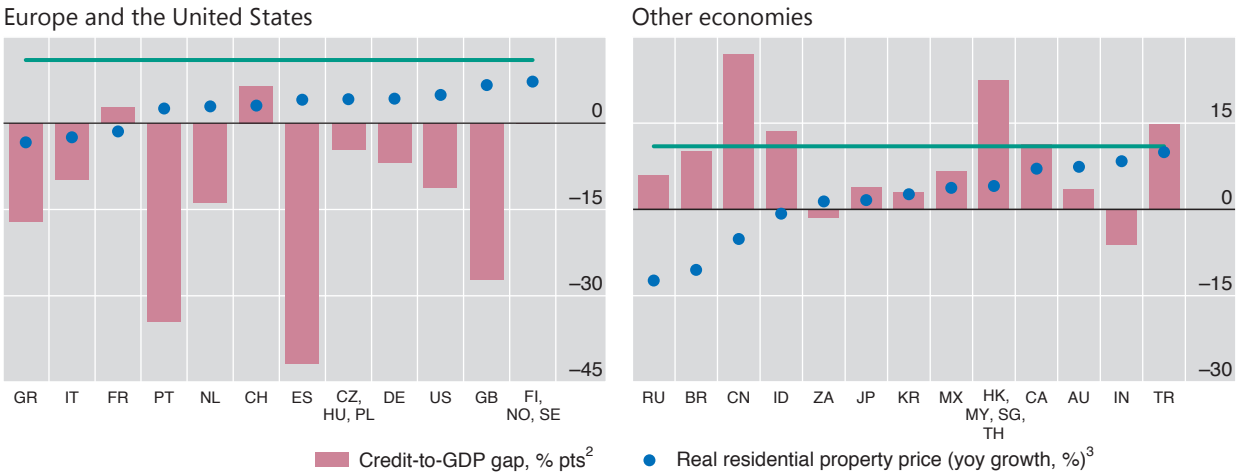
In countries at the centre of the financial crisis, including the United States, the United Kingdom and Spain, growth remained moderate in the wake of the balance sheet recession, but the financial cycle generally turned up. In the United States, growth was 2.4% in 2015 and continued at a similar pace in early 2016, constrained by US dollar appreciation. Real property price and credit growth picked up, gradually closing the credit-to-GDP gap (Graph III.2, left-hand panel). The euro area saw GDP expand by 1.6% in 2015, up from 0.9% in 2014. This pace of growth continued in early 2016 as the financial cycle kept recovering in most euro area economies, with increasing real property prices and credit-to-GDP gaps still negative. With consolidation efforts behind, fiscal headwinds waned.

In other advanced economies, developments varied. The expansion in Japan slowed in the second half of 2015 despite the fall in commodity import prices, with growth of 0.6% for the year. Canada returned to growth in the second half of 2015 after a mild recession triggered by a collapse in resource investment.

As commodity prices slumped and growth slowed in many EMEs, the domestic financial cycle remained in an upswing in many of them but turned down in others.

Financial cycles: turning down in major EMEs and up in many crisis-hit economies

Real property prices and credit-to-GDP gaps in 2015; annual averages[1] Graph III.2



A combination of high (low) credit-to-GDP gaps with falling (rising) real property prices tends to signal a peak (trough) in the financial cycle. The horizontal lines indicate the average credit-to-GDP gap three years before financial crises; the sample covers 34 crises in 28 economies since 1980.

[1] For groups of economies, weighted averages based on 2015 GDP and PPP exchange rates of the economies listed. [2] Total credit to the private non-financial sector. Deviation of the credit-to-GDP ratio from its long-run, real-time trend calculated with a one-sided HP filter using a smoothing factor of 400,000. [3] Deflated using consumer prices.

Sources: National data; BIS calculations.

The concept and measurement of the financial cycle

The broad concept of the financial cycle encapsulates joint fluctuations in a wide set of financial variables, including both quantities and prices (see also Box IV.A in the *84th Annual Report*). An obvious analogy is to the business cycle. The business cycle is often identified with movements in GDP, yet despite many years of research there is no universal agreement on which method to use. These can include an analysis of the unemployment rate or identifying turning points in a range of monthly indicators (as done by the NBER Business Cycle Dating Committee). Identifying the financial cycle is more challenging as there is no single aggregate measure of financial activity, even though a consensus has started to emerge that credit aggregates and asset prices, especially property prices, play a particularly important role. Methodologically, two different approaches have been proposed to measure the financial cycle more formally (the first two methods described below). In addition, insights from other strands of the literature can be used to pinpoint peaks and troughs (the third and fourth methods below). While the exact dates of turning points differ, the four methods discussed in this box generally coincide in identifying periods of expansion and contraction.

The *turning point method* dates the financial cycle with the same technique used by the NBER to date business cycles.① Cyclical peaks and troughs are identified in real credit, the credit-to-GDP ratio and real property prices. Drehmann et al (2012) identify a turning point in the financial cycle if all these three series turn within a three- to six-year window.

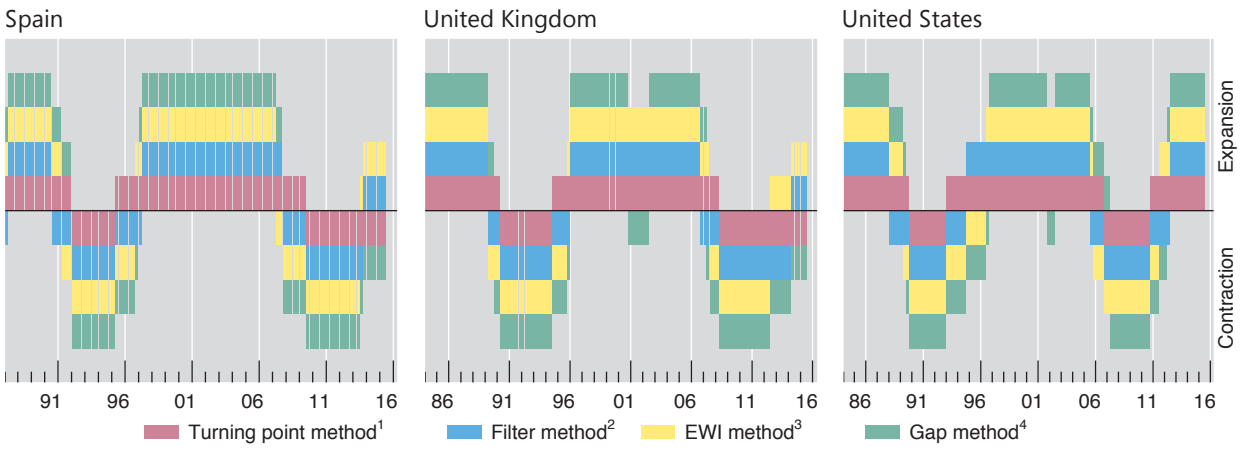
The *filter method* uses a statistical filter to extract cyclical fluctuations of real credit, the credit-to-GDP ratio and real property prices and combines them into a single series.② Specifics differ, but Drehmann et al (2012), for instance, rely on a bandpass filter to extract cyclical fluctuations between eight and 32 years in each of the series. They then take an average of the medium-term cycles in the three variables.

The *early warning indicator (EWI) method* builds on the financial crisis early warning indicator literature. In particular, large deviations of the credit-to-GDP ratio from a long-run trend have been found to provide a reliable single early warning signal.③ And the financial cycle is seen to turn once real residential property prices start to fall. On the flip side, a trough occurs when the credit-to-GDP gap is negative and property price growth turns positive, even though there is more uncertainty as property price growth sometimes fluctuates around zero for some time.

The *gap method* exploits insights from Juselius and Drehmann (2015) to decompose the financial cycle into two key variables that jointly pin down sustainable levels in the credit-to-GDP ratio.④ The first is the leverage gap, which

Different financial cycle dating methods generally coincide

Graph III.A



[1] The phases of the financial cycle are identified by the phases in real credit, the credit-to-GDP ratio and real residential property prices when the minimum length of the cycle is five years. The financial cycle turns if all three series turn within a three- to six-year window. [2] A bandpass filter is used to extract cyclical fluctuations between eight and 32 years in real credit, the credit-to-GDP ratio and real residential property prices. Afterwards, an average of the medium-term cycles in the three variables is taken. Peaks (troughs) occur when the growth rate turns from positive to negative (negative to positive). [3] A peak (trough) in the financial cycle is when credit-to-GDP gaps are positive (negative) and real residential property prices start to fall (rise) on a sustained basis. [4] An expansion (contraction) of the financial cycle is measured by a negative (positive) leverage gap. Each phase has to be at least two quarters long.

Sources: National data; BIS calculations.

is the deviation from the long-run equilibrium relationship between the credit-to-GDP ratio and key asset prices (real residential and commercial property prices and equity prices). The second is the debt service gap, which is the deviation from the long-run equilibrium relationship between the credit-to-GDP ratio and the average lending rate on outstanding debt. By embedding the gaps in a vector autoregressive system, the authors find that they are the key link between financial and real developments. Most importantly, a high debt service gap – when a high fraction of income is used to pay interest and amortise debt – significantly reduces expenditure. The leverage gap, on the other hand, is the key determinant of credit growth, boosting it when it is negative, ie when asset prices are high relative to credit-to-GDP ratios. Given that it embeds both credit and asset price dynamics, a negative (positive) leverage gap is associated with the expansion (contraction) of the financial cycle.

As an illustration, the expansion and contraction phases of the financial cycle for Spain, the United Kingdom and the United States generally coincide based on the four methods outlined above (Graph III.A). While close, the exact timing of turning points differs across methodologies. Otherwise, the only difference between methodologies emerges during the dotcom bust, after which the gap method identifies a contraction in the financial cycle in the United Kingdom and the United States, in contrast to the other approaches. This most likely arises because this is the only method that also includes information from equity prices, which were more volatile at the time.

While the four different methods provide a coherent picture of the financial cycle, in particular in retrospect, it is clear that none is sufficient to perfectly classify countries into different phases. For instance, currently all methods suggest that the financial cycle is expanding in the United States, but there remains more ambiguity for Spain and the United Kingdom. Given the heterogeneity in financial booms and busts, including owing to structural developments, it could be useful to rely on a broader range of indicators, including credit spreads, risk premia, default rates and proxies for risk perceptions and risk appetite.

① See M Drehmann, C Borio and K Tsatsaronis, "Characterising the financial cycle: don't lose sight of the medium term!", *BIS Working Papers*, no 380, June 2012; and M Terrones, M Kose and S Claessens, "Financial cycles: What? How? When?", *IMF Working Papers,* no WP/11/88, April 2011. ② See D Aikman, A Haldane and B Nelson, "Curbing the credit cycle", *The Economic Journal*, vol 125, no 585, June 2015, pp 1072–109; and P Hiebert, Y Schuler and T Peltonen, "Characterising the financial cycle: a multivariate and time-varying approach", *ECB Working Paper Series*, no 1846, September 2015. ③ See C Borio and M Drehmann, "Assessing the risk of banking crises – revisited", *BIS Quarterly Review,* March 2009, pp 29–46; C Detken, O Weeken, L Alessi, D Bonfim, M Boucinha, C Castro, S Frontczak, G Giordana, J Giese, N Jahn, J Kakes, B Klaus, J Lang, N Puzanova and P Welz, "Operationalising the countercyclical capital buffer: indicator selection, threshold identification and calibration options", European Systemic Risk Board, *Occasional Paper Series*, no 5, June 2014; and M Schularick and A Taylor, "Credit booms gone bust: monetary policy, leverage cycles, and financial crises, 1870–2008", *American Economic Review*, vol 102, no 2, April 2012, pp 1029–61. ④ The leverage and debt service gaps are identified by the cointegration relationship between the component series. See M Juselius and M Drehmann, "Leverage dynamics and the real burden of debt", *BIS Working Papers*, no 501, May 2015.

In China, growth eased to 6.9% in 2015 and continued at a similar pace in early 2016, with the financial cycle in retreat as property prices fell after a large, sustained increase in the credit-to-GDP ratio (Graph III.2, right-hand panel). The downturn in manufacturing and construction in China sapped commodity demand. Commodity price declines saw trade values and growth plunge for commodity exporters, although exchange rate depreciations cushioned the size of export falls in local currency terms (Graph III.1, centre panel). In India, growth picked up a little to 7.6% as the financial cycle gained momentum. In both Brazil and Russia, GDP contracted sharply, by 4%, and the financial cycle downturn compounded the drop in export prices and large currency depreciations. In other EMEs, including Turkey and Mexico, the financial cycle remained in an upturn.

The reduction in spare capacity in the United States and expected gradual monetary policy tightening boosted dollar appreciation. This coincided with signs of tighter global liquidity conditions, as US dollar borrowing outside the United States tapered off in late 2015. As capital inflows ebbed, commodity exporters and EMEs saw large currency depreciations into the first months of 2016. Subsequently, capital inflows resumed, and currencies recovered some of the earlier losses.

Overall, labour markets presented a more optimistic view of economic developments than did GDP. Labour markets tightened in most economies by more than expected in 2015 despite growth a bit below expectations (Graph III.1, right-hand panel). Commodity-exporting economies were the exception, with unemployment

rates typically increasing by more than anticipated, in some cases significantly. There has been a substantial tightening in most labour markets since the crisis and in some there is only moderate slack, although unemployment rates remain high in many European economies, particularly for the young.

The fairly bright overall picture painted by labour markets contrasts with the view that "anaemic" growth characterises the still "ongoing" recovery. That pessimistic interpretation seems rooted in the expectation of a return to pre-crisis headline (as opposed to per working age person) output growth if not to the pre-crisis output path. The questions these contrasting impressions raise about the state of the economy are critical for guiding the policy response (see below).

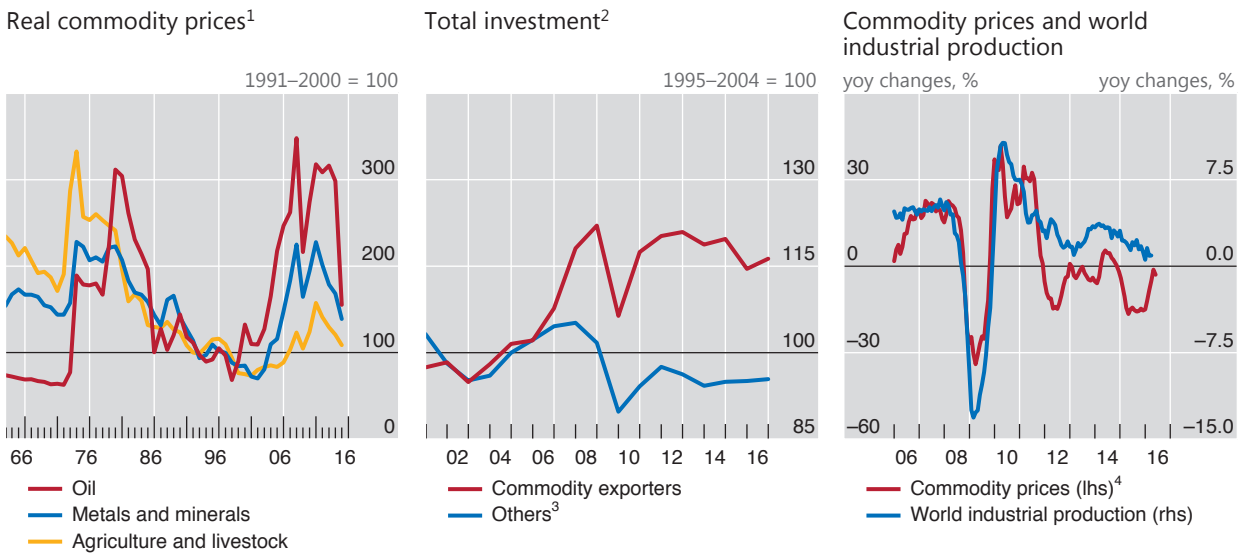
Large shifts in relative prices require big adjustments

The large exchange rate shifts and further commodity price falls represent sizeable changes in the relative prices that have guided investment and financing decisions for the best part of 15 years. If these changes persist, they will require significant restructuring in many economies. The transitions and realignments are likely to be a drag on growth in the near term. But they should eventually allow renewed and, above all, more sustainable and resilient growth, both in advanced economies and EMEs.

Commodity prices continued to fall

Oil prices have plummeted since mid-2014, overtaking the drops in other commodity prices, which have been declining for almost five years (Graph III.3, left-hand panel). The prospect of weaker demand, on top of steadily growing supply, hit

The unwinding commodity supercycle is hurting exporters — Graph III.3



[1] Commodity prices deflated by the US CPI from Jacks (2013). [2] Gross capital formation as a percentage of GDP; weighted average based on rolling GDP and PPP exchange rates. [3] Excluding China. [4] Commodity Research Bureau – Bureau of Labor Statistics (CRB BLS) spot index.

Sources: D Jacks, "From boom to bust: a typology of real commodity prices in the long run", *NBER Working Papers*, no 18874, March 2013; IMF, *World Economic Outlook*; Commodity Research Bureau; CPB Netherlands Bureau for Economic Policy Analysis; Datastream; BIS calculations.

crude markets hard: oil prices extended the slide of the second half of 2015, falling sharply to below $30 per barrel in mid-January 2016, a price not seen since 2003. In real terms, this was the largest decrease over any two-year period since the oil price became market-determined in the early 1970s. By May, the price had rebounded, but Brent was more than 50% below the high plateau observed between mid-2010 and mid-2014. The price declines for base metals and foodstuffs have been smaller over the past year, not least because their prices had already dropped substantially.

The surge in real commodity prices from the early 2000s and the subsequent decline have traced a supercycle comparable to the one in 1973–86. The most recent boom was driven by the robust growth of resource-intensive industries in China and other EMEs, supported by global liquidity conditions. The surge was only briefly interrupted by the sharp price drops at the peak of the crisis in late 2008. Highly stimulative monetary and fiscal policies put in place with the onset of the crisis and the resulting debt-fuelled spending, notably in China, swiftly brought commodity prices back to soaring heights. By late 2009, the real prices of all commodities were again at levels comparable to (or higher than) those seen in 2008.

Continued buoyant investment in infrastructure and construction, boosted by cheap and readily available borrowing and rapid growth in manufacturing, sustained the surge in the demand for raw materials. This lifted investment and growth more generally in commodity-exporting economies, both advanced and emerging (Graph III.3, centre panel). The resulting increased capacity came on line as demand growth moderated, especially in manufacturing (Graph III.3, right-hand panel). Thus, prices dropped, repeating the classic "hog cycle" typical of commodity markets.

For oil, the increase in demand was broader than for most other commodities, but the confluence of easy financing conditions and supply expansions was every bit as prominent. New firms borrowed heavily to increase shale oil production in the United States. From 2006 to 2014, oil and gas companies' bonds and syndicated loans grew at an annual rate of 14%. The high level of debt can have persistent effects. As credit conditions tighten, highly leveraged producers may maintain, or even increase, output even as the oil price falls in order to meet interest and debt repayments. Moreover, they will be more inclined to hedge exposure in derivatives markets. Dynamic hedging by their counterparts may add downward pressure to the spot market for some time. Increased supply has clearly contributed to the sharp price drop since mid-2014, reflecting not only the resilience of US shale oil production but, crucially, OPEC's reluctance to curtail output – a game changer.

The borrowing surge extended beyond oil and gas firms to other commodity producers. The debt issued by a broad range of commodity firms in advanced economies increased at an annual rate of 12% from 2005 to 2015. For EME firms, the growth was even higher, at 17%. In total, by December 2015 commodity firms had $4 trillion of debt outstanding globally. As their revenues sank, the debt service burden grew, despite historically low interest rates (Graph III.4, left-hand panel). In some cases, debt sustainability could come into question. But for many economies, the biggest risk may derive from sharp economic contractions induced by firms' and households' spending retrenchment and, critically, strongly procyclical fiscal policy.

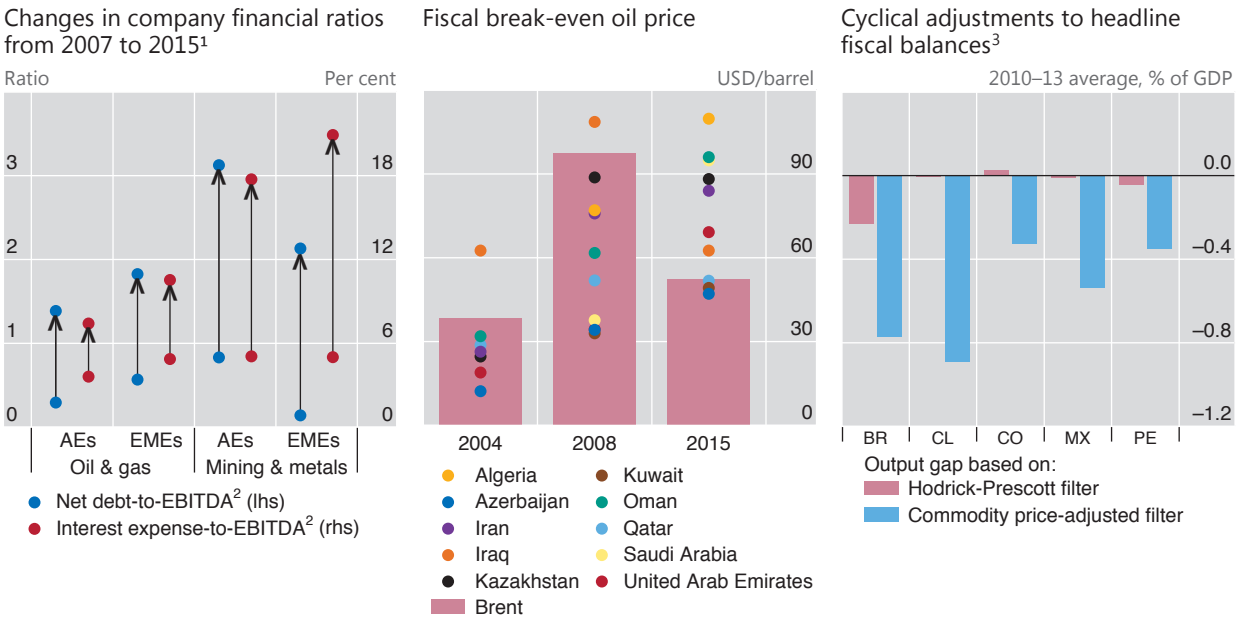
Waiting for the fillip to growth from lower commodity prices

For the world as a whole, the net impact of lower commodity prices induced by a cheaper and more ample supply of a key production input should be positive. But the size and timing are uncertain and depend on demand patterns.

Commodity-importing economies should benefit through terms-of-trade gains. Consumers, in particular, have historically boosted their expenditure. However, in

Risks have built up for commodity producers

Graph III.4



[1] Median ratio for each year. Datastream aggregates by regions and industries. [2] EBITDA = earnings before interest, tax, depreciation and amortisation. [3] Changes in the current fiscal balance to account for the cyclical fluctuations induced by the business cycle. The adjustment procedure follows the OECD methodology and corrects government revenues and expenditure for their economies' output gap (observed output relative to potential), based on estimated elasticities. Potential output is determined by smoothing observed GDP with either a standard Hodrick-Prescott filter or by a version that accounts for the possible effect of commodity price fluctuations.

Sources: E Alberola, R Gondo Mori, M Lombardi and D Urbina, "Output gaps and policy stabilisation in Latin America: the effect of commodity and capital flow cycles", *BIS Working Papers*, no 568, June 2016; N Girouard and C André, "Measuring cyclically-adjusted budget balances for OECD countries", *OECD Economics Department Working Papers*, no 434, July 2005; IMF; OECD; Datastream Worldscope; national data; BIS calculations.

the past year the expected fillip to growth failed to materialise to the extent expected. One reason could be that highly leveraged consumers used at least part of the income windfall to reduce debt. Indeed, over the period of falling oil prices household consumption growth picked up by about 1.5 percentage points less in the economies where household debt had increased most rapidly between 2000 and mid-2014 relative to those where it had risen more moderately. For firms, the uncertainty that has constrained investment in recent years may have contributed to the muted response.

For commodity producers, most of which are EMEs, the lower commodity prices are undoubtedly a net headwind. One clear channel is the sharp decline in investment. In 2015, investment fell by 2.5% for a selection of commodity-exporting EMEs, a major pullback from the 4.1% growth expected for 2015 as of January 2014, when commodity prices were much higher. And over the course of 2015, expected investment growth for 2016 was also cut from 3.3% to –0.5%. This would add to the reduction in consumer spending, as terms-of-trade losses sap real incomes.

Procyclical government spending was another headwind for EME commodity exporters. Tax revenue sinks directly with the lower income from governments' commodity assets and royalties, and indirectly with weaker economic activity. Historically, it has not been possible to smooth out this revenue shortfall with debt, as investors' confidence in the sovereign wanes and both sovereign and corporate bond spreads widen. This time around, governments in commodity-exporting countries had partly saved the gains early in the boom. But as growth sputtered

post-crisis despite commodity prices remaining high, fiscal consolidation stalled and debt stabilised or even increased. Overall, as prices fell, oil exporters with increased spending commitments were badly hit: the oil prices required to achieve fiscal balance soared (Graph III.4, centre panel).

The fiscal problem reflects in part the inherent difficulty of assessing fiscal positions during the boom, which depends on imprecise estimates of the cyclical component of output or the "output gap". Much like what happens with credit booms (Chapter V), a commodity price upswing may artificially boost potential output estimates, thereby concealing weak fiscal positions. The right-hand panel of Graph III.4 presents real-time estimates of cyclical adjustments to structural fiscal balances for a group of large Latin American commodity exporters, based on standard measures of the output gap alongside those adjusted for the commodity cycle.[2] When corrected for commodity price fluctuations, structural fiscal deficits during 2010–13 are significantly larger than those standard methods suggest. Fiscal policies were too loose during the boom years.

Floating (and sinking) exchange rates

The past year saw further large exchange rate shifts driven by the US dollar. For some EMEs, these shifts were outside the interquartile range of yearly changes of the past 20 years (Graph III.5, left-hand panel). In nominal effective terms, the dollar appreciated by 9% from May 2015 to January 2016, but then retraced some of this, so that the appreciation over the year to May was just 4%. Many currencies depreciated against the dollar and in nominal effective terms. The euro and yen nominal effective exchange rates appreciated by 5% and 18% over the year to May despite further monetary easing. EMEs and commodity exporters saw the largest depreciations. The currencies of Russia, South Africa and Brazil depreciated by 16%, 18% and 5%, respectively, in nominal effective terms, in part reflecting domestic factors. The renminbi depreciated slightly in nominal effective terms and vis-à-vis the dollar.

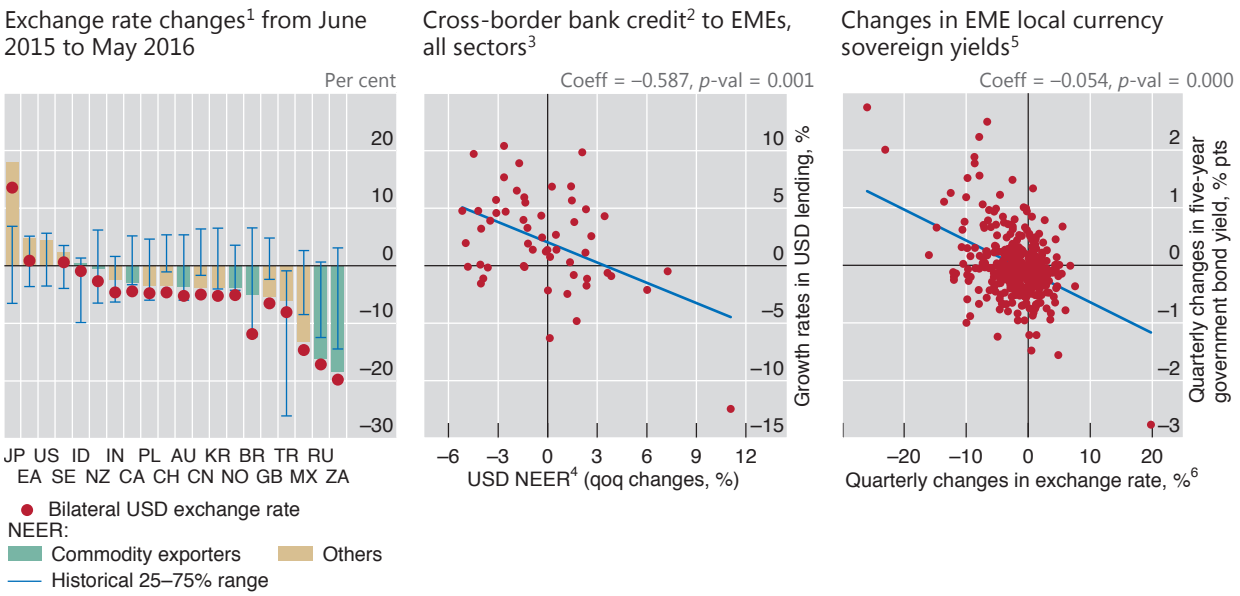
These exchange rate shifts may affect macroeconomic outcomes through at least two channels. The first works through changes in balance sheets and financial risk-taking.[3] A depreciation tends to weaken the balance sheets of entities that have net foreign currency liabilities. This may induce spending cuts. It also worsens credit conditions more broadly as their (bank and non-bank) lenders' risk-taking capacity diminishes, curtailing credit to others as well. The second channel works through trade (expenditure switching): a depreciation should improve net exports and add to domestic absorption, at least if the central bank does not raise rates to fend off inflation. Thus, exchange rate changes transfer demand from the appreciating to the depreciating jurisdictions.

[2] The real-time estimates of the output gaps used for the cyclical adjustment are based on country data available at the time of estimation; cyclical adjustment is then conducted according to the OECD methodology described in N Girouard and C André, "Measuring cyclically-adjusted budget balances for OECD countries", *OECD Economics Department Working Papers*, no 434, July 2005. For further details on the methodology, see E Alberola, R Gondo Mori, M Lombardi and D Urbina, "Output gaps and policy stabilisation in Latin America: the effect of commodity and capital flow cycles", *BIS Working Papers*, no 568, June 2016.

[3] On the risk-taking channel of the exchange rate, see V Bruno and H S Shin, "Global dollar credit and carry trades: a firm level analysis", *BIS Working Papers*, no 510, August 2015. For a more comprehensive discussion of the risk-taking channel of monetary policy transmission, see C Borio and H Zhu, "Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?", *Journal of Financial Stability*, vol 8, no 4, December 2012, pp 236–51.

The risk-taking channel of exchange rates

Graph III.5



[1] Monthly averages; an increase indicates an appreciation of the local currency. The error bars show the 25th–75th percentiles calculated over the moving 12-month percentage change of BIS broad nominal effective exchange rate (NEER) indices for April 1997–May 2016. [2] BIS reporting banks' cross-border loans and holdings of debt securities. [3] Quarterly changes over 2002–15. [4] BIS narrow NEER index. [5] Quarterly changes from Q1 2011 to Q1 2016 for each economy. Average figures for each quarter are used. [6] Percentage change in bilateral exchange rate of the local currency against the US dollar; a positive value indicates an appreciation of the local currency.

Sources: Bloomberg; Datastream; national data; BIS debt securities statistics and locational banking statistics; BIS calculations.

The risk-taking channel looms large for EMEs

Greater financial integration has probably increased the influence of the exchange rates of major international funding currencies on global financial conditions, especially in EMEs. This is highlighted by the substantial growth in the stock of US dollar-denominated debt of non-banks outside the United States, to $9.7 trillion at end-2015, with $3.3 trillion of this to EMEs, a doubling since 2009.[4]

The exchange rate risk-taking channel has both a quantity and a price dimension. Research has documented a relationship between local currency appreciation against the dollar and increasing bank leverage, credit growth and bond portfolio inflows, as well as declining sovereign yield spreads against US Treasuries and CDS spreads.[5]

The quantity side works through changes in the credit supply to domestic firms when the value of their local currency changes. As a local currency depreciation shrinks the collateral value of domestic firms' assets to foreign lenders, this reduces the latter's capacity to extend credit – for instance, through a value-at-risk (VaR) constraint.[6] While the mechanism is stimulative for appreciations, the retrenchment may be larger and more abrupt for the depreciations that follow prolonged

[4] These data are discussed in R McCauley, P McGuire and V Sushko, "Dollar credit to emerging market economies", *BIS Quarterly Review*, December 2015, pp 27–41.

[5] For evidence of impact on capital markets, see B Hofmann, I Shim and H S Shin, "Sovereign yields and the risk-taking channel of currency appreciation", *BIS Working Papers*, no 538, January 2016.

[6] Even for firms with dollar-denominated revenue, a stronger dollar may coincide with weaker revenue, as in the case of oil firms where a stronger dollar tends to go together with weaker oil prices.

appreciations, because of a build-up of a large stock of liabilities and currency mismatches during the upswing. The expansionary effect for EMEs is illustrated in the centre panel of Graph III.5. A 1% depreciation of the dollar is associated with a 0.6% increase in the quarterly growth rate of US dollar-denominated cross-border lending.

The price dimension works through widening credit spreads when the domestic currency depreciates and risk-taking decreases. This relationship between exchange rates and financial conditions is illustrated in the right-hand panel of Graph III.5. When the local currency appreciates, EME local currency sovereign yields fall. Currency appreciation and looser financial conditions go hand in hand.

This risk-taking channel is potent for EMEs but has no apparent role in advanced economies (Box III.B). An exchange rate depreciation (against the international financing currencies) leads to a contraction of GDP in EMEs, but not in advanced economies. Moreover, the impact in EMEs is quick but recedes somewhat with time.

The trade channel is more potent in advanced economies than EMEs

An exchange rate depreciation stimulates output through the trade channel, but its efficacy can depend on a number of factors. For example, the channel will be more potent the larger the trade share of GDP and the more responsive prices of tradeable goods are to the exchange rate. The trade channel is found to be important for both EMEs and advanced economies, even when controlling for the financial channel (Box III.B). For both groups of countries, the stimulus builds over time: the boost to growth is smaller in the short than in the long run. Overall, this evidence suggests that for EMEs the risk-taking channel is a significant offset to the trade channel, especially in the short run.

Recent studies generally suggest that trade exchange rate elasticities have declined in response to changes in trade structures, including currency denomination, hedging and the increasing importance of global value chains. For instance, a World Bank study finds that manufacturing export exchange rate elasticities almost halved between 1996 and 2012, with almost half of this decrease due to the spreading of global supply chains.[7] An OECD study also finds small trade elasticities: in G3 economies, a 10% depreciation increases the trade balance only 0.4–0.6 percentage points.[8] By contrast, a recent IMF study argues that exchange rates continue to have a sizeable effect on the value of net exports – with a 10% depreciation improving the trade balance by 1.5 percentage points. That said, the same study does find some evidence that the price elasticity of trade volumes has declined in recent years.[9]

Two interrelated financial factors may explain the lessening in trade sensitivities in advanced economies: the simultaneous nature of deleveraging and the lingering effects of the crisis. For instance, recent research finds that a boom in household debt tends to go hand in hand with currency appreciation, a stronger increase in imports and a bigger deterioration in net trade. After the bust, depreciation and a boost to net exports typically help offset the deleveraging-induced drag on growth.

[7] See S Ahmed, M Appendino and M Ruta, "Depreciations without exports? Global value chains and the exchange rate elasticity of exports", World Bank, *Policy Research Working Papers*, no 7390, August 2015.

[8] See P Ollivaud and C Schwellnus, "The post-crisis narrowing of international imbalances: cyclical or durable?", *OECD Economics Department Working Papers*, no 1062, June 2013.

[9] See IMF, "Exchange rates and trade flows: disconnected?", *World Economic Outlook*, October 2015, pp 105–38.

Box III.B

Exchange rates: stabilising or destabilising?

Economists have extensively studied the stabilising role of exchange rates through the adjustment of relative prices and the trade balance. Recent literature has also identified various financial channels through which exchange rates can affect economic activity. This box presents initial evidence that these financial effects are economically significant for output in EMEs.

A simple model can shed some light on the relative importance of the trade and financial channels for advanced and emerging economies. The model is an autoregressive distributive lag (ARDL) specifying GDP as a function of both the trade-weighted real effective exchange rate (REER) and a debt-weighted nominal exchange rate (DWER). The DWER for each country weights its bilateral exchange rates against each of the five major global funding currencies (US dollar, euro, Japanese yen, pound sterling and Swiss franc) by the shares of these global funding currencies in that country's foreign currency debt (both domestic and international). This is a conceptual improvement over the practice of using the US dollar bilateral exchange rate to capture financial effects, because it acknowledges the relative importance of other funding currencies in the liability structure of each country.

The sample comprises a quarterly panel of 22 EMEs and 21 advanced economies over the period 1980–2015.① In addition to the two exchange rate indices, various controls are included to limit endogeneity concerns.②

Table III.B displays the short- and long-run elasticities of GDP growth with respect to the two exchange rate measures separately for EMEs and advanced economies. There is strong evidence of the stimulative effects of exchange rate depreciations through the trade channel: for both groups of countries, the elasticity of the trade-weighted exchange rate is negative. The magnitudes are also similar, indicating that a 1 percentage point REER depreciation leads to an increase in GDP growth of 10–12 basis points on average in the long run. By contrast, only EMEs show evidence of the financial channel: a 1 percentage point depreciation of the DWER implies a 10 basis point decrease in their GDP growth in the long run. The corresponding effect is much smaller and not statistically significant for advanced economies.③

The ratios of short- to long-run elasticities reported in Table III.B indicate that the financial channel overshoots in the short run and has a larger short-run impact than the trade channel. For EMEs, the short-run elasticity of the DWER is larger than its long-run elasticity, implying that the initial impact fades somewhat over time. By contrast, for both EMEs and advanced economies, the REER long-run elasticity is larger than the short-run elasticity, meaning that the trade channel effect builds with time. For EMEs, the DWER's short-run elasticity is larger in absolute magnitude than that of the REER. This result provides tentative evidence for EMEs that in the short run, the effects of the financial channel dominate those of the trade channel so that an equal depreciation of the DWER and REER may be initially contractionary. For EMEs, a depreciation seems to provide only a small boost to GDP, and only after some quarters.

Long-run elasticity of GDP growth with respect to real effective (REER) and debt-weighted (DWER) exchange rates

Table III.B

	EMEs			Advanced economies		
	Short-run	Long-run	Ratio: short-run to long-run	Short-run	Long-run	Ratio: short-run to long-run
REER	–0.103***	–0.1217***	0.85	–0.058	–0.104***	0.56
	(0.017)	(0.040)		(0.034)	(0.044)	
DWER	0.1322***	0.105***	1.26	0.026	0.032	.[1]
	(0.025)	(0.033)		(0.027)	(0.033)	
Observations		1055			1072	
R-squared[2]		0.92			0.32	

Robust standard errors (clustered by country) in parentheses; ***/**/* denotes results significant at the 1/5/10% level.

[1] Neither elasticity is statistically significant at 10%. [2] The higher R-squared for EMEs is a reflection of the higher explanatory power of the lagged dependent variable compared with advanced economies.

① The panel is unbalanced and restricted by data availability, especially in the early part of the sample. ② The full model specification is as follows:

$$\Delta \ln(\text{GDP})_{i,t} = \sum_{k=1}^{4} \beta_k \Delta \ln(\text{GDP})_{i,t-k} + \sum_{k=0}^{4} \gamma_k \Delta \ln(\text{REER})_{i,t-k} + \sum_{k=0}^{4} \delta_k \Delta \ln(\text{DWER})_{i,t-k}$$
$$+ \sum_{k=0}^{4} \phi_{r,k} \Delta(\text{Policy rate})_{i,t-k} + \sum_{k=0}^{4} \phi_{c,k} \Delta \ln(\text{Commodity price})_{i,t-k}$$
$$+ \sum_{k=0}^{4} \phi_{f,k} \Delta \ln(\text{Foreign demand})_{i,t-k} + \psi_i + FC + \varepsilon_{i,t}$$

Foreign demand is measured as an export-weighted sum of foreign GDP. *FC* denotes a dummy variable representing the financial crisis (2008–09) and ψ_i is a country fixed effect. ③ The model was also estimated country by country using variation only in the time dimension. Results were qualitatively similar. In terms of magnitude, the median elasticities were higher than the ones obtained with the panel regressions. For instance, for EMEs the long-run median REER elasticity is –0.28 and the long-run DWER elasticity is 0.31.

But this mechanism may be substantially weaker when several countries deleverage simultaneously.[10] In addition, a depreciation may also have smaller effects on exports in the aftermath of a financial crisis if lack of funding, resource misallocations and high uncertainty constrain the output response.

Changing interdependence

With growth in some EMEs slowing and financial strains increasing, it is crucial to understand the extent to which these developments can spill over globally. Spillovers from EMEs to advanced economies have increased over time, as EMEs have accounted for a larger share of global trade and output growth – around 80% since 2008. While financial linkages have deepened, financial spillovers to EMEs remain more potent than those in the opposite direction. Spillovers depend not just on the size of interlinkages but also on the nature of the shocks (common or country-specific) and on various shock absorbers. The current global slowdown and risks resulting from the previous run-up in EME external debt and recent tightening global liquidity conditions are a case in point.

Increasing trade spillovers from EMEs

Increased trade is an important channel of greater spillovers from EMEs to advanced economies. EMEs now account for around 45% of global trade, up from just over 30% in 2000. The intensity of spillovers will depend on the size and nature of an economy's trade flows. Of particular note, China's rapid growth and increased trade openness have seen it account for a growing share of many countries' exports, particularly commodity exporters (Graph III.6, top panel).

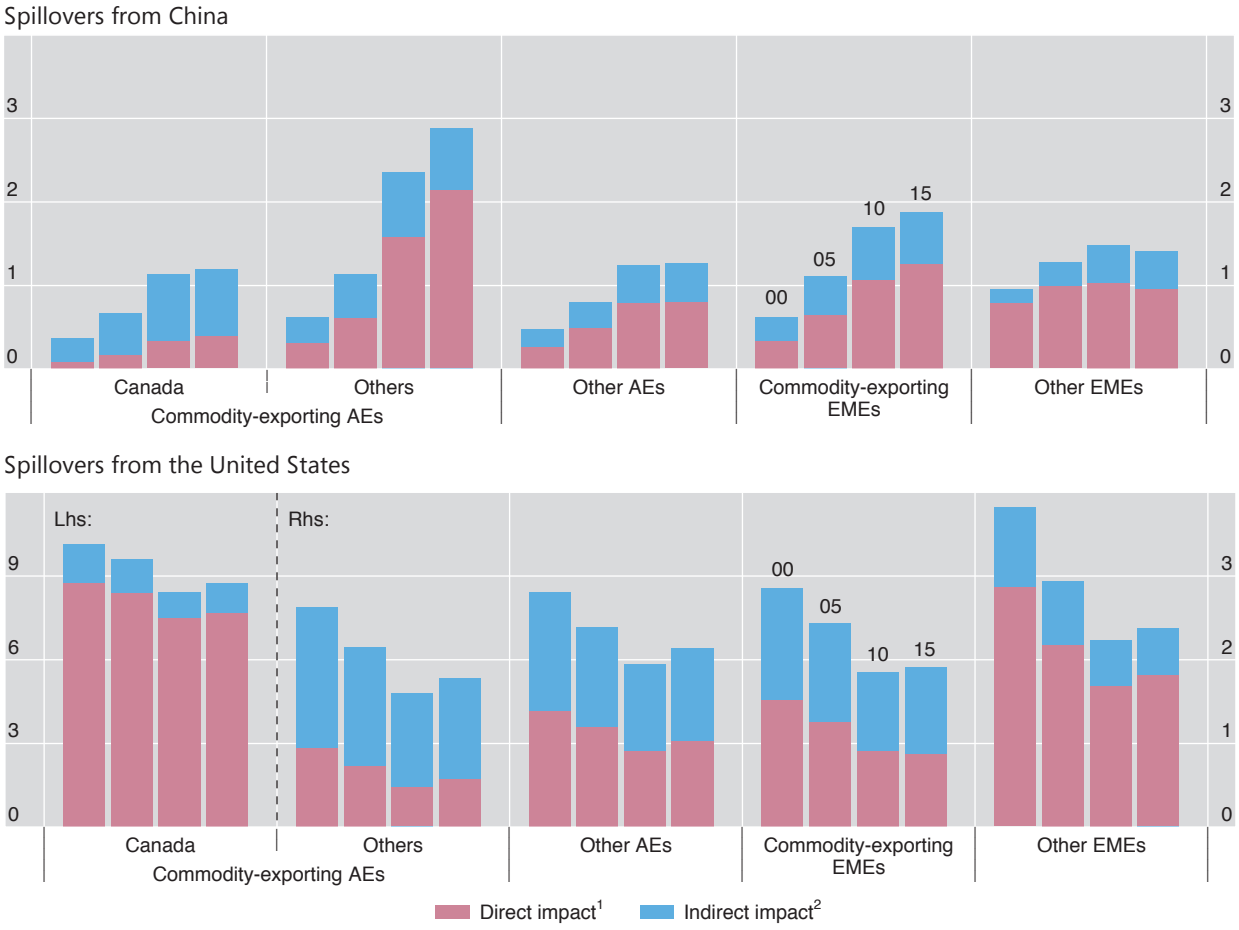
These spillovers are changing as China rebalances from investment-led growth towards a more service-oriented economy. Slower growth in construction and industry (the secondary sector) and a fall in the corresponding output prices resulted in virtually no growth in nominal value added for this sector in 2015. This is already having large spillovers to both commodity producers and capital goods exporters through drops in the value of their exports (Graph III.1, centre panel). Growth that is more services-intensive has smaller spillovers, given that services account for only around 10% of imports despite being around half of GDP.

[10] See A Mian, A Sufi and E Verner, "Household debt and business cycles worldwide", *NBER Working Papers*, no 21581, September 2015.

Trade spillovers from China have increased, and remain large from the United States

Impact of a 10% increase in imports by China and the US on total exports of given economy or group of economies; ratios for 2000, 2005, 2010 and 2015, in per cent

Graph III.6



[1] Shares of exports to China/the US in the respective economies multiplied by 10%. [2] Direct effect of the respective economies multiplied by the corresponding export shares.

Sources: IMF, *Direction of Trade Statistics*; BIS calculations.

In contrast to the significant rise in exports destined for China, the share of most countries' exports to the United States has remained stable or declined a little over the past 15 years (Graph III.6, bottom panel). Despite this, US demand is still more important than China's for most countries' exports.

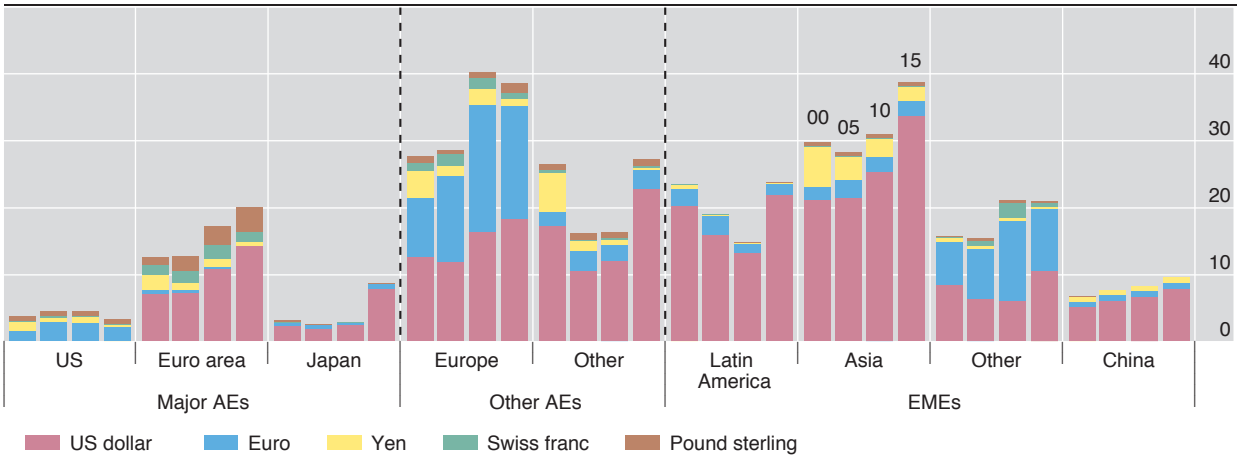
Trade spillovers can also occur through a third country that imports intermediate inputs used in the production of its own exports. As a result, for many advanced and commodity-exporting EMEs the indirect impact of a reduction in US imports is large relative to the direct effect (the blue bars are large relative to the red bars in the bottom panel of Graph III.6). Spillovers from other major advanced economies also remain important for both advanced and emerging market economies.

Larger spillovers and spillbacks through the financial channel

Financial spillovers from EMEs have increased along with their international liabilities and assets and other financial links. True, EMEs still appear to be more a

The US dollar is the dominant global funding currency[1]

Ratio of total foreign currency debt[2] to GDP for 2000, 2005, 2010 and 2015; in per cent — Graph III.7



[1] Simple average across regions. End-of-year ratios. [2] Total foreign currency debt of non-bank residents of the respective economies.

Sources: BIS debt securities statistics and locational banking statistics; national data; BIS calculations.

destination than a source of financial spillovers. However, financial spillovers to EMEs can cause a gradual accumulation of imbalances which can later result in substantial spillbacks to advanced economies.

A critical channel for financial spillovers, particularly to EMEs, is external borrowing, especially in international funding currencies. Most of this borrowing is in US dollars, increasing the importance of US financial conditions (Graph III.7). While other advanced economies also borrow in foreign currencies, more of that borrowing tends to be hedged, reducing vulnerabilities. Swings in the availability and cost of external borrowing can amplify domestic leverage and have outsize effects when borrowers face financial distress.

The accumulation of a large stock of foreign currency-denominated debt in EMEs has heightened the potential for spillbacks to advanced economies. Low US interest rates and a depreciating dollar have boosted credit, asset prices and growth in EMEs for quite some time. A turn in global liquidity conditions induced by prospects of higher US interest rates could trigger a reversal of easy liquidity conditions, as appeared to be the case during the period under review before markets regained their balance following the turbulence in early 2016 (Chapter II).

Spillovers to advanced economies from EME ownership of specific advanced economy assets, such as sovereign bonds, have increased. The reduction in holdings of US bonds was arguably one factor contributing to moves in US yields over the past year (Chapter II). By contrast, spillovers to advanced economies through wealth effects from direct ownership of EME assets are generally small, in line with the share of EME assets in advanced economy portfolios.

Larger spillovers can occur through the impact on advanced economies' asset prices. The sensitivity of equity prices to sharp moves in Chinese equity prices over the past year (Chapter II) highlights the growing importance of this channel.

A dose of growth realism

Since the financial crisis, headline GDP growth in both advanced and emerging market economies has consistently fallen short of forecasts and pre-crisis norms. The

resulting debate on the causes and implications of seemingly lacklustre growth is a critical backdrop for policy considerations. Whether growth is indeed underwhelming cyclically or structurally, and whether this results from deleveraging (part of the so-called debt supercycle – outsize financial booms gone wrong), factor misallocation, secular stagnation, technological slowdown or some other cause, influences not just the appropriate policy response but what policies can plausibly achieve. Unrealistic expectations of an economy's growth potential, structural and cyclical, can lead to excessive reliance on demand management policies. The end result may be an economy that bears the costs of activist policies without the anticipated benefits.

An economy's growth potential is conventionally thought to be determined by the expansion in aggregate supply, with demand having only a short-term influence. However, secular stagnation posits that protracted weak demand has been a persistent constraint on growth.[11] This section assesses growth potential in the light of the explanations above, by considering the key determinants of supply and demand. The causes of low growth are varied, but not least among them is the impact of the run-up in debt and its legacy.

Slower growth of supply

To a large extent, most economies' weaker growth in recent years reflects slower expansion of supply attributable to the factors of production, labour and capital, and to productivity.

The structural decline in labour force growth due to demographic factors is reducing potential output growth in almost all countries. The effect is large: while global GDP growth was 0.5 percentage points *below* its 1987–2007 average in 2015, growth of global GDP per working age person was actually 0.2 percentage points *above* its average (Graph III.1, left-hand panel). In Europe and other advanced economies, the baby boom generation is now reaching retirement. As a result, working age population growth is slowing sharply, by close to 1 percentage point in just a decade, and is already negative (Graph III.8, left-hand panel). In China, its decline is even more extreme, in excess of 2 percentage points. In other EMEs, working age population growth has also slowed, but remains positive (Graph III.8, centre panel). Even accounting for the partly offsetting influence of greater labour force participation – resulting from various policies, such as higher retirement ages, social trends and better health – labour's contribution to potential output growth has fallen (Graph III.8, right-hand panel).

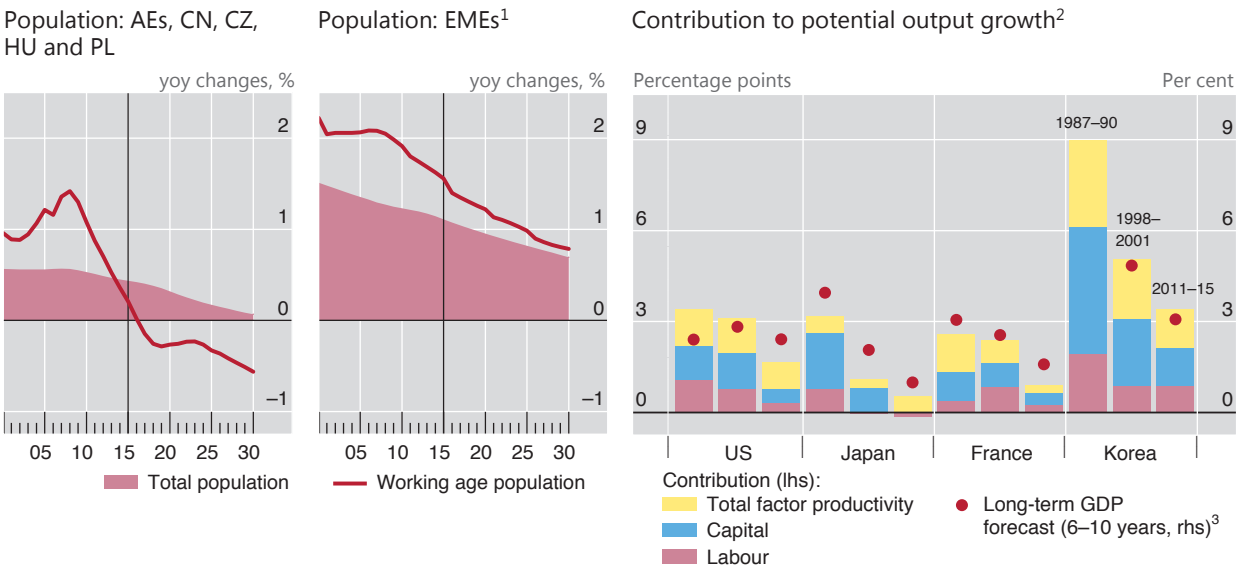
Slower accumulation of physical capital through investment has also contributed to weaker potential output growth post-crisis in advanced economies, but not in EMEs. Despite exceptionally easy financial conditions, firms in advanced economies have been unwilling to invest. A major reason for this appears to be uncertainty about future demand and thus profitability.[12] For some firms, cash hoarding and borrowing in order to buy back shares or pay dividends point towards this apparent dearth of attractive investment opportunities.[13] For others, the hangover from the

[11] For a broad discussion of secular stagnation, see the papers in C Teulings and R Baldwin (eds), *Secular stagnation: facts, causes and cures*, VoxEU, August 2014.

[12] See eg R Banerjee, J Kearns and M Lombardi, "(Why) Is investment weak?", *BIS Quarterly Review*, March 2015, pp 67–82; M Bussière, L Ferrara and J Milovich, "Explaining the recent slump in investment: the role of expected demand and uncertainty", Bank of France, *Working Papers*, no 571, September 2015; and M Leboeuf and R Fay, "What is behind the weakness in global investment?", Bank of Canada, *Staff Discussion Paper* 2016-5, February 2016.

[13] See A van Rixtel and A Villegas, "Equity issuance and share buybacks", *BIS Quarterly Review*, March 2015, pp 28–9.

Fewer workers means less growth shared among more consumers Graph III.8



[1] Excluding China, the Czech Republic, Hungary and Poland. [2] Period averages. [3] For 1987–90, only 1990 forecast.

Sources: OECD, *Economic Outlook*; United Nations, *World Population Prospects: The 2015 Revision*; Consensus Economics; BIS calculations.

run-up in debt appears to be restraining investment. While new finance has been cheap, and easy to obtain for most firms, the need to reduce the high leverage built up pre-crisis has weighed on investment in some countries.

A productivity growth slowdown over the past decade has also contributed to slower potential output growth. In addition to the impact of lower investment, some evidence suggests that one factor may be the persistent impact of the credit boom-induced misallocation of labour into weaker productivity growth sectors.[14] In addition, the current exceptionally easy financial conditions can create incentives for banks to evergreen loans, keeping otherwise unproductive firms alive. Those conditions may be detrimental to a swift reallocation of capital and labour, and distort competition across the economy.[15] A final, often cited factor might be a slowdown in technological progress, but this is less useful for explaining the decline in productivity growth that has also been seen in countries not at the technological frontier.[16]

[14] See C Borio, E Kharroubi, C Upper and F Zampolli, "Labour reallocation and productivity dynamics: financial causes, real consequences", *BIS Working Papers*, no 534, January 2016.

[15] For an analysis of zombie lending and its consequences in Japan, see R Caballero, T Hoshi and A Kashyap, "Zombie lending and depressed restructuring in Japan", *American Economic Review*, vol 98, no 5, December 2008.

[16] On the technological slowdown, see eg R Gordon, "Is US economic growth over? Faltering innovation confronts the six headwinds", *NBER Working Papers*, no 18315, August 2012. However, there is no consensus that technological innovation has slowed, with others arguing it will persist or even accelerate; see eg J Mokyr, "Secular stagnation? Not in your life", in C Teulings and R Baldwin (eds), *Secular stagnation: facts, causes and cures*, VoxEU, August 2014; and E Brynjolfsson and A McAfee, *The second machine age: work, progress, and prosperity in a time of brilliant technologies*, WW Norton & Company, 2016.

Is demand structurally deficient?

GDP growth has been disappointing post-crisis. A key question is whether this is drawn-out cyclical weakness resulting from the after-effects of excess leverage, or reflects structurally deficient demand, which could interact harmfully with supply side factors.

Some structural factors have clearly weighed on demand growth. For instance, population ageing has meant that more people are in pre-retirement cohorts that tend to have higher saving rates. Rising wealth and income inequality in some countries may also foster an increase in savings. In addition, firm investment demand may be weaker because of the relative growth of less capital-intensive industries.

However, a number of observations are at odds with the secular stagnation hypothesis. Notably, job creation and the general improvement in labour markets post-crisis argue against demand growth being deficient. It is also hard to see secular stagnation as a global phenomenon. Many EMEs have low capital stocks, and so their potential demand for investment is substantial. Even in its original context for the United States, secular stagnation sits at odds with the large US current account deficit at the time, which saw domestic demand outstripping supply while global growth was also strong with full employment.

Moreover, other factors contributing to weak demand may be persistent, but will subside with time. Following the substantial run-up in household debt pre-crisis, households in many advanced economies have sought to reduce their leverage or at least take on less new debt, temporarily increasing their saving rate. Further, persistently low interest rates may have weakened demand from households whose income relies heavily on interest earnings, or which are trying to attain a savings target, in particular for retirement.

Finally, supply side constraints may themselves have been weakening demand, akin to how weak demand can undercut supply through skill loss and slower capital accumulation. For instance, if resources are able to shift towards their best use more flexibly, this can unlock effective demand as incomes and investment rise. And increasing competition or allocating credit more effectively can stimulate both supply and demand. Thus, the legacy of the previous unsustainable financial boom may have been weighing on demand also through these channels.

The reality of slower growth, unless…?

Assessing the persistence of other recent headwinds has important implications for the growth that can realistically be achieved in coming years.

Some headwinds to growth will probably subside with time. The stock of debt increased greatly in many economies in the run-up to the Great Financial Crisis, and in others in the years since. But the resulting headwinds from deleveraging and factor misallocation will gradually wane, boosting potential growth. The sharp shifts of exchange rates and commodity prices are likely to impede growth in some economies for some time, but this too will subside.

Other headwinds, however, are not expected to disappear. Ageing populations will continue to weigh on output growth. The slowdown in working age population growth is substantial and powerful. Abstracting from offsets from higher labour force participation, it is reducing GDP growth by 1 percentage point over a decade for a range of countries.

Setting adequate policy priorities requires realistically assessing possible outcomes. For many economies, potential growth is already lower than in earlier decades, and will continue to be so in the coming years (Graph III.8, right-hand

panel). To counteract these headwinds, it is essential to implement long-run supply side reforms in order to boost productivity growth (see the *83rd* and *84th Annual Reports*). This would also help to reduce the burden on monetary policy to sustain economic activity across the globe.

IV. Monetary policy: more accommodation, less room

Monetary policy remained very accommodative over the past year as the room for manoeuvre narrowed. This long-standing exceptional stance was maintained against the backdrop of stubbornly low headline inflation in many economies, uneven global economic momentum and maturing domestic financial cycles in a number of emerging market economies (EMEs) and in some of the advanced economies least affected by the Great Financial Crisis.

Various domestic and external themes were prominent. Growing uncertainty about the timing and size of the policy divergence among the major advanced economies complicated policy and contributed to exchange rate fluctuations. Declining commodity prices weighed heavily on policy considerations. While these developments raised questions about the anchoring of inflation expectations, central banks also had to grapple with conflicting domestic and global inflation cross-currents of a cyclical and secular nature.

Meanwhile, there were lingering concerns about the declining effectiveness of domestic channels of monetary policy and about the side effects of persistent accommodation. The external channels, notably the exchange rate, became more prominent and raised challenges of their own.

In a broader perspective, another year of very accommodative policy, along with expectations of a more moderate pace of normalisation, highlighted the growing tensions between price stability and financial stability. These tensions heightened interest in evaluating the costs and benefits of more financial stability-oriented monetary policy frameworks and in their practical implementation.

The first section reviews the past year's monetary policy and inflation developments. The second examines challenges associated with the growing importance of the external channels of monetary policy as domestic channels wane. The third, taking further the analysis presented in previous years, explores how monetary policy frameworks can evolve to better account for financial stability and more effectively address the trade-offs between price stability and financial stability.

Recent developments

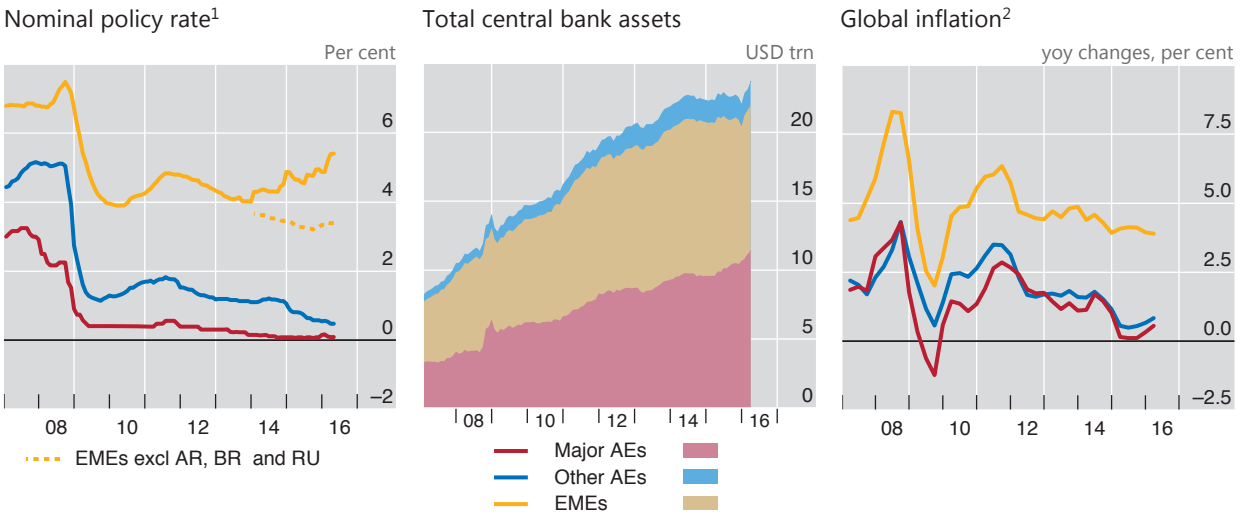
Central banks held nominal policy rates very low (Graph IV.1) amid increased prospects of a further delay in normalisation. The size of central bank balance sheets remained near historical highs, and some are poised to expand further. This transpired against the backdrop of low headline inflation, moderate economic expansion and tightening labour markets. The main differences across economies arose from variations in their exposure to exchange rate fluctuations, commodity price swings, financial market volatility and uncertainty about growth prospects.

Monetary policy normalisation delayed further

Central banks from the major advanced economies began the period under review with policy rates near zero and balance sheets larger than at the outset of the preceding year (Graph IV.2). With core inflation positive, real policy rates remained exceptionally low. In fact, real policy rates have not been so low for so long since

More global accommodation as inflation stays low

Graph IV.1



[1] Policy rate or closest alternative, simple averages. [2] Consumer prices; weighted averages based on rolling GDP and PPP exchange rates.

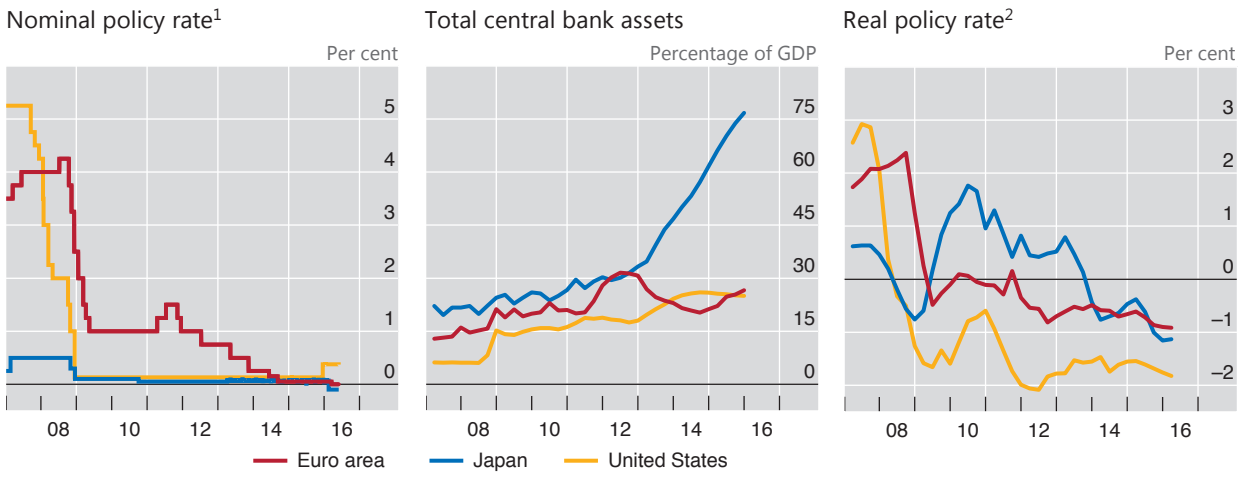
Sources: IMF, *International Financial Statistics* and *World Economic Outlook*; Datastream; national data; BIS calculations.

the start of the postwar period. Where domestic conditions differed, the prospects for policy divergence loomed large.

In the United States, the long-awaited policy rate lift-off came in December. The 25 basis point increase in the target band raised the effective federal funds rate to roughly 35 basis points. In taking its action, the Federal Reserve cited an improvement in labour market conditions, a pickup in underlying inflation pressures and a more favourable economic outlook, but also stated that current conditions would warrant "only gradual" further increases in the policy rate. However, early in 2016, higher downside risks to the recovery and a spike in global financial market

Policy rates stay very low for long as central bank balance sheets soar

Graph IV.2



[1] Policy rate or closest alternative. [2] Nominal policy rate less consumer price inflation excluding food and energy; for Japan, also adjusted for the consumption tax hike.

Sources: OECD, *Main Economic Indicators*; Datastream; national data; BIS calculations.

volatility led market participants to expect an even slower normalisation of the policy rate, including with a lower end point. The Federal Reserve's pace of normalisation is expected to be unusually gradual by historical standards.

Meanwhile, the ECB and the Bank of Japan eased policy further at the turn of the year. They cut policy rates and ramped up non-standard monetary measures. The size of their balance sheets continued to grow.

The ECB held its main policy rate (the rate on its main refinancing operations – MRO) just above zero for most of the period but cut rates in March 2016. It lowered the MRO rate to zero and the interest rate on the deposit facility to –40 basis points. With the euro overnight interest rate (EONIA) tracking the deposit rate, policy was more accommodative than indicated by the MRO rate alone. The ECB also launched a set of new measures that boosted the pace of its asset purchase programme, expanded asset eligibility to include non-financial corporate bonds and made its targeted longer-term refinancing operations (TLTRO) more attractive. The package sought to ease financing conditions, support the economy and address disinflationary risks.

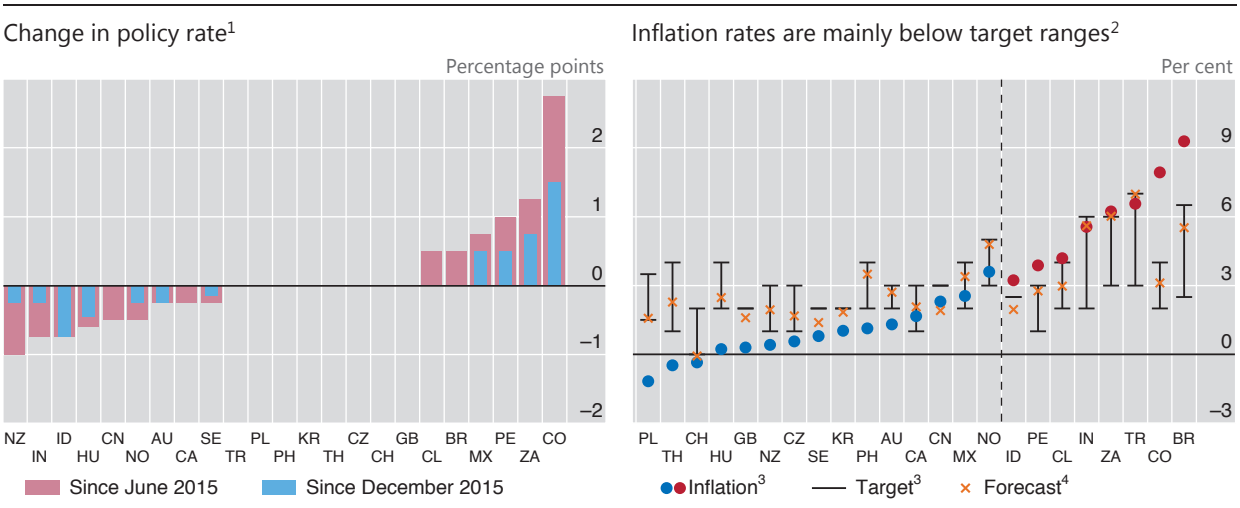
The Bank of Japan eased policy to achieve its 2% inflation target. With downside inflation risks emerging, especially from lower oil prices, weak external demand and yen appreciation, it enhanced its Quantitative and Qualitative Monetary Easing (QQE) programme in December and January. Its balance sheet reached new heights (Graph IV.2, centre panel). It also adopted negative policy rates for the first time, applying the negative rate only to marginal increases in current account balances so as to protect bank profitability (Chapter VI). The objective of the various measures was to lower the sovereign yield curve and benchmark lending rates.

Central banks outside the major advanced economies faced a more diverse set of challenges. A roughly equal number cut rates, kept them unchanged or raised them (Graph IV.3, left-hand panel). Most had policy rates below historical averages.

Deviations from inflation targets were a dominant theme for most central banks. With sharp commodity price drops pushing headline inflation down, those central banks already facing low core inflation trends cut rates further from historically low levels, including Australia, Canada, New Zealand and Norway.

Inflation concerns heavily influenced policy rate decisions

Graph IV.3



[1] From the date indicated to 30 May 2016. [2] Consumer prices, year-on-year changes. [3] As of April 2016; blue dot = below target; red dot = above target. [4] Consensus Economics forecast as of June 2015 for 2016.

Sources: Consensus Economics; national data; BIS calculations.

Inflation in some of these economies remained below target despite currency depreciations. At the same time, the growth of credit and house prices raised financial stability concerns, especially given high household debt.

Economic weakness in China proved to be challenging at home and abroad, inducing an easing bias, especially in Asia. The People's Bank of China, also addressing low inflation and financial stability concerns, cut its interest rates and the required reserve ratio five times beginning in early 2015. The depreciation of the renminbi helped soften the blow to the economy but increased the challenges faced by many of China's regional and global trading partners. The general slowdown in EMEs and lower inflation led Indonesia to cut rates and Korea and Thailand to maintain a very accommodative monetary policy stance.

Most central banks with policy rates at or near the lower bound and facing very low inflation – including Switzerland, the United Kingdom and some eastern European economies – kept rates unchanged given their limited policy room. In Sweden, however, where inflation was well below target despite robust growth, the central bank pushed rates deeper into negative territory, expanded its purchases of securities and, at an unscheduled policy meeting, increased its readiness to intervene in the currency market. Like the Swiss National Bank, the Swedish central bank expressed concerns about strong mortgage lending growth and residential property price increases. The Czech Republic maintained its exchange rate floor to reduce downside inflation risks from currency appreciation. These economies remained particularly exposed to exchange rate-induced disinflationary spillovers from the ECB's accommodative policy.

For others, sharp exchange rate depreciations and the associated higher inflation led to policy rate hikes. The central banks of South Africa, Turkey and many commodity-exporting EMEs in Latin America, whose currencies fell sharply, saw inflation run above target and either raised or maintained high rates despite deteriorating growth prospects. As a result, inflation was generally expected to finish 2016 inside the respective target bands of these countries (Graph IV.3, right-hand panel). Brazil and Colombia continued to address persistent above-target inflation with relatively high policy rates. In India, despite inflation running above the mid-point of the medium-term 4% target, the central bank cut rates, as falling inflation, albeit from high rates, was seen as consistent with its disinflation "glide path" announced the previous year.

Inflationary cross-currents

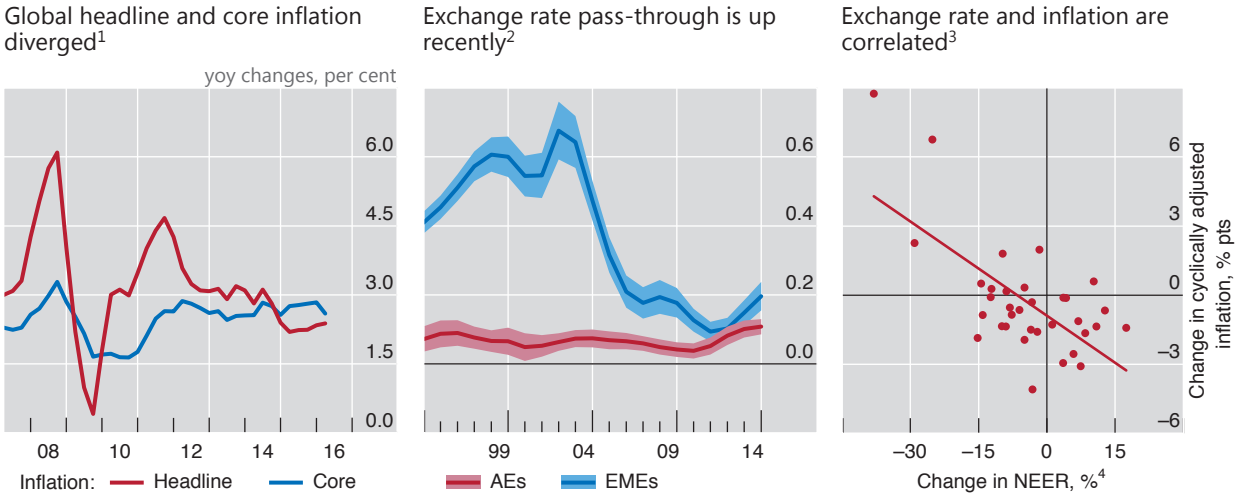
In the period under review, inflation continued to be driven by a complex mix of near-term, cyclical and secular factors (see also the detailed discussion in the *85th Annual Report*).

As noted above, among the near-term, proximate determinants of inflation, commodity prices and exchange rates loomed large. The sharp drop in commodity prices in 2015, especially the oil price, widened the wedge between headline and core inflation (Graph IV.4, left-hand panel). The large exchange rate changes influenced inflation to an extent that differed across countries, based in part on the incidence of second-round effects. Empirical evidence indicates that the pass-through to prices has generally fallen over time, first in advanced economies and later in EMEs (Graph IV.4, centre panel). Even so, it more recently appears to have picked up somewhat, possibly reflecting the size and greater persistence of exchange rate movements (Chapter III, and Graph IV.4, right-hand panel).

Cyclical demand drivers, notably various measures of economic slack, indicate a modest rise in the momentum of global inflation (Graph IV.5). Measures of slack, such as unemployment rates and conventionally measured output gaps (domestic

Wedge between headline and core inflation persists, reflecting near-term factors

Graph IV.4



NEER = nominal effective exchange rate.

[1] Consumer prices; weighted averages based on rolling GDP and PPP exchange rates. [2] Long-run pass-through of nominal effective exchange rate changes to changes in consumer price inflation, controlling for country fixed effects, changes in oil prices and the output gap. Shaded areas are 90% confidence bands. Time-varying coefficients estimated using (weighted) rolling regressions. [3] From January 2014 to latest. [4] A positive value indicates appreciation.

Sources: IMF, *International Financial Statistics* and *World Economic Outlook*; OECD, *Economic Outlook* and *Main Economic Indicators*; Bloomberg; CEIC; Datastream; national data; BIS; BIS calculations.

and global), are shrinking. With a lag, tighter labour markets point to incipient wage pressures.

Secular drivers, such as globalisation and technology, continue to hold down inflation. In many respects, these forces result in "good" disinflation, ie linked to a supply side expansion, in contrast to costly cyclical-demand-driven disinflation.

In fact, technological advances and other favourable global supply side forces appear to have become more prominent. One reason is that cost-cutting innovations are being transmitted more quickly through expanding global value chains (GVCs). These forces have kept a lid on prices directly, via low-cost tradable goods, as well as indirectly, by boosting competitive pressures on tradable and non-tradable inputs such as labour. Indeed, recent evidence indicates that the expansion of GVCs has had a significant effect on inflation, helping to account for the greater role of global slack in determining domestic inflation (Box IV.A).

Trends in long-run inflation expectations also play a role. Over the past year, persistent deviations of inflation from target – mostly on the low side but in some cases on the high side – have raised concerns about de-anchoring. For example, persistently low headline inflation, even if driven by transitory forces, could raise price stability risks if second-round effects were to take hold and feed into wage and inflation expectations. Risks would be higher if doubts grew about the ability of monetary authorities to boost inflation.

This puts the spotlight on the reliability of different indicators of inflation expectations. So far, survey-based measures suggest that long-term expectations remain well anchored in most economies (Graph IV.5, right-hand panel). In contrast, the message coming from financial markets is more mixed. In a number of countries, asset price indicators have pointed to a possible weakening in the anchor. That said, there are a number of reasons to question the reliability of these measures. The financial assets typically used to assess long-term inflation expectations (such as the

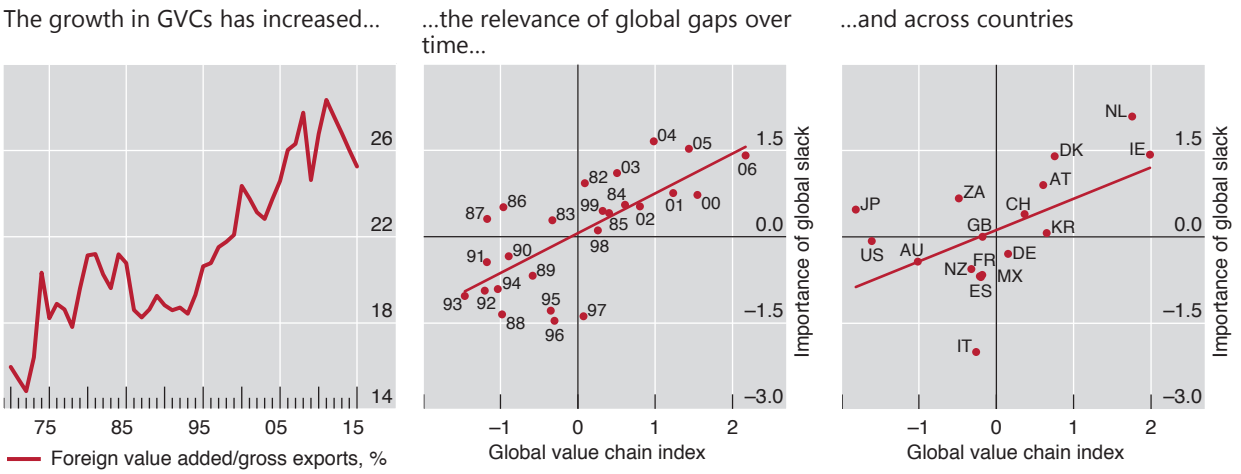
Global value chains and the globalisation of inflation

The rise of global value chains (GVCs) has made them a key channel through which the drivers of domestic inflation have become more global. GVCs are supply chains in which different stages of production are strategically dispersed and coordinated around the globe.① Their growth has transformed the nature of international production and trade. The growth is evident in the steady increase over the past several decades in the fraction of the value added of exports of goods and services due to their import content, which grew from 18% in 1990 to around 25% in 2015 (Graph IV.A, left-hand panel).

This trend has had implications for inflation dynamics. Domestic production costs depend not only on price developments at home but also on developments abroad, both directly and indirectly. And GVCs provide various channels through which foreign price pressures are transmitted to domestic inflation. The direct channel is through price pressures for imported inputs. The indirect channel is through implicit competition at each of the increasing number of links along the whole supply chain (ie contestability of markets). These channels are relevant for import-competing goods and services and also for non-tradable inputs, such as labour. Moreover, the trends in GVCs over time and across countries have strengthened these channels.

The impact of GVCs on inflation dynamics has been significant in recent decades. Recent research finds a strong positive relationship between the growth of GVCs and the strengthening of global factors influencing domestic inflation.② Over time, the growth of GVCs has coincided with the rising importance of global output gaps in explaining domestic inflation developments (Graph IV.A, centre panel). This correlation between GVCs and global output gaps can also be seen cross-sectionally (Graph IV.A, right-hand panel): those countries that are more highly integrated into GVCs exhibit a stronger association between global output gaps and domestic inflation.

Expansion of GVCs drives rising importance of global slack for domestic inflation — Graph IV.A



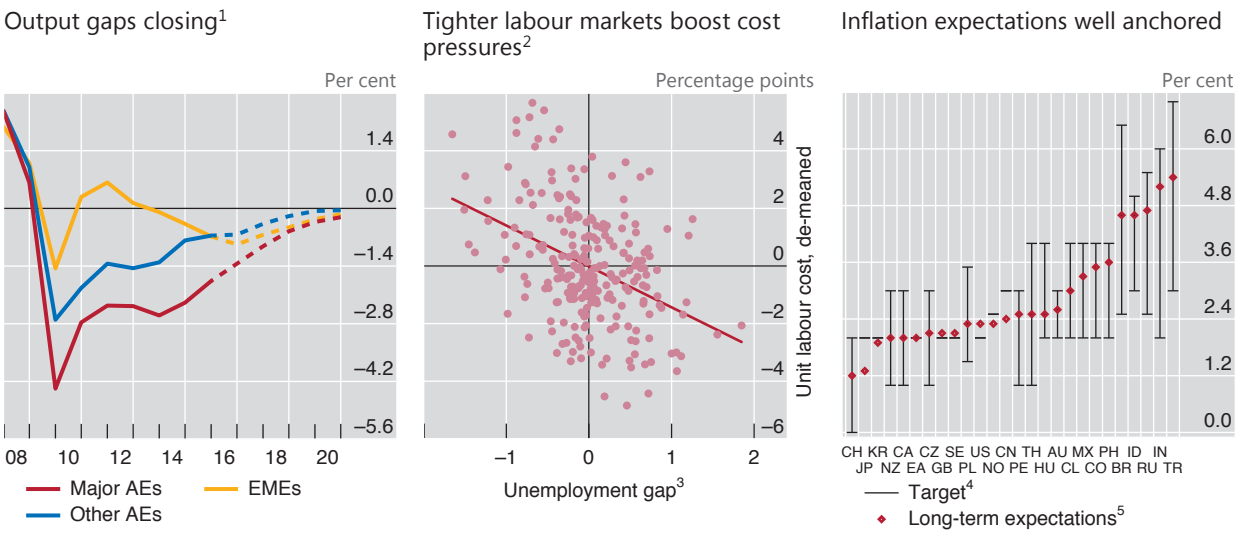
GVCs = global value chains.

The importance of global output gaps is defined as $\gamma - \beta$ from the regression $\pi_t = \alpha * E_t[\pi_{t+1}] + \beta * y_t^d + \gamma * y_t^f + \mathrm{X}_t + \varepsilon_t$, where domestic inflation is a function of expected inflation, the foreign output gap y_t^f, the domestic output gap y_t^d, and the set of control variables X_t. In the centre panel, each observation corresponds to an estimate of $\gamma - \beta$ from a 10-year rolling window for a sample of 17 emerging market and advanced economies from 1977 to 2011; in the right-hand panel, to the estimate of $\gamma - \beta$ for each country from 1977 to 2011. The GVC index is defined in Auer et al (2016).

Sources: R Auer, C Borio and A Filardo, "The globalisation of inflation: growing importance of international input-output linkages", BIS, mimeo, 2016; R Johnson and G Noguera, "Accounting for intermediates: production sharing and trade in value added", *Journal of International Economics*, vol 86, no 2, 2012, pp 224–36; J Mariasingham, "ADB Multi-Region Input-Output Database: sources and methods", Asian Development Bank, 2015; OECD, Trade in Value Added Database.

① The stages include design, production and marketing, among other activities. ② See the *84th Annual Report*, Chapter III, for evidence on the rising importance of global gaps; see also Auer et al (2016).

Core inflation supported by cyclical factors and anchored inflation expectations Graph IV.5



[1] Weighted averages based on rolling GDP and PPP exchange rates. The gap is the IMF output gap as a percentage of potential output. The dashed line is the IMF forecast for 2016–20. [2] The sample consists of 11 advanced economies and covers Q1 2005–Q3 2015. [3] Defined as the deviation of the unemployment rate from its Hodrick-Prescott trend; lagged one period. [4] As of April 2016. [5] April 2016 Consensus Economics forecast for six- to 10-year-ahead consumer price inflation expectations.

Sources: IMF, *World Economic Outlook*; OECD, *Economic Outlook* and *Main Economic Indicators*; Consensus Economics; Datastream; national data; BIS calculations.

five-year five-year-forward break-even rates) are subject to several distortions. These include liquidity and term premia, which can be hard to interpret at times. And the recent strong correlation between the decline in these measures and that in oil prices remains a puzzle. The oil price decline should not have a lasting effect on inflation five to 10 years down the road. Hence, the correlation suggests that short-term market conditions may be having an undue influence.

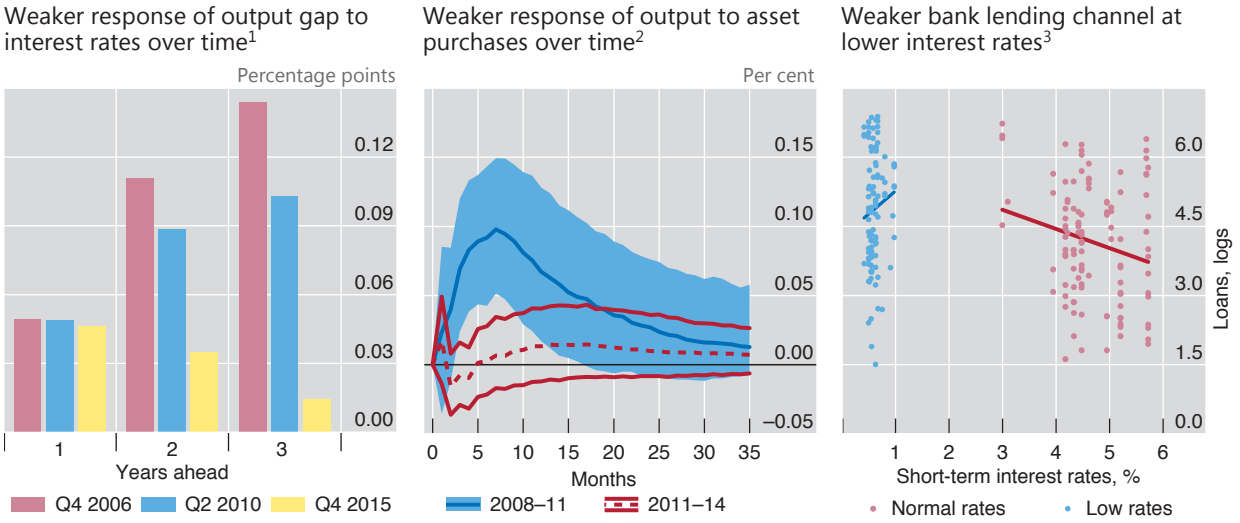
Shifting from domestic to external monetary policy channels

Global demand has grown only moderately and inflation has remained stubbornly low in advanced economies and some EMEs despite an extended period of exceptionally accommodative monetary policy. There is a general sense that post-crisis monetary policy has faced stiff headwinds, which may have sapped its effectiveness. Several factors have played a role, including large debt overhangs, an impaired banking system and the need to shift resources away from temporarily bloated sectors, such as construction and financial services. Simple analyses provide suggestive supportive evidence. In the United States, for instance, there are signs that the impact of policy on output via interest rates may have declined (Graph IV.6, left-hand panel). Policy's impact on inflation also appears to be more muted, given indications of a further weakening of the apparent link between measures of slack and inflation – a well known phenomenon.

These headwinds should have been abating owing to the gradual re-absorption of debt overhangs and improvements in impaired bank balance sheets. Nevertheless, the domestic channels through which unconventional monetary policies work may have become less effective as these measures have intensified and time has worn on. This could help explain why external channels, ie the exchange rate, have

Domestic channels of monetary policy may have become weaker

Graph IV.6



[1] Impulse responses to a two-year interest rate shock in a quarterly vector autoregression (VAR) for the United States, featuring the output gap, core CPI inflation, the spread between 10-year BAA corporate bond and government bond yields, and the difference between the two-year government bond yield and the conventionally estimated natural rate. Time-varying VAR coefficients are estimated with a Bayesian approach, with priors set to estimates in the Q2 1986–Q4 2006 sample. [2] From Hofmann and Weber (2016); impulse responses to the unexpected component of a $100 billion asset purchase announcement in a Bayesian VAR for the United States, consisting of log real GDP, log CPI, the size of the announced asset purchases, the 10-year Treasury yield and the log S&P 500 (the methodology closely follows that of Weale and Wieladek (2016)). Median and the 68% probability range of the impulse responses. The two subsamples considered are November 2008 to June 2011 (covering two large-scale asset purchase programmes, LSAP1 and LSAP2) and July 2011 to October 2014 (covering the maturity extension programme (MEP) and LSAP3). [3] The sample includes 108 international banks over the period 1995–2014. The short-term interest rates are a weighted average of three-month interbank rates in jurisdictions where banks get funding. Low rates are defined as those below 1.25% (the first quartile of the rate distribution); normal rates constitute the remaining sample. The result is robust to standard panel regression controls. The more specific role of net interest margins is discussed in Borio and Gambacorta (2016).

Sources: C Borio and L Gambacorta, "Monetary policy and bank lending in a low interest rate environment: diminishing effectiveness?", BIS, mimeo, 2016; B Hofmann and J Weber, "The macroeconomic effects of asset purchases revisited", BIS, mimeo, 2016; T Laubach and J Williams, "Updated estimates of Laubach-Williams model", 2016, http://www.frbsf.org/economic-research/economists/john-williams/Laubach_Williams_updated_estimates.xlsx; M Weale and T Wieladek, "The macroeconomic effects of asset purchases", *Journal of Monetary Economics*, vol 79, May 2016, pp 81–93; national data; BIS calculations.

gained prominence in the policy debate. A greater role for the exchange rate, however, raises a number of issues that deserve special attention.

The diminishing effectiveness of domestic channels…

Changes in policy rates influence spending through a variety of channels. Lower interest rates reduce the cost and improve the availability of external funding for both households and firms, including by boosting asset prices and cash flows. More generally, they provide incentives to bring spending forward by reducing the return on savings and hence the amount of future consumption that has to be given up by consuming more today.

The various types of so-called unconventional monetary policies adopted post-crisis operate in broadly similar ways. Large-scale asset purchases are designed to boost the price (ie compress the yield) of the corresponding assets and, through portfolio adjustments, those of others. Lending on favourable terms (ie long maturities, generous collateral valuations etc) is intended to improve funding conditions. Signalling the future path of the policy rates (ie forward guidance) seeks to lower the yield curve, especially over the policy horizon. And driving the policy rate into negative territory aims at shifting the yield curve downwards.

There may be reasons for believing that the effect of these policies on domestic financial conditions could decline over time. In some cases, declining effectiveness may reflect improving market conditions. For instance, some argue that balance sheet measures, such as asset purchase programmes, are likely to be most effective when financial markets are segmented and dislocated, so that the authorities' intervention works through alleviating the corresponding stresses. As the crisis forces waned, the apparent effectiveness of large-scale asset purchases in influencing output declined (Graph IV.6, centre panel).

In other cases, it is the impact of these measures on financial intermediation that may be contributing to the decline. A possible example is the impact on the financial system's profitability and resilience, and hence on its ability to support the economy. As rates fall further, possibly becoming negative, and retail bank deposit rates remain sticky, the compression of banks' interest margins may reduce their profitability as well as their ability and incentive to lend (Chapter VI). Some evidence suggests that the impact of interest rates on lending weakens as they fall to very low levels and squeeze net interest margins (Graph IV.6, right-hand panel). This might reflect the lower profitability of the lending business, possibly in combination with scarce capital. In Switzerland, for example, following the introduction of negative interest rates, banks initially raised mortgage rates in order to protect their profits (Chapter II).

In yet other cases, broader behavioural factors may be at work. For instance, it is well known that investment is not very responsive to interest rates: when interest rates are extraordinarily low, firms may be more tempted to borrow simply in order to buy back shares or acquire other firms (Chapter II). Similarly, at very low rates the need to save more for retirement becomes more evident, as highlighted by the large underfunding of pension funds (Chapter VI). Likewise, households' confidence may be shaken by the prospect of negative nominal interest rates, given the widespread attention paid to nominal variables (ie "money illusion") and the sense of direness that adopting negative rates may convey. A recent survey finds that only a small percentage of households would spend more if faced with negative rates, while a similar percentage would actually spend less.[1]

Behavioural factors may also complicate any additional policy easing. To have a big impact on yields and prices, easing must generally surprise markets. But surprising them becomes harder once they become used to large doses of accommodation: the bar rises with every measure taken. As a result, bigger measures may be needed to generate a given effect. This may be a reason, though not the only one, why successive large-scale asset purchase programmes appear to have had a smaller impact on yields for any given size of purchase (Graph IV.7).

More generally, there are natural limits to the process – to how far interest rates can be pushed into negative territory, central bank balance sheets expanded, spreads compressed and asset prices boosted. And there are limits to how far spending can be brought forward from the future. As these limits are approached, the marginal effect of policy tends to decline, and any side effects – whether strictly economic or of a political economy nature – tend to rise. This is why central banks have been closely monitoring these side effects, such as the impact on risk-taking, market functioning and financial institutions' profitability.

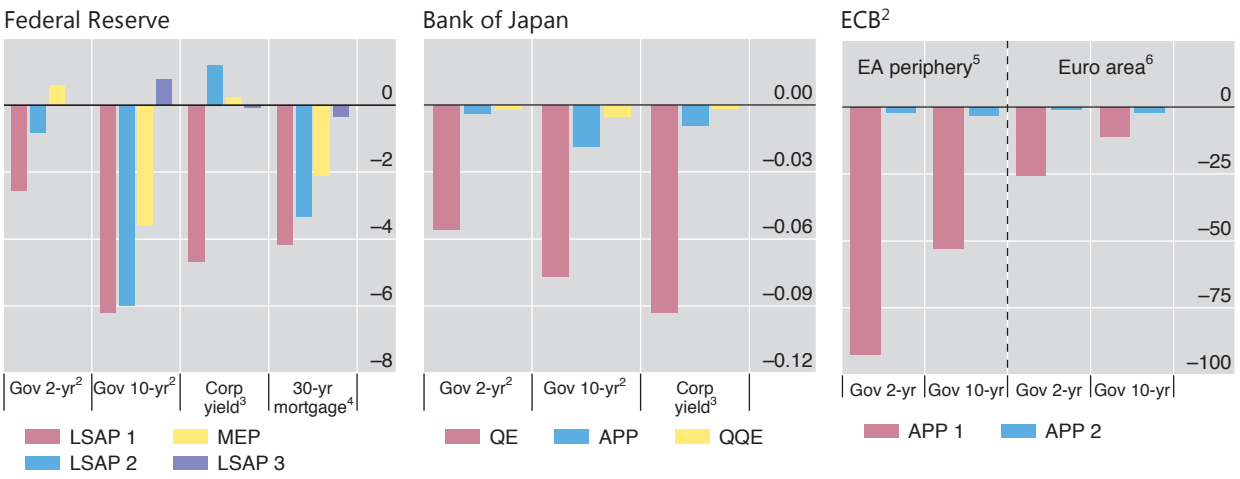
...and the rising prominence of external channels

As the effectiveness of domestic channels seems to have waned in recent years, a key external channel – ie the exchange rate – has naturally attracted greater

[1] ING, "Negative rates, negative reactions", *ING Economic and Financial Analysis*, 2016.

Unconventional monetary policies seemingly deliver less "bang for the buck"

Impact per 100 billion units of local currency[1] Graph IV.7



APP = asset purchase programme; LSAP = large-scale asset purchases; MEP = maturity extension programme; QE = quantitative easing; QQE = Quantitative and Qualitative Monetary Easing.

[1] For each programme, the cumulative two-day change in basis points around the announcement dates, divided by the total size of each programme in local currency. For open-ended programmes, divided by the estimated size of the programme assuming an unchanged pace of purchases until December 2017. For terminated programmes, the total amount of purchases at the time of termination. [2] Government bond yields; for the ECB, weighted averages based on rolling GDP and PPP exchange rates of the economies listed in footnotes 5 and 6. [3] Merrill Lynch corporate bond yields. [4] Thirty-year fixed mortgage rate. [5] Greece, Ireland, Italy, Portugal and Spain. [6] Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal and Spain.

Sources: Bank of America Merrill Lynch; Bloomberg; national data; BIS calculations.

attention. All else equal, monetary policy easing generally depreciates the currency, even if only as a by-product.

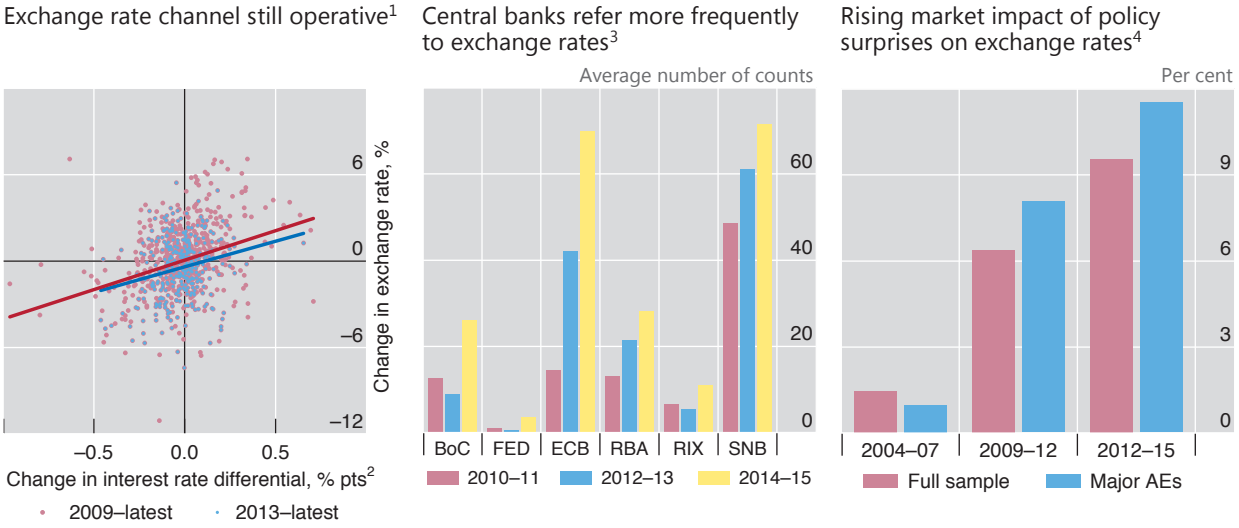
Indeed, shifts in the monetary policy stance continue to influence exchange rates. The relationship between exchange rates and interest rate differentials over the past few years has been fairly stable (Graph IV.8, left-hand panel). Monetary policy decisions have loomed large in medium-term currency swings in recent years (Chapter II). Similarly, the more prominent role of the exchange rate is evident from the greater frequency with which central bank statements make reference to them (Graph IV.8, centre panel) and from the seemingly larger exchange rate moves in response to policy announcements (right-hand panel).

From a purely domestic perspective, the exchange rate channel has a number of advantages for those economies facing stubbornly low inflation and growth. In the presence of too much debt and an impaired banking system, currency depreciation boosts demand while at the same time increasing saving (eg firms' profits). This can help repair balance sheets more quickly. Historically, depreciations have helped countries recover from crises. In addition, they have a quicker, if generally temporary, effect on inflation, unlike the weaker and more uncertain impact through domestic slack.

The de facto more prominent role of exchange rates, however, is not without problems. One country's currency depreciation is another's appreciation, and that appreciation may not be welcome. This is especially so in a world in which many central banks are facing inflation rates stubbornly below target and are seeking to boost demand and where some have been facing the build-up of financial imbalances. In this environment, central banks are becoming exposed to risks of large capital inflows, including in foreign currency (Chapter III). Hence, there has

External channels of monetary policy appear to grow in importance

Graph IV.8



BoC = Bank of Canada; FED = Federal Reserve; ECB = European Central Bank; RBA = Reserve Bank of Australia; RIX = Sveriges Riksbank; SNB = Swiss National Bank.

[1] For eight advanced economies. [2] Changes in the interest rate differential between two-year domestic and US government bonds. [3] In monetary policy statements and press conferences. [4] Changes of bilateral US dollar exchange rates over the 30-minute window around the timing of monetary policy announcements, per 1 percentage point increase in two-year bond yields. Full sample consists of seven advanced economies.

Sources: M Ferrari, J Kearns and A Schrimpf, "Monetary policy and the exchange rate", BIS, mimeo, 2016; national data; BIS calculations.

been a growing emphasis on foreign exchange intervention to stem appreciation pressures, including by countries that had been reluctant to do so in the past (Graph IV.9, left-hand and centre panels). The alternative or complement to such intervention has been easing monetary policy itself. Thus, easing in the large economies, home to international currencies, has induced easing elsewhere.[2]

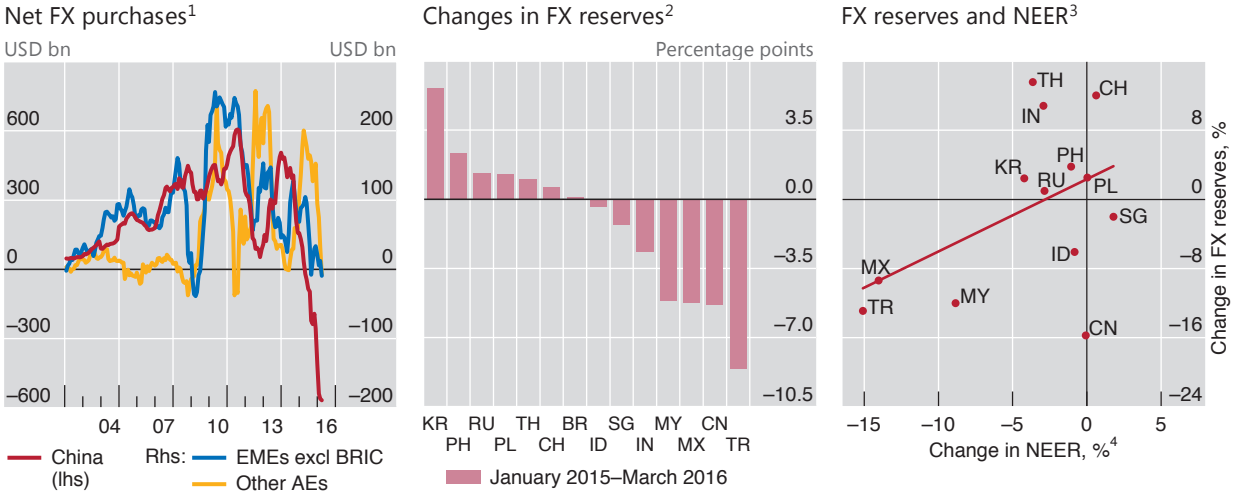
As a result, the exchange rate has not only redistributed global demand, but has also affected the stance of monetary policy at the global level. This arguably has contributed to financial imbalances in those countries that have been experiencing financial booms, notably many EMEs (Chapter III). And as the monetary policy stance has begun to turn in the United States, commodity prices have plunged and domestic financial cycles have been maturing, the process has started to reverse. Thus, depreciation pressures over the past year have prompted many countries to run down reserves (Graph IV.9). Moreover, for countries with high levels of foreign currency debt, the hoped-for expansionary effects may not materialise (Chapter III).

All this suggests that limits apply to the effectiveness of the external channel, especially from a global perspective. Some of the limits simply reflect the fact that, as discussed before, the domestic measures that result in currency depreciation in the first place can be pushed only so far and have their own well known side effects. But others stem from the additional constraints created by the global interaction of national monetary policies. These are even harder to address, given the dynamics involved.

[2] See M Carney, "Redeeming an unforgiving world", speech at the 8th Annual IIF-G20 Conference, Shanghai, China, February 2016; and R Rajan, "Towards rules of the monetary game", speech at the IMF/Government of India Conference, New Delhi, India, March 2016.

FX reserve holdings used to influence exchange rates

Graph IV.9



BRIC = Brazil, Russia, India and China; NEER = nominal effective exchange rate.

[1] Based on FX reserve variations, adjusted by valuation effects (currency composition based on IMF COFER). Actual operations data used whenever available, including forwards; accumulated over 12 months. [2] As a percentage of total central bank assets. [3] Changes from January 2015 to March 2016. [4] A positive value indicates appreciation.

Sources: IMF, *International Financial Statistics* and Currency Composition of Official Foreign Exchange Reserves (COFER); national data; BIS; BIS calculations.

Monetary policy frameworks: integrating financial stability

Another year of exceptionally accommodative monetary policy has highlighted the tension between price stability and financial stability. In many countries, interest rates have been kept extraordinarily low in order to boost inflation. In some cases, this has occurred even as strong credit and asset price increases have raised concerns about the build-up of vulnerabilities. In other cases, concerns about the impact of low interest rates on the profitability and soundness of financial institutions have been more prominent (Chapter VI). All this has added fuel to the debate over whether existing monetary policy frameworks can adequately address the trade-offs, especially in the light of complications arising from exchange rate swings.

Factoring in domestic financial cycle considerations

The tensions between price stability and financial stability reflect in part the different policy horizons over which central banks aim to achieve their primary goals. Price stability typically focuses on inflation developments over a horizon of roughly two years or so. Financial stability risks develop over a much longer horizon, as systemic financial strains emerge only infrequently: the corresponding financial booms and busts last considerably longer than traditional business cycles. One lesson from the crisis is the need to look beyond short-term inflation stabilisation to ensure overall stability: low and stable inflation does not guarantee financial, and thus macroeconomic, stability.

At least two concerns have been holding back a more systematic incorporation of financial stability considerations into monetary policy. The first is that, even if monetary policy did try to incorporate them, doing so would not improve economic

outcomes. The second is the lack of operational guides for implementing such a policy, beyond general indicators of the build-up of financial risks, such as those used in macroprudential frameworks. On balance, therefore, central banks have preferred to rely increasingly on macroprudential measures to address financial stability risks while keeping monetary policy firmly focused on short-term output and inflation objectives – a kind of separation principle.

The first concern has received particular attention over the past year. Additional research has found that a policy of "leaning against the wind" is unlikely to produce net benefits. In this work, a financial stability-oriented monetary policy is interpreted as one that focuses narrowly on pursuing traditional objectives most of the time: it deviates at the margin and temporarily only to avert a financial crisis when signs of financial imbalances emerge, such as unusually rapid credit growth. For a range of parameter values drawn from empirical studies, this research finds that leaning against the wind would be counterproductive in terms of deviations of output, unemployment and inflation from desirable levels.

Such research is very useful. At the same time, there are reasons for believing that it may underestimate the overall benefits of a financial stability-oriented monetary policy. Some of these reasons are of a more technical nature. The research typically assumes that the policy response does not affect the cost of crises, that these crises occur with a given frequency and that they do not result in permanent output losses – so that eventually output returns to its pre-crisis trend. These assumptions tend to reduce the costs of crises and limit the potential benefits of leaning against the wind. For example, the empirical evidence suggests that recessions that coincide with financial crises typically lead to permanent output losses and that growth rates may sometimes be persistently lower thereafter (Chapter V).

Other reasons have to do with the general interpretation of a financial stability-oriented monetary policy. It is indeed possible that if the policy amounts simply to responding to signs of financial imbalances at a somewhat advanced stage, it could end up doing too little too late. It could even be seen as precipitating the crisis it was supposed to avert. But a financial stability-oriented monetary policy is better interpreted as one that takes financial stability considerations into account *all the time*. In doing so, it would respond systematically to financial conditions to keep them on an even keel throughout the entire financial cycle. The idea is not to be too far away for too long from some notion of financial equilibrium.

Two strands of recent BIS research provide some support for this view. They share the view that financial developments are a core feature of economic fluctuations, whether these result in crises or not. The research considers the possible benefits of a financial stability-oriented monetary policy applied over the whole financial cycle. One strand highlights the analytical case for a leaning-against-the-wind monetary policy. It argues that persistent swings in financial booms and busts lend support to the case for leaning. Indeed, this research finds that in this context the question is not so much whether there are gains, but how large they are (Box IV.B).

The second strand, of a more empirical nature, estimates a small set of equations that describe the behaviour of the US economy, drawing on a more granular description of the financial cycle. It suggests that the implementation of such a systematic leaning strategy might have resulted in significant output gains (Box IV.C). Moreover, since, on average, economic slack is estimated to have been lower in this case, there appears to have been no necessary trade-off in terms of lower inflation. Any losses in the form of lower output and inflation in the short run are estimated to be more than offset in the longer run. And, intuitively, these estimates suggest that the earlier the policy is implemented, the larger are the gains.

Analytical case for a "leaning against the wind" monetary policy

A growing body of research is employing numerical simulations to evaluate the benefits and costs of monetary policy leaning against the build-up of financial imbalances. The various approaches assess the benefits of leaning in terms of a reduction in the likelihood of a crisis, and in its magnitude; and they assess the costs in terms of lower output or higher unemployment in the leaning phase.① The results are critically sensitive to three sets of factors: (i) the process driving the evolution of the likelihood of a crisis and its magnitude; (ii) the impact of a tighter monetary policy during the boom on the likelihood of a crisis and its magnitude; and (iii) how a policy easing affects output during the bust. This box discusses the sensitivity of cost-benefit assessments to the modelling approaches.

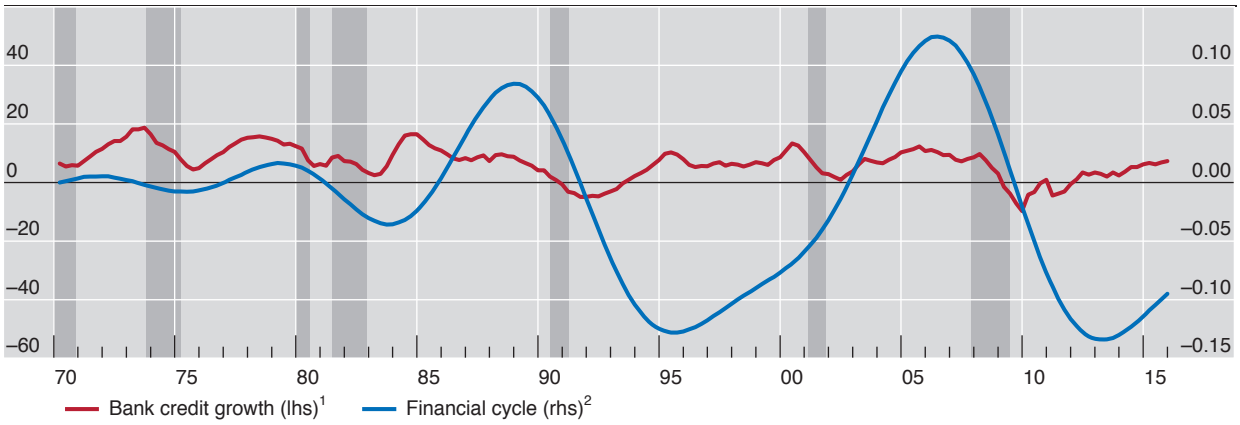
Clearly, as long as monetary policy cannot completely undo the costs of a crisis by "cleaning up" afterwards (ie point (iii) above) and it can reduce its probability or magnitude (ie point (ii) above), then leaning would produce some benefits. Intuitively, it would then pay to sacrifice *at the margin* a bit of output today to avoid possible future output losses. Thus, ignoring the potential role of other tools (eg prudential measures) and broader considerations, the question concerning optimal policies is less about whether to lean than about how much.

Some studies find that the net benefits of leaning are small or – in the case of a one-off policy tightening at some stage in the boom – even negative.② Certain assumptions underpinning the calibration contribute to this conclusion, including the assumption that there is no permanent loss in output (Chapter V). But a key assumption involves the evolution of the likelihood of a crisis and its magnitude. Some models assume both that the magnitude of a crisis is independent of the size of the financial boom ahead of distress *and* that the crisis risk is not expected to grow over time. For instance, the typical variable used to track the evolution of the likelihood of a crisis is credit growth, which itself is naturally mean-reverting. These assumptions effectively imply that there is little or no cost to delaying to lean. And they encourage consideration of counterfactual experiments in which the authorities simply deviate temporarily from their policy rule to influence the variable of interest, here credit growth, with a short horizon.

But the dynamics underlying crisis risks may be different. Credit growth has been found to be a good leading indicator,③ although by no means the only one. Other indicators put more emphasis on the gradual build-up of vulnerabilities; these are captured by the cumulative increases in debt stocks and, relatedly, in cumulative deviations of asset prices, especially property prices, from historical norms. In particular, cumulative deviations of the ratio of private sector credit to GDP or debt service ratios from such norms have been found to be especially important (see Box III.A and references therein). The idea of the financial cycle generalises these dynamics: it reflects prolonged credit and asset price booms followed by busts, with banking stress typically taking place close to the peak of the cycle. The contrast with the evolution of credit growth is obvious (Graph IV.B). The persistent nature of the stock

The financial cycle is much more persistent than bank credit growth

Graph IV.B



The shaded areas indicate recession periods as defined by the National Bureau of Economic Research.

[1] US private non-financial sector; year-on-year changes, in per cent. [2] Measured by frequency-based (bandpass) filters capturing medium- term cycles in US real credit, credit-to-GDP ratio and real house prices.

Sources: M Drehmann, C Borio and K Tsatsaronis, "Characterising the financial cycle: don't lose sight of the medium term!", *BIS Working Papers*, no 380, June 2012; national data; BIS calculations.

variables highlights the importance of understanding crisis dynamics, and economic fluctuations more generally, through the lens of the cumulative process of the financial cycle.

The policy implications are significant. If the evolution of financial stability risks is more akin to the financial cycle view, then failing to lean has a cost. In the absence of any action, the risks increase over time, and so do the costs if larger imbalances lead to larger busts. This puts a premium on early action and on a through-the-cycle, long-term perspective. Recent work has formalised this intuition.④ By calibrating a model to a stylised financial cycle, the benefits from leaning can increase considerably relative to those found in other approaches: it pays to lean early and systematically. This evidence is consistent with that based on a more granular financial cycle calibration (Box IV.C).

Obviously, the analysis here is a partial one and leaves out many considerations. These include credit growth associated with financial deepening and innovation; aspects of the uncertainty about the state of the economy and its behaviour; and the effectiveness of alternative instruments, notably prudential policies. In addition, it abstracts from the general equilibrium effects, especially important in small open economies, through which monetary policy can have an impact on exchange rates and capital flows and complicate a leaning strategy (see the main text). Nevertheless, the analysis sheds light on the importance of properly characterising crisis risks over time when assessing the costs and benefits of leaning against financial booms and busts. It thus sharpens the questions that need to be addressed both analytically and empirically.

① Deviations of inflation from target may also be included. But since these studies do not consider the possibility of negative supply side shocks, there is no trade-off between stabilising output and inflation ② See eg L Svensson, "Cost-benefit analysis of leaning against the wind: are costs larger also with less effective macroprudential policy?", *IMF Working Papers*, no WP/16/3, January 2016; and A Ajello, T Laubach, D López-Salido and T Nakata, "Financial stability and optimal interest-rate policy", Board of Governors of the Federal Reserve System, mimeo, February 2015. ③ M Schularick and A Taylor, "Credit booms gone bust: monetary policy, leverage cycles, and financial crises, 1870–2008", *American Economic Review*, vol 102, no 2, 2012, pp 1029–61. ④ A Filardo and P Rungcharoenkitkul, "Quantitative case for leaning against the wind", BIS, mimeo, 2016.

The second strand of research also yields hints about possible measures of the financial cycle as policy guides. Two readily available financial measures are potential candidates (Box III.A): leverage as reflected in the ratio of private sector debt to assets (property prices and equities); and the debt service burden. Deviations of these measures from their long-run values help define in more practical terms the notion of financial equilibrium. For example, responding to the debt service ratio can play a role in improving macroeconomic outcomes above and beyond the traditional gauges of inflation and economic activity. Leaning early to prevent the debt service burden from getting too far out of line could foster more stable financial conditions; a late response, once the signs of financial imbalances are all too evident, could precipitate a bust and a costly recession.

The second strand of research also sheds light on the question of how to think about the natural, or equilibrium, interest rate. This is the concept to which policymakers sometimes appeal when assessing the appropriate policy stance. As commonly estimated, this rate draws heavily on the behaviour of inflation. All else equal, declines in inflation signal below-potential output and a policy rate above the natural rate.

The analysis has yielded a number of observations. First, once financial factors are taken into account, and given a build-up of financial imbalances, the estimates of natural rates are higher than commonly thought. This is because financial factors, better than inflation, provide useful information about cyclical fluctuations of output around potential. Before the financial crisis, for instance, inflation was low and stable, and it was the outsize financial boom that arguably pointed to output running consistently ahead of its potential.

A second observation is that, against this benchmark, the policy rate has been consistently below the estimated natural rate, both pre- and post-crisis. To the

Box IV.C

The financial cycle, the natural rate of interest and monetary policy

How should monetary policy respond to the financial cycle? This box highlights two key insights from recent BIS research.① The first comes from supplementing the standard approach for estimating the natural interest rate by incorporating explicitly the influence of two financial cycle proxies: the leverage and debt service burdens of the business and household sectors (see Box III.A for details). Doing so yields what might be termed a *finance-neutral natural rate*. The second and related insight comes from a counterfactual experiment that assesses whether a monetary policy rule that responds systematically to the financial cycle can improve macroeconomic outcomes.

A finance-neutral natural rate

At the heart of the conventional approach is a natural rate of interest with two key characteristics.② First, the natural rate is defined as that which would prevail when actual output equals potential output. Second, inflation is the key signal of unsustainability. All else equal, if output is above potential, inflation will tend to rise; if it is below, inflation will tend to fall. However, pre-crisis experience indicates that inflation may be low and stable even if output is moving along an unsustainable path because financial imbalances are growing. Hence, it may be misleading to rely heavily on inflation to estimate potential output and its difference from actual output (ie the output gap) – a common measure of economic slack (Chapter V). This, in turn, can generate distorted estimates of the natural rate.

The alternative approach makes only a small modification, adding the two financial-cycle proxies to estimate the (finance-neutral) output gap and natural rate simultaneously. It exploits the fact that the deviations of leverage and the debt service burden from their respective long-run (ie steady state) values have a sizeable influence on the evolution of expenditures and output and provide a measure of how far the economy is away from financial equilibrium.

Finance-neutral estimates of the natural rate differ significantly from conventional ones. This is illustrated for the United States using quarterly data from 1985 to 2015. For example, the finance-neutral natural rate is currently positive and not below zero, in contrast to what the conventional approach indicates (Graph IV.C, left-hand panel). In line with the fall in trend output growth, the estimate of the finance-neutral natural rate has declined over time, but it has nearly always exceeded the conventional estimate, most notably by more than 1.5 percentage points post-crisis. Interestingly, since 2009, the policy rate adjusted for inflation has been consistently well below the finance-neutral natural rate.

Responding throughout the financial cycle

A monetary policy rule that responds systematically to the financial cycle draws on the previous estimates of the natural interest rate and output gap. It starts from a standard rule in which, given the estimate of the natural rate, the policy rate responds to deviations of inflation from target and to the output gap. The rule is then augmented to respond to a financial cycle proxy – the deviation of the debt service burden from its long-run equilibrium (ie the "debt service gap"). The counterfactual experiment relies on a broader econometric system that traces the dynamics of the economy (a vector autoregression – VAR).③

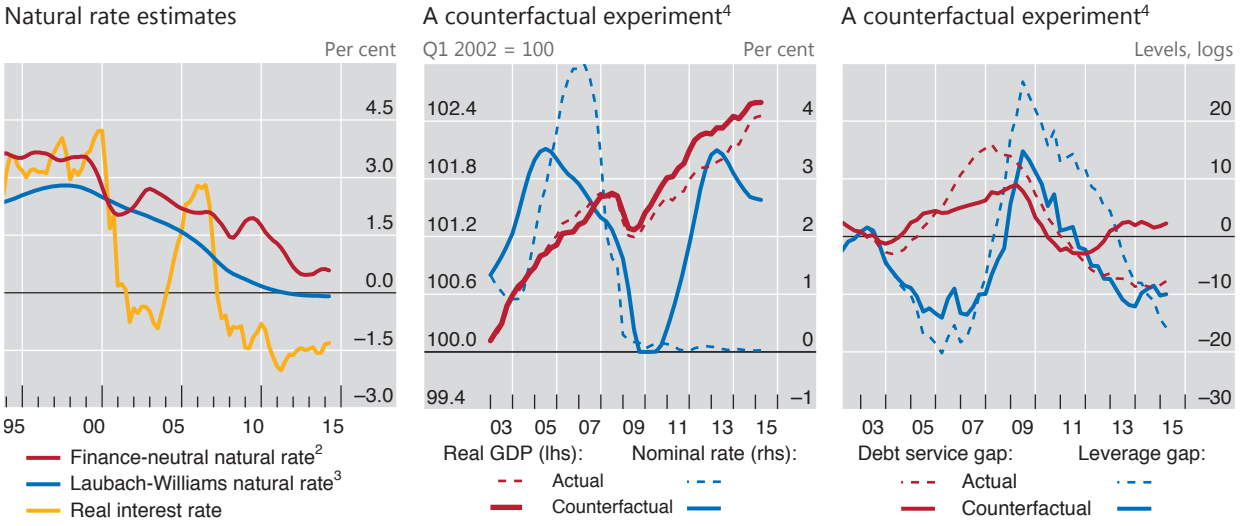
The simulations suggest that a monetary policy which takes financial developments *systematically* into account at all times can dampen the financial cycle, leading to significant output gains (Graph IV.C, centre panel). According to the simulations, implementing the policy starting in 2003 could have resulted in output gains of roughly 1% per year, or 12% cumulatively. The medium-term gain exceeds the near-term cost during the leaning phase, which amounts to about 0.35% per year until 2007.

The counterfactual policy rate path indicates that policy leans *early* against the build-up of the imbalances and, as a result, gains considerable room for manoeuvre after the bust (centre panel). On average, the policy rate is 1 percentage point higher until mid-2005 as the debt service gap rises alongside credit and property prices. It then starts to decline, close to the property price peak, as the debt service burden begins to weigh more heavily on output. Such a policy dampens the financial boom as measured by the leverage and debt service gaps (right-hand panel). The benefits become fully apparent after the September 2008 Lehman shock (still included in the simulations). A smaller debt overhang results in a much shallower recession and allows policymakers to start normalising policy as early as 2011.

The counterfactual exercise also points to a smaller decline in the finance-neutral natural rate (not shown). This is around 40 basis points higher, on average, after the recession in 2009, suggesting that potential output growth is more resilient. This, in turn, supports policy normalisation.

Accounting for the financial cycle increases the natural rate and improves output[1]

Graph IV.C



[1] Results are based on Borio et al (2016). [2] The finance-neutral natural rate is estimated with a Kalman filter based on Laubach and Williams (2016) and extended to include the leverage gap in the output gap equation. [3] Updated data provided by Laubach and Williams (2016). [4] In the counterfactual experiment, monetary policy follows an augmented Taylor rule that takes account of the finance-neutral natural rate, the finance-neutral output gap, inflation and the debt service burden gap. The counterfactual is implemented using a recursive procedure. First, the finance-neutral natural rate and output gap are estimated up to a point in time; second, a vector autoregression (VAR) is used to simulate the economy one period ahead conditional on the augmented monetary policy rule. Residuals from the full-sample VAR, including the Lehman shock and outliers, are retained for the counterfactual exercise. The counterfactual policy starts in Q1 2003.

Sources: C Borio, P Disyatat, M Drehmann and M Juselius, "Monetary policy, the financial cycle and ultra-low interest rates", BIS, mimeo, 2016; T Laubach and J Williams, "Updated estimates of Laubach-Williams model", 2016, http://www.frbsf.org/economic-research/economists/john-williams/Laubach_Williams_updated_estimates.xlsx; national data.

In the exercise, the output gains come with little change in overall inflation performance, even though interest rates are generally higher than in the baseline. This is not too surprising. Confirming well known findings, economic activity has little traction on inflation in the estimation; and, importantly, output is on average higher and the output gap lower in the counterfactual. In fact, even though inflation is around 10 basis points lower in the early part of the counterfactual, it ends up around 25 basis points higher. This suggests that mitigating really bad outcomes could help with both output and inflation.

The gains are larger if one starts the counterfactual experiment further back in time, eg in 1996. An earlier implementation succeeds in better containing financial imbalances. In this case, output is cumulatively some 24% higher (1.2% per year).

This exercise carries a number of important caveats. The most critical one is that the estimated relationships are assumed to be invariant to the change in the policy rule. Even so, the analysis suggests that a monetary policy framework that responds systematically to the financial cycle has the potential to promote better output and, as a result, better inflation performance over the medium term.

① C Borio, P Disyatat, M Drehmann and M Juselius, "Monetary policy, the financial cycle and ultra-low interest rates", BIS mimeo, June 2016. ② See eg M Woodford, *Interest and prices*, Princeton University Press, 2003. ③ Technically, all estimation errors (residuals) are retained, including the large negative output residual around the Lehman crisis, which indicates that the VAR cannot fully account for the fall in output at that point. This also means that, by construction, this residual source of output variation cannot be smoothed out in the counterfactual exercise.

extent that they may have contributed to the costly financial boom and bust, low rates in the past can then be seen as one reason for even lower rates today. This finding underscores the concern about the potential easing bias in current frameworks. Moreover, had policy succeeded in mitigating the financial cycle, and therefore its costs, equilibrium rates could also be higher today.

Finally, moving the economy closer to financial equilibrium may require the policy rate to deviate considerably from the natural rate in the short run – even the natural rate which incorporates the role of financial factors.

Clearly, any such research is subject to a number of caveats, and counterfactual exercises are fraught with serious difficulties. Even so, the results are consistent with the general proposition that a financial stability-oriented strategy means more than occasionally leaning against the wind. The costs and benefits of the strategy are best assessed over the course of the full financial cycle. And it suggests that policy choices at any given time can have important implications for financial developments both today and in the future, in turn significantly constraining future policy options (Chapter I).

Factoring in exchange rate considerations

Experience over the past several years has shown that risks to financial stability can originate both domestically and internationally. As an example, the unsustainable credit and asset price booms in past decades have been accompanied by waves of cross-border lending by both banks and non-banks (Chapter III). The impact of external influences has been felt especially by financially integrated small open economies. Such dynamics complicate financial stability-oriented monetary policymaking.

The potency of these international forces helps explain why central banks keep a close eye on global developments. Exchange rate flexibility can help promote financial stability, but only up to a point. On the one hand, flexibility may reduce incentives to stoke financial booms through one-sided exchange rate expectations, thereby helping insulate economies from international financial influences. On the other hand, prolonged unidirectional swings in the exchange rate are still possible. These, in turn, can fuel the build-up of financial imbalances, including by encouraging currency mismatches. A key mechanism operates through the greater willingness to provide foreign currency funding to domestic borrowers that have such mismatches: when these borrowers' foreign currency liabilities exceed their assets, a local currency appreciation improves their balance sheets (ie the risk-taking channel of the exchange rate) (Chapter III). These factors help explain why central banks are reluctant to see large deviations of their policy rates from those that prevail in key international currencies, most notably the US dollar.

Of course, when external financial conditions reverse, in response to either global developments or a turn in domestic financial cycles, they can create serious economic strains. The currency depreciates, foreign currency debt burdens rise and spreads soar (Graph IV.10).

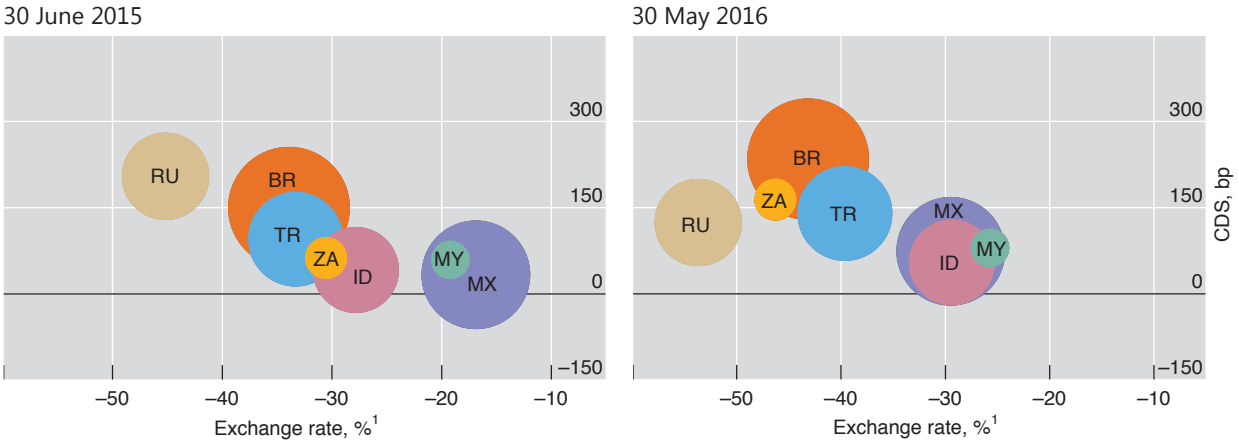
The previous discussion suggests that the influence of central banks whose currencies are used extensively abroad (ie international currencies) extends well beyond national borders.[3] This is not only because the rest of the world can borrow heavily in those currencies, but also because even financial asset prices denominated in domestic currencies are especially sensitive to conditions in the core currency economies. If business cycles are well synchronised, such influences may not be a major concern. This is also true for financial cycles. However, when they are out of synch, the concerns become more significant, especially if monetary policies in core currency economies diverge significantly from each other and from those elsewhere.

This raises tough challenges for small open economies seeking to pursue a financial stability-oriented monetary policy. The concern is that a tightening of monetary policy designed to rein in a financial boom may be partly offset by the

[3] For an in-depth discussion, see the *85th Annual Report*, Chapter V.

Currency mismatches led to FX and deleveraging feedback loops

Bilateral US dollar exchange rate and five-year sovereign CDS, changes from end-2012 Graph IV.10



CDS = credit default swaps.

The size of the bubbles indicates the size of US dollar-denominated credit to non-banks in the respective economies in Q4 2015.

[1] A negative value indicates a depreciation of the local currency.

Sources: S Avdjiev, R McCauley and H S Shin, "Breaking free of the triple coincidence in international finance", *BIS Working Papers*, no 524, 2015; Datastream; Markit; national data; BIS; BIS calculations.

induced portfolio adjustments and foreign currency borrowing, thereby leading to an unwelcome exchange rate appreciation and further foreign currency borrowing. The ample global liquidity that has prevailed in recent years heightens such risks. Moreover, the appreciation would also reduce inflation, at least temporarily, exacerbating the trade-off with price stability whenever inflation fell below objectives.

There are at least a couple of ways in which this trade-off may be addressed. One is to lean against the currency appreciation through foreign exchange intervention. This strategy has been used extensively in the past. It also has a favourable by-product – the accumulation of foreign exchange reserve buffers. The buffers would come in handy once the tide reverses. However, the historical record on the ability of intervention to rein in an appreciation is not clear-cut. And, at times, uncomfortably large interventions may be necessary.

A second strategy is to rely more on other policies in order to lighten the burden on monetary policy. Prudential, and in particular macroprudential, policies are essential in this context. Many countries have chosen this approach. Another possibility, hardly explored in practice, is to enlist the support of fiscal policy (Chapter V). As a last resort, one might also envisage temporary and careful use of capital flow management measures, as long as the imbalances do not reflect fundamental domestic disequilibria.

In all these strategies, it is important to avoid unbalanced policies that pull in opposite directions. An obvious example is easing monetary policy with an eye to currency appreciation while tightening macroprudential measures. This mix might send conflicting signals about policymakers' intentions. Experience suggests that these tools work best when used as complements rather than substitutes (see the *84th Annual Report*).

The additional difficulties that arise in pursuing a financial stability-oriented monetary policy in small open economies raise broader questions about the design of the international monetary and financial system. As discussed in Chapter V of

last year's Annual Report, there is a need to establish adequate anchors for the system as a whole. For monetary policy, this means a number of options with increasing degrees of ambition. One is enlightened self-interest, based on a thorough exchange of information. For example, when setting domestic policies, countries would individually seek to take spillovers and spillbacks more systematically into account; large jurisdictions that are home to international currencies have a special responsibility. Going one step further (and beyond the coordination seen during crises), cooperation could extend to occasional joint decisions on both interest rates and foreign exchange intervention. The third, and most ambitious, possibility would be to develop and implement new global rules of the game that would help instil greater discipline in national policies.

V. Towards a financial stability-oriented fiscal policy

Since 2008, policymakers have striven to contain the build-up of new financial vulnerabilities and to avoid repeating the mistakes that led to the Great Financial Crisis (GFC). They have tightened prudential regulation and supervision and made increasing use, especially in emerging market economies (EMEs), of macroprudential tools. But are these measures enough? Should not fiscal policy, too, be an essential part of the post-crisis macro-financial stability framework?

Financial stability generally, and financial cycles in particular, hardly feature in the design of fiscal policy. Yet history shows that financial crises wreak havoc with public finances. The latest crisis is no exception. Since 2007, public debt in many advanced economies has reached unprecedented peacetime peaks, in some cases raising serious doubts about its sustainability. Growing fiscal risks, in turn, weaken the financial system: they undermine the credibility of deposit guarantees and other financial backstops; weaken the balance sheets of banks holding public debt; and reduce the scope for authorities to run countercyclical policies.

The close two-way link between banks and public sector balance sheets also creates the potential for an adverse feedback loop. In this case, sovereign and financial risks reinforce each other, as demonstrated in the recent euro area debt crisis. To weaken this loop, it is essential to move away from the present favourable treatment of sovereign exposures in bank regulation to a framework that more accurately reflects sovereign risk. But this, by itself, is not enough. Banks would continue to be exposed indirectly, through the increased macroeconomic instability that rising sovereign risks can generate.

Maintaining or rebuilding a sound fiscal position is therefore key and requires that fiscal policy be run in a prudent and countercyclical way. If sufficient buffers are built up in a financial boom, room is created to repair balance sheets and stimulate demand when a crisis occurs. At the same time, a stronger countercyclical stance may also help contain the rise in credit and asset prices. But the most important contribution to crisis prevention may come from adjusting the structural component of fiscal policy: in many countries, the current long-term composition of taxes and subsidies unduly incentivises debt over equity, leading to excessive leverage and greater financial fragility.

After reviewing the historical record, this chapter discusses how the financial sector can be protected from the sovereign – focusing particularly on the treatment of banks' sovereign exposures in prudential regulation. It then suggests how a more active and targeted fiscal policy could be used to safeguard the sovereign from private sector financial excess.

The historical record

Since the GFC, several studies have parsed the historical record to investigate the causes and consequences of crises. A key conclusion is that, in both advanced economies and EMEs, systemic banking crises are often preceded by a large and rapid rise in private credit and asset prices. In other words, a financial bust is a financial boom gone wrong. That does not rule out excess public borrowing as a precursor of banking troubles, as Greece vividly demonstrated in 2009–10 and a number

of EMEs did in the 1980s and 1990s. But, at least among advanced economies, an upsurge in government borrowing has rarely preceded a banking crisis. And sovereign crises have generally been less frequent than banking crises.[1]

This observation does not make public debt irrelevant. On the contrary, another important conclusion is that the level of public debt critically amplifies the costs of a financial crisis. The higher the public debt at the onset of the crisis, the deeper the recession and the slower the recovery. Financial crises typically lead to substantial increases in public debt in their immediate aftermath. If public debt is already high, this may push debt closer to its limit. If so, sovereign spreads may soar and stabilisation policies may become severely constrained, worsening private sector financing conditions and deepening the output shortfall.

What follows considers, in turn, the damage a financial bust causes to public finances and the channels through which fiscal risks exacerbate financial risk.

The financial sector as a source of sovereign strains

Graph V.1 shows the behaviour of general government debt around banking crises over the post-Bretton Woods period. Three facts stand out. First, the post-crisis increase in public debt has been substantial in advanced economies and larger than in EMEs. The median rise is about 15 percentage points of GDP within three years in advanced economies (Graph V.1, left-hand panel) and 8 percentage points in EMEs (Graph V.1, right-hand panel). Second, debt continues to rise after the initial surge, if only gradually, for several years. Third, public debt is relatively stable before the crisis, consistent with the view that public borrowing is usually not responsible for the pre-crisis build-up of vulnerabilities.

Compared with the post-1970 crisis episodes, the GFC has led to larger and more persistent increases in public debt. After three years, the median debt rise in advanced economies was about the same as in previous episodes, but it was over 10 percentage points larger after eight years (Graph V.1, left-hand panel). The larger increase probably reflects the greater severity and, to some extent, the policy response to the latest crisis. By contrast, only in a few EMEs did banks require public support during the GFC.

Several factors typically drive the steep post-crisis rise in public debt.

First, the sovereign uses available fiscal resources to support the repair of banks' balance sheets (bailout costs). The government's role is critical, ranging from purchasing bad assets to recapitalising institutions, sometimes through temporary ownership. In some cases, the sovereign's support also extends to non-financial borrowers, including both corporations and households.

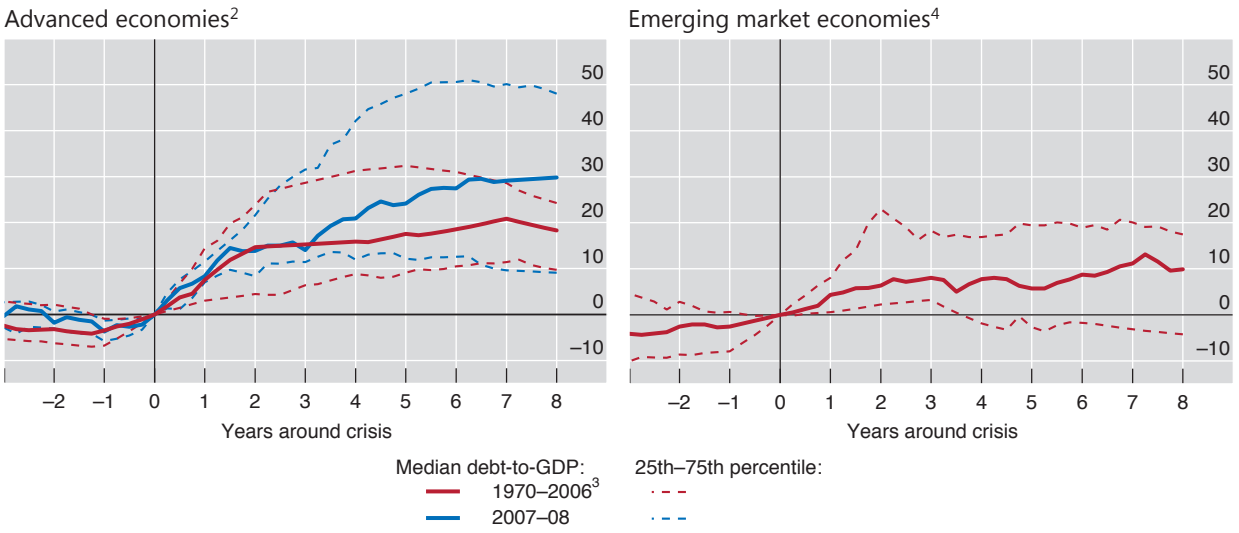
Bailout costs can be quite large, but are difficult to estimate precisely, even ex post. Depending on the method and time horizon, estimates vary widely. Moreover, over time, countries may be able to recover some or most of the initial costs, in some cases even making a small net profit, provided they resolve the crisis effectively. In EMEs, but not in advanced economies, such costs seem to be the main source of the debt increase.[2]

[1] See eg Ò Jorda, M Shularick and A Taylor, "Sovereigns versus banks: credit, crises, and consequences", *Journal of the European Economic Association*, February 2016; C Reinhart and K Rogoff, "From financial crash to debt crisis", *American Economic Review*, vol 101, August 2011; M Bordo and C Meissner, "Fiscal and financial crises", *NBER Working Papers*, no 22059, March 2016; and L Laeven and F Valencia, "Systemic banking crises database", *IMF Economic Review*, vol 61, 2013.

[2] See eg L Laeven and F Valencia, "Systemic banking crises database", *IMF Economic Review*, vol 61, 2013; and P Honahan and D Klingebiel, "Controlling the fiscal costs of banking crises", *Journal of Banking and Finance*, vol 27, 2003.

General government debt increases substantially after a crisis[1]

Banking crises between 1970 and 2008; in percentage points of GDP — Graph V.1



The vertical line indicates the year when the crises start.

[1] Starting years of the crises in parentheses. [2] Austria (2008), Belgium (2008), Denmark (2008), Finland (1991), France (2008), Germany (2008), Greece (2008), Ireland (2008), Italy (2008), Japan (1997), the Netherlands (2008), Norway (1991), Portugal (2008), Spain (1977 and 2008), Sweden (1991 and 2008), Switzerland (2008), the United Kingdom (2007) and the United States (1988 and 2007). [3] For emerging market economies, crises between 2007 and 2008 are also included. [4] Argentina (1980, 1989, 1995 and 2001), Brazil (1990 and 1994), Chile (1976 and 1981), Colombia (1982 and 1998), the Czech Republic (1996), Hungary (1991 and 2008), India (1993), Indonesia (1997), Korea (1997), Malaysia (1997), Mexico (1981 and 1994), Peru (1983), the Philippines (1983 and 1997), Poland (1992), Russia (1998 and 2008), Thailand (1983 and 1997) and Turkey (1982 and 2000).

Sources: L Laeven and F Valencia, "Systemic banking crises database: an update", *IMF Working Papers*, no 12/163, June 2012; C Reinhart, www.carmenreinhart.com/data; IMF, *International Financial Statistics* and *World Economic Outlook*; OECD, *Economic Outlook*; national data; BIS calculations.

Second, the collapse in output and employment and their slow recovery sap revenues and boost non-discretionary spending and transfers through automatic stabilisers. Initial output losses are substantial and surprisingly similar in advanced economies and EMEs, at least in the post-Bretton Woods period. Measured from peak to trough or from the peak to the point at which the growth rate returns to pre-crisis rates, such losses range from 6 to 15% on average across countries, against less than 4% in recessions not preceded by a financial crisis. In general, crises usher in weak recoveries: it takes several years for activity to return to its pre-crisis peak. Above all, there is evidence that these losses are not entirely recouped: the level of output does not return to its pre-crisis trend.

The one-off permanent loss of output may also go hand in hand with a long-lasting decline in trend output growth. Until recently, the literature had generally failed to find permanent effects on growth. But recent research has found that productivity growth may slow down for many years.[3] High public debt may be one reason. Lack of fiscal space may imply persistently higher credit spreads and higher distortionary taxation, which may exert a significant drag on productivity. Moreover, any reluctance to use fiscal resources to repair balance sheets can prolong the

[3] C Borio, E Kharroubi, C Upper and F Zampolli, "Labour allocation and productivity dynamics: financial causes, real consequences", *BIS Working Papers*, no 534, December 2015. See also C Reinhart and V Reinhart, "Financial crises, development, and growth: a long-term perspective", *The World Bank Economic Review*, April 2015.

economy's weakness. The Japanese experience, in which repair was delayed following the early 1990s bust, is a cautionary tale.

Third, the policy response may lead to a further deterioration in the fiscal position. If authorities have room for manoeuvre, they may increase discretionary spending or cut taxes to prop up aggregate demand. Several advanced economies did so in the wake of the GFC. In fact, in advanced economies the fiscal expansion, through either automatic stabilisers or discretionary measures, is frequently the single most important cause of the debt increase. By contrast, in EMEs the room for manoeuvre is smaller, most likely due to the tighter financing constraints they usually face after a crisis.

Fourth, for a given behaviour of output and income, compositional effects may weaken public finances further. In particular, the collapse in asset prices can play a key role. For example, empirical studies indicate that 30–40% of the deterioration of fiscal balances that took place in the United Kingdom and Sweden in the early 1990s was due to asset price effects, especially in the real estate market.[4]

Finally, exchange rates may play a similar role. This is the case whenever debt is denominated in a foreign currency and, as often happens, the crisis coincides with a sharp currency depreciation. Indeed, such concerns have been behind EMEs' attempts to reduce their reliance on foreign currency borrowing since the crises of the 1980s and 1990s. Even so, the sovereign may still remain indirectly exposed to currency mismatches if the private sector indulges in this practice.

The sovereign as a source of financial strains

The euro area debt crisis has reminded us that sovereign defaults are no longer confined to history or less developed economies. It would be unsafe, however, to assume that sovereign defaults occur only in countries that have given up their monetary sovereignty, such as those in the euro area, or in those that have borrowed in foreign currency. Defaults on domestic debt, albeit less frequent than those on foreign debt, are far from rare. Often, but not always, domestic defaults accompany external defaults, tending to occur when countries face harsher economic conditions and markedly higher inflation. In these circumstances, authorities may view default as less costly than high inflation, especially when debt is short-term or indexed.[5]

Moreover, even short of an outright default, an unsustainable fiscal position can have adverse consequences. One is higher inflation. Inflation volatility and uncertainty about the possible policy response can be very costly for financial and economic activity. Another is a sudden stop or abrupt capital flow reversal, which may interact with the financial damage caused by large currency depreciations. But, even before any of these scenarios materialises, a loss in the sovereign's perceived creditworthiness can have pervasive effects on banks. Several mechanisms may be at work.

First, such a loss can weaken banks' balance sheets directly.[6] It causes capital losses, whose incidence depends on the amount and duration of the government

[4] F Eschenbach and L Schuknecht, "Budgetary risks from real estate and stock markets", *Economic Policy*, vol 19, 2004.

[5] See eg C Reinhart and K Rogoff, "The forgotten history of domestic debt", *Economic Journal*, vol 121, 2011. Ratings acknowledge that domestic (local currency) debt is not riskless. For the 74 sovereigns that received first-time local currency sovereign ratings from at least one of the three major rating agencies between 1995 and 1999, the average gap between local and foreign currency ratings for the same sovereign narrowed from about 1.8 notches to 0.2 as of end-2015.

[6] See Committee on the Global Financial System, "The impact of sovereign credit risk on bank funding conditions", *CGFS Papers*, no 43, July 2011.

bonds held. And it can tighten banks' funding conditions, weakening them further. Even if losses are not marked to market, investors will in all probability perceive banks as riskier. Higher sovereign risk also reduces the value of sovereign securities that can be pledged as collateral, and that of explicit and implicit government guarantees. Indeed, sovereign rating downgrades normally translate into lower ratings for banks too. The sovereign normally represents a "ceiling" for firms' ratings.[7]

Second, a loss in creditworthiness can weaken banks indirectly, through its broader impact on the economy. For one, it can increase the cost of market finance. Sovereign yields typically set a floor under private market funding costs. Even large firms with access to foreign capital markets are not spared, unless they have large operations and sales abroad. In addition, economic weakness can depress credit demand and boost debt arrears and defaults among bank customers. Both factors also limit the ability of private non-financial issuers to substitute market debt for bank debt or equity funding.

Finally, financial repression may also creep in. Faced with rising sovereign risk, authorities may introduce measures aimed at reducing rollover risks and borrowing costs (eg cross-border capital controls, financial transaction taxes).[8] This erodes bank profitability and may further dent investor confidence.

The doom loop

This analysis suggests that sovereign risk and financial system risk can be mutually reinforcing. Empirical studies too have found evidence of significant contagion and two-way feedback between them (also known as the "doom loop"). The GFC highlighted this risk. A number of findings stand out.

First, sovereign and bank credit default swap (CDS) spreads tend to co-move and influence each other. The link is tighter than can be explained by common factors, such as the state of the economy or market volatility, pointing to a causal interdependence.[9]

Second, the size of sovereign and bank CDS spreads and their correlation tend to be higher in countries that are fiscally weaker. Similarly, weaker banks, as measured by market-to-book ratios, are associated with high public debt ratios (Graph V.2, left-hand panel). Furthermore, the two-way contagion is stronger for countries with a larger financial sector and a higher share of bank-intermediated finance.

Third, the higher the share of domestic sovereign debt in banks' assets, the stronger is the effect (Graph V.2, centre panel). As an indication that this relationship does not simply reflect country risk, research has also shown that, within the same country, banks with larger domestic sovereign exposures cut credit by more than other banks do in response to increased sovereign risk.[10] The characteristics of

[7] See eg M Adelino and M Ferreira, "Bank ratings and lending supply: evidence from sovereign downgrades", *Review of Financial Studies*, forthcoming, 2016; and Y Baskaya and S Kalemli-Özcan, "Sovereign risk and bank lending: evidence from the 1999 Turkish earthquake", unpublished mimeo, 2015.

[8] Short-term debt issuance usually increases steeply during episodes of fiscal stress, reflecting both the risk of default and higher future inflation. This increases rollover risks for the sovereign.

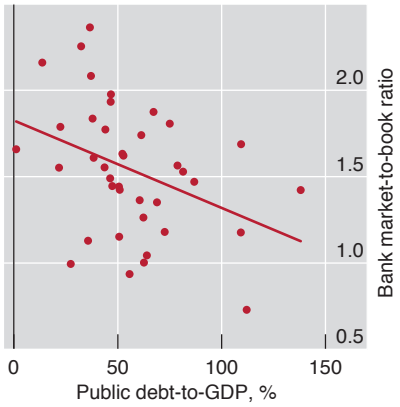
[9] See eg V Acharya, I Drechsler and P Schnabl, "A pyrrhic victory? Bank bailouts and sovereign credit risk", *Journal of Finance*, vol 69, 2014; and V de Bruyckere, M Gerhardt, G Schepens and R Vander Vennet, "Bank/sovereign risk spillovers in the European debt crisis", *Journal of Banking and Finance*, vol 37, 2013.

[10] See eg M Bottero, S Lenzu and F Mezzanotti, "Sovereign debt exposure and the bank lending channel: impact on credit supply and the real economy", Harvard University, working paper, January 2016.

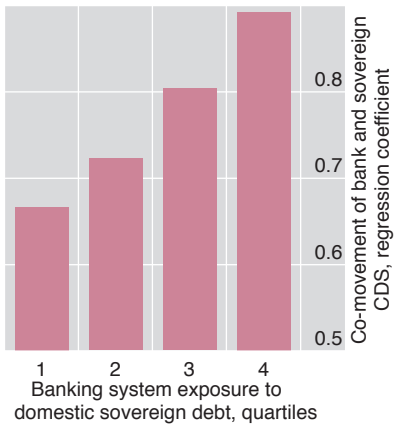
Public finances and bank risk are highly interdependent

Graph V.2

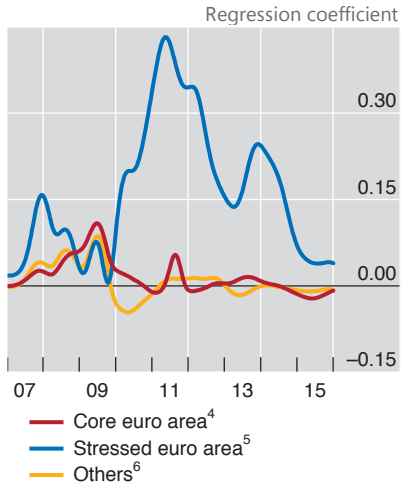
Bank valuation and public debt[1]



Bank and sovereign CDS spreads[2]



Doom loop between banks and sovereigns[3]



[1] Country averages of market-to-book ratio of banks and public debt as a percentage of GDP; the sample covers 39 advanced and emerging market economies for 1981–2016. The regression line is significant at the 5% level. [2] Co-movement of the natural logarithm of the CDS spreads of banks headquartered in the country concerned with sovereign CDS from a panel regression. The graph reports estimated coefficients of the logarithmic change in sovereign CDS interacted with a dummy variable indicating the quartile of the domestic banking system's aggregate exposure to domestic sovereign debt as a share of total banking assets, where 1 indicates banking systems with the lowest domestic sovereign exposure and 4 indicates the highest. The sample covers 32 advanced and emerging market economies. [3] Co-movement of bank and sovereign CDS premia, estimated from a regression of sovereign CDS on the CDS spreads of banks headquartered in the country concerned. The time variation in the coefficients is obtained by running regressions using observations weighted by a Gaussian distribution centred on each week, with a 12-week standard deviation. [4] Ireland, Italy, Portugal and Spain. [5] Austria, Finland, France and Germany. [6] Denmark, Sweden, the United Kingdom and the United States.

Sources: IMF; Datastream; Markit; BIS; BIS calculations.

individual banks or the banking sector also matter. Sovereign risk more strongly affects banks that are less capitalised, more reliant on wholesale funding and with lower loan-to-asset ratios.[11]

The GFC provides a vivid illustration of the feedback mechanisms at play. When the crisis began in 2008, bank solvency risk, as measured by CDS spreads, went up without increasing sovereign risk. After the first bailouts and explicit government guarantees, bank CDS spreads fell. But soon afterwards, this raised sovereign risk. And when the euro area crisis broke out in 2010, the co-movement increased strongly in stressed countries. Confronted by high debt and a lack of fiscal space, financial market participants viewed risks as intertwined (Graph V.2, right-hand panel).

Protecting the financial sector from sovereign risk

In many countries, domestic government securities constitute a significant share of bank and non-bank assets, directly exposing them to sovereign risk. This is true of both banks and non-bank financial institutions, such as pension funds, insurance firms and collective investment vehicles. How can prudential regulation help protect

[11] See eg V de Bruyckere, M Gerhardt, G Schepens and R Vander Vennet, "Bank/sovereign risk spillovers in the European debt crisis", *Journal of Banking and Finance*, vol 37, 2013; and A Demirgüç-Kunt and H Huizinga, "Are banks too big to fail or too big to save? International evidence from equity prices and CDS spreads", *Journal of Banking and Finance*, vol 37, 2013.

them from sovereign risk? What follows focuses first and foremost on banks, given their critical role in systemic risk and macroeconomic stability. That said, a fuller treatment would also need to address other types of institution, not least given their growing importance in the financial system (Chapter VI).

Bank exposures to sovereign risk

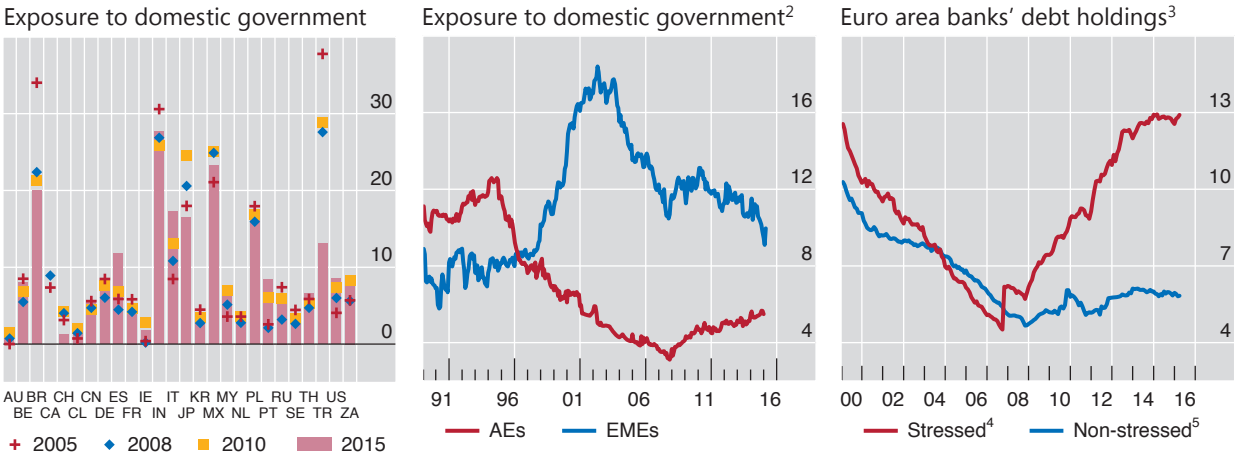
Banks' exposures to the domestic sovereign differ significantly across countries. For example, as a share of bank assets, exposures are now relatively large in Brazil, India, Italy, Japan and Mexico, but small in Canada, Chile, Sweden and Switzerland (Graph V.3, left-hand panel). In general, they tend to be larger in EMEs than in advanced economies.

Such cross-country differences tend to persist over time, reflecting in part structural factors. One such factor is *financial depth*. For example, in several EMEs government bonds are the only high-grade domestic security. A second is *public debt*. Banks in countries with high public debt, such as Brazil, India, Italy and Japan, naturally exhibit relatively higher sovereign exposures. A third is the *central bank market operations framework*, which defines eligible collateral. In some countries, for instance, only public sector securities are eligible. Finally, *regulatory constraints* differ across countries. Yet, over time and especially post-crisis, regulation has become increasingly harmonised, generally in the direction of favouring public debt over private debt. A good example is the new international standards for liquidity regulation, such as the Liquidity Coverage Ratio (LCR) (Chapter VI).

Sovereign exposures also vary significantly over time within countries, reflecting both secular and cyclical forces (Graph V.3, centre panel). In EMEs, exposures (as a share of assets) have been on a declining trend, interrupted only temporarily by the GFC. This trend partly echoes the increasing financial sophistication and integration of EMEs, but also financial booms and hence strong private credit growth. In

Banks' sovereign exposures vary significantly across countries and over time[1]

As a share of total assets, in per cent — Graph V.3



[1] By residence. The reporting population comprises all solo entities resident in the country, including those which are foreign-owned subsidiaries or branches of foreign entities. Branches and subsidiaries abroad of domestically owned entities are not included. [2] Median across the economies listed. [3] Domestic sovereign debt securities plus loans to domestic sovereigns from monetary financial institutions excluding the European System of Central Banks, as a share of total assets. [4] Greece, Ireland, Italy, Portugal and Spain. [5] Austria, Belgium, Finland, France, Germany and the Netherlands.

Sources: ECB; IMF, *International Financial Statistics*; national data; BIS calculations.

advanced economies too, sovereign exposures were on a downward trend before the GFC. Yet, as the financial cycle turned and public debt rose sharply, exposures began to rise again (Graph V.3, centre panel). Unsurprisingly, when credit demand declines and risk appetite is low, there may be no better alternatives to domestic public debt in terms of liquidity and safety.

The post-crisis increase in exposures has not been uniform across countries. Particularly in the euro area, cross-country dispersion and the home bias have risen. Moreover, the home bias has risen relatively more in countries that were under fiscal stress (Graph V.3, right-hand panel). This seems paradoxical. To be sure, banks profit from the higher spread between their own sovereign and their funding costs. But this does not explain why investors in other countries do not take advantage of it. One possibility is that domestic banks' equity holders and managers are able to shift part of the additional risk onto bank creditors and the taxpayer (risk-shifting). In the case of a sovereign default, the lack of a backstop would affect all domestic banks, even those with little exposure to domestic debt. Another possibility is moral suasion. During market stress, authorities may induce banks to play a stabilising role as contrarian investors. Over time, however, this would risk tightening the link between banks and sovereigns unless policymakers took advantage of calmer market conditions to strengthen public finances.

Treatment of sovereign risk in prudential regulation

The Basel risk-weighted capital framework prescribes minimum capital requirements commensurate with the underlying credit risk, in line with the objective of ensuring risk sensitivity. This applies to sovereign debt too. There are, however, exceptions to the general rule.[12] Under the Standardised Approach for credit risk and market risk, sovereign exposures are risk-weighted according to their external ratings, with positive risk weights prescribed for debt rated at under AA–. But national supervisors can, at their discretion, apply a lower or even zero weight to domestic sovereign debt, provided it is denominated and funded in domestic currency. Under the alternative method for credit risk, the Internal Ratings-Based (IRB) Approach, banks are permitted to use their own models to estimate default probabilities and loss-given-default. In this case, sovereign debt is exempt from the 3 basis point floor under the default probability prescribed for private issuers with broadly similar characteristics. In fact, the risk weights typically applied to domestic sovereign debt are often close to zero. Another key aspect of the present regulation is that sovereign debt is also exempt from the large exposure requirement that limits exposures to any single counterparty or group of connected counterparties to 25% of eligible capital.

The standard argument for treating sovereign debt as if it were (almost) risk-free is that a sovereign can always meet the nominal repayment by issuing more of its own currency. This argument is vulnerable to three criticisms. First, debt monetisation may not be feasible due to institutional constraints, as in the euro area, or it may not always be the least costly option, as indicated by several past cases, especially in EMEs. Second, within a country, subnational entities (eg municipal or regional governments) or state-owned enterprises can and do default. This is normally reflected in different market prices for their debt. Finally, volatility in bond prices driven by changing perceptions of fiscal risks can hurt banks, even short of default (see above). This is true even when credit risk in a narrow sense is ruled out and investors worry only about higher inflation or currency devaluation.

[12] See Bank for International Settlements, "Treatment of sovereign risk in the Basel capital framework", *BIS Quarterly Review*, December 2013, p 10.

Eliminating the present favourable treatment of sovereign exposures would have several benefits.[13] Ex ante, it would discourage the build-up of large bank exposures in domestic sovereign bonds, thus also limiting moral hazard on the part of banks and regulators. Ex post, it would make banks better capitalised and able to withstand financial distress. These factors should promote both better risk management and greater macroeconomic resilience, not least by attenuating the "doom loop". This could ultimately translate into lower long-term funding costs for both banks and the government.[14] Moreover, by reducing distortions among asset classes, it could also increase the supply of credit to private non-financial corporates.

These benefits need to be weighed against potential adverse effects on the functioning of the financial system. At least three are relevant.

First, banks may have less room to act as *buffers or contrarian investors* at times of market stress. Critics argue that self-fulfilling liquidity crises may become more likely; and by limiting the room for countercyclical fiscal policy, country risk and hence the health of banks may deteriorate. However, reducing the scope for banks to play this role could improve the ex ante incentives towards sound fiscal policy, thus making market stress less likely in the first place. Policymakers will have to tread a fine line between avoiding bad outcomes ex post and providing the right incentives ex ante.

Second, *bond market liquidity* may be lower even outside periods of market stress. Regulatory capital charges on government securities may increase bank intermediation costs in both the cash and repo markets for sovereign securities, as dealers reduce inventories. Yet, if banks become more resilient and market stress less likely, market liquidity should become more robust and central banks would have to provide emergency liquidity less frequently (Chapter VI).

Third, *monetary policy transmission* may become less effective. Government bonds are a key source of collateral in repo markets, which facilitates arbitrage by enhancing bank liquidity and flexibility to fund positions. By inhibiting bond holdings, regulation may therefore lead to less arbitrage and greater interest rate volatility, hence weakening the impact of policy rate changes on long-term yields. Yet this is no sure conclusion. Non-bank institutions, too, may ensure sufficient arbitrage along the yield curve. And central banks could further help by adding such institutions to their list of eligible counterparties. Furthermore, by improving banks' resilience, regulation may reduce interest rate volatility on average, making the transmission mechanism more stable over the cycle.

The strength of these potentially adverse effects depends, to a significant extent, on the financial system's structure and sophistication. In less developed financial systems, banks tend to have less room for diversification domestically. Their non-bank investor base may be relatively small. And diversifying away from home debt would expose banks to currency risk, which may be costly to hedge. Another important factor is the size of outstanding public debt. Countries with very high levels of public debt may find it difficult or impossible to impose strict limits on bank holdings. That said, financial systems operate with quite different levels of sovereign exposure, as noted above, suggesting that these are issues for the transition to a stricter regulation, but not necessarily an argument against regulation per se.

Against this backdrop, any change to the current treatment of sovereign exposures would have to take into account a number of issues.

[13] See also Box VI.E in the *85th Annual Report*.

[14] For a formal argument on how regulation can lead to a reduction in interest rates, see eg E Fahri and J Tirole, "Deadly embrace: sovereign and financial balance sheets doom loops", *NBER Working Papers*, no 21843, January 2016.

The first is how to *measure sovereign risk*. Most sovereigns, especially among advanced economies, have not defaulted in the last few decades. While the recent historical record does not imply zero default probability or zero loss-given-default, it provides little information for estimating these two parameters under the IRB Approach. Under the Standardised Approach, instead, risk weights are based on ratings provided by external agencies (or, in jurisdictions where this is not possible, on alternative metrics). Credit ratings summarise a large amount of information and are supposed to be forward-looking. They are also readily available and known to provide reliable ordinal rankings of risk. Yet they also tend to change infrequently and abruptly, as rating agencies seek to avoid ratings volatility. Moreover, authorities in various countries have outlawed, or are now actively discouraging, their use for regulatory purposes.

Alternative measures could be based on market or non-market indicators. The former, such as CDS spreads, are readily available and easy to translate into familiar risk measures such as default probabilities. But their pricing is also affected by liquidity risk premia and shifts in investors' risk appetite (Chapter II), making them highly volatile. Furthermore, the necessary data may not be available for all countries. This leaves more standard non-market metrics such as debt-to-GDP ratios and other indicators of fiscal sustainability or country risk. Still, the translation of these indicators into risk weights is inevitably sensitive to modelling assumptions.

The second issue is what regulatory *instruments* to use: risk weights, large exposure limits or a combination of the two? Higher risk weights raise the required capital on each unit of investment in sovereign bonds, aiming to ensure that banks are sufficiently capitalised to withstand eventual losses. Large exposure limits constrain risk concentration more directly. Soft limits – increasing risk weights based on a bank's concentration of sovereign exposures – are also possible, making them more similar to risk weights. For instance, an increasing capital charge may be imposed for exposures above the limit or for step-wise thresholds.

The third issue concerns the *consistency* of credit risk regulation with the treatment of other risks. For example, sovereign debt tends to be held in the banking book, which does not require Pillar 1 capital charges for interest rate risk. The treatment of these holdings is therefore inconsistent with the use of zero risk weights in the credit risk framework, which effectively assume that the government can monetise its debt – which would necessarily translate into market risk. In addition, government securities are eligible for the LCR. This indicates that they can be sold at any time; moreover, even when used as collateral, they are subject to haircuts. Consistency would then suggest that they be held in the trading book. Requiring banks to reallocate their holdings accordingly would address both inconsistencies and would help to better align banks' risk-taking incentives, albeit at the cost of potentially larger reductions in capital at times of sovereign stress.

The final issue is how to handle the *transition* to any new sovereign risk requirement. Non-zero risk weights would require banks in several jurisdictions to raise their capital ratios and strict exposure limits to scale down exposures, especially in countries with high public debt. To prevent any adverse impact, the transition to any new treatment would have to be gradual. And regardless of the letter of the regulation, experience suggests that banks might try to front-load the reduction in exposures. Where diversification possibilities are limited, such as in several EMEs, complementary measures to broaden the investor base would also help.

In conclusion, the current prudential treatment of sovereign exposures is no longer tenable. Moving to a more balanced treatment that acknowledges the risky nature of public debt would provide a clear signal that no asset is truly default-free. It would also reduce distortions by respecting proportionality to risks, and weaken the adverse feedback loop between the sovereign and banks. That said,

any change would also need to take into account the special role of sovereign debt in the financial system – as a source of liquidity and a potential buffer for the macroeconomy. Moreover, the risk of possible side or unintended effects, especially during the transition, needs to be addressed.

Even then, though, banks would still be exposed to sovereign risk indirectly. And the sovereign is the ultimate backstop for the banking system. Hence, prudential regulation is a useful complement to sound fiscal finances, but not a substitute for them.

Protecting the sovereign from financial sector risk

Recognising and measuring the flattering effect of financial booms

The first step towards protecting the sovereign from financial sector risk is to recognise that fiscal positions, as typically measured, may provide a misleading view of a country's actual fiscal situation. This is especially the case during a financial boom, in particular if accompanied by a commodity upswing, notably in EMEs (Chapter III). Potential output and potential growth are overestimated. Compositional effects, especially those associated with rises in asset or commodity prices, boost revenues further.[15] And nominal exchange rates may appreciate, temporarily reducing the domestic currency equivalent of foreign exchange-denominated debt and the corresponding interest payments. A further complication is that, under political economy pressure, policymakers may feel encouraged to relax fiscal policy further.

Standard measures of the cyclically adjusted fiscal balance do not account for these effects. One possible, yet partial, remedy is to adjust the fiscal balance using measures of the output gap that incorporate information about credit and financial developments. Box V.A explains and illustrates the method. The comparison with ordinary measures is striking. In the boom that preceded the GFC, fiscal balances adjusted according to standard measures of the output gap were stronger than the corresponding unadjusted fiscal balance (Graph V.A, red bars). In comparison with either of these measures, fiscal balances adjusted using the finance-neutral output gap (a measure that incorporates information on the financial cycle) were weaker (blue bars). Between 2003 and 2008, the cyclical adjustment to the fiscal balance was negative and amounted to almost 0.70 percentage points of GDP in the United States, almost 1 in Spain and around 0.25 in Italy. Alternatively, for countries that rely heavily on commodity exports, the cyclical correction of fiscal balances can be made using information about commodity prices (Chapter III).

Correcting fiscal balances in this way helps, but is not sufficient. To obtain a fully neutral measure of the fiscal balance over the financial boom-bust cycle requires other elements to be taken into account, including the compositional effects of asset price booms (for a given output level), exchange rate-induced effects on the valuation of debt, and systematic patterns in interest rate behaviour. Importantly, such a measure would also have to incorporate the expected realisation of contingent liabilities. In practice, contingent liabilities are hard to measure. Some are explicit and known ex ante, but most are not. Even when they are explicit and their full scope could be defined, the information is rarely aggregated. As to implicit liabilities, their scope is difficult to define ex ante. The historical record can provide

[15] Asset price booms can affect personal and corporate income taxes as well as rental income through sales or the accrual of capital gains. In addition, taxes are also paid on transactions. Since turnover intensifies during a boom, revenues tend to increase for a given level of asset prices.

Box V.A

Fiscal balances and the financial cycle

A key indicator of the fiscal stance is the budget balance, ie government revenues minus current expenditure. However, since an upswing of the business cycle naturally boosts revenues and reduces expenditure, fiscal balances need to be adjusted in order to measure the underlying solidity of fiscal positions. Such an adjustment is normally based on standard measures of the difference between actual and potential output (the "output gap"). However, since these measures do not account for financial conditions, they may misestimate potential output. BIS research① has developed an alternative measure of potential output obtained by augmenting a standard method (the Hodrick-Prescott (HP) filter) with information from credit and property prices (a "finance-neutral" measure). Such a measure can help to recognise in real time the economy's disguised overheating due to unsustainable financial booms, and the flattering effect on fiscal balances. This box illustrates how to obtain a finance-neutral measure of the fiscal balance by a simple modification of the cyclical adjustment procedure in use at the OECD.

According to the OECD methodology,② cyclically adjusted balances are constructed by adjusting government revenues and expenditure by the position of output relative to potential. In formal terms, the cyclically adjusted fiscal balance B^* is defined as:

$$B^* = \left[\sum_{i=1}^{4} T_i (Y^*/Y)^{\eta_{Ti}} - G(Y^*/Y)^{\eta_G} + X\right]/Y^*,$$

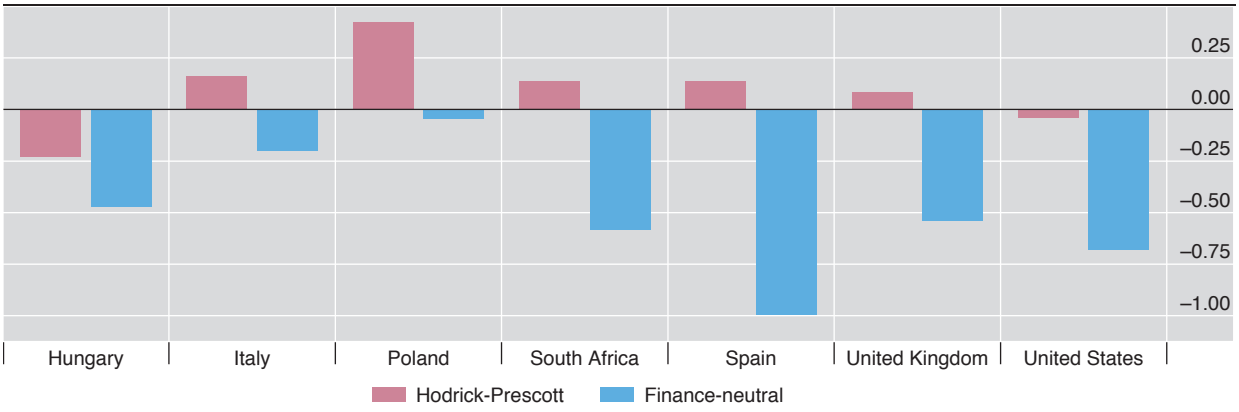
where Y and Y^* denote, respectively, actual and potential output; T_i are revenues from different types of tax (personal and corporate income taxes, social security contributions and indirect taxes); G is primary government expenditure; and X is non-tax revenues. Tax revenues and government expenditure are adjusted by means of their elasticities with respect to the output gap, denoted, respectively, by η_{Ti} and η_G.③

Naturally, estimates of the output gap play a key role in the formula. This is illustrated in Graph V.A, which compares cyclical adjustments based on the finance-neutral output gap with those based on the HP filter during the run-up to the Great Recession. The results are striking: the HP-filtered cyclical adjustments consistently improve the apparent fiscal strength for all countries, while those based on the finance-neutral measure worsen it in all cases. The average of the pre-crisis adjustment under the finance-neutral approach accounts for almost 1% of GDP in Spain and more than ½% in the United States and the United Kingdom, while it is around ¼% for Italy. The effects of the financial cycle on estimates of fiscal solidity are also visible for EMEs, although they are somewhat less sizeable. The average pre-crisis adjustment is about ½% for Hungary and South Africa, while it is close to zero for Poland, although this result compares with the positive adjustment of almost ½% suggested by the HP filter.

The method illustrated above to correct potential output for the effects of the financial cycle has the advantage of simplicity, parsimony and transparency. Yet it also has drawbacks. One is that it only slowly recognises the permanent loss of output that appears to be a stylised feature of financial crises. Moreover, it does not adjust entirely for the effects of the financial cycle. These effects include the likely use of public sector money to support

Cyclical adjustment of fiscal balances

As a percentage of GDP; 2003–08 average — Graph V.A



Sources: IMF, *World Economic Outlook*; OECD; BIS calculations.

balance sheet repair during the bust; the compositional effects on tax and expenditure (for a given level of output); the exchange rate-induced effects on the valuation of debt and debt servicing costs; and systematic patterns in interest rate behaviour. And, as for any statistical method, it is subject to a number of caveats.④

① C Borio, P Disyatat and M Juselius, "Rethinking potential output: embedding information about the financial cycle", *BIS Working Papers*, no 404, February 2013. ② C André and N Girouard, "Measuring cyclically-adjusted budget balances for OECD countries", *OECD Working Papers*, no 434, July 2005. ③ For further details, see C Borio, M Lombardi and F Zampolli, "Fiscal sustainability and the financial cycle", *BIS Working Papers*, no 552, March 2016. ④ These are discussed in detail in C Borio, P Disyatat and M Juselius, "A parsimonious approach to incorporating economic information in measures of potential output", *BIS Working Papers*, no 442, February 2014.

some clues as to the possible losses. Direct bailout costs tend to increase with the size of the financial sector as well as the duration and scale of the financial boom. Even so, estimates based on past banking crises are subject to considerable uncertainty.

This analysis also has implications for any assessment of fiscal space at the present moment (Box V.B), suggesting that the need for an additional buffer to address financial stability risks should be explicitly taken into account. This is especially important in countries that have recently been experiencing financial booms. But it also applies to those that have not: from a structural, long-run perspective, the extra buffer is an essential ingredient of macro-financial stability frameworks, regardless of specific cyclical conditions. Furthermore, interest rates have sunk to exceptionally and persistently low levels (Chapter II), which may lead policymakers and investors to overestimate fiscal sustainability.

Can fiscal policy be used to contain financial sector risks?

Fiscal policy could also be employed to *actively* restrain financial booms and stabilise output around a sustainable level, rather than simply containing a boom's fallout as it turns to bust. This could be done in two ways: by adjusting the cyclical stance of fiscal policy; or by modifying its structural component.

At the cyclical level, fiscal policy could usefully help monetary and macroprudential policy to lean against the wind. Recent research suggests that tighter fiscal policy has, on average, materially restrained private credit growth with relatively small output costs (Graph V.4). And, at least compared with monetary policy, it could be more targeted (eg through taxes specific to the housing sector) and may avoid or at least limit the currency appreciation (and possible surge in capital inflows) that typically accompanies higher interest rates (Chapter IV).

A key challenge is timing. Discretionary fiscal policy normally involves significant lags in decision-making and implementation. And political pressures towards a looser stance might also be especially strong. These problems could be mitigated by designing automatic stabilisers or budget rules that define ex ante how and under what conditions certain taxes or subsidies should be adjusted.

Removing the bias towards debt accumulation

The structure of taxes and subsidies can influence private sector decisions on leverage. Yet, at present, fiscal incentives often do more to encourage greater leverage than they do to support financial stability. Examples include underpriced government guarantees of debt liabilities and tax systems that favour debt over equity.

Government guarantees for financial risks redistribute tail risks from the private to the government sector. Guarantees can help stabilise the financial sector at times

Fiscal room for manoeuvre?

Public debt is at record highs in advanced economies: its median value has increased by over 30 percentage points of GDP since 2007 and now stands at nearly 100% (Annex Table A.3). Furthermore, headline deficits are still large in several countries, pointing to higher debt in the next few years. In EMEs, the debt increase has been less dramatic, from 34% to 44%. But fiscal deficits and funding conditions there have worsened since 2015, reflecting in particular the sharp drop in commodity prices, currency depreciations and tighter global financial conditions (Chapter III).

Despite high and rising public debt, calls abound in advanced economies for fiscal stimulus and, in particular, for greater public investment. According to some recent estimates, several countries still seem to have ample fiscal space – that is, room to raise debt without provoking adverse investor reactions – and should therefore take advantage of exceptionally low borrowing costs. But how much can we rely on these estimates? Fiscal space is an abstract concept that depends on market participants' perceptions of fiscal sustainability and liquidity. As such, any measure would inevitably be characterised by a large degree of uncertainty.

Market perceptions of solvency will crucially depend on at least three factors. The first is the government's ability to impose higher taxes. This, in turn, depends on the economy's structure and potential growth. Taxes create distortions, creating Laffer curve effects: beyond a certain point, further tax increases may lead to output losses large enough to push down overall revenues. Moreover, politically tolerable taxation levels may be even lower than Laffer curves would suggest. And population ageing too is likely to weigh on future growth (Chapter III). The second factor is how far expenditure can be cut. Economies require some minimum level of government expenditure to function, and most societies have adopted social compacts that put a floor under spending of considerably more than that minimum. Increasing demands related to population ageing may, in particular, pose significant challenges. The third factor is the (growth-adjusted) interest rate on debt that is expected to prevail in the future. Risk premia on public debt are currently deeply negative in many advanced economies, but fluctuate widely and may at some point return to more normal levels (Chapter II). Their evolution, in turn, depends on market perceptions of the previous factors and on global financial market conditions. A final factor is the size of any future contingent liabilities due to a possible future financial crisis or even a natural catastrophe.①

That said, fiscal sustainability depends not only on a country's fundamentals, but also on investors' beliefs and behaviour. This creates the potential for debt crises to be, at least partially, self-fulfilling: agents may want to sell off

The uncertainty around fiscal space is high

Fiscal debt limits as a percentage of GDP[1] Table V.B

	United States	Japan	Germany	United Kingdom	Italy
Historical *r* (Ghosh et al (2013))[2]	183	N.S.[6]	154	182	N.S.[6]
Projected *r* (Ghosh et al (2013))[2]	161	N.S.[6]	176	167	N.S.[6]
Uncertainty on the shape of the FRF, optimistic[3]	260	258	257	258	251
Uncertainty on the shape of the FRF, pessimistic[4]	128	N.S.[6]	123	122	N.S.[6]
Memo: Nominal gross government debt level in 2015[5]	*97*	*212*	*71*	*89*	*133*

[1] Fiscal debt limit calculated as in Ghosh et al (2013), based on data up to 2007. Moody's recommends that countries keep a distance from estimated debt limits of at least 125 percentage points of GDP (Zandi et al (2011)). This is intended to ensure that there is no adverse market reaction and to allow for unexpected contingencies. [2] Debt limit derived from estimated fiscal reaction function on a panel of advanced economies assuming that the reaction function follows a cubic shape. Growth-adjusted interest rate is equal to the 1998–2007 average (historical) or to 2010 IMF projections of long-term bond yields and GDP growth. [3] Debt limit calculated by adding one standard deviation to the reaction function coefficient estimates. [4] Debt limit calculated by subtracting 0.15 times the standard deviation from the coefficient estimates. [5] Nominal value of total credit to the general government sector (consisting of debt securities, loans and currency and deposits). For consistency across countries, this measure differs from the IMF *World Economic Outlook* definition, which includes other accounts payable, monetary gold and SDRs, and insurance and pension liabilities in some countries. [6] Debt is not sustainable.

Sources: IMF, *International Financial Statistics*; OECD; BIS calculations.

debt because they believe others might do the same. This type of crisis is more likely to break out when debt is high, especially in foreign currency, and when policy credibility is low.②

A country's debt limit therefore depends not only on structural factors, but also on the interaction between government choices, market expectations and intrinsic randomness. Recent general equilibrium models that attempt to capture this complexity are promising, but their use is limited by computational complexity. In practice, simpler methods are often used. The most straightforward one consists in computing the steady-state debt level based on hypothetical long-run average values of the primary surplus and growth-adjusted interest rates (the gap between the average borrowing cost and growth). But these measures do not consider whether, in response to adverse fiscal shocks, a country would succeed in bringing debt back onto a sustainable path. This issue has been partially addressed by estimating fiscal reaction functions: in this case, debt is stable if the primary balance responds to increases in debt by more than the interest rate. There are, of course, limits to how much the primary surplus can increase, due to the factors mentioned above. Historically, countries have struggled to maintain primary surpluses of more than 5% of GDP for long.③

Recent methodologies have tried to take into account the diminishing ability to generate fiscal surpluses – or "fiscal fatigue". One popular approach is to use a non-linear reaction function – for example, one with a cubic shape – which amounts to postulating that, for sufficiently high debt levels, the response of the fiscal authorities diminishes as debt increases (see eg Ghosh et al (2013)).④ This approach finds debt limits of over 150% of GDP (Table V.B, first row) in the United States, Germany and the United Kingdom, which, given current debt levels (fifth row), indicates that relatively ample fiscal space exists in these countries. By contrast, the estimated fiscal response is insufficient to stabilise debt in Japan and Italy, suggesting a lack of fiscal space there.

That said, these estimates of debt limits are subject to considerable uncertainty and should therefore be taken with great caution. For one, future interest rates and GDP growth are uncertain. Baseline estimates are based on historical averages of the growth-adjusted interest rate. Yet using projected values of the growth-adjusted interest rate (Table V.B, second row) leads to differences in estimated debt limits of about 20 percentage points. Another source of uncertainty is the shape of the non-linear relationship between the primary balance and the debt-to-GDP ratio. Since the reaction function is estimated on historical data, the parameters that determine the shape of this relationship are subject to sample uncertainty. To illustrate how this uncertainty translates into uncertainty about the effective debt limit, two alternative scenarios are constructed. The first scenario is a benign one and refers to a "more reactive" fiscal reaction function. This is obtained by raising the coefficients' point estimates by one standard deviation. The alternative scenario instead postulates a "less reactive" fiscal response, obtained by reducing the coefficients symmetrically by one standard deviation.⑤ The benign scenario (third row) implies much higher debt limits for all countries, in the region of 260% of GDP. By contrast, under the pessimistic scenario, the fiscal reaction is not sufficient to stabilise debt for any country, indicating no fiscal space (not shown in the table). A somewhat more reactive reaction function, obtained by cutting the coefficients by just 0.15 times the standard deviation, succeeds in making debt sustainable for three countries, but at considerably lower levels; those in Japan and Italy, however, remain on an unsustainable path (fourth row). Cutting coefficients by more than 0.15 times the standard deviation would make debt unsustainable in a greater number of countries. It is striking that current debt levels can be either sustainable or unsustainable depending on parameters being just one standard deviation away from their point estimates.

There are additional reasons why debt limit estimates should be treated with great caution. First, the estimates are largely based on extrapolation, as few countries have ever experienced debt levels anywhere close to those limits. Little is known about how governments or financial markets would react if debt rose that high or if governments were to communicate that they would only try to consolidate opportunistically – that is, only if growth were to pick up substantially. Importantly, it would be unsafe to assume that debt levels could reach their estimated limits without triggering a sharp increase in interest rates (which would, in turn, invalidate those estimates). Second, estimates largely ignore the risk that economic conditions may deteriorate and expectations of debt sustainability suddenly shift. In particular, a country's debt limit should naturally depend on a government's ability to sustain debt not only under *average* economic and financial conditions, but also under stressed ones – that is, for example, when tax revenues are low and/or interest rates high. Third, a future financial crisis cannot be safely assumed away. When contingent liabilities are taken into account, fiscal space would be reduced. Finally, and most importantly, the estimates do not explicitly incorporate the additional demands on fiscal resources from expected increases in age-related spending, which loom large in many countries. Existing methods have yet to capture these concerns satisfactorily.

All in all, the above analysis and considerations indicate that the debt limits should not be interpreted as boundaries that can be safely tested. Prudent policymakers should try to keep debt levels well away from them: the estimated fiscal space is not space that can be entirely spent. That is why, for instance, Moody's recommends that countries maintain a buffer of 125 percentage points of GDP below the limit it estimates. While it is unclear how this threshold has been set and why it should be identical across countries, it does seem to have a relationship with

credit ratings: Moody's reports that all sovereigns rated Aaa have at least 125 percentage points of fiscal space, while those rated Baa or less have less space or none.⑥ To be sure, it is still an open question how best to determine the buffer's optimal size, given a country's characteristics. But, at a minimum, the buffer indicates that the "safe" limit may be far below the "estimated" one. That is, policymakers should be aware that having fiscal space – as determined by current methods – does not mean it is possible or advisable to use it all.

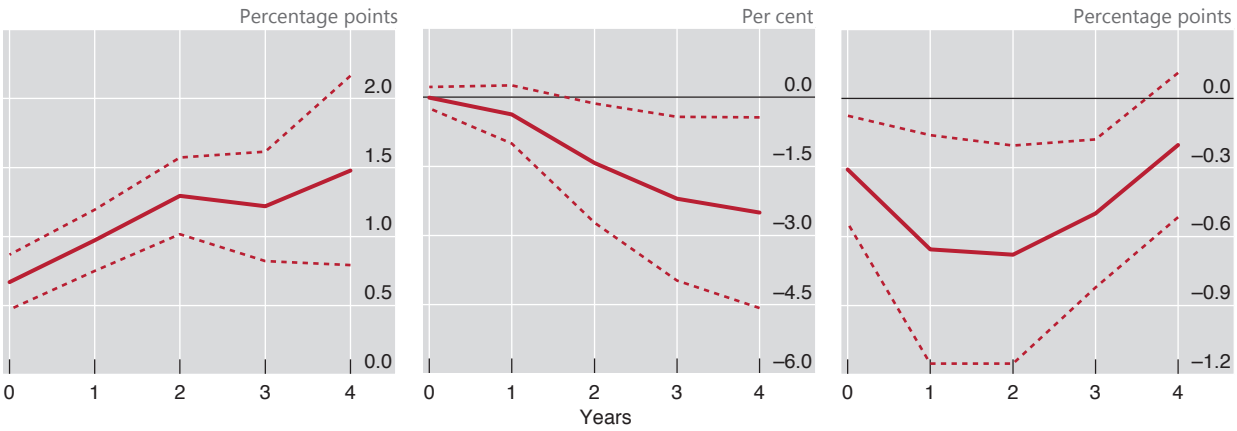
① See M Obstfeld, "On keeping your powder dry: fiscal foundations of financial and price stability", *Monetary and Economic Studies*, vol 31, November 2013. ② See P D'Erasmo, E Mendoza and J Zhang, "What is sustainable public debt?", *Handbook of Macroeconomics*, vol 2, forthcoming. ③ See B Eichengreen and U Panizza, "A surplus of ambition: can Europe rely on large primary surpluses to solve its debt problem?", *Economic Policy*, vol 31, 2016. ④ A Ghosh, J Kim, E Mendoza, J Ostry and M Qureshi, "Fiscal fatigue, fiscal space and debt sustainability in advanced economies", *Economic Journal*, vol 123, February 2013; see also J Fournier and F Fall, "Limits to government debt sustainability", *OECD Economics Department Working Papers*, no 1229, 2015. ⑤ The estimates are based on data up to 2007, as in Ghosh et al (2013), but there are good reasons to believe that the fiscal reaction has become flatter since then: that is, many countries have accumulated large amounts of public debt and have been slow to consolidate. ⑥ M Zandi, X Cheng and T Packard, "Fiscal space", *Special Report*, Moody's Analytics, December 2011.

of severe distress, but are also hard to price. As a result, explicit guarantees are likely to be underpriced, while implicit ones are essentially free. Underpricing encourages socially excessive debt accumulation and financial risk-taking. And guarantees can be pervasive. In the United States, for example, the government is estimated to have explicitly guaranteed no less than a third of financial sector liabilities in 2014, and a further 26% implicitly (Graph V.5, left-hand panel).

Globally, bank creditors also benefit from implicit government support. The centre panel of Graph V.5 shows the ratings uplift that bank bonds gain from implicit sovereign support. Around the time of the GFC, implicit support boosted bank credit ratings by 2–3 notches on average. At end-2011, such support lowered the spreads that banks had to pay on long-term bonds by an estimated 1–2 percentage points. The implicit degree of support has since declined, but bank bonds continue to benefit from an estimated subsidy of 30 basis points. Recent policy initiatives that raise bank capital and facilitate the orderly resolution of large

Can fiscal policy prevent the build-up of financial sector risks?

Cumulative change in response to a 1 percentage point increase in the underlying primary balance — Graph V.4



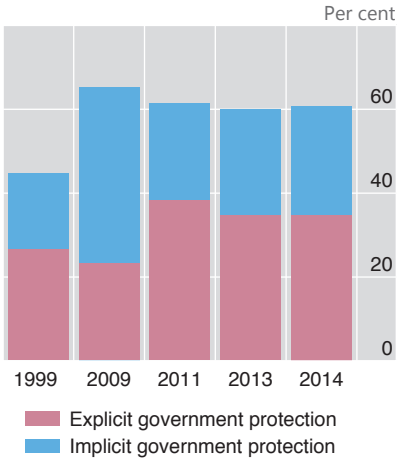
The dotted lines represent 90% confidence bands around point estimates (solid line).

Source: R Banerjee and F Zampolli, "What drives the short-run costs of fiscal consolidation? Evidence from OECD economies", *BIS Working Papers*, no 553, March 2016.

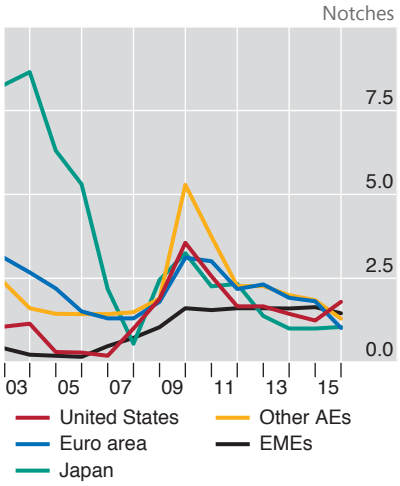
Government subsidies encourage private sector leverage

Graph V.5

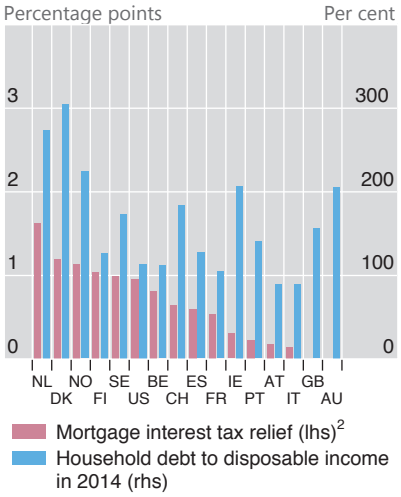
Share of US private sector financial liabilities subject to government protection



Uplift to bank ratings from sovereign support[1]



Mortgage interest tax relief and household leverage



[1] Difference between stand-alone and all-in rating. [2] Gap between market interest rate and after-tax debt financing costs. This takes into account if interest payments on mortgage debt are deductible from taxable income and if there are any limits on the allowed period of deduction or the deductible amount, and if tax credits for loans are available. For countries that have no tax relief on debt financing costs, this indicator equals zero.

Sources: Federal Reserve Bank of Richmond; OECD; Bank of America Merrill Lynch; Fitch Ratings; BIS calculations.

banks aim to curtail the need for government support of the financial sector in periods of stress and hence to reduce this implicit subsidy.

In most countries, tax systems favour debt over equity. Removing this debt bias would increase the resilience of private sector balance sheets and help reduce the likelihood and cost of crises (Box V.C).

Many countries provide tax relief on mortgage interest payments, often to encourage home ownership. Yet these policies also encourage households to leverage up, increasing their vulnerability. The OECD estimates that the tax relief wedge on mortgage interest payments is particularly large in Denmark, the Netherlands and Norway, three countries with household debt in excess of 200% of disposable income (Graph V.5, right-hand panel). Removing such tax relief may help to reduce leverage. That said, leverage is also relatively high in countries that have no such tax relief (eg Australia and the United Kingdom), indicating that other factors are also important, including inelastic housing supply, interest rates and credit conditions.[16]

In the corporate sector, the asymmetrical tax treatment of different funding sources has no strong economic rationale. Yet corporate income taxes generally allow interest payments to be deducted when determining taxable profits, whereas the return-on-equity, either through dividends or capital gains, is typically not

[16] See P Hendershott, G Pryce and M White, "Household leverage and the deductibility of home mortgage interest: evidence from UK house purchases", *Journal of Housing Research*, vol 14, 2003. They estimate that the removal of mortgage tax relief in the United Kingdom reduced initial loan-to-value ratios of unconstrained purchasers by 30%, but had a smaller effect on more constrained borrowers.

Box V.C

Debt bias in taxation, firm leverage and the cost of financial crises

The preferential tax treatment of debt over equity affects firms' funding choices, potentially increasing the likelihood and cost of financial crises. Firms have an incentive to increase leverage to reduce their tax burden, which may heighten their own vulnerability and that of the corporate sector as a whole. This box briefly reviews evidence concerning the impact of the tax code on firms' financing decisions.

Early empirical studies based on the use of non-debt tax shields (eg depreciation and investment tax credits) failed to find a strong link between taxes and leverage.① Yet, thanks to better measurement of marginal tax rates, subsequent work in the 1990s and 2000s succeeded in pinpointing a statistically significant yet modest relationship: meta-analysis based on many studies finds that a 1 percentage point lower tax on corporate income reduces the debt-to-asset ratio in non-financial corporations by only 0.27 percentage points.② For banks, the literature found a broadly similar effect, although for larger banks the effect seemed weaker.③ However, these studies are cross-sectional. As such, they may not fully capture the causal effect of tax changes.

The latest stream of research has addressed this concern by exploiting tax changes within countries. For example, since 2006, changes in tax laws have enabled firms in Belgium to deduct a notional interest expense from their return on equity. For non-financial firms and banks, the effect of these changes on leverage is similar to that found in the previous literature.④ That said, the latest empirical work also finds other financial stability benefits in the banking sector from reducing the tax debt bias. For example, following a reduction in the tax discrimination against equity, banks started to manage their risks against return more conservatively, in that weakly capitalised banks directed new lending to firms with lower default probabilities.

The broad benefits from eliminating the debt bias appear substantial. A number of studies calculate, first, how much bank leverage would fall; then, how much the probability of a crisis diminishes as a result; and, finally, the corresponding GDP gains. For example, De Mooij et al (2014) estimate gains of between 0.5 and 11.9% of GDP, depending on the initial level of bank leverage. Langedijk et al (2015) find that the direct bailout cost of a systemic financial crisis on public finances could be reduced by between 17 and 77% in European economies.⑤ All in all, this evidence suggests that removing, or at least reducing, the debt bias in taxation could be a key ingredient of a macro-financial stability framework.

① S Myers, "The capital structure puzzle", *Journal of Finance*, vol 39, 1984. ② L Feld, J Heckemeyer and M Overesch, "Capital structure choice and company taxation: a meta-study", *Journal of Banking and Finance*, vol 37, 2013. ③ M Keen and R de Mooij, "Debt, taxes, and banks", *IMF Working Papers*, no 12/48, 2012. ④ F Panier, F Pérez-González and P Villanueva, "Capital structure and taxes: what happens when you (also) subsidize equity?", Stanford University, working paper, 2013; G Schepens, "Taxes and bank capital structure", *Journal of Financial Economics*, forthcoming; and L Gambacorta, G Ricotti, S Sundaresan and Z Wang, "The effects of tax on bank liability structure", mimeo, 2016. ⑤ R de Mooij, M Keen and M Orihara, "Taxation, bank leverage, and financial crises", in R de Mooij and G Nicodème (eds), *Taxation and regulation of the financial sector*, MIT Press, 2014; and S Langedijk, G Nicodème, A Pagano and A Rossi, "Debt bias in corporate income taxation and the costs of banking crises", *CEPR Discussion Papers*, no 10616, 2015.

deductible.[17] Across most major economies, the tax savings from debt relative to equity issuance appear large. For instance, estimates indicate that in, say, the United States, Japan and France the marginal effective tax rate on debt is over 12 percentage points lower than that on equity (Graph V.6, left-hand panel).

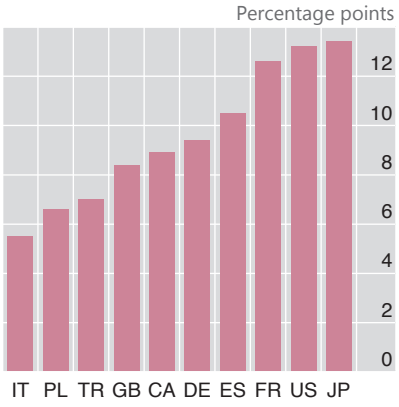
Evidence indicates that such tax advantages can have significant effects on firms' leverage (Box V.C). Firms tend to have higher leverage in countries with higher effective tax rates on corporate income (Graph V.6, centre panel). As with mortgage debt, the significant dispersion of corporate leverage, both within and between sectors, is a clear indication that other factors matter. These include the pledgeability of assets as collateral, revenue volatility, and broader aspects of legal and governance frameworks. Even so, changes in the tax code could make a difference, especially in the financial sector, where leverage ratios are particularly high (Graph V.6, right-hand panel).

[17] Also, personal income taxes on capital gains and dividends magnify debt bias. However, personal income taxes on interest income can reduce it.

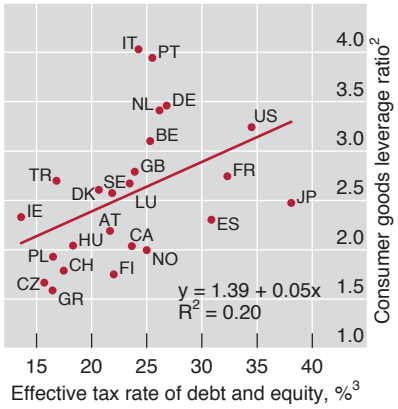
Corporate sector taxes and leverage

Graph V.6

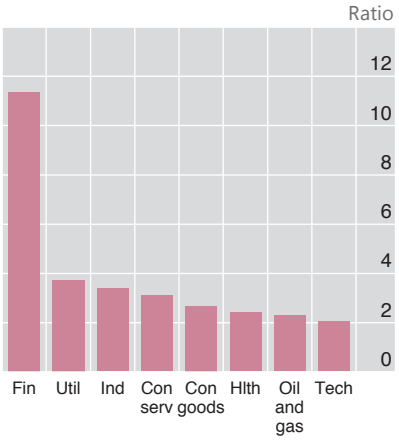
Difference between the marginal tax rates on new equity and debt[1]



Effective corporate tax rate and leverage



Leverage ratios by industry[4]



Con goods = consumer goods; Con serv = consumer services; Fin = financials; Hlth = health; Ind = industrials; Tech = technology; Util = utilities.

[1] 2012 estimates. [2] The leverage ratio is defined as the ratio of total assets to shareholders' equity for the consumer goods sector as defined by Worldscope; end-2015 observation. [3] The effective corporate tax rate is defined as the average of the effective tax rate on new equity and debt in 2012. [4] The leverage ratio is defined as the ratio of total assets to shareholders' equity for the sectors as defined by Worldscope for the world index; end-2015 data.

Sources: ZEW Center for European Economic Research, "Effective tax levels", *Project for the EU Commission*, 2012; Datastream Worldscope.

VI. The financial sector: time to move on

The Basel III framework is nearing completion. In addition to finalising the remaining calibration decisions, consistent and thorough implementation is now key, alongside more rigorous supervision. With regulatory uncertainty receding, banks need to keep adjusting their business models to the new market environment. This includes addressing legacy problems, such as those related to non-performing loans (NPLs). Once financial sector repair is completed, safer and stronger banks will unambiguously contribute to a more resilient economy.

Any remaining adjustments to bank business models will have to be implemented in a challenging macroeconomic environment. Various factors, such as low or, in some cases, negative interest rates (Chapter II), will complicate adjustment for those banks that have yet to fully implement balance sheet repair.

Institutional asset managers, particularly life insurers and pension funds, are subject to very similar pressures. Since their performance is driven largely by the interest rate environment and their product mix, persistently low rates make it more difficult to maintain target returns and traditional asset-liability structures. As risks continue to migrate from banks to these and other non-bank players, additional prudential challenges arise. Key areas include insurance supervision and mutual fund regulation.

This chapter investigates the challenges the financial sector is facing. First, it reviews recent developments among international banks as well as in the insurance and pension fund sectors. It then discusses the nearing completion of the Basel III regulatory framework and assesses the macroeconomic impact of the resulting transition to a more robust, better capitalised banking system. It ends with a discussion of the prudential implications for the non-bank sector.

Coping with a challenging environment

Banks: dealing with stiff headwinds

The process of strengthening bank balance sheets continues. Banks, most notably in Europe, have further raised their capital ratios, reducing balance sheet leverage (Graph VI.1, left-hand panel). A variety of forces are driving this adjustment. Clearly, the phasing-in of the new regulatory framework is an important one. In addition, the losses incurred during the recent crises have enhanced investor incentives to scrutinise banks' risk-return trade-offs, favouring higher levels of capitalisation.

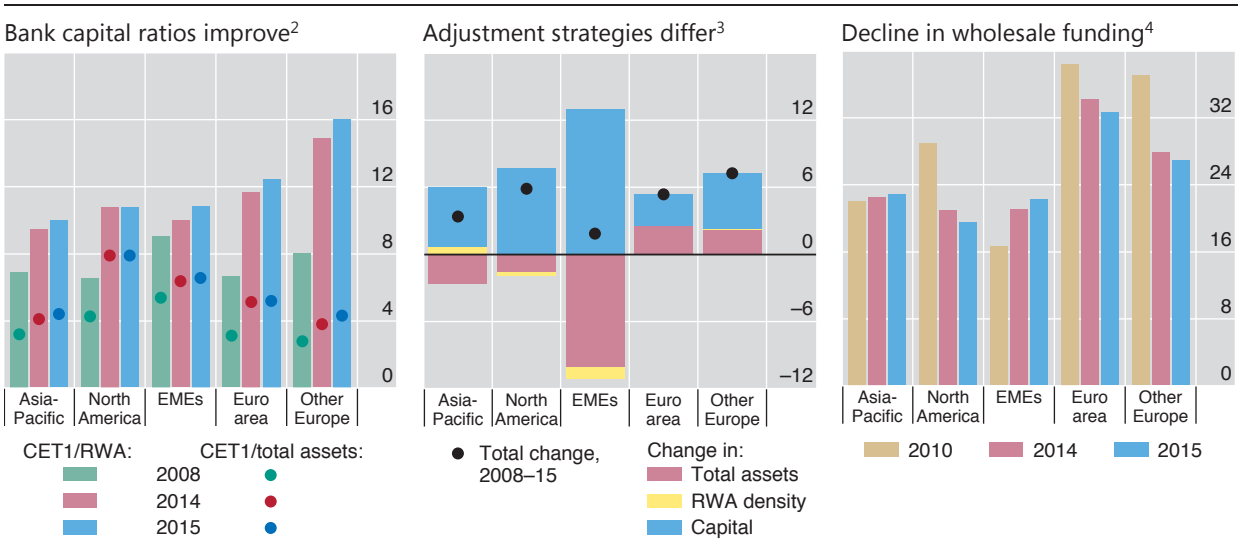
Banks have opted for different adjustment strategies to improve capital ratios, reflecting the varied economic environment they faced (Graph VI.1, centre panel). While retained earnings have represented an important source of capital for most banks, capital ratios in Europe, for example, have tended to improve in a context of balance sheet compression. By contrast, large banks in North America and many emerging market economies (EMEs) have generally improved their ratios against the backdrop of growing balance sheets and robust loan demand.

Bank funding models have also been put on a more stable footing, further adding to bank resilience. Reliance on short-term wholesale funding, a key channel of contagion during recent crises, has declined markedly in many advanced economies (Graph VI.1, right-hand panel). Likewise, banks' holdings of high-quality

Banking systems are becoming more resilient[1]

In per cent

Graph VI.1



[1] Sample of more than 100 banks with at least $10 billion of total assets in 2014. Asia-Pacific: Australia and Japan; EMEs: Brazil, China, Chinese Taipei, Hong Kong SAR, India, Korea, Malaysia, Russia, Singapore, South Africa and Turkey; euro area: Austria, Belgium, France, Germany, Greece, Ireland, Italy, the Netherlands and Spain; North America: Canada and the United States; other Europe: Denmark, Norway, Sweden, Switzerland and the United Kingdom. [2] Median ratios; values for 2008 may overstate actual values due to imperfect adjustment to new capital/risk-weighted asset (RWA) definitions. [3] The graph decomposes the change in the Common Equity Tier 1 (CET1) capital ratio into additive components. The total change in the ratios is indicated by dots. The contribution of a particular component is denoted by the height of the corresponding segment. A negative contribution indicates that the component had a capital ratio-reducing effect. All figures are weighted averages using end-2015 total assets as weights. [4] Region-wide wholesale funding divided by region-wide total assets.

Sources: B Cohen and M Scatigna, "Banks and capital requirements: channels of adjustment", *BIS Working Papers*, no 443, March 2014; SNL; BIS calculations.

liquid assets (HQLA) have continued to grow, providing additional buffers. The majority of banks monitored by the Basel Committee on Banking Supervision (BCBS) already meet the fully phased-in Liquidity Coverage Ratio (LCR) requirement, well ahead of its full implementation on 1 January 2019.[1]

Given the progress made in transitioning to stronger bank balance sheets, ensuring sustained profitability is now the key issue in maintaining the sector's resilience. Empirical evidence suggests that better capitalised banks enjoy lower funding costs and lend more (Box VI.A). Yet equity investors remain generally cautious about the outlook for bank profitability, suggesting that the necessary adjustments to business models have so far proceeded unevenly. Price-based indicators highlight that bank equity valuations of many advanced economy banks, in particular, have yet to recover from their collapse during the Great Financial Crisis, with market values below book values in a number of economies (Graph VI.2, left-hand panel).

A complicating factor is that efforts to complete balance sheet repair and bolster profitability face a confluence of both cyclical and structural headwinds. Key challenges include the prospect of persistently low interest rates amid an often subdued growth outlook. These factors can affect bank profitability through a

[1] For details, see BCBS, *Basel III monitoring report*, March 2016. The report also indicates that, on average, banks already maintain a Net Stable Funding Ratio (NSFR) above the minimum requirement, which is to become effective by 1 January 2018.

Bank capital and lending behaviour: empirical evidence

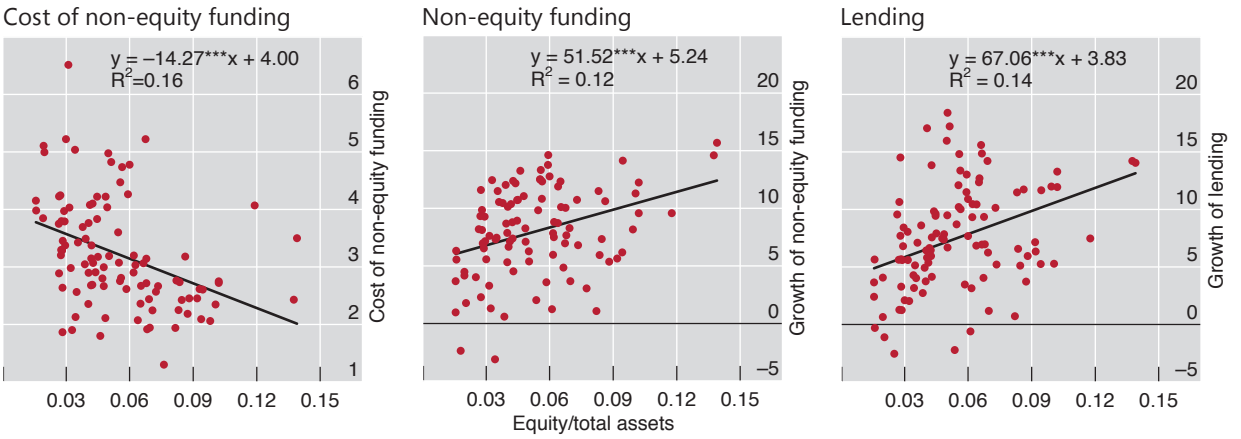
Discussions of the macroeconomic impact of higher bank capital sometimes presume that higher bank capital increases total (equity plus debt) funding costs, which then translate into higher lending spreads and less lending. The argument invokes observed deviations from the Modigliani-Miller (MM) theorem, which posits that the capital structure is irrelevant for the cost of funding.①

Deviations from the MM theorem are indeed well documented,② but this is not sufficient to establish that higher bank capital entails reduced lending. Indeed, recent research suggests the opposite may be true: higher bank capital goes hand in hand with higher lending. For one, a study by the EBA (2015) finds substantial positive credit supply effects from higher bank capital for a sample of European banks. In addition, Michelangeli and Sette (2016), using granular data on internet-brokered mortgages, show that better capitalised banks lend more.③

One potential mechanism driving the positive relationship between loan supply and bank capital is the lower borrowing costs of better capitalised banks. Gambacorta and Shin (2016) find that a 1 percentage point increase in the equity-to-total assets ratio is associated with a 4 basis point reduction in borrowing (non-equity funding) costs. Given that non-equity funding represents, on average, around 86% of total bank liabilities, the resulting effects on the overall cost of funding can be sizeable and will mitigate any assumed cost of raising additional equity.

Stylised facts on bank leverage[1]

1995–2012 averages, in per cent — Graph VI.A



[1] Scatter plots between the average level of leverage for a group of 105 international banks and selected bank-specific indicators: average cost of funding, average growth rate of non-equity funding and average annual growth rate of lending. Each dot represents a bank; values are calculated as averages over the period 1995–2012; *** denotes significance at the 1% level.

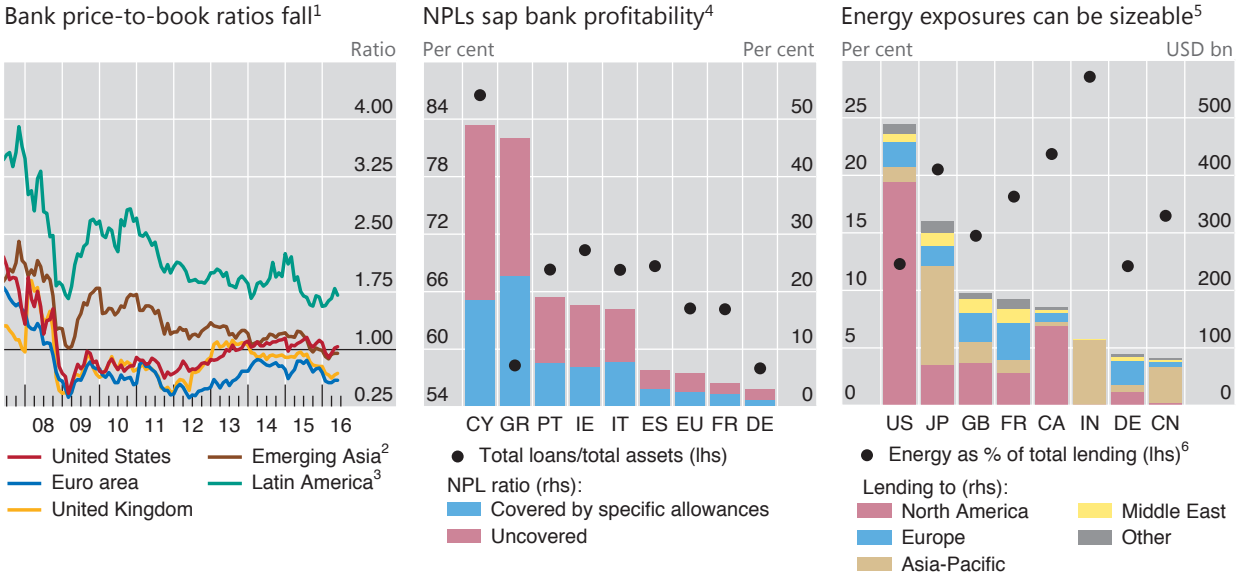
Sources: Gambacorta and Shin (2016); Bankscope.

Graph VI.A plots average levels of leverage (defined as the ratio of equity to total assets) for a sample of banks over the period 1995–2012. The three panels show how bank leverage is related to non-equity funding costs (left-hand panel), non-equity funding (centre) and lending (right-hand panel). Being based on raw data without statistical controls, the scatter plots overstate the noise in the observed relationships. Yet it is apparent that lower leverage is associated with lower debt funding costs and a higher growth rate of both non-equity funding and lending.④

① See F Modigliani and M Miller, "The cost of capital, corporation finance and the theory of investment", *American Economic Review*, vol 48, no 3, 1958, pp 261–97. ② See eg D Miles, J Yang and G Marcheggiano, "Optimal bank capital", *The Economic Journal*, no 123, 2013, pp 1–37. ③ European Banking Authority, "2015 EU-wide transparency exercise results", London, 2015; V Michelangeli and E Sette, "How does bank capital affect the supply of mortgages? Evidence from a randomized experiment", *BIS Working Papers*, no 557, April 2016. ④ L Gambacorta and H S Shin, "Why bank capital matters for monetary policy", *BIS Working Papers*, no 558, April 2016. The results shown are reinforced after controlling for business cycle conditions and bank-time fixed effects: a 1 percentage point increase in the equity-to-total assets ratio is associated with a 0.6 percentage point higher annual growth rate in lending.

Market valuations flag concerns about bank profitability and balance sheet risks

Graph VI.2



[1] Region-wide total market capitalisation divided by region-wide total book value of common equity. [2] China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Singapore, Sri Lanka and Thailand. [3] Argentina, Brazil, Chile, Colombia and Mexico. [4] The NPL ratio is calculated as NPLs and advances divided by total gross loans (including advances), as of Q4 2015. [5] Outstanding amounts of syndicated loan commitments (including undrawn facilities) to borrowers in the metals, mining, oil and gas sectors, as of end-May 2016. [6] Share of energy-related commitments as a percentage of total syndicated loan commitments.

Sources: European Banking Authority, *Risk dashboard*; Datastream; Dealogic; S&P Capital IQ; BIS calculations.

variety of channels[2] whose strength depends on the individual bank's balance sheet composition, its business model and the surrounding macroeconomic environment. Reflecting differences among these factors, major banks' profitability has recently improved in some jurisdictions, while showing persistent signs of weakness in others.

One channel through which low interest rates are affecting bank profitability is via their impact on net interest margins, the main source of revenue for many banks. Weak credit demand, paired with declining interest rates on new loans or existing floating rate loans, compresses banks' interest revenue. Unless counterbalanced by other factors, this can squeeze margins, as is apparent for major banks in several economies (Table VI.1).

Pressures on net interest margins are particularly pronounced among banks from jurisdictions that now face negative short-term rates (Chapter II, Box II.A). Many banks in Denmark, Sweden and Switzerland, for example, have experienced declining net interest margins over recent years, with the compression in interest income often outpacing the reduction in interest expenses (Graph VI.3, left-hand panel).

More recently, banks have typically refrained from cutting retail deposit rates below zero in order to retain customers. By contrast, passing through negative rates to institutional clients has generally been easier. Thus, banks that rely heavily on retail deposits have seen their interest expenses decline less than their more wholesale-funded peers (Graph VI.3, centre panel). Yet many banks have still managed to protect their profits by tapping other revenue sources, for example by encouraging retail clients to shift to fee-generating investment products.

[2] For a more detailed discussion, see C Borio, L Gambacorta and B Hofmann, "The influence of monetary policy on bank profitability", *BIS Working Papers*, no 514, October 2015.

Profitability of major banks[1] Table VI.1

	Net income			Net interest income			Gains on securities[2]			Loan loss provisions		
	2014	2015	15 vs 09–12	2014	2015	15 vs 09–12	2014	2015	15 vs 09–12	2014	2015	15 vs 09–12
	% of total assets		% pts	% of total assets		% pts	% of total assets		% pts	% of total assets		% pts
Major AEs												
Japan (5)	0.67	0.60	0.28	0.77	0.74	–0.18	0.12	0.12	–0.02	–0.03	0.02	–0.20
United States (12)	1.09	1.35	0.53	2.20	2.24	–0.29	0.50	0.50	–0.12	0.19	0.23	–0.74
Euro area												
France (4)	0.22	0.47	0.21	0.74	0.81	–0.11	0.35	0.44	0.17	0.14	0.15	–0.09
Germany (4)	0.18	–0.13	–0.25	0.90	1.02	0.16	0.17	0.17	–0.01	0.10	0.08	–0.09
Italy (4)	–0.11	0.40	0.53	1.44	1.36	–0.30	0.21	0.28	0.13	0.96	0.52	–0.19
Spain (6)	0.60	0.57	0.22	1.99	2.04	–0.09	0.31	0.25	–0.01	0.76	0.65	–0.48
Other AEs												
Australia (4)	1.27	1.26	0.14	1.74	1.62	–0.23	0.13	0.14	0.04	0.11	0.10	–0.21
Canada (6)	1.05	0.97	0.00	1.59	1.51	–0.12	0.15	0.13	–0.07	0.16	0.15	–0.11
Sweden (4)	0.75	0.80	0.24	0.87	0.88	–0.03	0.11	0.17	0.01	0.06	0.06	–0.12
Switzerland (4)	0.28	0.17	–0.26	0.78	0.88	0.28	0.28	0.39	–0.22	0.01	0.02	0.00
United Kingdom (6)	0.39	0.29	0.04	1.14	1.29	0.17	0.43	0.36	–0.20	0.11	0.15	–0.43
EMEs												
Brazil (3)	1.68	0.67	–1.48	2.97	2.09	–1.99	1.06	1.37	0.15	1.15	1.62	0.22
China (4)	1.64	1.50	0.01	2.45	2.30	0.06	0.03	0.05	0.01	0.33	0.42	0.16
India (3)	1.16	1.18	–0.22	2.80	2.76	0.23	0.34	0.48	0.18	0.74	0.89	0.32
Korea (5)	0.56	0.60	–0.20	1.85	1.72	–0.55	0.21	0.24	0.02	0.38	0.33	–0.34
Russia (4)	0.91	0.61	–1.13	3.45	2.98	–1.56	0.18	0.40	–0.14	1.63	1.73	–0.16

In parentheses, number of banks included; the third column per category shows the difference between 2015 values (as a percentage of total assets) and the corresponding simple average over the period 2009–12.

[1] The calculation of total assets may differ across banks due to different accounting rules (eg on netting of derivative positions). [2] Realised and unrealised gains on securities.

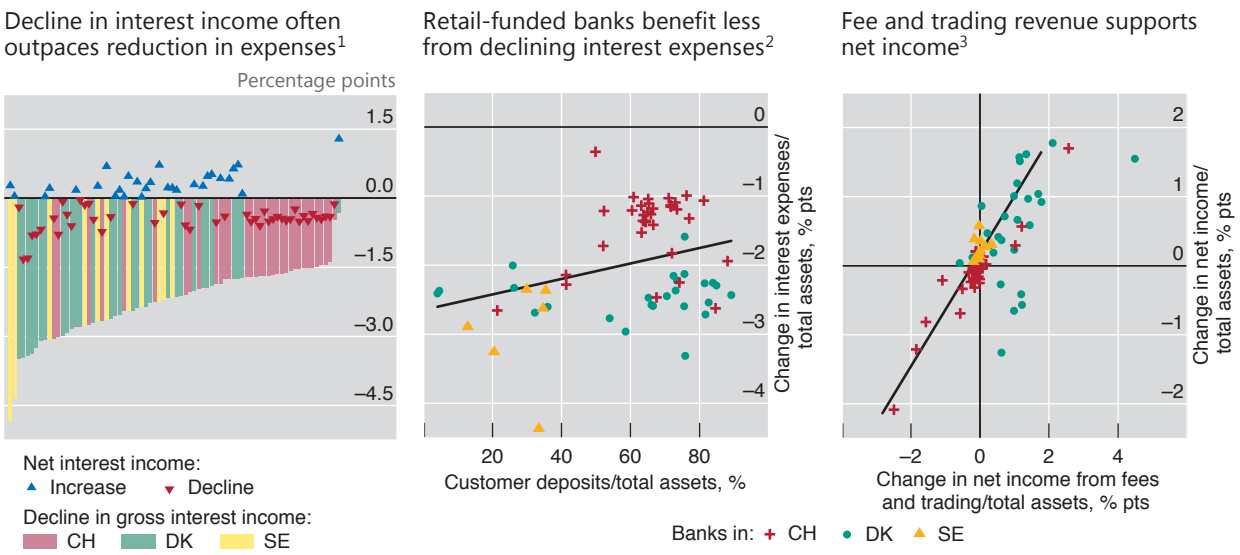
Sources: SNL; BIS calculations.

In some cases, revenues have also been supported by a buoyant housing market and strong demand for mortgage loans. But, while boosting income in the short run, increasing such exposures may eventually weigh on earnings via high loan write-offs, especially if balance sheet expansion coincides with declining lending standards or aggressive pricing.

A second channel through which low interest rates are affecting profitability is banks' capital market activities (Table VI.1 and Graph VI.3, right-hand panel). Over the past few years, with corporate issuers seeking to lock in favourable market funding, the persistent expansion in non-financial corporate bond issuance has bolstered banks' underwriting business and trading revenues. In addition, banks in many jurisdictions have benefited from mark-to-market gains on their securities portfolios, with the global decline in interest rates pushing asset valuations to new highs. The flip side, however, is that these valuation gains are one-off and bound to

Ultra-low interest rates squeeze traditional income sources

Graph VI.3



Based on a sample of 76 banks.

[1] Each triangle (bar) represents the change in net (gross) interest income as a percentage of total assets for an individual bank from 2008 to 2015. [2] The horizontal axis refers to 2015 values; the vertical axis shows the change from 2008 to 2015. The black line represents a simple trend line. [3] The horizontal axis represents the change in net income from fees and commissions as well as from realised and unrealised gains on securities as a percentage of total assets from 2008 to 2015; the vertical axis shows the change in net income as a percentage of total assets for the same period. The black line represents a simple trend line.

Sources: SNL; BIS calculations.

reverse if the underlying assets are held to maturity. Growing holdings of low coupon bonds, in turn, will weigh on banks' future portfolio returns. Rising issuance of such bonds has increased substantially the duration of outstanding securities, making unhedged securities positions vulnerable to mark-to-market losses even for small increases in yields. Indeed, banking sectors in a number of economies posted declining revenues from fees and trading over the last year, reflecting volatile conditions and weaker client activity in several major bond markets (Chapter II).

Cyclical factors are adding to concerns about legacy assets, particularly in the euro area. A sluggish recovery continues to weigh on borrowers' repayment capacity in a number of euro area countries, as rising non-performing loans (NPLs) remain unresolved. In this context, low interest rates may initially mask looming credit risks by compressing borrowers' debt service burdens. They also provide incentives for banks to postpone write-offs by lowering the cost of keeping troubled borrowers afloat. While some progress has been made to address NPLs, recent data from the European Banking Authority highlight that such exposures remain a major impediment to European banks' profitability (Graph VI.2, centre panel).[3] They can also make banks more vulnerable to borrowers' fortunes and restrain new lending.

Varied NPL patterns suggest that there are no "one size fits all" solutions. Past experience shows that authorities can help improve banks' incentives via changes to the tax code, by reducing impediments to collateral sales, and by addressing obstacles to debt restructuring. This includes the use of public sector funds, subject to strict conditions and proper incentives – an effective catalyst of balance sheet

[3] For several large banks, legacy issues also include dealing with litigation related to past misconduct. For major UK banks, for example, supervisory fines and similar conduct costs were equivalent to some 3% of their equity between 2011 and 2015.

repair in past crises.[4] In making the relevant policy decisions, the benefits of reducing systemic risks and unlocking economic activity are likely to dominate any constraints implied by competition policy considerations.

With the global growth outlook softening, rising NPLs are also expected to weigh on EME banks' performance. Most vulnerable are banks in countries where financial booms have been turning or are in the late stages, such as China and other East Asian economies (Chapter III), or where large exposures to commodity- and energy-related sectors bulk large. NPLs and other borrower risk metrics in some major EMEs have already worsened, requiring banks to step up their loan loss provisioning (Table VI.1) as equity price-to-book ratios have weakened (Graph VI.2, left-hand panel).

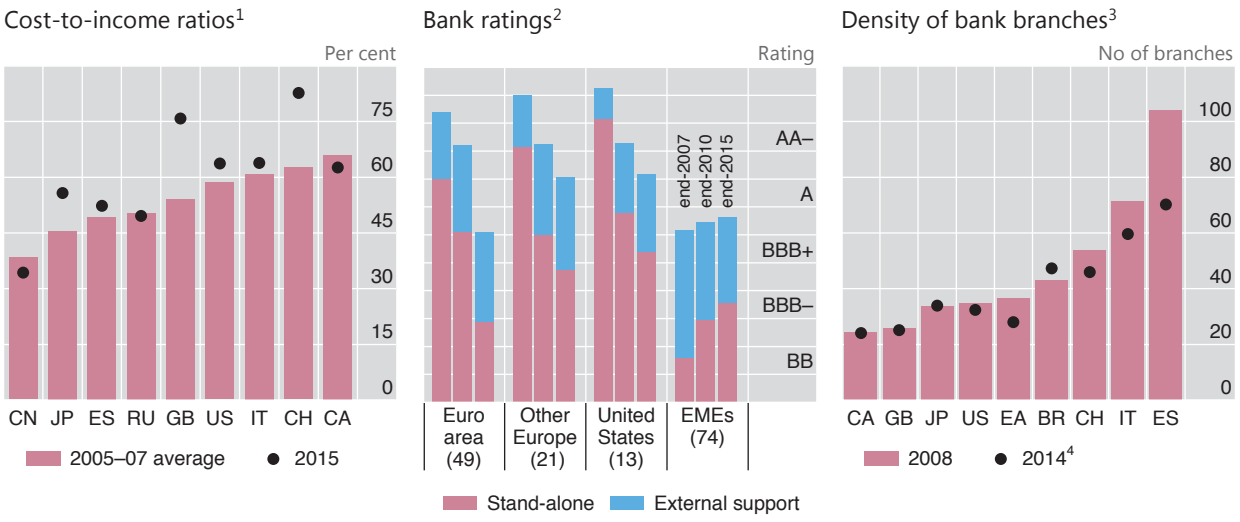
Exposures to commodity risks extend beyond EME banks. A number of regional financial institutions in Canada and the United States, in particular, have a relatively high concentration of lending to the energy sector. And internationally active banks had energy-related syndicated loan commitments (including undrawn facilities) amounting to some $2.2 trillion at end-May 2016. Geographical diversification of such loans may turn out to be ineffective in mitigating risk if commodity price weakness is prolonged (Graph VI.2, right-hand panel).

Persistent structural challenges to bank profitability are reinforcing the effect of these cyclical factors. One such challenge is the ongoing shift in intermediation towards non-banks (see below), which, in the medium term, could be further amplified by new financial technologies (Box VI.B). Maintaining profitability will therefore require banks to identify overcapacity and cut costs, while seeking to reap the efficiency gains of technological innovation.

Advances in this area have been mixed. For many banking systems, cost-to-income ratios have broadly remained on an upward path post-crisis (Graph VI.4,

Improving cost efficiency in a challenging environment

Graph VI.4



[1] Median of major banks. [2] Number of banks in parentheses. [3] Number of commercial bank branches per 100,000 adult residents. [4] For the United Kingdom, 2013 data.

Sources: World Bank; Moody's; SNL; BIS calculations.

[4] See C Borio, B Vale and G von Peter, "Resolving the financial crisis: are we heeding the lessons from the Nordics?", *BIS Working Papers*, no 311, June 2010.

Box VI.B

Digitalisation in the financial sector: opportunities and challenges

Digitalisation and "fintech" are umbrella terms that encompass a wide range of technological innovations affecting the financial sector. A shared feature of all these innovations is that the volume of related activities remains small, while being potentially transformative in terms of banks' business models and corporate cultures. They all tend to provide new ways to communicate, store and process information, and to access financial services. As such, they are changing the way banks interact with each other and with their customers. In addition, many of these new technologies were created by non-financial firms and, in some cases, provide ways for customers to access financial services without bank involvement, adding to competition. Digitalisation thus provides the banking sector with both opportunities and challenges.①

Matching services. One area of particular importance to the banking industry is matching technologies. Over the last few years, several electronic venues have started offering services providing such matching, often referred to as "crowdfunding" or "peer-to-peer" lending. Under a pure matching model, the firms providing these services do not actually borrow or lend themselves and thus do not take any risk onto their own balance sheets. Some crowdfunding services have begun to move beyond debt contracts, expanding into services such as equity financing and even some types of structured financial products, and are thus competing more directly with traditional bank-intermediated products. In response, some banks have started to integrate crowdfunding technologies into their business models, for example by entering into formal partnerships with matching platforms or similar venues.

Big data. This term refers to huge data sets that contain massive amounts of detailed information on a large number of individuals, often in the form of multiple linked databases. To the extent that banks accumulate such data on their customers, big data technology can be used to tailor banks' services more effectively (eg by evaluating the credit quality of their borrowers on a larger number of metrics). As a result, individual loan terms and risk factors are likely to be better aligned, improving risk management and pricing. However, as non-financial companies are accumulating big data sets about their own customers and are building the capacity to analyse them, they may be able to compete with banks to offer financial services, putting pressure on bank margins.

Digital payments. In digital payments, smartphones and other electronic devices are now providing access to various banking services and the established payments system. Even though the payment service components of these applications are typically routed through the banking sector, service providers may offer additional financial services, such as means of saving or storing funds. This can increase competition and the cost pressures banks face.

Distributed ledgers. A potentially more substantial development in the payments area is the more widespread use of distributed ledger and blockchain technologies. This innovation provides an alternative means of recording financial information without recourse to trusted intermediaries.② With a distributed ledger, it is possible for everyone in a given financial network to know the resources of all parties in the network as well as the history of all transactions. This technological ability to uniquely and verifiably execute transactions could be applied to a wide range of financial products. Some financial institutions, for example, have experimented with distributed ledgers to place and trade certain types of securities, such as syndicated loans, or are considering offering features such as "smart contracts" that allow automated execution and verification once certain conditions are met. In general, the decentralised nature of distributed ledgers would reduce the need for certain record keeping and back office services, suggesting that trading and settlement might be provided more quickly and at a lower cost.

Digitalisation trends are evolving rapidly and any net effects remain unclear. While some aspects of digitalisation appear to increase competition for banks, significant resources are already invested in these technologies so as to utilise them to enhance bank business models and cut costs. Authorities will have to monitor these effects with a view to expanding the sectoral scope of regulation should less regulated service providers gain a significant foothold in the provision of digitally based financial services.

① See eg European Banking Federation, *The digital transformation of banks and the Digital Single Market*, June 2015. ② See Committee on Payments and Market Infrastructures, *Digital currencies*, November 2015.

left-hand panel). Often, subdued revenues and the associated downward pressure on banks' ratings have offset cost-cutting gains (Graph VI.4, centre panel).

Improving cost efficiency will thus require a mix of strategies. These will include further operational enhancements, such as raising the efficiency of back office functions, as well as continuous evaluation of the product and service portfolio.

Another key element is strengthening bank resilience, which can help offset the impact of reduced implicit government guarantees on bank funding costs.

In all this, it will be critical to cut excess capacity. One gauge of potential overcapacity is the density of bank branches. This measure, while broadly declining post-crisis, is still high for several European countries by international standards (Graph VI.4, right-hand panel). And the overall scale of the adjustment so far appears rather limited compared with historical crisis experience. After the onset of the Nordic crisis in 1991, for example, banks in Finland reduced the number of branches by more than 40% within four years, while cutting operating expenses by more than 50%.

Other financials: more of the same?

Financial institutions outside the banking sector face challenges from the same macro-financial factors as their bank peers. The current low interest rate environment, in particular, makes it more difficult for insurers to maintain targeted profitability levels, by reducing demand for their life insurance products and their fee-charging ability. As a result, traditional savings products are waning and some insurers have responded by shifting to so-called unit-linked (ie mutual fund-style) products. Defined benefit (DB) pension plans (whose liabilities reflect member benefits that accrue over a long period of time after retirement) are facing similar pressures.

A key challenge to balance sheet management for insurers and pension funds (IPFs) is the interest rate sensitivity of their liabilities, which tend to be very long-term. Fixed income securities on the asset side, in contrast, typically have shorter maturities. This gives rise to a duration mismatch. As a result, the present discounted values of these client claims can be rather volatile and, unless immunised (eg via the use of derivatives), move more strongly than those of the corresponding assets. This applies to life insurance and DB pension plans, but also to products such as long-term care and disability insurance. Thus, risk profiles in both sectors depend primarily on the interest rate environment and firms' product mix.

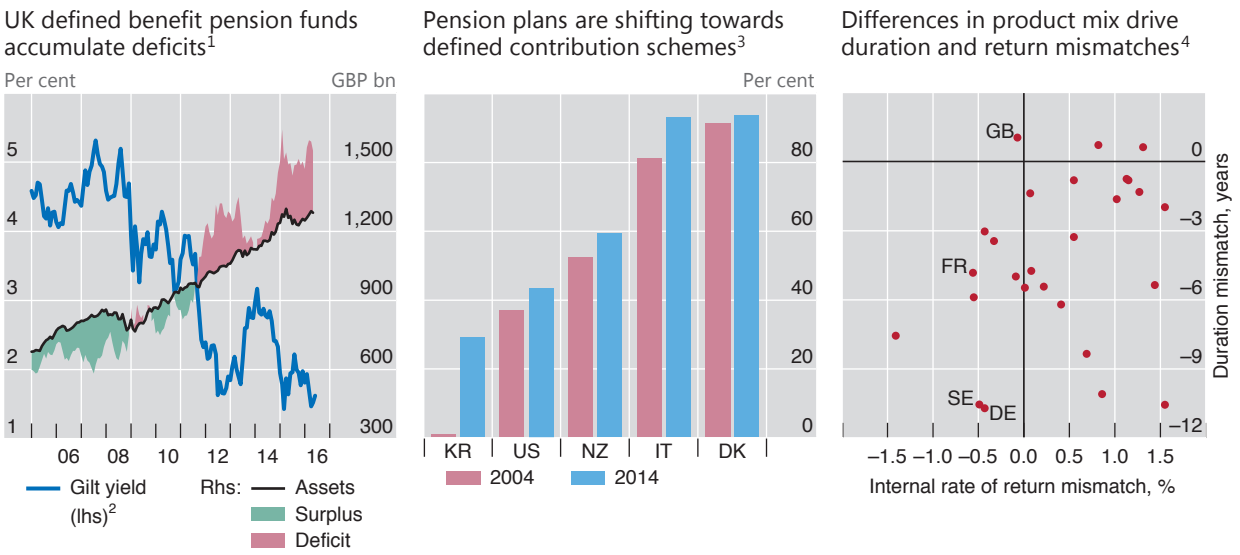
Recent developments in DB pension schemes illustrate some of these balance sheet pressures. Given the discounting of projected financial obligations with market yields and the underlying duration mismatches, lower interest rates have boosted pension fund liabilities relative to assets, generating large deficits in some cases. In the United Kingdom, for example, 82% of a sample of about 6,000 private company DB schemes were underfunded at the end of the first quarter of 2016, with the aggregate deficit at around £302 billion (Graph VI.5, left-hand panel) in March. Likewise, S&P 500 companies' estimated pension deficits totalled about $455 billion at the end of the same quarter. Developments in other jurisdictions have been similar.

In response, firms have begun to adjust their product mix and asset composition. In insurance, this has added to the general shift towards unit-linked products, which generate higher fees and are less capital-intensive because investment risks are not borne by the insurance company. Pension funds, in turn, have continued to shift towards defined contribution (DC) schemes, which, like unit-linked insurance, shift investment risks onto pension plan members (Graph VI.5, centre panel). The resulting flows into mutual funds and similar investment vehicles have further boosted their assets under management – a trend that predates the financial crisis (Graph VI.6, left-hand panel).

As shifts in the product mix take time, the low interest rate environment has so far left its imprint mainly on the asset side of IPFs' balance sheets. For one, across various jurisdictions, low rates have depressed portfolio yields as well as

Pension funds and insurance companies struggle with low interest rates

Graph VI.5



[1] UK Pension Protection Fund data, based on a sample of over 6,000 private company defined benefit schemes. [2] Nominal yield on 10-year UK government securities. [3] Assets in defined contribution schemes as a percentage of total occupational plan assets. [4] The duration (return) mismatch is calculated as the difference between the duration (internal rate of return) of assets and liabilities; 2014 data.

Sources: Bank of England; European Insurance and Occupational Pensions Authority; OECD; UK Pension Protection Fund; BIS calculations.

premium growth and, hence, earnings (Table VI.2). Because substantial parts of IPFs' investment portfolios are allocated to fixed income instruments, persistently low rates make it much more difficult for them to invest at original yields as investments mature. This encourages them to search for yield (as discussed in last year's Annual Report), especially if they have to generate returns above those guaranteed on liabilities (see below). They could also respond by reaching for longer duration (eg low coupon bonds or equities) to better match liabilities and hence reduce risk.

Some European IPFs, for example, have sought to counter growing liabilities durations by shifting into sovereign bonds. These bonds typically have longer maturities and, hence, durations than corporate bonds and are more liquid. The entry into force of the new Solvency II regulatory standard on January 2016, in turn, strengthened such incentives for European insurers, given relatively favourable risk weights for sovereign and certain corporate exposures (Box VI.C). As a result, according to EU flow of funds statistics, the IPFs' share of euro area government debt outstanding rose from about 19% in 2009 to 23% at end-2015. As yields have been declining, this has been hurting interest rate income and profitability, possibly contributing to feedback effects and short-term asset price volatility.[5]

The performance of the sector has differed across institutions and jurisdictions, reflecting differences in market structures and product mix.[6] For one, despite their interest rate risk immunisation attempts, life insurers in most European countries continue to have negative duration gaps, implying net valuation losses if interest

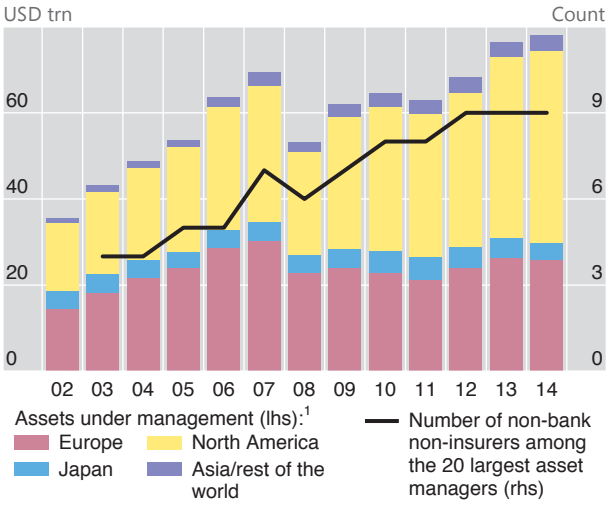
[5] See D Domanski, H S Shin and V Sushko, "The hunt for duration: not waving but drowning?", *BIS Working Papers*, no 519, October 2015.

[6] See eg IMF, "Chapter 3: The insurance sector – trends and systemic risk implications", *Global Financial Stability Report*, April 2016.

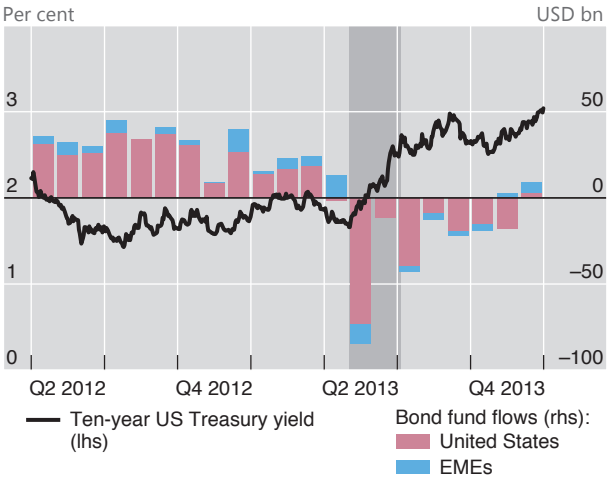
Market activity and liquidity risks continue to migrate to new players

Graph VI.6

New types of asset managers gain importance



Taper tantrum: bond funds face redemption pressures[2]



[1] Regional grouping as in Towers Watson (2015). [2] The grey shaded area indicates the May–July 2013 bond market sell-off ("taper tantrum").

Sources: Towers Watson, "The 500 largest asset managers", 2015; Datastream; Lipper; BIS calculations.

rates decline further. Many of these insurers also face an investment return mismatch (eg in France, Germany and Sweden). That is, the embedded return guarantees on their liabilities exceed the returns on their assets, raising questions about the sustainability of their business models in the current low interest rate environment (Graph VI.5, right-hand panel). UK insurers, by contrast, appear to be less exposed – in part because of their greater reliance on unit-linked products.

Profitability of major insurance companies[1]

In per cent

Table VI.2

	Non-life						Life					
	Premium growth			Return on equity			Premium growth			Return on equity		
	2011–12	2013–14	2015	2011–12	2013–14	2015	2011–12	2013–14	2015	2011–12	2013–14	2015
Australia	5.3	4.7	–0.8	17.7	22.9	12.4	1.7	21.1	–6.0	…	…	…
France	1.5	2.6	1.9	5.8	6.2	5.7	–10.7	7.6	…	6.2	8.0	…
Germany	3.9	0.3	4.8	9.3	9.7	10.0	–1.8	3.7	…	4.7	4.7	…
Japan	2.8	5.3	3.3	3.1	6.8	3.9	6.3	1.8	3.0	…	…	…
Netherlands	–0.1	–0.5	…	8.0	9.3	…	–5.7	–3.9	–7.1	–0.2	0.0	…
United Kingdom	2.9	0.1	2.1	6.1	14.0	9.6	3.5	–6.3	2.5	…	…	…
United States	3.5	4.3	0.3	5.7	10.6	7.7	6.1	0.7	–3.1	10.2	12.4	10.6

Values in multi-year columns are simple averages.

[1] Provisional figures for 2015.

Sources: National supervisory authorities; Swiss Re, sigma database.

Box VI.C

Solvency II: overview of key elements

Solvency II is the new regulatory framework for insurance undertakings in the European Economic Area (comprising the EU countries as well as Iceland, Liechtenstein and Norway). It was first adopted in 2009.① The new rules seek to harmonise the regulation of insurers across the EEA, while introducing the concept of risk-based solvency requirements. In doing so, Solvency II adopts a total balance sheet approach that aims to reflect the full range of risks on both the asset and liability side of insurers' balance sheets, based on market-consistent valuations. The new rules apply at both group and solo insurance levels. They are due to be phased in over an extended period, beginning in January 2016, and are expected to significantly affect insurers' asset allocations and reserving.②

Risk-based capital requirements. Much like banking regulation, Solvency II organises capital requirements in three pillars: quantitative requirements (pillar 1), qualitative aspects and supervisory review (pillar 2), and disclosure requirements (pillar 3). Capital adequacy is part of the first pillar and based on two sets of rules: the Solvency Capital Requirement (SCR) and the Minimum Capital Requirement (MCR), along with a "ladder of intervention" for supervisors tied to both capital measures. The SCR can be regarded as a solvency buffer which, when breached, triggers supervisory intervention; the MCR is the minimum level of capital below which a firm is put into run-off. The SCR stipulates that an insurer is sufficiently capitalised when it covers unexpected losses with a probability of 99.5% over a one-year horizon. Eligible capital items are classified into three tiers, according to their loss-absorbing capacity. As under Basel II/III, insurance undertakings can calculate SCR charges through internal models, subject to regulatory approval, or apply standardised formulae.

Risk modules. Risks are divided into six risk modules – market, counterparty (default), life, non-life, health and intangible risk – and each module is further divided into sub-modules. Diversification effects between these risks are recognised, which will tend to benefit insurance conglomerates. In addition, there is a capital charge for operational risk and an adjustment for loss-absorbing effects (eg from deferred taxes). The design of market risk charges is perhaps the most important innovation in the new framework. The market risk module is itself divided into seven sub-modules: equity, spread, interest rate, property, currency, concentration and illiquidity risk (relating to the illiquidity premium in the discount rate). Given the relevance of fixed income products for insurance portfolios, the spread and interest rate sub-modules are key. In the spread risk module, which covers the risk of a change in value due to a deviation of the actual from the expected market price of credit risk, capital requirements under the standardised formula are mainly driven by external ratings and duration. Both sovereign and (investment grade as well as unrated) corporate bonds receive relatively favourable treatment.③ The interest rate risk (ie changes in value caused by a deviation of actual interest rates from expected ones) sub-module, in turn, addresses risks on both the asset and liability side. In order to assess net interest rate risk, all relevant exposures are stress-tested by applying up-/downward stress to the yield curve. Capital charges are then calculated on this basis.

Market-consistent valuations. While many assets are traded in markets deep enough to yield reliable prices and market values, the same may not apply to liabilities. In determining the value of insurance liabilities, Solvency II thus requires insurers to forecast expected future liability-related cash flows and discount them with a risk-free interest rate (plus a risk margin) to obtain market-consistent values. Because different discount rates for matched assets and liabilities can create a valuation mismatch and cause artificial balance sheet volatility, matching adjustments to insurers' discount rates may then be used to offset part of this impact of short-term asset price fluctuations.

New disclosures, the first-time use of internal models and national regulators' different interpretations of individual rules may complicate the transition to the new standard from a stakeholder perspective. A key question concerns the extent to which capital positions and thus solvency margins will turn out to be more volatile than under previous standards. In addition, with group-based and solo treatment placed on the same footing, the new standard is likely to generate significant diversification benefits for large insurers, adding to consolidation pressures. Questions about international equivalence, in turn, should provide additional impetus to the finalisation of the globally harmonised Insurance Capital Standard (ICS) by the International Association of Insurance Supervisors (IAIS).

① See European Commission, *Directive 2009/138/EC* and *Directive 2014/51/EU*. ② See Committee on the Global Financial System, *Fixed income strategies of insurance companies and pension funds*, July 2011. ③ See CGFS (2011); bonds issued by member states' central governments and central banks denominated and funded in the governments' domestic currency receive a zero risk charge, irrespective of their external rating.

Going forward, countries with insurance sectors that suffer from both duration and return mismatches appear particularly vulnerable. This will tend to weigh on the profitability of sectors with a larger share of traditional guaranteed-return savings products and with smaller, standalone life insurers. Authorities there may have to exploit any available leeway to help adjust IPFs' minimum return guarantees. Supervisors, in turn, may have to increase their scrutiny of the insurance sector's duration and return mismatches, especially for smaller players, while standing ready to accommodate the consolidation pressures that weakening profitability generates. In Europe, the adoption of Solvency II, by introducing market-consistent valuations, might accelerate this consolidation process via the diversification benefits that derive from group-level regulation and by encouraging a secondary market in insurance liabilities (Box VI.C).

Finalising the post-crisis reforms

Finishing the job on banking regulation

The overhaul of the Basel regulatory framework is nearing completion. The BCBS has committed to finalise its post-crisis reforms by end-2016, with the phase-in extending to 2019.[7] Other regulatory measures, such as new or enhanced resolution regimes, will be implemented in parallel. This will help to gradually remove regulatory uncertainty and support banks' capital and liquidity planning. In taking the final calibration decisions, the BCBS will focus on not significantly increasing overall capital requirements. However, ample room is available for national authorities to further raise regulatory capital, providing sufficient flexibility to activate countercyclical capital buffers and similar requirements, as needed. The result will be a stronger and more resilient banking system, which ensures individual institutions are less likely to fail and reduces the impact on the economy in case they do. Banks will also be able to support the real economy through greater lending than otherwise. Hence, even under very conservative assumptions, the substantial longer-term benefits for the real economy should outweigh any short-term transitional adjustment costs.

Following the January 2016 decision on the calibration of the minimum leverage ratio (LR) and the subsequent publication of the BCBS's new market risk standard, the post-crisis bank regulatory framework is now almost complete. To be sure, work on specific items is continuing, notably on new standardised approaches for credit and operational risk as well as on risk weight floors and the treatment of sovereign exposures (Chapter V). But the main calibration decisions are due by year-end.

The new framework addresses important weaknesses of the international banking system revealed by the 2007–09 financial crisis. Uppermost among these are insufficient loss-absorbing bank capital and liquidity buffers. As part of enhanced risk-weighted capital requirements (RWRs), banks now have to comply with a minimum ratio of 4.5% Common Equity Tier 1 (CET1) capital to risk-weighted assets (RWAs) and a 6% Tier 1 capital ratio (comprising a broader capital definition). They also have to maintain an additional CET1 capital conservation buffer of 2.5%. As a result, the new framework sets significantly higher loss absorption requirements and puts greater emphasis on capital quality, while broadening the coverage of bank risks.

[7] BCBS, "Revised market risk framework and work programme for Basel Committee is endorsed by its governing body", press release, 11 January 2016.

The RWRs are complemented with a number of additional requirements. These include: (i) the new minimum LR requirement that backstops the existing RWRs with a simple, non-risk-based measure; (ii) capital surcharges for systemic risk (eg the countercyclical capital buffer and additional requirements for global systemically important banks (G-SIBs)); and (iii) standards for short-term funding and maturity transformation risk (ie the LCR and NSFR). Complementary measures to these core elements comprise improved resolution regimes that support authorities in dealing with failing financial institutions, including via a requirement for G-SIBs to have greater Total Loss-Absorbing Capacity (TLAC) in resolution.[8]

While the full phase-in of these requirements will take several years, many banks have already completed most of the adjustment. As a result, capital levels have increased and reliance on wholesale funding has declined (Graph VI.1). Remaining capital shortfalls are now at or close to zero on most measures (Table VI.3). For example, even on a fully phased-in "target" basis (ie ignoring any transitional arrangements and including the 2.5% capital conservation buffer and G-SIB capital surcharges, where they apply), the aggregate CET1 shortfall is now only €0.2 billion. Moreover, all of it is due to the smaller of the 230 banks the BCBS monitors. In terms of total capital requirements, which include CET1 as well as additional Tier 1 and Tier 2 capital instruments, the aggregate capital shortfall has declined to €29.2 billion. This is equivalent to less than 0.1% of banks' total RWAs, according to the most recent BCBS (2016) data.

Importantly, raising capital has been achieved without much sign of an adverse shorter-term impact on bank lending to the real economy. For example, bank lending to the private non-financial sector as a share of GDP has continued to grow in many jurisdictions (Graph VI.7, left-hand panel). That is, any short-term impact of the new regulations was either small to begin with, or has been mitigated by offsetting macroeconomic policies.[9]

Macroeconomic impact

A key policy question is whether these higher target capitalisation levels are likely to be beneficial from a macroeconomic perspective. The BCBS's long-term economic impact (LEI) assessment provides a suitable framework to formulate an answer.

On this basis, analysing the effects of higher bank capital levels comprises three main elements (see Box VI.D for details): (i) an estimate of the increase in capital associated with the new minimum requirements (the implied "*capital shortfall*"); (ii) the *benefits* from higher capital in the form of lower (expected) crisis costs (ie the reduction in the crisis probability times costs in terms of output losses for a given increase in bank capital); and (iii) the *possible output loss* from any increase in lending spreads that might result from the same increase in bank capital. The LEI provides very conservative estimates for the latter two elements. Once adjusted for more stringent capital definitions and RWA calculations under Basel III, these can then be combined into a net benefits schedule that indicates the estimated macroeconomic impact from rising minimum CET1/RWA requirements.

[8] As of 1 January 2022, all G-SIBs will be required to have eligible TLAC instruments equal to a minimum of at least 18% of their RWAs, not including any applicable regulatory capital buffers. TLAC will also need to be equivalent to at least 6.75% of the Basel III leverage ratio exposure measure. For more details, see Financial Stability Board, *Summary of findings from the TLAC impact assessment studies*, November 2015.

[9] See eg S Cecchetti, "The jury is in", *CEPR Policy Insights*, no 76, December 2014.

Aggregate bank capital ratios and capital shortfalls[1] Table VI.3

	Fully implemented requirement, %		Basel III capital ratios, %		Risk-based capital shortfalls, EUR bn[2]		Combined risk-based capital and leverage ratio shortfalls, EUR bn[2]	
	Min	Target[3]	Transitional	Fully phased-in	Min	Target[3]	Min	Target[3]
Group 1 banks								
CET1 capital	4.5	7.0–9.5	11.9	11.5	0.0	0.0	0.0	0.0
Tier 1 capital[4]	6.0	8.5–11.0	13.2	12.2	0.0	3.4	0.0	3.4
Total capital[5]	8.0	10.5–13.0	15.8	13.9	0.0	12.8	0.0	12.8
Sum					0.0	16.2	0.0	16.2
Group 2 banks								
CET1 capital	4.5	7.0	13.1	12.8	0.0	0.2	0.0	0.2
Tier 1 capital[4]	6.0	8.5	13.8	13.2	0.0	2.9	4.3	7.2
Total capital[5]	8.0	10.5	16.0	14.5	0.3	5.6	0.3	5.6
Sum					0.3	8.6	4.6	13.0

[1] Group 1 banks are those that have Tier 1 capital of more than €3 billion and are internationally active. All other banks covered are considered as Group 2 banks. [2] The shortfall is calculated as the sum across individual banks where a shortfall is observed. The calculation includes all changes to risk-weighted assets (eg counterparty credit risk, trading book and securitisation in the banking book) and changes to the definition of capital. The Tier 1 and total capital shortfalls are incremental assuming that the higher-tier capital requirements are fully met. [3] The shortfalls at the target level include the capital conservation buffer and the capital surcharges for 30 G-SIBs, as applicable. [4] The shortfalls presented in the Tier 1 capital row are Additional Tier 1 capital shortfalls. [5] The shortfalls presented in the total capital row are Tier 2 capital shortfalls.

Source: BCBS, *Basel III monitoring report*, March 2016.

Graph VI.7 (right-hand panel) depicts two sets of marginal net benefit schedules, given alternative crisis cost estimates and a starting point of 7% CET1/RWA (as per Table VI.3). The first schedule (solid red line) reports the baseline results from the original LEI, which are based on moderate crisis costs of 63% of GDP in net present value terms. The second one (solid black line) uses a higher cost estimate of 100% of GDP, which seeks to incorporate also the more recent – very costly – crises. Even for the moderate crisis cost estimate, the benefits of rather large additional minimum regulatory requirements clearly outweigh the costs.

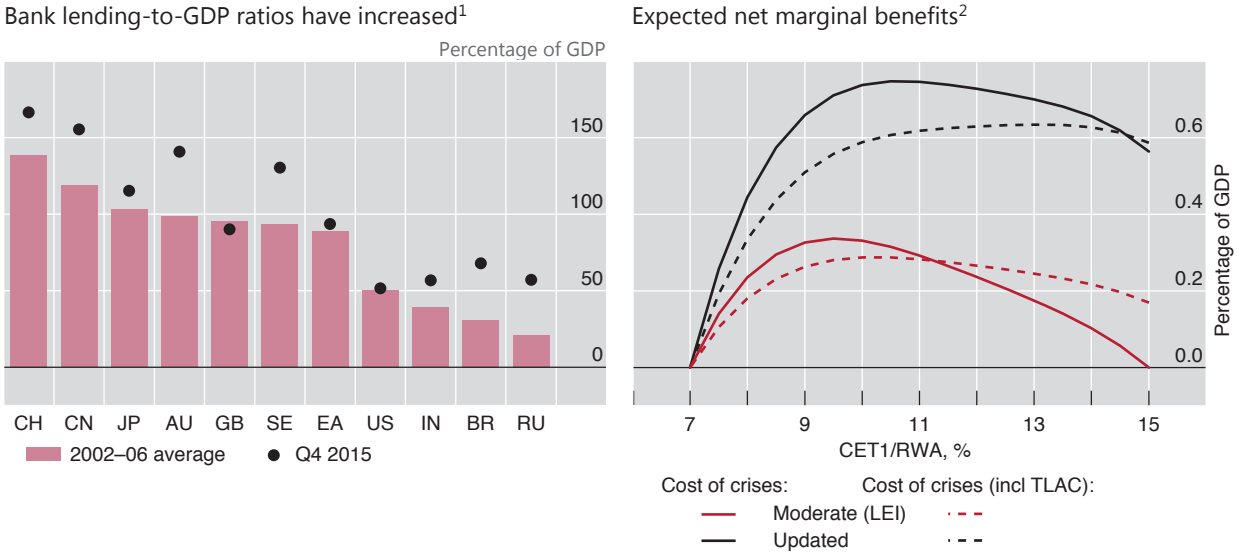
Notably, these figures *intentionally overstate* the likely cost of higher capital ratios, while failing to reflect the effects of the new TLAC requirement for G-SIBs. The LEI estimates assume away the reduction in borrowing costs linked to higher capital, confirmed by recent BIS research (Box VI.A). The two alternative schedules (Graph VI.7, right-hand panel, dotted lines) seek to take at least part of this effect into account by applying a capital cost "offset" of 50%, as the academic literature suggests (Box VI.D). This halves the estimated impact on output. They also adjust marginal benefits for the effects of TLAC, which is likely to reduce both crisis costs and probabilities for any given capitalisation level.[10]

The resulting range of estimates suggests that there is ample room for the BCBS to make its final calibration decisions. The net economic benefits (measured

[10] TLAC is estimated to reduce crisis costs by 5.4 percentage points of GDP, whereas the probability of systemic crises is reduced by 26% relative to the LEI estimates. See BIS, *Assessing the economic costs and benefits of TLAC implementation*, November 2015.

Additional bank capital yields sizeable economic benefits

Graph VI.7



[1] Bank lending to the private non-financial sector. [2] The moderate crisis cost (LEI baseline) estimate assumes a cost of systemic crises equal to 63% of GDP, whereas the updated crisis cost estimate assumes a cost of 100% of GDP. The dashed lines show the corresponding estimates if the impact of introducing the new TLAC requirements and a 50% reduction in the cost of regulation ("Modigliani-Miller" offset) are taken into account.

Sources: I Fender and U Lewrick, "Calibrating the leverage ratio", *BIS Quarterly Review*, December 2015, pp 43–58; BCBS, *An assessment of the long-term economic impact of stronger capital and liquidity requirements*, August 2010; Bankscope; BIS total credit statistics; BIS calculations.

by the impact on the level of output per year) of higher capital requirements are exhausted only after a substantial increase from the baseline level of 7% for the CET1/RWA ratio. Within that range, more stringent regulatory standards are growth-friendly, in particular if phased in gradually.

Shifting the prudential focus

As bank prudential reform is nearing completion, regulatory attention is being refocused. One key area comprises efforts to end regulatory fragmentation. Another relates to the interplay of banking regulation with financial markets, and how banking sector developments may interact with those in the non-bank sector.

Regulatory fragmentation is likely to remain an issue for internationally active insurance groups for some time, but efforts to address it are progressing. In Europe, Solvency II is establishing a new harmonised regulatory regime for the entire insurance sector (Box VI.C). While this will eventually end fragmentation for European insurers, the new rules allow rather stretched-out phase-in arrangements subject to regulatory approval, which can lead to transitional implementation differences. In this context, both insurance company managements and investors will have to adjust to the volatility of capital positions and, hence, of solvency margins that the new standard implies. At the international level, efforts to establish a new global Insurance Capital Standard (ICS) seek to address fragmentation by establishing broad-based equivalence among national regulations. Technical development continues. Once finalised, the ICS would be the first comprehensive, group-wide capital standard that is broadly applicable to internationally active

Box VI.D

The long-term economic impact (LEI) of stronger capital and liquidity requirements

The LEI methodology proceeds in two steps: (i) it assesses the long-term *expected benefits* of higher bank capital requirements via the reduction in expected output losses from systemic banking crises; and (ii) it compares these benefits with the *expected costs* in terms of forgone output.① In deriving these estimates, the LEI adopts an explicitly very conservative approach by making assumptions that overestimate costs and downplay expected benefits.

Expected benefits. Conceptually, the expected benefits are based on multiplying the *probability* of systemic banking crises, given different minimum capital ratios, by the expected macroeconomic *costs* (lost output) of such crises should they occur. To link crisis probabilities with capitalisation levels, the LEI uses a range of models and credit risk analyses. Averaging the results from these models, it then derives a benefit schedule. The schedule exhibits diminishing marginal returns (ie the extra effect of additional capital declines as the capital level increases). For the starting capital ratio of 7% CET1/RWA (see main text), this yields a crisis probability of 1.6%, after taking the effects of the NSFR into account. Later studies broadly confirm these results.②

Crisis cost estimates are derived from academic studies of crisis experiences. The LEI report finds that the median output cost of systemic banking crises is 63% of GDP in net present value terms. Yet the variation in cost estimates is large, as subsequent studies have confirmed. A shortcoming of most of these studies is that they rely only on pre-2007 data, missing the impact of the most recent crisis episode. An exception is Ball (2014), with results that imply a weighted average cumulative loss across all OECD countries of about 180% of pre-crisis GDP.③ Adding this estimate to the pre-crisis median will increase crisis costs. The analysis here assumes an updated cost estimate of 100%.

Expected costs. If higher bank capital requirements raise banks' costs, banks may respond by raising their lending spreads to offset the decline in their return on equity (ROE). As a result, borrowing costs for households and firms may rise, leading to lower investment and output. To estimate the size of this effect in the long run, the LEI assumed that banks maintain a constant ROE by passing on to their customers *all* additional costs due to higher capital requirements. The estimated increases in lending spreads were then fed into a variety of macroeconomic models to assess the resulting impact on GDP.

The headline result of this exercise is that a 1 percentage point increase in the CET1/RWA ratio translates into a 0.12% median decline in the level of output relative to its baseline, if converted into Basel III terms (with the corresponding value for the liquidity requirements being a one-off 0.08% output decline).④ By design, these results are likely to overstate the true costs, given that the LEI methodology abstracts from Modigliani-Miller effects.⑤ In practice, banks' required ROE can be expected to decline as their leverage and the risks to their shareholders fall.⑥

Other factors. The conservative nature of the LEI approach also implies that any indirect effects of increased bank capital requirements are unlikely to materially affect the overall impact assessment. One such effect could arise from any regulatory impact on banks' market-making activities (see main text). Any reduction in such activity might imply higher liquidity premia and, ultimately, increased costs of issuing debt in normal times. For banks, however, these costs are counterbalanced by reduced balance sheet risk. For non-bank issuers, in turn, any increase in costs would be expected to be smaller than the LEI-implied increase in bank lending spreads. This is because these issuers can revert to banks as an alternative source of funding. The impact on both crisis costs and probabilities, finally, would depend on the degree to which non-bank investors underestimate the cost of having to liquidate assets during stressed market conditions ("liquidity illusion") – a risk that should decline as liquidity premia increase.

① See BCBS, *An assessment of the long-term economic impact of stronger capital and liquidity requirements*, August 2010. ② See I Fender and U Lewrick, "Calibrating the leverage ratio", *BIS Quarterly Review*, December 2015, pp 43–58; original LEI results are converted into CET1/RWA terms using a conversion factor of about 0.78. ③ L Ball, "Long-term damage from the great recession in OECD countries", *European Journal of Economics and Economic Policies*, vol 11, no 2, 2014, pp 149–60. ④ Converted from the original LEI results using a conversion factor of about 0.78. ⑤ The Modigliani-Miller theorem states that, under certain assumptions (such as the absence of taxes, bankruptcy costs, agency costs and asymmetric information), the value of a firm is unaffected by how that firm is financed. See F Modigliani and M Miller, "The cost of capital, corporation finance and the theory of investment", *American Economic Review* vol 48, no 3, 1958, pp 261–97. ⑥ See eg D Miles, J Yang and G Marcheggiano, "Optimal bank capital", *The Economic Journal,* no 123, 2013, pp 1–37, who document a capital cost offset in the range of 45–75% for a sample of UK banks.

insurance groups. Implementation is planned for 2019, following an initial testing and refinement process.[11]

In addition, concerns over market liquidity have come to the fore (Chapter II). They have highlighted the role that institutional investors and collective investment vehicles may play in future market adjustments. Given these institutions' growing allocations to corporate bonds and other comparatively illiquid assets, their portfolio decisions may challenge market liquidity under stress. This raises the question of whether regulation has kept pace with these players' increasing importance.

A key structural feature of fixed income and, in particular, corporate bond markets is their continued reliance on market-makers. Market liquidity generally hinges on whether these specialised dealers respond to *temporary* imbalances in supply and demand by stepping in as trading counterparts. Market liquidity conditions in fixed income and repo markets have tightened somewhat over the last few years, at least on some metrics and when compared with pre-crisis times of overly ample market liquidity and compressed liquidity premia. While the overall evidence for any structural change in market liquidity remains scant, it is apparent that market-maker behaviour is changing (Chapter II).[12] Less clear are the underlying causes and implications for regulation, if any.

There are both supply and demand factors at play, with net effects likely to differ across market segments. On the supply side, market-makers appear to be raising the price for their services, even though this may not be readily visible in the usual market liquidity indicators. This adjustment reflects both cyclical and structural factors. As regards cyclical ones, dealer banks in many jurisdictions have reportedly reappraised their risk tolerance in the wake of the financial crisis, cutting back on various activities, including market-making. Given that dealers adjust their leverage procyclically, financial markets tend to exhibit cycles in liquidity conditions.

Monetary policy will influence these cyclical effects, both by supporting market confidence and by easing banks' funding conditions. The latter, if passed through, also support the financing of other (non-bank) market-makers. At the same time, the current environment of low yields and rising market risks is affecting the risk-return trade-off of market-makers by reducing revenues from carrying inventory, while raising their exposure to interest rate movements. This will offset at least part of the supporting effect of ample bank funding.

On the structural side, in addition to the recent growth in electronic trading and non-bank intermediation (Chapter II), bank regulators are requiring key market-making institutions to strengthen their balance sheets and funding models. By preventing the build-up of excessive leverage and funding mismatches, the new regulatory framework aims at containing the risk that banks are forced to suddenly compress their balance sheets in response to adverse shocks, as was, for example, the case for US broker-dealers at the onset of the Great Financial Crisis.[13] Such structural improvements also protect the financial system more broadly, by reducing the risk that liquidity crises and any associated "fire sales" spread contagiously across institutions and markets. This will support the robustness of market liquidity, though

[11] International Association of Insurance Supervisors, *First public consultation on global insurance capital standard*, December 2014, and *Annual Report 2013–14*, September 2014.

[12] See Committee on the Global Financial System, *Market-making and proprietary trading: industry trends, drivers and policy implications*, CGFS Papers, no 52, November 2014, and *Fixed income market liquidity*, CGFS Papers, no 55, January 2016.

[13] See H S Shin, "Market liquidity and bank capital", speech given at the London Business School, 27 April 2016.

possibly at the cost of somewhat lower activity in normal times.[14] That is, stronger market-makers make for more robust market liquidity.

Importantly, these developments are taking place just as demand for, and dependence on, market liquidity are on the rise. Asset managers' assets under management have been growing steadily in recent years (Graph VI.6, left-hand panel), signalling a large increase in the potential demand for liquidity. Funds that promise daily redemptions have been quite prominent, as suggested by the increasing presence of open-end mutual funds in corporate bond markets. In the United States, for example, they now hold some 22% of corporate debt according to financial accounts data – up from about 8% in 2005. Investors may thus find that liquidating positions proves more difficult than expected, particularly when market sentiment turns.[15] An example is the May–July 2013 "taper tantrum" (Chapter II), when bond funds faced significant redemption pressures (Graph VI.6, right-hand panel).

What do these developments imply for regulation? A key point is that, regardless of regulatory constraints, market-makers will not be "catching a falling knife".[16] That is, in transitioning to an environment that avoids unduly compressed liquidity premia, it is investors, not market-makers, who need to internalise the risk that liquidity will evaporate whenever everybody heads for the exits. For this, liquidity risk management needs to be up to the task. Market-based initiatives, such as liquidity stress tests and associated disclosures, are a vital tool. This should help market participants better understand each other's behaviour, which would also help inform their own responses. Regulatory measures can provide support, for example, by developing standardised disclosures or guidance for liquidity management.[17]

In addition, regulators may also want to more directly incentivise investors to better align their asset holdings and liquidity risks. One example is recent regulatory measures targeting open-end US mutual funds. The measures aim to address externalities (eg from fire sales) that may be arising from the redemption risks the industry faces.[18] The new rules would require fund managers to hold a minimum amount of liquid assets that can be sold within three days to satisfy immediate liquidity needs, similar in spirit to the Basel III LCR requirement, along with a cap on illiquid assets. In addition, the new regulations would allow, but not require, implementation of "swing pricing" – a mechanism to pass on the trading costs associated with redemptions to those investors that are redeeming their positions in order to protect other investors from net asset value dilution. The feature is well

[14] Empirical research on the impact of recent regulatory changes on market liquidity remains inconclusive. While J Dick-Nielson ("Dealer inventory and the cost of immediacy", paper presented at the Midwest Finance Association Annual Meeting, 2013) conjectures that recent regulatory adjustments may have raised transaction costs for US corporate bonds, F Trebbi and K Xiao ("Regulation and market liquidity", mimeo, 2016) find no evidence of negative effects from US regulatory action on US fixed income market liquidity.

[15] For evidence on mutual fund fragility due to strategic complementarities among investors, see Q Chen, I Goldstein and W Jiang, "Payoff complementarities and financial fragility: evidence from mutual fund outflows", *Journal of Financial Economics*, vol 97, 2010, pp 239–62.

[16] See I Fender and U Lewrick, "Shifting tides – market liquidity and market-making in fixed income instruments", *BIS Quarterly Review*, March 2015, pp 97–109.

[17] See CGFS (2014, 2016), and FSB, *Strengthening oversight and regulation of shadow banking*, August 2013.

[18] Securities and Exchange Commission, *SEC proposes liquidity management rules for mutual funds and ETFs*, 22 September 2015.

known in Europe: asset managers operating under UCITS rules have been utilising variants of swing pricing for some time. Available disclosures, however, have generally been limited, making it difficult to reliably assess the effectiveness of the mechanism. Going forward, regulators will need to keep monitoring the impact of these measures on the mutual fund sector, while considering the implementation of similar requirements in other parts of the asset management industry, as needed.

Statistical Annex

Output growth, inflation and current account balances[1]

Table A1

	Real GDP				Consumer prices				Current account balance[2]		
	Annual percentage changes				Annual percentage changes				Percentage of GDP		
	2014	2015	2016	1996–2006	2014	2015	2016	1996–2006	2014	2015	2016
World	**3.4**	**3.2**	**3.1**	**3.9**	**3.1**	**2.3**	**2.5**	**4.6**	**0.2**	**0.6**	**0.6**
AEs	**1.7**	**1.9**	**1.6**	**2.7**	**1.4**	**0.2**	**0.7**	**1.9**	**–0.2**	**–0.2**	**–0.1**
United States	2.4	2.4	1.8	3.4	1.6	0.1	1.2	2.6	–2.2	–2.7	–2.7
Euro area[3]	0.9	1.6	1.6	2.3	0.4	0.0	0.2	1.9	2.4	3.2	2.9
France	*0.7*	*1.2*	*1.3*	*2.3*	*0.5*	*0.0*	*0.2*	*1.6*	*–0.9*	*–0.1*	*–0.4*
Germany	*1.6*	*1.4*	*1.6*	*1.5*	*0.9*	*0.2*	*0.4*	*1.4*	*7.3*	*8.5*	*8.0*
Italy	*–0.3*	*0.6*	*1.1*	*1.5*	*0.3*	*0.0*	*0.1*	*2.4*	*1.9*	*2.2*	*2.2*
Spain	*1.4*	*3.2*	*2.7*	*3.8*	*–0.1*	*–0.5*	*–0.3*	*3.0*	*1.0*	*1.5*	*1.5*
Japan	–0.1	0.6	0.5	1.1	2.7	0.8	0.0	0.0	0.5	3.3	4.1
United Kingdom	2.9	2.3	1.9	3.0	1.5	0.1	0.7	1.6	–5.1	–5.2	–4.6
Other western Europe[4]	2.0	2.0	1.9	2.7	0.5	0.2	0.8	1.4	8.4	8.7	7.3
Canada	2.5	1.1	1.7	3.2	1.9	1.1	1.6	2.0	–2.3	–3.3	–2.8
Australia	2.7	2.5	2.6	3.7	2.5	1.5	1.5	2.6	–3.0	–4.6	–4.4
EMEs	**4.9**	**4.3**	**4.4**	**5.6**	**4.6**	**4.1**	**4.0**	**5.6**	**0.9**	**1.9**	**1.8**
Asia	6.4	6.2	6.0	7.0	3.2	2.4	2.7	3.1	2.4	3.4	3.0
China	*7.3*	*6.9*	*6.5*	*9.5*	*2.0*	*1.4*	*1.9*	*1.4*	*2.1*	*3.0*	*2.7*
India[5]	*7.3*	*7.6*	*7.6*	*6.7*	*6.0*	*4.9*	*5.1*	*4.5*	*–1.3*	*–1.0*	*–1.2*
Korea	*3.3*	*2.6*	*2.6*	*5.2*	*1.3*	*0.7*	*1.2*	*3.2*	*6.0*	*7.7*	*7.3*
Other Asia[6]	*4.2*	*3.7*	*3.8*	*4.0*	*3.9*	*2.7*	*2.4*	*4.6*	*4.4*	*5.8*	*5.2*
Latin America[7]	1.3	–0.1	–0.4	3.1	7.4	7.7	8.8	6.5	–3.3	–3.3	–2.6
Brazil	*0.1*	*–3.8*	*–3.7*	*2.7*	*6.4*	*10.7*	*7.0*	*7.7*	*–4.3*	*–3.3*	*–1.4*
Mexico	*2.3*	*2.5*	*2.4*	*3.5*	*4.1*	*2.1*	*3.2*	*4.4*	*–1.9*	*–2.8*	*–3.0*
Central Europe[8]	3.1	3.7	3.1	4.0	0.1	–0.5	0.0	3.1	–0.9	0.7	0.5
Poland	*3.3*	*3.6*	*3.5*	*4.4*	*0.2*	*–0.9*	*–0.3*	*2.5*	*–2.0*	*–0.2*	*–0.5*
Russia	0.7	–3.7	–1.2	4.3	11.4	12.9	7.2	12.9	2.9	5.3	4.1
Turkey	3.1	4.0	3.4	4.7	8.9	7.7	7.7	24.6	–5.5	–4.4	–4.4
Saudi Arabia	3.7	3.5	0.8	2.9	2.7	2.2	3.5	0.5	9.8	–8.2	–12.6
South Africa	1.6	1.3	0.9	3.5	6.1	4.6	6.4	4.2	–5.4	–4.4	–4.4

[1] Based on May 2016 consensus forecasts. For the aggregates, weighted averages based on GDP and PPP exchange rates. 1996–2006 values refer to average annual growth and inflation (for EMEs, inflation calculated over 2001–06). [2] For the aggregates, sum of the countries and regions shown or cited; world figures do not sum to zero because of incomplete country coverage and statistical discrepancies. [3] Current account based on the aggregation of extra-euro area transactions. [4] Denmark, Norway, Sweden and Switzerland. [5] Fiscal years (starting in April). [6] Chinese Taipei, Hong Kong SAR, Indonesia, Malaysia, the Philippines, Singapore and Thailand. [7] Argentina, Brazil, Chile, Colombia, Mexico and Peru. For Argentina, consumer price data are based on official estimates, which contain a methodological break in December 2013. [8] The Czech Republic, Hungary and Poland.

Sources: IMF, *World Economic Outlook*; Consensus Economics; national data; BIS calculations.

Residential property prices

Annual averages, year-on-year changes; in per cent — Table A2

	Nominal				Real[1]			
	2013	2014	2015	2007–12 average	2013	2014	2015	2007–12 average
United States	11.1	7.1	5.1	–4.8	9.5	5.4	4.9	–6.9
Euro area	–1.9	0.2	1.6	0.5	–3.2	–0.2	1.5	–1.5
Austria	*4.7*	*3.4*	*4.2*	*5.4*	*2.6*	*1.8*	*3.2*	*3.1*
Belgium	*1.2*	*–0.5*	*0.7*	*3.5*	*0.1*	*–0.8*	*0.2*	*1.0*
France	*–1.9*	*–1.6*	*–1.4*	*1.9*	*–2.7*	*–2.1*	*–1.4*	*0.2*
Germany	*3.2*	*3.1*	*4.5*	*1.4*	*1.7*	*2.2*	*4.3*	*–0.3*
Greece	*–10.8*	*–7.5*	*–5.0*	*–3.0*	*–10.0*	*–6.2*	*–3.3*	*–5.8*
Ireland	*2.1*	*13.0*	*10.5*	*–9.4*	*1.6*	*12.8*	*10.9*	*–10.6*
Italy	*–5.7*	*–4.4*	*–2.4*	*0.6*	*–6.9*	*–4.6*	*–2.5*	*–1.6*
Netherlands	*–6.0*	*0.8*	*3.5*	*–1.3*	*–8.3*	*–0.2*	*2.9*	*–3.1*
Portugal	*–1.9*	*4.3*	*3.1*	*–3.0*	*–2.2*	*4.5*	*2.6*	*–4.9*
Spain	*–9.1*	*0.3*	*3.6*	*–3.7*	*–10.4*	*0.5*	*4.1*	*–5.9*
Japan	1.6	1.6	2.4	–1.0	1.3	–1.2	1.6	–0.8
United Kingdom	3.5	10.0	6.7	1.7	0.9	8.4	6.6	–1.4
Canada	5.7	6.6	8.3	4.7	4.7	4.6	7.1	2.8
Sweden	5.5	9.4	13.1	4.7	5.5	9.6	13.2	3.0
Australia	6.6	9.1	9.0	4.6	4.1	6.4	7.4	1.8
Asia								
China	*5.9*	*2.6*	*–3.8*	*4.4*	*3.2*	*0.6*	*–5.2*	*0.8*
Hong Kong SAR	*17.5*	*6.0*	*15.5*	*14.5*	*12.6*	*1.5*	*12.1*	*11.0*
India	*14.5*	*14.8*	*13.6*	*21.8*	*4.0*	*7.9*	*8.3*	*11.1*
Indonesia	*12.0*	*7.0*	*5.6*	*3.1*	*5.3*	*0.6*	*–0.8*	*–2.8*
Korea	*–0.4*	*1.5*	*3.4*	*4.0*	*–1.7*	*0.2*	*2.6*	*0.8*
Malaysia	*10.9*	*8.5*	*7.1*	*6.6*	*8.6*	*5.2*	*4.9*	*4.1*
Philippines	*11.3*	*8.9*	*6.5*	*3.7*	*8.2*	*4.5*	*5.0*	*–0.2*
Singapore	*3.2*	*–2.9*	*–3.9*	*9.8*	*0.8*	*–3.9*	*–3.3*	*5.9*
Thailand	*7.8*	*5.7*	*2.5*	*2.6*	*5.5*	*3.8*	*3.5*	*–0.2*
Latin America								
Brazil	*9.5*	*5.1*	*–2.5*	*20.2*	*3.1*	*–1.2*	*–10.6*	*14.3*
Chile	*8.5*	*5.9*	*...*	*4.7*	*6.3*	*1.4*	*...*	*1.0*
Colombia	*9.7*	*8.2*	*10.7*	*11.8*	*7.5*	*5.1*	*5.4*	*7.2*
Mexico	*3.8*	*4.4*	*6.6*	*5.1*	*0.0*	*0.4*	*3.8*	*0.7*
Peru	*16.9*	*12.7*	*6.2*	*16.5*	*13.7*	*9.2*	*2.6*	*12.8*
Central Europe								
Czech Republic	*0.0*	*2.4*	*4.0*	*–1.8*	*–1.4*	*2.1*	*3.7*	*–3.6*
Hungary	*–2.6*	*4.3*	*11.5*	*–2.5*	*–4.2*	*4.5*	*11.6*	*–7.1*
Poland	*–4.4*	*1.0*	*1.5*	*–1.0*	*–5.5*	*0.8*	*2.5*	*–4.6*
Russia	3.8	1.4	1.2	11.8	–2.8	–6.0	–12.4	2.4
South Africa	10.0	9.3	6.0	4.7	4.0	3.1	1.4	–1.5
Turkey	12.7	14.4	18.4	11.0	4.9	5.1	9.9	3.1

[1] Deflated using consumer prices.

Sources: CEIC; national data; BIS database on property price statistics; BIS calculations.

Fiscal positions[1]

Table A3

	Overall balance[2]			Underlying government primary balance[3]			Gross debt[2]		
	2013–15 average	2016	Change	2013–15 average	2016	Change	2006	2015	Change
AEs									
Austria	–1.9	–1.9	0.1	1.8	1.8	0.0	67	86	19.3
Belgium	–2.9	–2.0	0.9	0.6	1.2	0.6	91	106	14.9
Canada	–2.1	–1.5	0.6	–1.2	–1.0	0.3	53	71	18.3
France	–3.9	–3.4	0.6	–0.8	–0.5	0.3	64	96	31.6
Germany	0.4	0.6	0.3	2.0	1.6	–0.4	66	71	4.9
Greece	–6.7	–7.7	–0.9	5.8	6.1	0.2	104	177	73.8
Ireland	–3.9	–1.1	2.8	0.8	1.3	0.6	24	94	70.2
Italy	–2.9	–2.2	0.7	4.2	3.7	–0.5	102	133	30.4
Japan	–7.6	–5.7	2.0	–6.9	–5.5	1.5	152	212	59.9
Netherlands	–2.3	–1.3	1.0	–0.2	–0.1	0.0	44	65	20.6
Portugal	–5.0	–2.8	2.2	3.8	3.9	0.1	69	129	59.8
Spain	–5.7	–2.9	2.8	1.8	1.6	–0.2	39	99	60.3
Sweden	–1.4	–0.6	0.8	–0.2	–0.9	–0.7	43	43	0.3
United Kingdom	–5.1	–2.6	2.5	–4.1	–3.4	0.7	42	89	46.9
United States	–5.1	–4.2	0.9	–1.2	–0.8	0.5	57	97	40.0
EMEs									
Brazil	–6.4	–8.7	–2.2	–0.9	–0.5	0.4	65	73	8.2
China	–1.5	–3.1	–1.6	–0.6	–2.2	–1.6	32	44	12.1
India	–7.3	–7.0	0.3	–2.6	–2.4	0.3	77	68	–8.6
Indonesia	–2.3	–2.7	–0.4	–1.0	–1.2	–0.2	36	27	–9.5
Korea	0.3	0.3	0.0	–0.2	0.4	0.6	24	40	16.7
Malaysia	–3.2	–3.3	–0.1	–1.2	–1.9	–0.6	39	55	15.1
Mexico	–4.1	–3.5	0.6	–1.4	–0.4	1.0	20	36	15.6
South Africa	–4.0	–3.8	0.2	–0.6	0.3	0.9	34	52	18.9
Thailand	–0.1	–0.4	–0.3	0.9	0.5	–0.3	23	33	9.3

[1] For the general government. [2] As a percentage of GDP; gross debt at nominal value (for Korea, at market value). [3] As a percentage of potential GDP; excluding net interest payments. OECD estimates are adjusted for the cycle and for one-off transactions, and IMF estimates are adjusted for the cycle.

Sources: C Dembiermont, M Scatigna, R Szemere and B Tissot, "A new database on general government debt", *BIS Quarterly Review*, September 2015, pp 69–87; IMF, *World Economic Outlook*; IMF, *Fiscal Monitor*; OECD, *Economic Outlook*; BIS total credit statistics.

Early warning indicators for stress in domestic banking systems[1]

Table A4

	Credit-to-GDP gap[2]	Property price gap[3]	Debt service ratio[4]	Debt service ratio if interest rates rise by 250 bp[4, 5]
Asia[6]	14.0	6.6	1.8	4.1
Australia	3.9	3.9	1.2	5.1
Brazil	8.5	–19.6	7.4	9.2
Canada	13.5	8.7	2.6	6.7
China	29.7	–4.9	5.5	8.8
Central and eastern Europe[7]	–10.8	8.3	0.4	1.9
France	1.2	–11.0	1.0	4.0
Germany	–6.8	12.2	–1.8	0.0
Greece	–12.1	9.4		
India	–3.2		1.8	2.9
Italy	–11.2	–15.5	0.1	2.3
Japan	4.4	12.5	–1.9	0.9
Korea	3.9	6.1	–0.6	3.0
Mexico	7.7	2.1	0.5	1.2
Netherlands	–19.0	–13.0	1.0	5.8
Nordic countries[8]	–0.6	3.4	1.0	5.0
Portugal	–38.3	10.2	–1.3	1.9
South Africa	–0.3	–7.6	–0.5	0.9
Spain	–46.1	–21.2	–2.9	–0.1
Switzerland	5.5	9.4	–0.1	3.0
Turkey	11.8		5.7	7.4
United Kingdom	–25.6	2.2	–2.0	0.8
United States	–10.1	3.0	–1.8	0.8
Legend	*Credit/GDP gap>10*	*Property gap>10*	*DSR>6*	*DSR>6*
	2≤Credit/GDP gap≤10		*4≤DSR≤6*	*4≤DSR≤6*

For the credit-to-GDP gap, data up to Q4 2015 except for Bulgaria, Lithuania and the Philippines, for which data end in Q1 2016; for the property price gap, data up to Q4 2015 except for France, Germany, Greece, Hong Kong SAR, Korea, the Netherlands, Norway, Singapore, South Africa, Sweden, Switzerland, Thailand and the United Kingdom, for which data end in Q1 2016; for the debt service ratio, data up to Q4 2015.

[1] Thresholds for red cells are chosen by minimising false alarms conditional on capturing at least two thirds of the crises over a cumulative three-year horizon. A signal is correct if a crisis occurs in any of the three years ahead. The noise is measured by the wrong predictions outside this horizon. Beige cells for the credit-to-GDP gap are based on guidelines for countercyclical capital buffers under Basel III. Beige cells for the debt service ratio (DSR) are based on critical thresholds if a two-year forecast horizon is used. For a derivation of critical thresholds for credit-to-GDP gaps and property price gaps, see M Drehmann, C Borio and K Tsatsaronis, "Anchoring countercyclical capital buffers: the role of credit aggregates", *International Journal of Central Banking*, vol 7, no 4, 2011, pp 189–240. Country aggregates are simple averages. [2] Difference of the credit-to-GDP ratio from its long-run, real-time trend calculated with a one-sided HP filter using a smoothing factor of 400,000, in percentage points. [3] Deviations of real residential property prices from their long-run trend calculated with a one-sided HP filter using a smoothing factor of 400,000, in per cent. [4] For the DSR series and methodology, see www.bis.org/statistics/dsr/index.htm. Difference of DSRs from country-specific long-run averages since 1999 or later depending on data availability and when five-year average inflation fell below 10%, in percentage points. [5] Assuming that interest rates increase 2.50 percentage points and all the other components of the DSR stay fixed. [6] Hong Kong SAR, Indonesia, Malaysia, the Philippines, Singapore and Thailand; excluding the Philippines and Singapore for the DSR and its forecast. [7] Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Russia; excluding the Czech Republic and Romania for the real property price gap; excluding Bulgaria, Estonia, Latvia, Lithuania and Romania for the DSR and its forecast. [8] Finland, Norway and Sweden.

Sources: National data; BIS; BIS calculations.

Annual changes in foreign exchange reserves

In billions of US dollars

Table A5

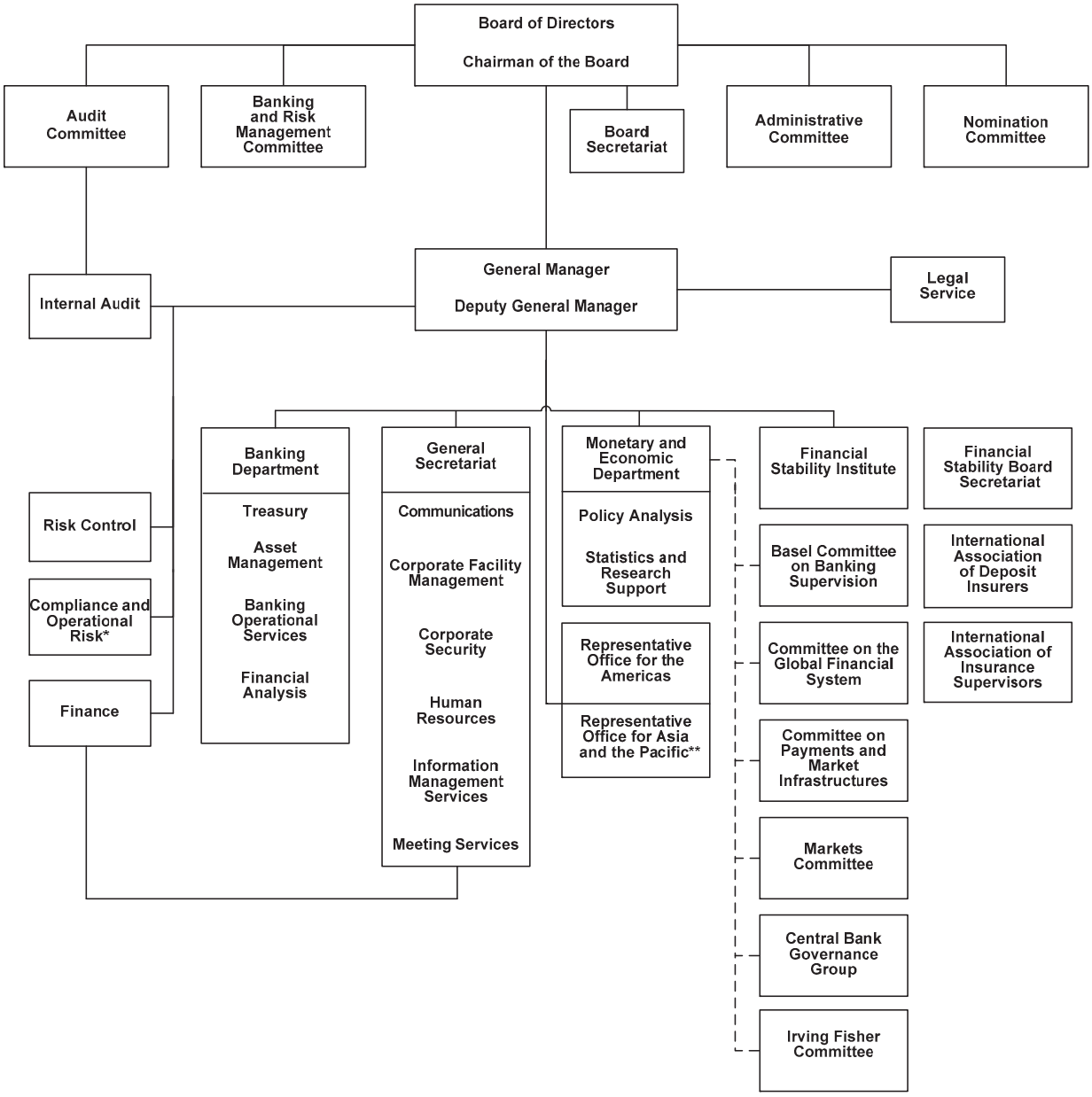
	At current exchange rates						*Memo: Amounts outstanding*
	2010	2011	2012	2013	2014	2015	*Dec 2015*
World	**1,100**	**940**	**747**	**730**	**–94**	**–668**	***10,921***
AEs	194	269	195	55	7	71	*2,364*
United States	2	0	–2	–2	–6	–3	*39*
Euro area	13	1	12	1	7	18	*246*
Japan	39	185	–28	9	–3	–21	*1,180*
Switzerland	126	54	197	21	10	62	*561*
EMEs	823	621	485	602	–90	–672	7,378
Asia	651	424	239	529	52	–471	5,461
China	448	334	130	510	22	–513	*3,330*
Chinese Taipei	34	4	18	14	2	7	426
Hong Kong SAR	13	17	32	–6	17	30	*359*
India	9	–5	–1	6	28	32	*328*
Indonesia	29	14	2	–12	13	–5	*101*
Korea	22	11	19	19	18	5	*359*
Malaysia	9	27	6	–4	–19	–20	*91*
Philippines	16	12	6	2	–4	2	*72*
Singapore	38	12	21	14	–16	–9	*246*
Thailand	32	0	6	–12	–10	0	*149*
Latin America[1]	81	97	51	–6	25	–32	*686*
Argentina	4	–7	–3	–12	1	–5	*21*
Brazil	49	63	19	–13	6	–6	*349*
Chile	2	14	0	0	0	–2	*37*
Mexico	21	23	16	15	17	–17	*168*
Venezuela	–9	–3	0	–4	1	–1	*6*
CEE[2]	14	3	15	20	–22	–12	*261*
Middle East[3]	50	88	148	76	–16	–140	662
Russia	27	8	32	–17	–129	–18	*309*
Memo: Net oil exporters[4]	*107*	*141*	*220*	*76*	*–146*	*–228*	*1,387*

[1] Countries shown plus Colombia and Peru. [2] Central and eastern Europe: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. [3] Kuwait, Libya, Qatar and Saudi Arabia. [4] Algeria, Angola, Kazakhstan, Mexico, Nigeria, Norway, Russia, Venezuela and the Middle East.

Sources: IMF, *International Financial Statistics*; Datastream; national data.

Contents

Organisation of the BIS as at 31 March 2016



* Direct access to the Audit Committee on compliance matters.

** Provides banking services to the region's monetary authorities.

The BIS: mission, activities, governance and financial results

The Bank for International Settlements (BIS) serves central banks in their pursuit of monetary and financial stability, fosters international cooperation in those areas and acts as a bank for central banks. In outline, the BIS pursues this mission by:

- facilitating dialogue and collaboration among central banks and other authorities that are responsible for promoting financial stability;
- conducting research on policy issues confronting central banks and financial supervisory authorities;
- acting as a prime counterparty for central banks in their financial transactions; and
- serving as an agent or trustee in connection with international financial operations.

The BIS has its head office in Basel, Switzerland, and representative offices in the Hong Kong Special Administrative Region of the People's Republic of China (Hong Kong SAR) and in Mexico City.

In the light of the above aims, this chapter reviews the BIS's activities, and those of the groups it hosts, for the financial year 2015/16; describes the institutional framework that supports their work; and presents the year's financial results.

The meetings programmes and the Basel Process

The BIS promotes international cooperation among monetary authorities and financial supervisory officials through its meetings programmes and through the Basel Process – hosting and supporting international groups pursuing global financial stability (such as the Basel Committee on Banking Supervision and the Financial Stability Board) and facilitating their interaction.

Bimonthly meetings and other regular consultations

Governors and other senior officials of BIS member central banks hold bimonthly meetings, normally in Basel, to discuss current developments and the outlook for the world economy and financial markets. They also exchange views and experiences on issues of interest to central banks.

Global Economy Meeting

The Global Economy Meeting (GEM) comprises the Governors of 30 BIS member central banks in major advanced and emerging market economies that account for about four fifths of global GDP. The Governors of another 19 central banks attend the GEM as observers.[1] Chaired by Agustín Carstens, Governor of the Bank

[1] The members of the GEM are from the central banks of Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Hong Kong SAR, India, Indonesia, Italy, Japan, Korea, Malaysia, Mexico, the Netherlands, Poland, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom and the United States and also the ECB. The observers are from the central banks of Algeria, Austria, Chile, Colombia, the Czech Republic, Denmark, Finland, Greece, Hungary, Ireland, Israel, Luxembourg, New Zealand, Norway, Peru, the Philippines, Portugal, Romania and the United Arab Emirates.

of Mexico, the GEM has two main roles: (i) monitoring and assessing developments, risks and opportunities in the world economy and the global financial system; and (ii) providing guidance to three BIS-based central bank committees – the Committee on the Global Financial System, the Committee on Payments and Market Infrastructures and the Markets Committee.

The GEM's economic discussions focus on current macroeconomic and financial developments in major advanced and emerging market economies. Specific topics discussed by the GEM over the past year included: the appropriate mix of monetary, fiscal and structural policies at the current juncture; the natural rate of interest; implications of recent large movements in exchange rates; risks to real and financial globalisation; and changing drivers of global growth.

Economic Consultative Committee

The Economic Consultative Committee (ECC) is an 18-member group that supports the work of the GEM. Also led by the GEM Chairman and comprising all Governors participating in the BIS Board meeting and the BIS General Manager, the ECC conducts analyses and prepares proposals for the GEM's consideration. In addition, the ECC Chairman makes recommendations to the GEM on the appointment of Chairs of the three central bank committees mentioned above and on the composition and organisation of those committees.

All Governors' Meeting

The All Governors' Meeting comprises the Governors of the 60 BIS member central banks and is chaired by the Chairman of the Board. It convenes to discuss selected topics of general interest to its members. In 2015/16, the topics discussed were inequality and monetary policy; whether innovation has peaked; central clearing – trends and current issues; issues for central banks arising from financial inclusion and education; liquidity assistance by central banks; and climate change and the financial system.

By agreement with the GEM and the BIS Board, the All Governors' Meeting is responsible for overseeing the work of two other groups that have a broader network or membership than the GEM. These are the Central Bank Governance Group, which also meets during the bimonthly meetings, and the Irving Fisher Committee on Central Bank Statistics.

Central Bank Governors and Heads of Supervision

The Group of Central Bank Governors and Heads of Supervision (GHOS) is a high-level forum responsible for international collaboration on banking supervision. Chaired by Mario Draghi, President of the ECB, the GHOS meets periodically to decide on global banking regulations and oversee the work of the Basel Committee on Banking Supervision (see page 138).

Other meetings of Governors

The central bank Governors of major emerging market economies (EMEs) meet three times a year – during the January, May and September bimonthly meetings – to discuss issues of importance to their economies. The topics discussed in 2015/16 included global asset management companies and emerging market asset classes; international currencies and the international monetary system; and the implications for EMEs of exchange rate and commodity price developments.

Regular meetings were also held for the Governors of central banks in small open economies.

Other consultations

In addition, the Bank regularly organises various meetings that bring together senior central bank officials and, occasionally, representatives from other financial authorities, the private financial sector and the academic community to discuss topics of shared interest.

During the past year, these events included:

- the annual meetings of the working parties on monetary policy, held in Basel but also hosted at a regional level by central banks in Asia, central and eastern Europe, and Latin America;
- a meeting of Deputy Governors of emerging market economies on inflation mechanisms; and
- the high-level meetings organised by the Financial Stability Institute in various regions of the world for Governors and Deputy Governors and heads of supervisory authorities.

The Basel Process

The Basel Process refers to the BIS's role in hosting and supporting international groups – six committees and three associations – engaged in standard setting and the pursuit of financial stability. Co-location at the BIS facilitates communication and collaboration among these groups as well as their interaction with central bank Governors and other senior officials in the context of the BIS's regular meetings programme. The BIS also supports the work of these committees and associations with its expertise in economic research and statistics and its practical experience in banking.

The hosted committees, whose agendas are guided by various sets of central banks and supervisory authorities, are as follows:

- the Basel Committee on Banking Supervision (BCBS): develops global regulatory standards for banks and seeks to strengthen micro- and macroprudential supervision;
- the Committee on the Global Financial System (CGFS): monitors and analyses issues relating to financial markets and systems;
- the Committee on Payments and Market Infrastructures (CPMI): analyses and sets standards for payment, clearing and settlement infrastructures;
- the Markets Committee: monitors developments in financial markets and their implications for central bank operations;
- the Central Bank Governance Group: examines issues related to the design and operation of central banks; and
- the Irving Fisher Committee on Central Bank Statistics (IFC): addresses statistical issues relating to economic, monetary and financial stability.

The hosted associations are as follows:

- the Financial Stability Board (FSB): an association including finance ministries, central banks and other financial authorities in 24 countries; coordinates at the international level the work of national authorities and international standard setters and develops policies to enhance financial stability;
- the International Association of Deposit Insurers (IADI): sets global standards for deposit insurance systems and promotes cooperation on deposit insurance and bank resolution arrangements; and
- the International Association of Insurance Supervisors (IAIS): sets standards for the insurance sector to promote globally consistent supervision.

The Bank's own Financial Stability Institute (FSI) facilitates the dissemination of the standard-setting bodies' work to central banks and financial sector supervisory and regulatory agencies through its extensive programme of meetings, seminars and online tutorials.

The Basel Process is based on three key features: synergies of co-location; flexibility and openness in the exchange of information; and support from the BIS's expertise in economics, statistics, banking and regulation.

Synergies

The physical proximity of the nine committees and associations at the BIS creates synergies that produce a broad and fruitful exchange of ideas. In addition, each group's costs of operation are reduced through economies of scale.

Flexibility

The limited size of these groups is conducive to flexibility and openness in the exchange of information, thereby facilitating coordination and preventing overlaps and gaps in their work programmes. At the same time, their output is much larger than their size would suggest, as they are able to leverage the expertise of the international community of central bankers, financial regulators and supervisors, and other international and national public authorities.

Support from the BIS's economic expertise and banking experience

The work of the Basel-based committees is informed by the BIS's economic research and statistics and, where appropriate, by the practical experience it gains from the implementation of regulatory standards and financial controls in its banking activities.

Activities of BIS-hosted committees and the FSI

This section reviews the year's principal activities of the six committees hosted by the BIS and of the Financial Stability Institute.

Basel Committee on Banking Supervision

The Basel Committee on Banking Supervision (BCBS) seeks to enhance supervisory cooperation and improve the quality of banking supervision worldwide. Its mandate is to strengthen the regulation, supervision and practices of banks for the purpose of enhancing financial stability. The Committee supports supervisors by providing a forum for exchanging information on national supervisory arrangements, improving the effectiveness of techniques for supervising banks, and setting minimum supervisory and regulatory standards.

The Committee consists of senior representatives of banking supervisory authorities and central banks responsible for banking supervision or financial stability in the Committee's member jurisdictions. It is chaired by Stefan Ingves, Governor of Sveriges Riksbank, and generally meets four times a year. The Committee seeks the endorsement of the Group of Governors and Heads of Supervision (GHOS), its governing body, for its major decisions and its work programme.

Current work programme

During 2015, the Basel Committee made substantial progress towards finalising its post-crisis policy reforms; promoting globally consistent implementation of the agreed regulatory framework; and identifying emerging issues in supervision.

The Committee's 2016 work programme is focused on finalising its financial crisis-related reform agenda and addressing the problem of excessive variability in risk-weighted assets (RWAs). This programme includes the following key elements: (i) the removal of internal model approaches for certain risks (eg the Advanced Measurement Approaches for operational risk); and (ii) imposing additional constraints on the use of internal model approaches for credit risk, in particular through the use of minimum capital requirements based on standardised approaches (ie capital floors). The GHOS will review the Committee's proposals on the risk-weighted framework and the design and calibration of capital floors around the end of 2016.

In January 2016, the GHOS agreed that the leverage ratio should be based on a Tier 1 definition of capital and should comprise a minimum level of 3%. Additional elements may be required for global systemically important banks (G-SIBs). Over the coming year, the Committee will finalise the design and calibration of the leverage ratio for G-SIBs to allow sufficient time for it to be implemented as a Pillar 1 measure by 1 January 2018.

Policy reform

During the year, the Committee consulted on proposed revisions to the standardised approaches for credit risk and operational risk, and finalised the revised market risk framework. Ongoing work on the calibration of the capital floors based on standardised approaches is closely linked to the finalisation of the overall package of reforms to enhance the comparability of risk-weighted assets calculated using internal ratings-based approaches for credit risk.

The Committee finalised or issued for consultation a number of global standards for banks during the year.

Margin requirements for non-centrally cleared derivatives. In March 2015, the Committee and the International Organization of Securities Commissions (IOSCO) revised the framework for margin requirements for non-centrally cleared derivatives.

Interest rate risk in the banking book. In June 2015, the Committee proposed changes to the regulatory capital treatment and supervision of interest rate risk in the banking book (IRRBB). These expand upon, and are intended to ultimately replace, the Basel Committee's 2004 *Principles for the management and supervision of interest rate risk*. The review of the regulatory treatment of IRRBB will, first, help to ensure that banks have appropriate capital to cover potential losses from exposures to changes in interest rates. Second, it is intended to limit capital arbitrage between the trading book and the banking book, as well as between banking book portfolios that are subject to different accounting treatments.

Net Stable Funding Ratio disclosure standards. In June 2015, the Committee finalised the Net Stable Funding Ratio (NSFR) disclosure standards, following the publication of the NSFR standard in October 2014. The disclosure requirements are designed to improve the transparency of regulatory funding requirements, reinforce the *Principles for sound liquidity risk management and supervision*, strengthen market discipline, and reduce market uncertainty as the NSFR standard is implemented. To

that end, internationally active banks in all Basel Committee member jurisdictions will be required to publish their NSFRs according to a common template. Banks are required to comply with the disclosure standards from their first reporting period after 1 January 2018.

Review of the Credit Valuation Adjustment risk framework. In July 2015, the Committee issued a consultative paper on its *Review of the Credit Valuation Adjustment risk framework* with the aim of (i) ensuring that all important drivers of credit valuation adjustment (CVA) risk and CVA hedges are covered in the Basel regulatory capital standard; (ii) aligning the capital standard with the fair value measurement of CVA employed under various accounting regimes; and (iii) ensuring consistency with the proposed revisions to the market risk framework under the Basel Committee's *Fundamental review of the trading book*. In parallel, the Committee undertook a quantitative impact study in the second half of 2015 to inform deliberations on the final calibration of the framework.

Criteria for identifying simple, transparent and comparable securitisations. In July 2015, the Committee and IOSCO released their final criteria to assist in the development of simple, transparent and comparable (STC) securitisation structures. In November 2015, the Committee issued for consultation additional criteria for the specific purpose of differentiating the capital treatment of STC securitisations from that of other securitisation transactions. The Committee is proposing to reduce minimum capital requirements for such STC securitisations by reducing the risk weight floor for senior exposures, and by rescaling risk weights for other exposures.

Haircut floors for non-centrally cleared securities financing transactions. In November 2015, the Committee issued a consultative proposal for incorporating the FSB's policy framework for haircut floors for non-centrally cleared securities financing transactions into the Basel III framework. The proposal is designed to create incentives for banks to set their collateral haircuts above the floors rather than hold more capital.

TLAC holdings. In November 2015, the Committee issued for consultation its proposed prudential treatment of banks' investments in Total Loss-Absorbing Capacity (TLAC) instruments, following the FSB's publication of its relevant principles and TLAC term sheet. Applicable to all banks subject to national regulations that are based on the Basel Committee's standards, including non-G-SIBs, the proposed treatment is for banks to deduct from their regulatory capital their holdings of TLAC instruments, subject to thresholds. The aim is to support the TLAC regime by reducing the risk of contagion should a G-SIB enter resolution. The TLAC regime also necessitates changes to Basel III to specify how G-SIBs must take account of the TLAC requirement when calculating their regulatory capital buffers.

Revisions to the Standardised Approach for credit risk. In December 2015, the Committee released a second consultative document on *Revisions to the Standardised Approach for credit risk*, which forms part of the Committee's broader review of the capital framework to balance simplicity and risk sensitivity, and to reduce variability in banks' risk-weighted assets. This revised proposal reintroduces the use of credit ratings, in a non-mechanistic manner, for exposures to banks and corporates; includes alternative approaches for jurisdictions that do not allow the use of external ratings for regulatory purposes; modifies the proposed risk weighting of real estate loans; and includes proposals for exposures to multilateral development banks, retail and defaulted exposures, and off-balance sheet items.

Identification and measurement of step-in risk. In December 2015, the Committee released proposals to identify and measure the risk that a bank will provide financial support to a stressed entity beyond, or in the absence of, its contractual obligations. The proposals fall within the G20 initiative to strengthen the oversight and regulation of the shadow banking system and mitigate the associated risks. The Committee will assess the potential impacts of the proposals, particularly as to whether they adequately capture entities posing potential step-in risk.

Minimum capital requirements for market risk. In January 2016, the Committee issued the revised minimum capital requirements for market risk as agreed by the GHOS. A key component of the Basel Committee's overall reform efforts, the revised framework is designed to ensure that the standardised and internal model approaches to market risk deliver credible capital outcomes and promote consistent implementation of the standards across jurisdictions. The final standard incorporates changes that have been made following two consultative documents published in 2013 and 2014 and several quantitative impact studies.

Frequently asked questions. To promote consistent global implementation of Basel III, the Committee periodically reviews frequently asked questions (FAQs) and publishes answers along with any necessary technical elaboration of the rules text and interpretative guidance. FAQs were published on the Basel III leverage ratio framework in July 2015, on the standardised approach for measuring counterparty credit risk exposures in August, and on the Basel III Countercyclical Capital Buffer in October.

Policy implementation

Implementation of the regulatory framework is a key priority for the Committee. The Regulatory Consistency Assessment Programme (RCAP) monitors the Committee's member jurisdictions' progress on implementation and assesses the consistency and completeness of the adopted standards. The RCAP also facilitates dialogue among Committee members and assists the Committee in developing standards.

During the year, RCAP jurisdictional assessments were conducted for India, Saudi Arabia and South Africa. Reviews are under way to assess the consistency of capital and Liquidity Coverage Ratio (LCR) regulations in Argentina, Indonesia, Korea, Russia and Turkey and of the frameworks for systemically important banks (SIBs) in the member jurisdictions that are home to G-SIBs (China, the European Union, Japan, Switzerland and the United States).

Four years after the RCAP was launched, the Committee is reviewing the programme and considering how its effectiveness could be further enhanced. For example, the Committee has revised its monitoring template and report to take into account new or revised standards. It has also commissioned a study to review the progress of the RCAP and the strategic direction of the Committee's implementation mandate.

In addition, the Committee published several other reports relating to the implementation of the Basel framework.

RCAP-Report on risk-weighted assets for counterparty credit risk (CCR). In October 2015, the Committee published a report on the regulatory consistency of RWAs for counterparty credit risk. The report presents the findings from a hypothetical portfolio exercise to examine variability in banks' modelling of derivatives, and specifically in exposure modelling. The report focuses on the internal models method and the advanced CVA risk capital charge for over-the-counter (OTC)

derivative trades. This exercise completes the Committee's review of trading-related internal models.

Basel III Monitoring Report. Published twice a year, the study is based on the rigorous reporting process to periodically review the implications of the Basel III standards. The results of the monitoring exercise assume that the final Basel III package is fully in force and do not take account of any transitional arrangements, such as the gradual phase-in of deductions from regulatory capital.

The March 2016 report shows that all large internationally active banks meet the Basel III risk-based minimum capital requirements as well as the Common Equity Tier 1 (CET1) target level of 7.0% (plus the surcharges for G-SIBs, as applicable). The reports also collect bank data on Basel III's liquidity requirement. Regarding the Liquidity Coverage Ratio (LCR), which came into effect on 1 January 2015, all banks in the LCR sample reported an LCR at or above the 60% minimum requirement that was in place for 2015, while 84% reported a ratio that met or exceeded 100%. As for the Net Stable Funding Ratio (NSFR), which will become a minimum standard by 1 January 2018, 79% of the Group 1 banks and 83% of the Group 2 banks in the NSFR sample reported a ratio that met or exceeded 100%, while 92% of the Group 1 banks and 94% of the Group 2 banks reported an NSFR at or above 90%.[2]

Progress report on adoption of the Basel regulatory framework. This updated progress report provides a high-level view of Basel Committee members' progress in adopting Basel III regulations as of end-September 2015. It focuses on the status of domestic rule-making processes to ensure that the Basel standards are transformed into national law or regulation according to the internationally agreed time frames. The report covers the risk-based capital standards, the liquidity standards (LCR and NSFR), the framework for SIBs, the leverage ratio, the revised Pillar 3 disclosure requirements and the large exposure framework.

Quantitative impact studies. In November 2015, the Committee published a quantitative impact study on TLAC, focusing on shortfall analyses. The purpose was to assess whether G-SIBs can meet the TLAC standard. The Committee also published the results of its interim impact analysis of its fundamental review of the trading book in November 2015. The report assesses the impact of proposed revisions to the market risk framework set out in two consultative documents of October 2013 and December 2014.

Progress reports. In July 2015, the Committee issued a progress report on the implementation of principles for effective supervisory colleges, highlighting the challenges faced by supervisors in running effective supervisory colleges as well as the practical approaches taken to address them. In December 2015, the Committee also published its third progress report on banks' adoption of the Committee's 2013 *Principles for effective risk data aggregation and risk reporting*.

Reports to the G20. In November 2015, the Committee reported to the G20 Leaders on its progress in finalising post-crisis reforms and on the implementation status of the Basel III reforms since November 2014. The report summarises the steps taken by member jurisdictions to adopt the Basel III standards, banks' progress in bolstering their capital and liquidity positions, the consistency of implementation in

[2] Group 1 banks have Tier 1 capital of more than €3 billion and are internationally active. All other banks are Group 2 banks.

jurisdictions assessed since the Committee's last report, and the Committee's implementation work plan.

Supervision

During the year, the Committee published several documents to aid supervisors in undertaking effective supervision of banks.

Developments in credit risk management across sectors: current practices and recommendations. In June 2015, the Committee published a report on the current supervisory framework for credit risk, the state of credit risk management and implications for the supervisory and regulatory treatments of credit risk. It is based on a survey that was conducted with supervisors and firms in the banking, securities and insurance sectors worldwide.

Report on the impact and accountability of banking supervision. In July 2015, the Committee published a range-of-practice study on how supervisors around the world define, evaluate and manage the impact of their policies and actions, and then account for it to their stakeholders. The report shows how a well designed system of accountability can support operational independence and enhance transparency while safeguarding confidential, institution-specific information.

Corporate governance principles for banks. In July 2015, the Committee published a revised set of principles on corporate governance. The guidelines elaborate the importance of risk governance as part of a bank's overall corporate governance framework and promote the value of effective boards and board committees together with strong control functions. They also provide guidance for bank supervisors in evaluating the processes used by banks to select board members and senior management.

Guidelines for identifying and dealing with weak banks. In July 2015, the Committee published updated guidelines building on the Committee's 2002 guidance. These cover the underlying supervisory preconditions for dealing with weak banks and set out techniques for identifying problems as well as corrective measures and, for resolution authorities, tools for dealing with failing or failed banks.

General guide to account opening. In July 2015, the Committee issued for public consultation a revised version of the *General guide to account opening and customer identification*, first published in 2003. The customer information collected and verified at the account-opening stage is crucial for the bank to fulfil its obligations under anti-money laundering and combating the financing of terrorism (AML/CFT) rules. When finalised, the revised version will become an annex to the Committee's *Sound management of risks related to money laundering and financing of terrorism*, published in January 2014.

Guidance on credit risk and accounting for expected credit losses. Issued in December 2015, this guidance replaces the Committee's *Sound credit risk assessment and valuation for loans* published in 2006. The guidance sets out supervisory expectations for banks relating to sound credit risk practices associated with implementing and applying an expected credit loss (ECL) accounting framework.

Guidance on the application of the Core principles for effective banking supervision to the regulation and supervision of institutions relevant to financial inclusion.

Published in December 2015, the consultative document sets out additional guidance on the application of the Core principles for effective banking supervision to the supervision of financial institutions serving the financially excluded. It includes a report on the range of practice in the regulation and supervision of institutions relevant to financial inclusion, and expands on microfinance activities.

BCBS: www.bis.org/bcbs

Committee on the Global Financial System

The Committee on the Global Financial System (CGFS) monitors financial market developments for the Governors of the BIS Global Economy Meeting and analyses the implications for financial stability and central bank policy. Chaired by William C Dudley, President of the Federal Reserve Bank of New York, the Committee comprises Deputy Governors and other senior officials from 23 central banks of major advanced and emerging market economies, as well as the Head of the BIS's Monetary and Economic Department and its Economic Adviser.

Among the topics discussed by the Committee during the past year were the challenges posed to international financial stability by divergent monetary policy across currency areas, as well as the impact from a slowdown in EME growth prospects. In its regular monitoring of global liquidity trends, the Committee focused on the potential risks posed by the build-up of financial imbalances among countries that had so far been relatively unaffected by the global financial crisis. It also discussed the potential risks from the compression of risk premia in different asset markets earlier in the year, and the implications of increased asset price volatility. Finally, the Committee organised a workshop where experts reviewed member jurisdictions' experiences with macroprudential policymaking to identify areas where further study could be beneficial.

Additionally, in-depth studies are commissioned from groups of central bank experts. Two such reports were published this year.

Fixed income market liquidity. Confirming the findings of a 2014 report on market-making and proprietary trading, the January 2016 report established that diverging supply and demand trends for liquidity services may have made liquidity conditions more fragile. As key drivers, the report identified the rise of electronic trading, dealer deleveraging, possibly reinforced by regulatory reform, and unconventional monetary policy. It concluded that, in the medium term, more stringent capital requirements and other measures taken to bolster market intermediaries' risk-absorption capacity will strengthen systemic stability, not least by ensuring a more sustainable supply of immediacy services. Overall, the report underscores the need for a close monitoring of liquidity conditions as well as an ongoing assessment of how new liquidity providers and trading platforms will affect the distribution of risks among market participants.

Regulatory change and monetary policy. Issued jointly with the Markets Committee in May 2015, this report focused on the likely effects of new financial regulation on financial system structure and financial intermediaries, and how central banks will need to take these changes into account when implementing monetary policy. Based on information from central bank case studies and structured interviews with private sector market participants, among other sources, the report argues that the effect on monetary policy operations and transmission should be limited and manageable. It concludes that central banks should be able to adjust their existing

policy frameworks to preserve policy effectiveness. These adjustments will tend to differ across jurisdictions.

CGFS: www.bis.org/cgfs

Committee on Payments and Market Infrastructures

The Committee on Payments and Market Infrastructures (CPMI) promotes the safety and efficiency of payment, clearing, settlement and reporting systems and arrangements, thereby supporting financial stability and the wider economy. Comprising senior officials from 25 central banks, the CPMI is a global standard setter that aims to strengthen regulation, policy and practice in this field worldwide. It also serves as a forum for central banks to monitor and analyse developments in payment, clearing, settlement and reporting within and across jurisdictions and to cooperate in related oversight, policy and operational matters, including the provision of central bank services. The Committee Chair is Benoît Cœuré, a member of the ECB's Executive Board.

Monitoring implementation of standards for financial market infrastructures

The CPMI-IOSCO *Principles for financial market infrastructures* (PFMI), published in April 2012, set out international regulatory standards for systemically important financial market infrastructures (FMIs) and specify the responsibilities for the authorities that oversee, supervise or regulate them.

Monitoring the implementation of the PFMI, a high priority for the CPMI, involves three phases: Level 1, on the adoption of the PFMI in domestic regulatory frameworks; Level 2, on the completeness and consistency of these regulatory frameworks; and Level 3, on the consistency in the outcomes of the PFMI implementation across jurisdictions.

Level 1: In June 2015, the CPMI and IOSCO published a second update to the Level 1 assessments, which showed that the 28 participating jurisdictions are continuing to make good progress in implementing the PFMI. In particular, the report highlighted significant progress on implementation measures applicable to central securities depositories and securities settlement systems.

Level 2: In December 2015, the CPMI and IOSCO published a Level 2 assessment report on implementation measures applicable to central counterparties (CCPs) and trade repositories in Australia. In November 2015, they published a Level 2 report on the assessment of the completeness and consistency of frameworks and outcomes of jurisdictions' implementation of the PFMI's "Responsibilities of authorities".

Level 3: In June 2015, the CPMI and IOSCO initiated a Level 3 assessment focusing on a subset of PFMI requirements that relate to CCPs' financial risk management. Covering certain governance, stress-testing, margin, liquidity, collateral and recovery practices, the assessment looks at the outcomes achieved by a number of globally and locally active CCPs that clear exchange-traded and OTC derivative products. A report presenting the results of this assessment is expected to be published in 2016.

CCP resilience and recovery

In April 2015, the BCBS, CPMI, FSB and IOSCO agreed on a workplan to coordinate their respective international policy work aimed at enhancing the overall resilience, recovery planning and resolvability of CCPs and to work in close collaboration.[3] The workplan also calls for better understanding of the interdependencies between CCPs and their direct and indirect members. Jointly with IOSCO, the CPMI is responsible for the work related to strengthening CCP resilience and recovery, and is working closely with the other committees on CCP resolution and interdependencies.

Taking into account the findings from the implementation monitoring of the PFMI, the CPMI and IOSCO started work on the strengthening of CCP resilience and recovery in mid-2015, paying particular attention to the adequacy of existing standards. A consultative report on the findings from this analysis is set for publication in 2016.

Harmonisation of OTC derivatives data

In November 2014, the CPMI and IOSCO set up a working group to develop guidance on the harmonisation of key OTC derivatives data, including uniform transaction and product identifiers. Consultative reports published so far include the *Harmonisation of the Unique Transaction Identifier* in August 2015, the *Harmonisation of key OTC derivatives data elements (other than UTI and UPI) – first batch* in September 2015, and the *Harmonisation of the Unique Product Identifier* in December 2015. The working group will conduct additional public consultations with a view to fulfilling its mandate by end-2017.

Retail payments

The CPMI's report on *Digital currencies*, published in November 2015, analyses the impact on financial markets and the wider economy that could accrue from digital currency schemes with an embedded decentralised transfer mechanism based on distributed ledger technology.

Correspondent banking

The CPMI's consultative report on *Correspondent banking*, published in October 2015, reviews technical measures relating to know-your-customer (KYC) utilities; the increased use of the Legal Entity Identifier (LEI); information-sharing mechanisms; and improvements in payment messages. It also puts forward four recommendations for consideration by the industry and authorities.

Cyber resilience in FMIs

A consultative report on *Guidance on cyber resilience for financial market infrastructures* was published in November 2015, with a final report envisaged in 2016. These publications follow up the CPMI's November 2014 report on *Cyber resilience in financial market infrastructures*, which noted the importance of an integrated and comprehensive approach to the cyber resilience of FMIs and the need for international cooperation in this area. The report aimed to raise awareness of the systemic implications of cyber attacks on FMIs. Building on their previous

[3] See http://www.bis.org/cpmi/publ/d134b.pdf.

separate work on cyber resilience, the CPMI and IOSCO established a joint working group on cyber resilience for FMIs in December 2014 to consider additional guidance and identify other relevant issues.

Payment aspects of financial inclusion

The CPMI and the World Bank Group set up a joint task force in mid-2014 to examine demand and supply factors affecting financial inclusion in the context of payment systems and services, and to suggest measures that could be taken to address these issues. A consultative report was published in September 2015 on the payment aspects of financial inclusion and set out guiding principles designed to assist countries that seek to advance financial inclusion in their markets through payments. A final report is expected in 2016.

Red Book statistics

After launching a revision of the statistical methodology in June 2015, the CPMI published in December 2015 its annual update of the *Statistics on payment, clearing and settlement systems in the CPMI countries*.

CPMI: www.bis.org/cpmi

Markets Committee

The Markets Committee is a forum where senior central bank officials jointly monitor developments in financial markets and assess their implications for market functioning and central bank operations. With a membership comprising 21 central banks, the Committee is chaired by Guy Debelle, Assistant Governor of the Reserve Bank of Australia.

The Committee's discussions during the year were shaped by the divergent monetary policy settings of the major central banks as well as by market developments in emerging economies. Among the topics discussed were negative policy rates, and the implications of monetary policy measures and exchange rate movements for market functioning.

In addition to monitoring near-term developments, the Committee considered longer-term structural and operational issues. Topics included the evolving structure of the US Treasury market, as well as market intelligence-gathering and the provision of custody and banking services by central banks.

One special project undertaken by the Committee in May 2015 was to set up a working group to support the establishment of a single global code of conduct for the foreign exchange market and to promote adherence to the new standards and principles. This work is being undertaken in collaboration with a group of market participants from the major financial centres in both advanced and emerging market economies. The target date for the code's finalisation, as well as for the proposals to ensure greater adherence, is May 2017.

In January 2016, the Committee held a workshop with private sector participants on industry-led initiatives to create independent netting and execution facilities for orders used to set price benchmarks (fix orders) in the foreign exchange market.

The Committee's report on *Electronic trading in fixed income markets*, issued in January 2016, examines how electronic trading has transformed the structure of the fixed income markets, including price discovery and the nature of liquidity provision. The report finds that electronic trading has underpinned strong growth in algorithmic and high-frequency trading in the most liquid market segments.

Innovative trading venues and protocols have proliferated, and new market participants have emerged.

Markets Committee: www.bis.org/markets

Central Bank Governance Group

The Central Bank Governance Group serves as a venue for the exchange of views among Governors on matters relating to the design and operation of their institutions. The focus is on the institutional and organisational setting in which central banks pursue monetary and financial policies, including their functions, independence and decision-making structures. The group comprises nine Governors and is chaired by Zeti Akhtar Aziz, Governor of the Central Bank of Malaysia.

Discussions are informed by information flows through the Central Bank Governance Network, comprising almost 50 of the BIS member central banks. Information on institutional design and governance collected via the Network and other research are made available to central bank officials. Selected examples of this research are published.

In 2015/16, the Governance Group convened during several BIS bimonthly meetings to discuss, among other topics, the evolution of liquidity assistance policies and their legal foundations; reasons why central banks might create senior executive positions along the lines of private sector chief officer posts; issues around changing central bank law; and the commission by central banks of special purpose reviews of their own performance and arrangements. The information and insights provided help central banks assess the effectiveness of their own arrangements as well as the alternatives available.

Central Bank Governance Group: www.bis.org/cbgov

Irving Fisher Committee on Central Bank Statistics

The Irving Fisher Committee on Central Bank Statistics (IFC) is a forum for central bank economists and statisticians to address statistical topics related to monetary and financial stability. Governed by the international central banking community, it is hosted by the BIS and associated with the International Statistical Institute (ISI). The IFC has 83 institutional members, including almost all BIS shareholder central banks, and is currently chaired by Turalay Kenç, Deputy Governor of the Central Bank of the Republic of Turkey.

The IFC organised several activities in 2015/16 with the support of its member central banks and a number of international organisations. A significant part of this work was conducted in cooperation with the G20-endorsed international Data Gaps Initiative (DGI) to enhance economic and financial statistics. One important outcome in 2015 was the reference document *Consolidation and corporate groups: an overview of methodological and practical issues*, which draws on the outcome of an IFC workshop on residency/local and nationality/global views of financial positions. Published by the Inter-Agency Group on Economic and Financial Statistics (IAG), the report completes the DGI recommendation to investigate the issue of monitoring and measuring cross-border exposures of corporations.

Another key DGI recommendation is to develop and improve sectoral financial accounts. To that end, the IFC has continued to organise regional workshops for central banks, including one at the Bank of Algeria for the African region in early 2016. In a third DGI-related area, the IFC has followed up on data-sharing issues and good practices between statistical and supervisory authorities.

The Committee also continued its work on financial stability analysis and balance of payments issues as well as on other topics relevant to the central banking statistical community. In particular, following the publication of a specific IFC Bulletin on financial inclusion indicators, it surveyed its members on national practices and projects related to financial inclusion in 2015. It also reviewed central banks' experience and interest in exploring big data as well as their use of the SDMX (Statistical Data and Metadata eXchange) standard, with the publication of two reports on these topics.

In terms of meetings, the IFC organised a seminar on the assessment of post-crisis international capital flows in cooperation with the Central Bank of Brazil and the Center for Latin American Monetary Studies (CEMLA). Together with Narodowy Bank Polski (the central bank of Poland), it also held a workshop on combining micro and macro statistical data for financial stability analysis. Finally, the IFC sponsored several sessions at the ISI's 60th biennial World Statistics Congress in 2015 on topics such as central bank sources and uses of derivatives statistics; improving government debt statistics; the use of surveys by central banks; developing and improving sectoral accounts; and micro data for multipurpose data provision.

IFC: www.bis.org/ifc

Financial Stability Institute

The Financial Stability Institute (FSI) assists supervisors worldwide in strengthening their financial systems by disseminating global financial standards. The FSI carries out this task through high-level meetings; policy and implementation meetings; conferences and seminars; FSI Connect, the BIS's online information resource and learning tool; and by monitoring the implementation of Basel standards in non-BCBS member jurisdictions.

High-level meetings

The FSI organises high-level meetings jointly with the BCBS in all major regions of the world. These meetings are designed for the Deputy Governors of central banks and heads of supervisory authorities, and focus on policy discussions relating to global banking standards, emerging financial developments, and regional implementation issues. In 2015, 286 heads of supervision in Africa, Asia-Pacific, central and eastern Europe, Latin America, and the Middle East and North Africa attended FSI high-level meetings.

The topics discussed included the recent BCBS policy work to mitigate risk-weighted asset variability through the enhancement of standardised approaches; the impact of Basel III on bank business models; bank governance and culture; the FSB's new Total Loss-Absorbing Capacity (TLAC) requirements; and emerging cyber risks in the financial industry.

Policy and implementation meetings

In 2015, the FSI introduced policy and implementation meetings for senior officials who play a key decision-making role in implementing regulatory reforms at the national level (ie divisional/departmental heads at financial authorities). The purpose is to discuss policy and supervisory issues related to new aspects of the Basel III framework. Held in Lima and Hong Kong, the first such meetings focused on revisions to the standardised approach for credit risk.

Conferences and seminars

These events provide a venue for supervisors around the world to confer on core aspects of financial sector regulation and supervision. Separate events cover banking, insurance, and cross-sectoral areas.

On the banking side, the FSI organised 30 seminars and conferences in 2015. These included 10 events in Switzerland and 20 in other jurisdictions, which were organised in cooperation with 14 regional supervisory groups.[4] The main topics covered at these events included supervisory techniques and bank practices on stress testing; supervisory approaches to dealing with regional and domestic systemically important banks; liquidity risk management and supervision; and the implementation of the Basel III Countercyclical Capital Buffer.

The FSI held eight insurance-related seminars, of which five were in collaboration with the International Association of Insurance Supervisors (IAIS). The main topics covered were the new solvency and capital standards for insurers; the policy framework for global systemically important insurers (G-SIIs); and the emerging resolution framework for insurers. The FSI, in collaboration with the IAIS, also organised a virtual seminar for 189 insurance supervisors from 59 jurisdictions, involving a series of seven webinars and selected FSI Connect tutorials covering topics on the key elements of insurance supervision.

In 2015, the FSI organised two cross-sectoral events, one jointly with IOSCO and another with International Association of Deposit Insurers (IADI). The joint event with IOSCO covered cross-sectoral issues relating to the trading book, market infrastructure and the culture of compliance. The event co-organised with IADI focused on current and emerging issues related to bank resolution, crisis management and deposit insurance.

In total, 1,544 central bankers and financial sector supervisors attended FSI conferences and seminars.

FSI Connect

FSI Connect offers over 260 tutorials covering a wide range of regulatory policy and supervisory topics. It now has about 10,000 subscribers from over 300 central banks and other public sector financial authorities.

In 2015, the FSI released 29 new and updated tutorials on topics such as the leverage ratio; the standardised approach to counterparty credit risk; external audit; the new accounting standards on financial instrument impairment; regulation and supervision of inclusive insurance markets; basic capital requirements and market-adjusted valuation for G-SIIs; and the *Core principles for effective deposit insurance systems*.

[4] Africa: Macroeconomic and Financial Management Institute of Eastern and Southern Africa (MEFMI); and Southern African Development Community (SADC). Americas: Association of Supervisors of Banks of the Americas (ASBA); Center for Latin American Monetary Studies (CEMLA); and Caribbean Group of Banking Supervisors (CGBS). Asia and the Pacific: Executives' Meeting of East Asia-Pacific Central Banks (EMEAP) Working Group on Banking Supervision; South East Asian Central Banks (SEACEN); and Central Banks of South East Asia, New Zealand and Australia (SEANZA) Forum of Banking Supervisors. Europe: European Banking Authority (EBA); and Group of Banking Supervisors from Central and Eastern Europe (BSCEE). Middle East: Arab Monetary Fund (AMF); and Gulf Cooperation Council (GCC) Committee of Banking Supervisors. Other: Group of French-Speaking Banking Supervisors (GSBF); and Group of International Finance Centre Supervisors (GIFCS).

Monitoring implementation of Basel standards in non-BCBS member jurisdictions

The FSI annually surveys non-BCBS member jurisdictions on their implementation of the Basel III framework. The results of this survey are part of the annual BCBS report to the G20 Leaders. The 2015 survey results showed that 121 countries worldwide, including BCBS member jurisdictions, had implemented or were in the process of implementing Basel III.[5]

FSI: www.bis.org/fsi

Activities of BIS-hosted associations

This section reviews the year's principal activities of the three associations hosted by the BIS in Basel.

Financial Stability Board

The Financial Stability Board (FSB) coordinates at the international level the financial stability work of national authorities and international standard-setting bodies, and develops and promotes financial sector policies to enhance global financial stability. The FSB's mandate, membership and framework of committees and management are set out in its Annual Report. The FSB is chaired by Mark Carney, Governor of the Bank of England.

The FSB continued its policy work to address the causes of the financial crisis, increased its work to analyse the implementation and effects of these reforms, and continued to monitor emerging vulnerabilities in the financial system.

Reducing the moral hazard posed by systemically important financial institutions

The FSB finalised important elements of its policy agenda to address the moral hazard risks posed by global systemically important financial institutions (G-SIFIs).

Resolution of SIFIs. In November 2015, the FSB published the final Total Loss-Absorbing Capacity (TLAC) standard to ensure that failing G-SIBs will have sufficient loss-absorbing and recapitalisation capacity for authorities to implement an orderly resolution that mitigates the impact on financial stability, maintains the continuity of critical bank functions and avoids the use of public funds.

In November 2015, the FSB published *Principles for Cross-border Effectiveness of Resolution Actions*, which provides principles on statutory and contractual mechanisms that jurisdictions should consider including in their legal frameworks to give cross-border effect to resolution actions. In November 2015, the FSB also published guidance on cooperation and information-sharing between supervisors in Crisis Management Groups (CMGs) for G-SIFIs and authorities from jurisdictions not represented on a CMG where a firm is systemic for their market.

In November 2015, the FSB published a progress report for the G20 on its ongoing resolution work. The report set out the results of the first round of the Resolvability Assessment Process (RAP) and ongoing policy work to promote the full

[5] A jurisdiction that has implemented or indicated plans to implement at least one component of Basel III is deemed to be in the process of implementing Basel III. "Implementation" here refers to a change made in a jurisdiction's legislation, rules and policy documents.

implementation of the *Key Attributes of Effective Resolution Regimes for Financial Institutions*. In the same month, the FSB also issued consultative documents on funding in resolution and on arrangements to support operational continuity in resolution, and on effective resolution strategies for systemic insurers. In March 2016, the FSB published its second thematic peer review on resolution regimes for banks in FSB member jurisdictions.

In July 2015, the FSB announced it would wait to finalise the assessment methodologies for identifying non-bank non-insurer global systemically important financial institutions (NBNI G-SIFIs) until work on the financial stability risks posed by asset management activities was completed. This allowed for further time to analyse these activities and will inform the decision on further steps to take on the revised assessment methodology.

The FSB, BCBS, CPMI and IOSCO continued their work to enhance the resilience, recovery planning and resolvability of central counterparties.

SIFI identification and higher loss absorbency. The FSB published new lists for G-SIBs and G-SIIs in November 2015. In the same month, the International Association of Insurance Supervisors (IAIS) consulted on revisions to the G-SII methodology and changes to the definition of non-traditional, non-insurance (NTNI) activities. Both efforts will be instrumental for a revised G-SII methodology that can appropriately address all types of insurance, reinsurance and other financial activities of global insurers. The 2016 G-SII list is expected to use the agreed new methodology.

In October 2015, the IAIS published the first version of its Higher Loss Absorbency (HLA) requirement for G-SIIs, which was endorsed by the FSB Plenary in September.

More intense supervisory oversight. In May 2015, the FSB published a thematic peer review on supervisory frameworks and approaches for systemically important banks. The review concluded that national authorities have taken significant steps to enhance supervisory effectiveness. More work is needed to further enhance effectiveness, in particular by strengthening cross-border supervisory cooperation.

Improving the OTC derivatives markets

In November 2015, the FSB published its 10th progress report on the implementation of OTC derivatives market reforms. In the same month, the FSB also published a thematic peer review on OTC derivatives trade reporting; this report found that, while good progress has been made in implementing these requirements, further work needs to be undertaken (including by addressing legal barriers to reporting and access) to ensure data collected by trade repositories can be effectively used by regulators.

Transforming shadow banking into resilient market-based finance

Also in November 2015, the FSB published its fifth shadow banking monitoring report, which included a new activity-based "economic function" approach to narrow the focus to parts of the non-bank financial sector where shadow banking risks may arise and may need appropriate policy responses. The report was published together with a progress report on the FSB's work on *Transforming Shadow Banking into Resilient Market-based Finance*. In the same month, to address financial stability risks, the FSB also published final policy recommendations for haircuts on certain non-bank-to-non-bank, non-centrally cleared securities financing transactions.

In November 2015, the FSB also published *Standards and Processes for Global Securities Financing Data Collection and Aggregation*, which set out details about enhanced data collection on securities financing markets to obtain a more timely and comprehensive perspective on developments in these markets and so detect financial stability risks.

Measures to reduce misconduct risk

The FSB coordinated several workstreams addressing misconduct in the financial sector and published a progress report to the G20 in November 2015. The workstreams included considering whether post-crisis reforms to incentives are sufficient to address misconduct risks; and whether steps are needed to improve global standards of conduct in the fixed income, commodity and currency (FICC) markets, including improvements in the integrity and reliability of benchmarks. A further update on the use of governance frameworks and various compensation tools for addressing misconduct risk will be provided by the time of the G20 Leaders' Summit in September 2016.

In July 2015, the FSB published a progress report on steps being taken by authorities to reform interest rate benchmarks in key currencies. These included steps to improve major interest rate benchmarks (such as Libor, Euribor and Tibor), as well as the development and introduction of near risk-free interest rate benchmarks in several jurisdictions. The FSB also published a progress report on reforms to foreign exchange benchmarks in October 2015.

Addressing the decline in correspondent banking

The FSB initiated work to examine the extent and causes of banks' withdrawal from correspondent banking and the implications for affected jurisdictions. The resulting *Report to the G20 on actions taken to assess and address the decline in correspondent banking* published in November 2015 presented a four-point action plan that will be implemented in partnership with other organisations. The work will further examine the reasons for the decline in correspondent banking relationships and implications for financial inclusion and financial stability; clarify regulatory expectations, including through additional guidance by the Financial Action Task Force; support domestic capacity-building in jurisdictions that are home to affected respondent banks; and strengthen tools for due diligence by correspondent banks.

Addressing data gaps

The International Monetary Fund (IMF) and the FSB published their sixth annual progress report on the implementation of the G20 Data Gaps Initiative in September 2015. The report noted significant progress in addressing the data gaps identified after the financial crisis. The IMF and FSB proposed a second phase with a five-year horizon with more specific objectives that promote the regular flow of high-quality statistics for policy use. This was endorsed by the G20.

Advancing transparency through the Legal Entity Identifier

The objective of the global Legal Entity Identifier (LEI) system is to provide unique identification of parties to financial transactions across the globe. Over 415,000 entities in 195 countries have received unique identifiers for financial transactions. Authorities in several FSB jurisdictions are already using the LEI to support regulatory actions, as described in the progress report of the LEI Regulatory Oversight

Committee (LEI ROC). The FSB is providing secretariat services to the LEI ROC and will continue to promote LEI uses to support regulatory actions and data quality.

Strengthening accounting standards

The FSB supports the work of the International Forum of Independent Audit Regulators (IFIAR) to enhance audit quality. In September 2015, it publicly expressed encouragement for the IFIAR's work with the big six audit firms to promote greater consistency of audit quality in G-SIFIs.

Enhanced Disclosure Task Force (EDTF)

The EDTF was a private sector initiative to enhance the risk disclosure practices of major banks. It has issued principles and recommendations for such disclosures and has conducted three annual surveys on the level and quality of implementation in the major banks' annual reports. The last survey was published in December 2015 and showed significant progress in implementing the recommendations.

At the FSB's request, the EDTF published in December 2015 a report on the *Impact of Expected Credit Loss Approaches on Bank Risk Disclosures*, which recommends changes banks will need to make to their financial disclosures with the implementation of the new accounting standards for expected credit loss.

The EDTF's work has now been completed, and the Task Force has been formally disbanded.

Task Force on Climate-related Financial Disclosure (TCFD)

In December 2015, the FSB established the TCFD to develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to lenders, insurers, investors and other stakeholders. The Task Force will consider the physical, liability and transition risks associated with climate change, and what constitutes effective financial disclosures in this area. The FSB announced the initial membership of the Task Force in January 2016 and presented its Phase 1 report to the FSB in March.

Corporate funding structures and incentives

The FSB coordinated work to consider the factors that shape the liability structure of corporates, focusing on the implications for financial stability. The report to the G20 highlighted the growth of non-financial corporate debt in many countries over the past 15 years, including an acceleration in emerging economies since the financial crisis.

Monitoring implementation and the effects of reforms

Implementation monitoring of agreed standards and the analysis of the effects of the G20 reforms are a key part of the FSB's work. In November 2015, the FSB published its first annual report to the G20 on the implementation and effects of financial regulatory reforms. The report found that implementation progress has been steady but uneven; that the most tangible effect of the reforms has been to make the banking sector more resilient; and that this improved resilience has been achieved while maintaining the overall provision of credit to the real economy.

In addition to periodic progress reports, the FSB monitors the implementation and effectiveness of international financial standards and policies via its peer review

programme. Over the past year, the FSB published country peer reviews of China, Saudi Arabia and Turkey, as well as a thematic review on supervisory frameworks and approaches for SIBs in May 2015. During the year, it started work on the country review of India and a thematic review on shadow banking.

FSB: www.fsb.org

International Association of Deposit Insurers

The International Association of Deposit Insurers (IADI) is the global standard-setting body for deposit insurance systems. IADI contributes to the stability of financial systems by advancing standards and guidance for effective deposit insurance systems and promoting international cooperation among deposit insurers, bank resolution authorities and other safety net organisations.

The number of organisations affiliated with IADI stands at 102, comprising 80 deposit insurers as members, nine central banks and bank supervisors as associates, and 13 institutional partners. Thus, almost 70% of all jurisdictions with explicit deposit insurance systems are represented within IADI's membership.

In 2015, Thomas M Hoenig, Vice President of the US Federal Deposit Insurance Corporation, was appointed as IADI's President and Chair of its Executive Council, succeeding Jerzy Pruski, President of the Management Board of Poland's Bank Guarantee Fund.

Strategic goals

IADI revised its strategic goals for 2015–18, adopting three new objectives: promoting compliance with the IADI Core Principles for Effective Deposit Insurance Systems; advancing deposit insurance research and policy development; and providing IADI members with technical support to modernise and upgrade their systems.

IADI's Core Principles are incorporated in the FSB's Key Standards for Sound Financial Systems, and are used in the Financial Sector Assessment Program (FSAP) reviews conducted by the IMF and the World Bank.

After updating the Core Principles in 2014, IADI updated its Core Principles Assessment Handbook. The Handbook is used for ensuring accurate interpretation and understanding of each Principle when conducting the assessment process against IADI standards.

In support of the strategic goals, the Association has undertaken a review of its governance structure and funding arrangements, with a strong emphasis on building a long-term funding model that would adequately resource the planned framework of IADI's initiatives for policy development and technical assistance.

International conferences and events

IADI's Third Biennial Research Conference, held in June 2015 at the BIS in Basel, provided a forum for researchers and safety net practitioners to advance their knowledge on a wide range of issues facing contemporary deposit insurers.

In September 2015, IADI and the FSI held their fifth annual joint seminar on bank resolution, crisis management and deposit insurance issues. Since 2008, IADI, in cooperation with the FSI, has produced eight online tutorials on deposit insurance systems.

Crisis management, together with the challenges deposit insurers face in responding to upcoming crises, was the focus of IADI's 14th Annual Conference, held in October 2015 in Kuala Lumpur, Malaysia.

IADI also hosted global and regional seminars in a wide variety of locations, on topics identified in IADI member survey results, including funding, claims management, legal frameworks, and Islamic and integrated deposit insurance systems.

IADI: www.iadi.org

International Association of Insurance Supervisors

The International Association of Insurance Supervisors (IAIS) is the global standard-setting body for the insurance sector. Its mission is to promote effective and globally consistent insurance supervision and to contribute to global financial stability so that policyholders benefit from fair, safe and stable insurance markets. Victoria Saporta, Director of Financial Policy of the Prudential Regulation Authority at the Bank of England, chairs the IAIS Executive Committee.

ComFrame

Since 2011, the IAIS has been designing ComFrame, a common framework for the supervision of internationally active insurance groups (IAIGs). It provides a set of international supervisory requirements focusing on effective group-wide supervision of IAIGs. These requirements expand upon those in the IAIS Insurance Core Principles. Field-testing of ComFrame started in 2014 and will continue through 2019, when it is scheduled for formal adoption. Members will begin implementing it shortly thereafter.

In February 2016, the IAIS completed field-testing of the qualitative requirements for IAIGs set out in ComFrame. These covered legal and management structures, in addition to governance and enterprise risk management. Field-testing results will be taken into account in future drafts for further public consultation later in 2016.

Assessment methodology for global systemically important insurers

Global systemically important insurers (G-SIIs) are insurance entities whose distress or disorderly failure would cause significant disruption to the global financial system and economic activity. Throughout 2015 and continuing into 2016, the IAIS undertook its first three-year review of the 2013 initial assessment methodology used by the FSB to identify G-SIIs and, in November 2015, issued a consultation document reflecting improvements and refinements drawn from the application of the initial assessment methodology. The IAIS is expected to approve a revised methodology later in 2016.

Global insurance capital standards

In November 2015, the IAIS adopted its initial version of the higher loss absorbency requirements for G-SIIs, which G20 leaders subsequently endorsed. This followed Executive Committee approval and FSB endorsement in October 2015.

In September 2015, IAIS workgroups completed the second annual field-testing exercise for the development of the first two insurance capital standards – the basic capital requirement and higher loss absorbency for G-SIIs. These workgroups have also drafted field-testing packages for launch in May 2016 and consultation for launch in July 2016.

Insurance Core Principles

Insurance Core Principles (ICPs) developed by the IAIS provide a globally accepted framework for the regulation and supervision of the insurance sector. In November 2015, the IAIS adopted revisions to Licensing (ICP 4), Suitability of Persons (ICP5), Corporate Governance (ICP 7), Risk Management and Internal Control (ICP 8), Group-wide Supervision (ICP 23) and Supervisory Cooperation and Coordination (ICP 25). These changes followed the comprehensive self-assessments and peer reviews, taking into account recent developments in group supervision, corporate governance and risk management, as well as standards and guidance issued by other standard-setting bodies.

International accounting and auditing

As part of the revisions to Insurance Core Principle 7 adopted in November 2015, the IAIS strengthened supervisory expectations of insurer boards in overseeing external audit processes. The IAIS also submitted comments to the International Accounting and Auditing Standards Board concerning its proposal on "Enhancing audit quality in the public interest".

Macroprudential policy and surveillance framework

In January 2016, the IAIS released its *2015 Global Insurance Market Report* covering the global insurance sector from a supervisory perspective with a focus on sector performance and key risks. This report is a key component of the IAIS macroprudential policy and surveillance framework. The report found that the global (re)insurance sector remains stable in the midst of a challenging economic and financial environment with surging merger and acquisition activity in the sector.

Supporting materials

Over the course of the year, the IAIS published papers on the regulation and supervision of captive insurers, conduct of business risk and its management, and conduct of business in inclusive insurance.

Self-assessment and peer reviews

As part of a comprehensive thematic review of the Insurance Core Principles, the IAIS released its aggregate report on Supervisory Measures in October 2015. This report included a review of Supervisory Review and Reporting (ICP 9), Preventative and Corrective Measures (ICP 10) and Enforcement (ICP 11). These assessment results help identify areas for potential revision and feed into IAIS standard-setting and implementation efforts.

Multilateral memorandum of understanding

Insurance supervisor signatories to the IAIS Multilateral Memorandum of Understanding (MMoU) participate in a global framework for cooperation and information exchange. The memorandum sets the minimum standards required of signatories. Supervisors participating in the MMoU are in a better position to promote the financial stability of cross-border insurance operations for the benefit of consumers. Twelve new signatories joined the MMoU, bringing the number of signatories to 55 jurisdictions representing more than 65% of worldwide premium volume.

Coordinated implementation framework

The Coordinated Implementation Framework guides the implementation of the IAIS supervisory material work programme. Last year, the IAIS provided online training for 177 new supervisors from 46 jurisdictions in partnership with the Financial Stability Institute. It also launched an update of the Core Curriculum with the World Bank, continued its regional capacity-building programme with the Asian Development Bank, and collaborated with the Access to Insurance Initiative, to advance capacity-building in inclusive insurance markets, a key focus for standard-setting bodies under the Global Partnership for Financial Inclusion.

IAIS: www.iaisweb.org

Economic analysis, research and statistics

The BIS's economic analysis and research on monetary and financial stability policy issues are conducted by its Monetary and Economic Department (MED). Economists are located at the head office in Basel and at the BIS Representative Offices in Hong Kong SAR and Mexico City. The BIS also compiles and disseminates international statistics on financial institutions and markets. Through its economic analysis, research and statistics, the BIS helps to meet the needs of monetary and supervisory authorities for policy insight and data.

Analysis and research in the Basel Process

Analysis and research at the BIS are the basis of its background notes for meetings, analytical support for the Basel-based Committees, and the Bank's own publications. Research seeks to strike a balance between responsiveness to short-term issues and proactiveness in identifying what will become key themes in future.

Collaborative efforts with central bank and academic researchers around the world stimulate broad dialogue on the policy questions that merit deeper study. To strengthen research collaboration with senior professionals from academia and research institutions, the BIS in 2015 launched the Alexandre Lamfalussy Senior Research Fellowship. This fellowship complements the visiting fellows programme for academic researchers and the Central Bank Research Fellowship (CBRF) Programme. Moreover, the BIS has set up an Advisory Panel, consisting of distinguished academics with established reputations, that serves as an independent sounding board for BIS research and analysis, provides connections between subject areas and offers new insights on current research topics.

The BIS also organises conferences and workshops to bring together participants from policy, research and business. The flagship event for central bank Governors is the BIS Annual Conference. In June 2015, the 14th BIS Annual Conference focused on financial markets, taking stock of post-crisis lessons about the way they function and exploring if they were evolving towards a "new normal". Moreover, the semiannual meetings of the BIS Research Network provide an opportunity to discuss current macroeconomic and financial topics.

Most BIS analysis and research is published on the Bank's website, and in the *Annual Report*, the *BIS Quarterly Review*, *BIS Papers* and *BIS Working Papers*. BIS economists also publish in professional journals and other external publications.

BIS research: www.bis.org/forum/research.htm

Research topics

Reflecting the Bank's mission, BIS research centres on monetary and financial stability. The key areas of research are currently changes in financial intermediation; new frameworks for monetary and financial stability policy; and the global economy and spillovers. Under these headings, the specific topics taken up in the year included the evolution of non-bank financial intermediaries and the implications for systemic risk; the effectiveness of current monetary policies; pre- and post-boom resource misallocations; determinants of global liquidity; and the risk-taking channel of the exchange rate.

The research on financial intermediation aims at clarifying the interaction between financial institutions and markets. Analysing the way different intermediaries operate and markets function is an important foundation for this work. The perspectives gained help policymakers evaluate changes in the financial system for financial stability and monetary policies, both nationally and internationally. They also underpin the monitoring of financial vulnerabilities and cross-border spillovers, and inform the design of regulation and supervision, crisis management tools and resolution techniques as well as various aspects of monetary policy frameworks, including strategy, tactics and day-to-day implementation.

Over the past year, work in this area included research on the behaviour of asset managers and other non-bank financial intermediaries; the impact of monetary policy on bank profitability and the portfolio choices of long-term investors; the determinants of long-term debt issuance; and the implications of negative interest rates for market functioning.

Research on post-crisis monetary and financial stability policy frameworks aims to strengthen the analytical foundations of central bank policy. The gap between the theory and practice of central bank policy has widened as central banks have adopted increasingly unconventional measures, and the lines between policies targeting financial, macroeconomic and price stability have become increasingly blurred.

During the past year, specific projects in this area studied the impact of credit cycles on resource allocation; leverage and debt service ratios as drivers of financial cycles; and the effectiveness of macroprudential policies and their relationship with monetary policy.

Research on the global economy and spillovers focuses on how monetary and financial stability is affected by the tight real and financial integration of the global economy. The importance of such spillovers is reflected in the increasingly popular notion of "global liquidity", in both academic and policy circles.

One main focus of research in this area during the year was the risk-taking channel of the exchange rate. Others included policy dilemmas for emerging economies resulting from dollar borrowing; international reserves and capital flow dynamics; and the financial stability and macroeconomic implications of foreign currency borrowing. The BIS international banking statistics provide key information for these studies.

International statistical initiatives

The BIS's unique set of international banking and financial statistics underpins the Basel Process by supporting the analysis of global financial stability. This involves close cooperation with other financial international organisations, especially through the BIS's participation in the Inter-Agency Group on Economic and

Financial Statistics (IAG).[6] This is the body tasked with coordinating and monitoring the implementation of the recommendations to address the data gaps revealed by the financial crisis, in accord with the FSB and IMF proposals to the G20. Following the completion of the initiative's first phase in 2015, a second five-year phase is now under way with the aim of implementing the regular collection and dissemination of comparable, timely, integrated, high-quality and standardised statistics for policy use.

To close the data gaps related to international banking activities, the CGFS approved in 2011–12 enhancements to a key set of BIS data, the international banking statistics (IBS) reported by central banks under the guidance of the CGFS. These enhancements, finalised in 2015, have extended the coverage of the locational and consolidated banking statistics from banks' international activities to their domestic positions and the provision of information on banks' counterparties, specifically on their location and sector. As part of the second phase, the BIS has now started work with all reporting countries to close reporting gaps, review options for improving the consistency between the consolidated IBS and supervisory data, and support efforts to make data more widely available.

In addition to banking statistics, the BIS is also expanding the variety of the other statistics published on its website, including property prices, debt securities, debt service ratios, credit to the private and public sectors, global liquidity, effective exchange rates, foreign exchange markets, derivatives and payment systems. This statistical work focuses on long-term financial stability indicators to support the BIS's own research agenda as well as the initiatives of the Basel Process and the G20. It relies extensively on the BIS Data Bank, which contains, in particular, key economic indicators shared among BIS member central banks.

As part of these efforts, the BIS significantly expanded its statistical releases with the launch in September 2015 of the *BIS Statistical Bulletin,* now published concurrently with the *BIS Quarterly Review* and accompanied with informative charts illustrating the latest developments. The new bulletin comprises, in particular, the enhanced data on international banking and debt securities issuance as well as the new BIS series on government debt and estimates of debt service ratios for selected sectors. To complement the enhanced *BIS Statistics Warehouse*, a search tool for customised statistical queries was set up: the *BIS Statistics Explorer* is a new browsing tool for pre-defined views of the most current data.

Finally, the BIS hosts the International Data Hub, where information about systemically important financial institutions is stored and analysed on behalf of a limited number of participating supervisory authorities. The analysis supports participating supervisors in their engagement with G-SIBs and by enriching the dialogue between supervisors across jurisdictions. The first phase of this initiative, covering firms' credit exposures, was completed in 2013. The second phase, now under way, involves the gathering of data covering these firms' funding dependencies. The third phase will lead to the collection of additional information on the consolidated balance sheet of individual G-SIBs.

BIS statistics: www.bis.org/statistics

[6] The IAG comprises the BIS, the ECB, Eurostat, the IMF, the OECD, the United Nations and the World Bank (www.principalglobalindicators.org). These organisations also sponsor the Statistical Data and Metadata eXchange (SDMX), whose standards the BIS uses for its collection, processing and dissemination of statistics (www.sdmx.org).

Other areas of international cooperation

The BIS participates in international forums such as the G20 and collaborates with key international financial institutions such as the International Monetary Fund and the World Bank Group. The BIS also contributes to the activities of central banks and regional central bank organisations by participating in their events as well as occasionally hosting joint events. During the past year, it co-organised events or collaborated with the following regional organisations on the topics outlined below:

- CEMLA (Center for Latin American Monetary Studies) – foreign exchange intervention, financial information, payment and settlement systems, regional banking integration, and reserves management;
- EMEAP (Executives' Meeting of East Asia-Pacific Central Banks) – foreign exchange and other financial markets;
- FLAR (Latin American Reserve Fund) – reserves management;
- MEFMI (Macroeconomic and Financial Management Institute of Eastern and Southern Africa) – macroprudential surveillance and reserves management; and
- SEACEN (South East Asian Central Banks) Research and Training Centre – stress testing, payment and settlement systems, macroeconomic and monetary policy management, financial stability and banking supervision.

Financial services

Through its Banking Department, the BIS offers a wide range of financial services designed to support the reserves management activities of central banks and other official monetary authorities, and to foster international cooperation in this area. Some 140 institutions, as well as a number of international organisations, make use of these services.

Safety and liquidity are the key features of BIS credit intermediation, which is supported by rigorous internal risk management. Independent control units reporting directly to the BIS Deputy General Manager monitor and control the related risks. A compliance and operational risk unit monitors operational risk, while financial risks – ie credit, liquidity and market risks – are overseen by a risk control unit that is also responsible for ensuring an integrated approach to risk management.

BIS financial services are provided from two linked trading rooms: one in Basel, at the Bank's head office; and one in Hong Kong SAR, at its Representative Office for Asia and the Pacific.

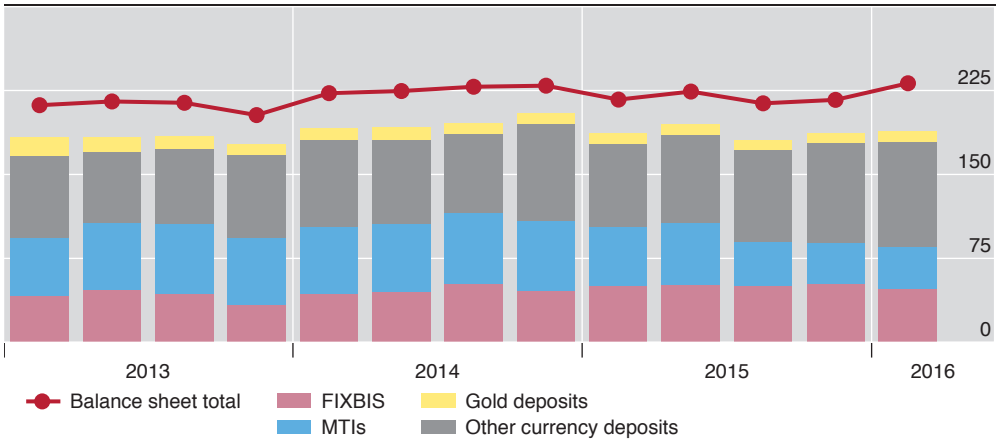
Scope of services

As an institution owned and governed by central banks, the BIS is well placed to understand the needs of reserves managers – their primary focus on safety and liquidity as well as the evolving need to diversify their exposures. To meet those needs, the BIS offers investments that vary by currency, maturity and liquidity. In addition, the Bank provides short-term liquidity facilities and extends credit to central banks, usually on a collateralised basis. Moreover, the Bank can act as trustee and collateral agent in connection with international financial operations.

Tradable instruments are available in maturities ranging from one week to five years, in the form of Fixed-Rate Investments at the BIS (FIXBIS), Medium-Term Instruments (MTIs) and products with embedded optionality (Callable MTIs). These instruments can be bought or sold throughout the Bank's dealing hours. Also offered are money market placements, such as sight/notice accounts and fixed-term deposits.

Balance sheet total and deposits by product

End-quarter figures, in billions of SDR



The sum of the bars indicates total deposits.

On 31 March 2016, total deposits stood at SDR 189 billion, of which about 95% were denominated in currencies and the remainder in gold (see graph).

The Bank transacts foreign exchange and gold on behalf of its customers, thereby providing access to a large liquidity base in the context of their rebalancing of reserve portfolios. The Bank's foreign exchange services encompass spot transactions in major currencies and Special Drawing Rights (SDR), as well as swaps, outright forwards, options and dual currency deposits (DCDs). In addition, the Bank provides gold services that include buying and selling, sight accounts, fixed-term deposits, earmarked accounts, quality upgrading, refining and location exchanges.

The BIS provides asset management products in the form of (i) dedicated portfolio management mandates tailored to each customer's preferences; or (ii) BIS Investment Pools (BISIPs), which are open-end fund structures that allow customers to invest in a common pool of assets. The BISIP structure is also used for the Asian Bond Fund (ABF) initiative sponsored by EMEAP to foster the development of local currency bond markets. Also based on this structure are the following initiatives developed with a group of advising central banks: the BISIP ILF1 (a US inflation-protected government securities fund); the BISIP CNY (a domestic Chinese sovereign fixed income fund); and the BISIP KRW (a domestic Korean sovereign fixed income fund).

The BIS Banking Department hosts global and regional meetings, as well as seminars and workshops on reserves management issues. These gatherings facilitate the exchange of knowledge and experience among reserves managers and promote the development of investment and risk management capabilities in central banks and international organisations. The Department also occasionally supports central banks in reviewing and assessing their reserves management practices.

Representative Offices

The BIS has a Representative Office for Asia and the Pacific (the Asian Office), located in Hong Kong SAR, and a Representative Office for the Americas (the

Americas Office), located in Mexico City. The Representative Offices promote cooperation and foster the exchange of information and data within each region by organising meetings, supporting regional institutions and Basel-based committees, and conducting research. The Asian Office also provides banking services to the region's monetary authorities. It is also through the office in Hong Kong that the Financial Stability Institute delivers a programme of meetings and seminars in the region that are closely tailored to local priorities.

As part of the overall BIS research programme, economists in the Representative Offices work with academics from around the world. In addition, both offices have developed secondment programmes to deepen research collaboration with member central banks in their respective regions. Papers based on research carried out in the Representative Offices, and published in BIS reports or external journals, have been used to inform policy discussions in various central bank meetings.

The Asian Office

The Asian Office's research activities are guided by the Asian Consultative Council (ACC), comprising the Governors of the 12 BIS member central banks in the Asia-Pacific region.[7] Governor Graeme Wheeler of the Reserve Bank of New Zealand succeeded Governor Amando Tetangco of Bangko Sentral ng Pilipinas as the Council's Chair in April 2016.

Economists in the Asian Office carried out research on two themes endorsed by the ACC. On the monetary policy side, the theme was "Expanding the boundaries of monetary policy in Asia and the Pacific". The highlights of the research findings were discussed at a conference held in Jakarta in August 2015. On the financial stability side, the theme for the 2016 research conference is "Financial systems and the real economy".

At an ACC meeting in February 2016, the Council endorsed a new research theme on exchange rates. Topics such as the effect of currency movements on output and inflation and the risk-taking channel of exchange rates will be covered.

The Asian Office organised nine high-level BIS policy meetings. Most of these were organised jointly with a central bank or with either the Executives' Meeting of East Asia-Pacific Central Banks (EMEAP) or the South East Asian Central Banks (SEACEN).

In February 2016, the ACC convened with other Governors from around the world in a meeting that combined the Special Governors' Meeting and BIS bimonthly meeting. This was held in Shanghai with the People's Bank of China as host. For the sixth consecutive year, the event included a roundtable with the chief executive officers of large financial institutions. The discussions covered issues arising from asset valuations in financial markets and the possible impact of digital technologies on the financial industry.

Other policy discussions organised by the Asian Office included the above-mentioned research conference in Jakarta; the 18th meeting of the Working Party on Monetary Policy in Asia, hosted by Bangko Sentral ng Pilipinas in May 2015 in Manila; the 10th Meeting on Monetary Policy Operating Procedures, held in June 2015 in Hong Kong; a meeting of the EMEAP-BIS Forum on Foreign Exchange Markets, held in the same month in Hong Kong; the Workshop on Financial Systems and the Real Economy, held in July 2015 in Hong Kong; the SEACEN-BIS Exco Seminar, held in October in Port Moresby; the Meeting of the EMEAP-BIS Forum on

[7] The 12 central banks are those of Australia, China, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand.

Foreign Exchange Markets, held in December 2015 in Singapore; and the Roundtable on Developing Corporate Bond Markets, held in December 2015 in Hong Kong.

BIS Asian Office: www.bis.org/about/repoffice_asia.htm

The Americas Office

The Americas Office conducts its cooperative activities under the guidance of the Consultative Council for the Americas (CCA), comprising the Governors of eight BIS member central banks in the region.[8] Stephen S Poloz, Governor of the Bank of Canada, has chaired the CCA since January 2016, succeeding José Darío Uribe, Governor of the Bank of the Republic, Colombia. The work of the Americas Office centres on three main areas: research, central bank operations and financial stability. It also engages in outreach activities.

Research activities are organised mainly through an annual research conference and research networks, under the direction of a Scientific Committee. In April 2015, the Bank of Mexico hosted the Sixth Annual CCA research conference on "Detecting vulnerabilities, monetary policy normalisation and policy frameworks" in Mexico City. The new research network on "The commodity cycle: macroeconomic and financial stability implications" held a workshop in October 2015, hosted by the Americas Office in Mexico City. The network is expected to conclude its work by the end of 2016.

The Consultative Group of Directors of Operations (CGDO) holds regular teleconferences to exchange views on financial market developments and central bank operations. At their annual meeting, hosted by the Central Reserve Bank of Peru in Lima in November 2015, the CGDO discussed derivatives markets in the region. This meeting took place back to back with that of the Working Party on Markets in Latin America, which brought together the members of the CGDO, the BIS Markets Committee and private sector participants. A new study group has been set up to analyse liquidity in forex markets in the Americas.

The Consultative Group of Directors of Financial Stability (CGDFS) deals with financial stability issues of interest to the CCA members, focusing on research. Its annual meeting took place in September 2015 in Vancouver, hosted by the Bank of Canada, where each central bank's main topics of interest were reviewed. Group members were also updated on the working group studying the effectiveness of macroprudential policies based on credit registry data. The working group held a workshop in Mexico City in August 2015, hosted by the Americas Office, and is expected to conclude its work by mid-2016.

Another activity related to financial stability was the Second Roundtable of CCA Governors and chief executive officers of large financial institutions, which was held in May 2015 in Cancún, hosted by the Bank of Mexico. The topics discussed included the challenges arising from falling commodity prices, corporate leverage, liquidity strains and the potential effects of regulation on the financial sector.

As for outreach activities, in August 2015 the Americas Office co-organised with CEMLA a roundtable in Paraguay on the changing patterns of financial intermediation. Furthermore, it organised two sessions at the Annual Meeting of LACEA (Latin American and Caribbean Economic Association), the main economic academic conference in the region.

BIS Americas Office: www.bis.org/about/repoffice_americas.htm

[8] The eight central banks are those of Argentina, Brazil, Canada, Chile, Colombia, Mexico, Peru and the United States.

Governance and management of the BIS

The governance and management of the Bank are conducted at three principal levels: the General Meeting of BIS member central banks; the BIS Board of Directors; and BIS Management.

BIS member central banks

Bank of Algeria
Central Bank of Argentina
Reserve Bank of Australia
Central Bank of the Republic of Austria
National Bank of Belgium
Central Bank of Bosnia and Herzegovina
Central Bank of Brazil
Bulgarian National Bank
Bank of Canada
Central Bank of Chile
People's Bank of China
Bank of the Republic (Colombia)
Croatian National Bank
Czech National Bank
Danmarks Nationalbank (Denmark)
Bank of Estonia
European Central Bank
Bank of Finland
Bank of France
Deutsche Bundesbank (Germany)
Bank of Greece
Hong Kong Monetary Authority
Magyar Nemzeti Bank (Hungary)
Central Bank of Iceland
Reserve Bank of India
Bank Indonesia
Central Bank of Ireland
Bank of Israel
Bank of Italy
Bank of Japan
Bank of Korea
Bank of Latvia
Bank of Lithuania
Central Bank of Luxembourg
National Bank of the Republic of Macedonia
Central Bank of Malaysia
Bank of Mexico
Netherlands Bank
Reserve Bank of New Zealand
Central Bank of Norway
Central Reserve Bank of Peru
Bangko Sentral ng Pilipinas (Philippines)
Narodowy Bank Polski (Poland)
Bank of Portugal
National Bank of Romania
Central Bank of the Russian Federation
Saudi Arabian Monetary Agency
National Bank of Serbia
Monetary Authority of Singapore
National Bank of Slovakia
Bank of Slovenia
South African Reserve Bank
Bank of Spain
Sveriges Riksbank (Sweden)
Swiss National Bank
Bank of Thailand
Central Bank of the Republic of Turkey
Central Bank of the United Arab Emirates
Bank of England
Board of Governors of the Federal Reserve System (United States)

The General Meeting of BIS member central banks

Sixty central banks and monetary authorities are currently members of the BIS and have rights of voting and representation at General Meetings. The Annual General Meeting (AGM) is held no later than four months after 31 March, the end of the BIS financial year. The AGM approves the annual report and the accounts of the Bank, decides on the distribution of a dividend and elects the Bank's auditor.

The BIS Board of Directors

The Board is responsible for determining the strategic and policy direction of the BIS, supervising Management and fulfilling the specific tasks given to it by the Bank's Statutes. The Board meets at least six times a year.

The Board may have up to 21 members, including six ex officio Directors comprising the central bank Governors of Belgium, France, Germany, Italy, the United Kingdom and the United States. Each ex officio member may appoint another member of the same nationality. Nine Governors of other member central banks may be elected to the Board.[9] The Board elects a Chairman from among its members for a three-year term and may elect a Vice-Chairman. In September 2015, the Board elected Jens Weidmann, President of the Deutsche Bundesbank, as its Chairman, to succeed Christian Noyer, Governor of the Bank of France. Two months later, Raghuram Rajan, Governor of the Reserve Bank of India, was elected as the Bank's Vice-Chairman, also with effect from November 2015.

Four advisory committees, established pursuant to Article 43 of the Bank's Statutes, assist the Board in its work:

- The Administrative Committee reviews key areas of the Bank's administration, such as budget and expenditures, human resources policies and information technology. The Committee meets at least four times a year. Its Chairman is Haruhiko Kuroda.
- The Audit Committee meets with internal and external auditors, as well as with the compliance unit. Among its duties is the examination of matters related to the Bank's internal control systems and financial reporting. The Committee meets at least four times a year and is chaired by Stephen S Poloz.
- The Banking and Risk Management Committee reviews and assesses the Bank's financial objectives, the business model for BIS banking operations and the risk management frameworks of the BIS. The Committee meets at least once a year. Its Chairman is Stefan Ingves.
- The Nomination Committee deals with the appointment of members of the BIS Executive Committee and meets on an ad hoc basis. It is chaired by the Board's Chairman, Jens Weidmann.

Board of Directors[10]

Chairman: Jens Weidmann, Frankfurt am Main
Vice-Chairman: Raghuram G Rajan, Mumbai
Mark Carney, London
Agustín Carstens, Mexico City

[9] In addition, one member of the Economic Consultative Committee (see page 136) serves as an observer to BIS Board meetings on a rotating basis.

[10] As at 1 June 2016. The list includes the rotating observer mentioned above.

Luc Coene, Brussels
Jon Cunliffe, London
Mario Draghi, Frankfurt am Main
William C Dudley, New York
Stefan Ingves, Stockholm
Thomas Jordan, Zurich
Klaas Knot, Amsterdam
Haruhiko Kuroda, Tokyo
Anne Le Lorier, Paris
Fabio Panetta, Rome
Stephen S Poloz, Ottawa
Jan Smets, Brussels
Alexandre A Tombini, Brasília
François Villeroy de Galhau, Paris
Ignazio Visco, Rome
Janet L Yellen, Washington
Zhou Xiaochuan, Beijing

Alternates

Andreas Dombret, Frankfurt am Main
Stanley Fischer, Washington
Jean Hilgers, Brussels
Chris Salmon, London
Marc-Olivier Strauss-Kahn, Paris
Emerico Zautzik, Rome

BIS Management

BIS Management is under the overall direction of the General Manager, who is responsible to the Board of Directors for the conduct of the Bank. The General Manager is assisted by the Deputy General Manager and advised by the Executive Committee of the BIS. The Executive Committee, chaired by the General Manager, further comprises the Deputy General Manager; the Heads of the three BIS departments – the General Secretariat, the Banking Department and the Monetary and Economic Department; the Economic Adviser and Head of Research; and the General Counsel. Other senior officials are the Deputy Heads of the departments and the Chairman of the Financial Stability Institute.

General Manager	Jaime Caruana
Deputy General Manager	Luiz Awazu Pereira da Silva
Secretary General and Head of General Secretariat	Peter Dittus
Head of Banking Department	Peter Zöllner
Head of Monetary and Economic Department	Claudio Borio
Economic Adviser and Head of Research	Hyun Song Shin
General Counsel	Diego Devos

Deputy Head of Monetary and Economic Department	Philip Turner
Deputy Secretary General	Monica Ellis
Deputy Head of Banking Department	Jean-François Rigaudy
Chairman, Financial Stability Institute	Josef Tošovský

BIS budget policy

Management begins preparing the annual BIS expenditure budget by establishing an overall business plan and financial framework. Within that context, business areas specify their detailed plans and resource requirements. The process of reconciling detailed business plans, objectives and overall resources culminates in a draft budget, which must be approved by the Board before the start of the financial year.

The budget distinguishes between administrative and capital expenditures. In 2015/16, these expenditures collectively amounted to CHF 309.7 million. The Bank's overall administrative expense amounted to CHF 285.2 million.[11] Management and staff expense – including remuneration, pensions, and health and accident insurance – amounts to around 70% of administrative expenditure, comparable to the ratio seen in organisations similar to the BIS. New staff positions were added during the year in accordance with the Bank's business plan, which emphasised mainly economic research and the Basel Process.

The other major categories of administrative spending are information technology (IT), buildings and equipment, and general operational costs, each accounting for about 10%.

Capital spending, relating mainly to buildings and IT investment, can vary significantly from year to year depending on projects in progress. For 2015/16, capital expenditure amounted to CHF 24.5 million.

BIS remuneration policy

At the end of the 2015/16 financial year, the BIS employed 632 staff members[12] from 58 countries. The jobs performed by staff members are classified into job grades associated with a structure of salary ranges. The salaries of individual staff members move within the ranges of the structure on the basis of performance.

Every three years, a comprehensive survey benchmarks BIS salaries against compensation in comparable institutions and market segments, with adjustments taking place as of 1 July in the following year. In benchmarking, the Bank focuses on the upper half of market compensation in order to attract highly qualified staff.

[11] The financial statements report a total administrative expense of CHF 359.8 million. That figure consists of the CHF 285.2 million actual administrative expense reported here plus CHF 74.6 million of financial accounting adjustments for post-employment benefit obligations. This additional expense is not included in the budget for the coming financial year because it depends on actuarial valuations as at 31 March, which in turn are not finalised until April, after the budget has been set by the Board.

[12] This corresponds to 602.1 full-time equivalent positions. At the end of the 2014/15 financial year, the Bank employed 623 staff members, corresponding to 600.1 full-time equivalent positions. Including positions related to hosted organisations and not funded by the Bank, the number of staff was 668 in 2014/15 and 683 in 2015/16.

The analysis takes into account the differing rates of taxation on compensation at the surveyed institutions.

In years between comprehensive salary surveys, the salary structure is adjusted as of 1 July on the basis of Switzerland's inflation rate and the weighted average real wage development in industrial countries. As of 1 July 2015, this adjustment produced an increase of 0.65% in the salary structure.

The salaries of senior officials are also regularly benchmarked against compensation in comparable institutions and market segments. As of 1 July 2015, the annual remuneration of senior officials, before expatriation allowances, is based on the salary structure of CHF 743,410 for the General Manager;[13] CHF 629,040 for the Deputy General Manager; and CHF 571,850 for Heads of Department.

BIS staff members have access to a contributory health insurance plan and a contributory defined benefit pension plan. At the Bank's headquarters, non-Swiss staff members recruited from abroad, including senior officials, are entitled to an expatriation allowance as well as an education allowance for their children, subject to certain conditions.

The Annual General Meeting approves the remuneration of members of the Board of Directors, with adjustments taking place at regular intervals. The total fixed annual remuneration paid to the Board of Directors was CHF 1,143,784 as of 1 April 2016. In addition, Board members receive an attendance fee for each Board meeting in which they participate. Assuming that the full Board is represented in all Board meetings, the annual total of these attendance fees amounts to CHF 1,065,120.

Financial activities and results

The Bank's balance sheet

The Bank's balance sheet increased by SDR 14.5 billion over the year, following a decrease of SDR 5.7 billion in 2014/15. The balance sheet total on 31 March 2016 was SDR 231.4 billion.

Deposits, primarily from central banks, constitute the largest share of the Bank's liabilities. About 95% of the deposits are denominated in currencies, with the remainder in gold. On 31 March 2016, total deposits amounted to SDR 189.0 billion, compared with SDR 186.7 billion at the end of March 2015.

Currency deposits at 31 March 2016 stood at SDR 178.8 billion, which was SDR 1.9 billion higher than at the previous year-end. Notwithstanding this increase, deposits held during 2015/16 were on average SDR 14 billion lower than in the previous financial year. The currency composition of deposits remained stable, with deposits in US dollars at 76%, in euros at 12% and in sterling at 7%. Gold deposits stood at SDR 10.2 billion on 31 March 2016, an increase of SDR 370 million over the financial year.

Funds received from deposit liabilities are invested in assets that are managed in a conservative manner. At 31 March 2016, 52% of total assets comprised government and other securities or treasury bills. Reverse repurchase agreements (primarily with commercial banks using sovereign bonds as collateral) made up a further 24%, with unsecured commercial bank assets and gold accounting for 9% and 5%, respectively. The gold balances include 104 tonnes in the Bank's own investment portfolio.

[13] In addition to the basic salary, the General Manager receives an annual representation allowance and enhanced pension rights.

Financial performance

Operating profit

The BIS's financial results for 2015/16 were shaped by continuing low interest rates together with higher volatility in key financial markets. This environment led to lower interest income on the Bank's own fund investment assets, and while the net interest margin on the customer banking business improved, this was on a lower level of deposits and in a more volatile environment. As a result, overall net interest and valuation income decreased by 20% to SDR 525.9 million.

The Bank recorded a foreign exchange loss of SDR 1.2 million, compared with a gain in the previous financial year of SDR 38.8 million, while net fee and commission income was relatively stable at SDR 5.1 million. The Bank's administrative expense, which is denominated mainly in Swiss francs, amounted to CHF 359.8 million, 1.0% higher than in the previous year. In SDR terms, however, the expenditure was 2.7% higher, at SDR 265.4 million, owing to the Swiss franc's appreciation. Depreciation was SDR 15.5 million, bringing the total operating expense for 2015/16 to SDR 280.9 million.

As a result of these developments, the operating profit, at SDR 248.9 million, was 41% lower than last year.

Net profit and total comprehensive income

Net profit comprises operating profit plus the realised gains, or losses, from sales of gold and securities held in the Bank's own fund portfolios. During the year, the Bank sold 4 tonnes of its own gold, realising a gain of SDR 84.3 million. In addition, the Bank's own funds securities portfolio produced realised gains of SDR 79.7 million when securities were sold as part of the regular rebalancing to benchmarks. As a result, net profit for 2015/16 was SDR 412.9 million (2014/15: SDR 542.9 million), representing a return of 2.3% on average equity (2014/15: 3.0%).

Other comprehensive income includes unrealised valuation movements on the Bank's own gold and investment securities as well as re-measurements of the actuarial liabilities for post-employment benefit obligations. The valuation of the Bank's own gold decreased by SDR 36.4 million following the sale of 4 tonnes, partly offset by a 1.9% increase in the SDR gold price. In addition, the Bank recorded a revaluation gain of SDR 16.8 million on its investment securities, reflecting marginally lower interest rates. There was a loss on the re-measurement of defined benefit obligations of SDR 162.2 million. As a result, total comprehensive income, which combines net profit and other comprehensive income, was SDR 231.1 million for 2015/16.

Allocation and distribution of profit

Proposed dividend

Consistent with the BIS's dividend policy, it is proposed to declare a dividend of SDR 215 per share for the financial year 2015/16. The dividend is payable on 558,125 shares, and will result in a total payment of SDR 120.0 million. After payment of the dividend, SDR 292.9 million would be available for allocation to reserves.

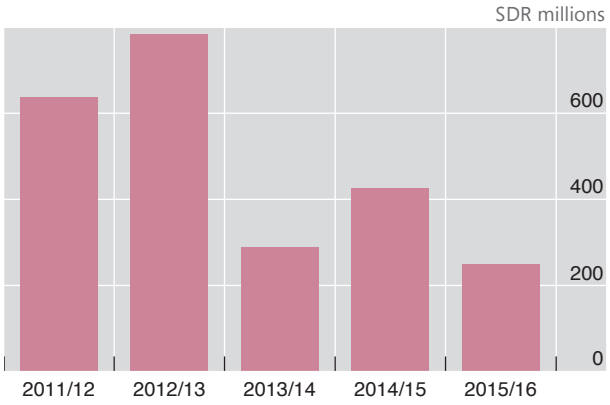
Proposed allocation of net profit for 2015/16

In accordance with Article 51 of the BIS Statutes, the Board of Directors recommends that the General Meeting allocate the 2015/16 net profit of SDR 412.9 million in the following manner:

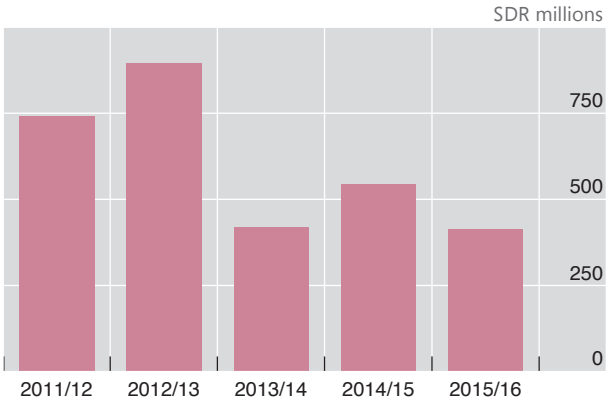
(a) SDR 120.0 million to be paid as a dividend of SDR 215 per share;
(b) SDR 14.6 million to be transferred to the general reserve fund; and
(c) SDR 278.3 million, representing the remainder of the available profit, to be transferred to the free reserve fund.

Five-year graphical summary

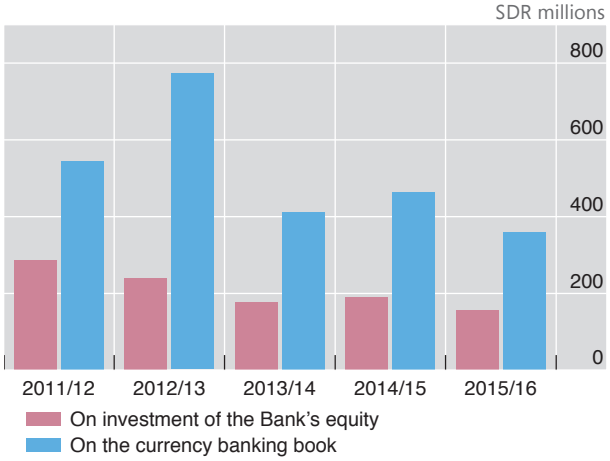
Operating profit



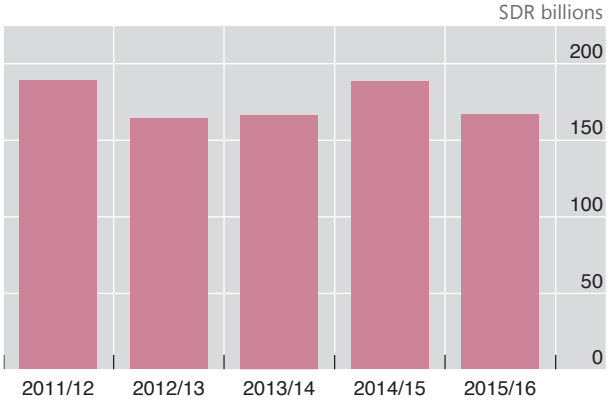
Net profit



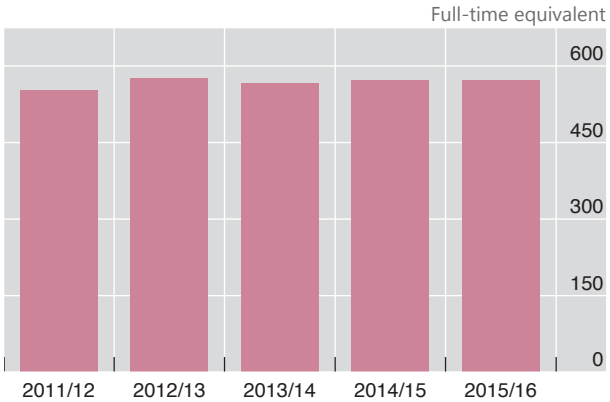
Net interest and valuation income



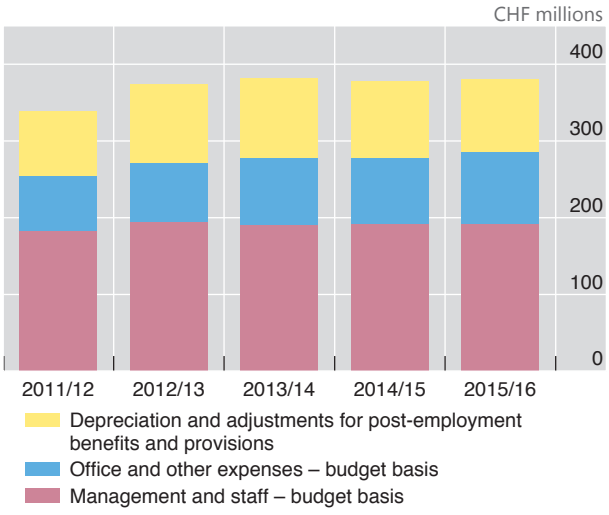
Average currency deposits (settlement date basis)



Average number of employees



Operating expense



Independent auditor

Election of the auditor

In accordance with Article 46 of the BIS Statutes, the Annual General Meeting is invited to elect an independent auditor for the ensuing year and to fix the auditor's remuneration. The Board policy is to rotate the auditor on a regular basis. The financial year ended 31 March 2016 was the fourth consecutive year of Ernst & Young's term as auditor.

Report of the auditor

The BIS financial statements for the year ended 31 March 2016 have been audited by Ernst & Young, who confirm that they give a true and fair view of the Bank's financial position and of its financial performance and its cash flows for the year then ended. The audit report can be found on page 246.

Financial statements

as at 31 March 2016

The financial statements on pages 177–245 for the financial year ended 31 March 2016 were approved on 9 May 2016 for presentation to the Annual General Meeting on 26 June 2016. They are presented in a form approved by the Board of Directors pursuant to Article 49 of the Bank's Statutes and are subject to approval by the shareholders at the Annual General Meeting.

Jaime Caruana
General Manager

Luiz Awazu Pereira da Silva
Deputy General Manager

Balance sheet

As at 31 March

SDR millions	Note	**2016**	2015
Assets			
Cash and sight accounts	1	25,847.0	11,375.3
Gold and gold loans	2	13,176.8	14,155.5
Treasury bills	3	39,578.6	33,926.0
Securities purchased under resale agreements	3	56,218.6	49,003.6
Loans and advances	3	17,337.4	17,966.2
Government and other securities	3	67,128.4	80,910.2
Derivative financial instruments	4	1,685.3	6,958.7
Accounts receivable and other assets	5	10,215.9	2,345.4
Land, buildings and equipment	6	196.4	194.1
Total assets		**231,384.4**	216,835.0
Liabilities			
Gold deposits	7	10,227.6	9,857.3
Currency deposits	8	178,790.5	176,842.0
Securities sold under repurchase agreements	9	1,447.7	773.3
Derivative financial instruments	4	3,902.2	2,162.2
Accounts payable	10	17,548.8	8,049.9
Other liabilities	11	1,089.0	877.2
Total liabilities		**213,005.8**	198,561.9
Shareholders' equity			
Share capital	13	698.9	698.9
Less: shares held in treasury	13	(1.7)	(1.7)
Statutory reserves	14	14,997.0	14,579.7
Profit and loss account		412.9	542.9
Other equity accounts	15	2,271.5	2,453.3
Total equity		**18,378.6**	18,273.1
Total liabilities and equity		**231,384.4**	216,835.0

Profit and loss account

For the financial year ended 31 March

SDR millions	Note	**2016**	2015
Interest income	16	1,804.1	1,568.3
Interest expense	17	(975.3)	(815.2)
Net interest income		**828.8**	753.1
Net valuation movement	18	(302.9)	(97.8)
Net interest and valuation income		**525.9**	655.3
Net fee and commission income	19	5.1	5.8
Net foreign exchange movement	20	(1.2)	38.8
Total operating income		**529.8**	699.9
Operating expense	21	(280.9)	(274.6)
Operating profit		**248.9**	425.3
Net gain on sales of available for sale securities	22	79.7	52.0
Net gain on sales of gold investment assets	23	84.3	65.6
Net profit		**412.9**	542.9

Statement of comprehensive income

For the financial year ended 31 March

SDR millions	Note	**2016**	2015
Net profit		**412.9**	542.9
Other comprehensive income			
Items either reclassified to profit and loss during the year, or that will be reclassified subsequently when specific conditions are met			
Net movement on revaluation of available for sale securities	15A	16.8	102.5
Net movement on revaluation of gold investment assets	15B	(36.4)	29.9
Items that will not be reclassified subsequently to profit and loss			
Re-measurement of defined benefit obligations	15C	(162.2)	(10.1)
		(181.8)	122.3
Total comprehensive income		**231.1**	665.2

Statement of cash flows

For the financial year ended 31 March

SDR millions	Note	**2016**	2015
Cash flow from / (used in) operating activities			
Interest and similar income received		2,154.9	2,178.3
Interest and similar expenses paid		(581.1)	(595.9)
Net fee and commission income	19	5.1	5.8
Net foreign exchange transaction gain	20	13.9	7.1
Operating expenses	21	(265.4)	(258.4)
Non-cash flow items included in operating profit			
Valuation movements on operating assets and liabilities	18	(302.9)	(97.8)
Net foreign exchange translation movements	20	(15.1)	31.7
Change in accruals and amortisation		(745.1)	(829.3)
Change in operating assets and liabilities			
Currency deposit liabilities held at fair value through profit and loss		(7,678.9)	(7,234.7)
Currency banking assets		8,860.3	3,980.9
Sight and notice deposit account liabilities		4,221.9	2,987.1
Gold deposits		370.3	(1,440.2)
Gold and gold loans		925.1	6,457.3
Accounts receivable		(4.3)	0.8
Accounts payable and other liabilities		30.7	(162.5)
Net derivative financial instruments		7,013.4	(4,427.2)
Net cash flow from operating activities		**14,002.8**	603.0
Cash flow from / (used in) investment activities			
Net change in currency investment assets available for sale		611.7	(365.8)
Securities sold under repurchase agreements		(97.7)	177.4
Net change in gold investment assets		101.6	79.0
Net purchase of land, buildings and equipment	6	(17.9)	(14.1)
Net cash flow from / (used in) investment activities		**597.7**	(123.5)

SDR millions	Note	**2016**	2015
Cash flow from / (used in) financing activities			
Dividends paid		(125.6)	(120.0)
Net cash flow used in financing activities		**(125.6)**	(120.0)
Total net cash flow		**14,474.9**	359.5
Net effect of exchange rate changes on cash and cash equivalents		69.7	(136.5)
Net movement in cash and cash equivalents		14,405.2	496.0
Net change in cash and cash equivalents		**14,474.9**	359.5
Cash and cash equivalents, beginning of year	1	**11,904.0**	11,544.5
Cash and cash equivalents, end of year	1	**26,378.9**	11,904.0

Movements in the Bank's equity

SDR millions	Note	Share capital	Shares held in treasury	Statutory reserves	Profit and loss	Other equity accounts: Defined benefit obligations	Other equity accounts: Gold and securities revaluation	Movement in total equity
Balance as at 31 March 2014		**698.9**	**(1.7)**	**14,280.4**	**419.3**	**(238.9)**	**2,569.9**	**17,727.9**
Payment of 2013/14 dividend		–	–	–	(120.0)	–	–	(120.0)
Allocation of 2013/14 profit		–	–	299.3	(299.3)	–	–	–
Total comprehensive income	15	–	–	–	542.9	(10.1)	132.4	665.2
Balance as at 31 March 2015		**698.9**	**(1.7)**	**14,579.7**	**542.9**	**(249.0)**	**2,702.3**	**18,273.1**
Payment of 2014/15 dividend		–	–	–	(125.6)	–	–	(125.6)
Allocation of 2014/15 profit		–	–	417.3	(417.3)	–	–	–
Total comprehensive income	15	–	–	–	412.9	(162.2)	(19.6)	231.1
Balance as at 31 March 2016		**698.9**	**(1.7)**	**14,997.0**	**412.9**	**(411.2)**	**2,682.7**	**18,378.6**

Introduction

The Bank for International Settlements (BIS, "the Bank") is an international financial institution which was established pursuant to the Hague Agreements of 20 January 1930 as well as the Bank's Constituent Charter and its Statutes.

The headquarters of the Bank are at Centralbahnplatz 2, 4002 Basel, Switzerland. The Bank maintains representative offices in Hong Kong, Special Administrative Region of the People's Republic of China (for Asia and the Pacific), and in Mexico City, Mexico (for the Americas).

The objectives of the BIS, as laid down in Article 3 of its Statutes, are to promote cooperation among central banks, to provide additional facilities for international financial operations and to act as trustee or agent for international financial settlements. In the course of its activities, the Bank accepts deposits from customers, which it then invests. The Bank also invests its own equity.

Sixty central banks are currently members of the Bank. The governance and management of the BIS are discussed in "The BIS: mission, activities, governance and financial results" in this Annual Report.

Accounting policies

The accounting policies set out below have been applied to both of the financial years presented unless otherwise stated.

1. Scope of the financial statements

These financial statements recognise all assets and liabilities that are controlled by the Bank and in respect of which the economic benefits, as well as any rights and obligations, lie with the Bank.

As part of its activities, the BIS undertakes financial transactions in its own name but for the economic benefit of other parties. These include transactions on a custodial or agency basis, such as those undertaken on behalf of investment entities operated by the Bank and on behalf of the staff pension fund, which do not have separate legal personality from the BIS. Unless otherwise stated, such transactions are not included in these financial statements.

The preparation of the financial statements requires the Bank's Management to make assumptions and use estimates to arrive at reported amounts. In doing so, Management exercises judgment based on reliable information. Actual results could differ significantly from these estimates.

The notes to the financial statements containing the areas of estimation uncertainty considered to require critical judgment and which have the most significant effect on the amounts recognised in the financial statements are: note 12, "Post-employment benefit obligations"; note 28, "Fair value hierarchy"; and note 31, "Contingent liabilities".

All figures in these financial statements are presented in SDR millions unless otherwise stated. Amounts are subject to rounding and consequently there may be small differences both within and between disclosures.

2. Functional and presentation currency

The functional and presentation currency of the Bank is the Special Drawing Right (SDR) as defined by the International Monetary Fund (IMF).

As currently calculated, one SDR is equivalent to the sum of USD 0.660, EUR 0.423, JPY 12.1 and GBP 0.111. The composition of the SDR is subject to periodic review and following a review by the IMF during 2015, changes will be made to the SDR basket effective from 1 October 2016, including the addition of the Chinese renminbi to the basket.

Monetary assets and liabilities are translated into SDR at the exchange rates ruling at the balance sheet date. Other assets and liabilities and profits and losses are translated into SDR at the exchange rates ruling at the date of the transaction. Exchange differences arising from the retranslation of monetary assets and liabilities and from the settlement of transactions are included as net foreign exchange gains or losses in the profit and loss account.

3. Presentation of interest

In the profit and loss account, interest income includes "negative" interest on liabilities while interest expense includes "negative" interest on assets. Interest on derivatives is presented as interest income. Notes to the financial statements separately analyse components of interest income and interest expense. The presentation of prior year items has been amended to reflect this practice.

4. Designation of financial instruments

Upon initial recognition, the Bank allocates each financial instrument to one of the following categories:

- Loans and receivables
- Financial assets and financial liabilities held at fair value through profit and loss
- Available for sale financial assets
- Financial liabilities measured at amortised cost

The allocation to these categories is dependent on the nature of the financial instrument and the purpose for which it was entered into, as described in Section 5 below.

The resulting designation of each financial instrument determines the accounting methodology that is applied, as described in the accounting policies below. Where the financial instrument is designated as held at fair value through profit and loss, the Bank does not subsequently change this designation.

5. Asset and liability structure

Assets and liabilities are organised into two sets of portfolios:

A. Banking portfolios

These comprise currency and gold deposit liabilities and related banking assets and derivatives.

The Bank operates a banking business in currency and gold on behalf of its customers. In this business, the Bank is exposed to credit and market risks. The extent of these exposures is limited by the Bank's risk management approach.

The Bank designates all currency financial instruments in its banking portfolios (other than cash and sight and notice accounts with banks, and sight and notice deposit account liabilities) as held at fair value through profit and loss. The use of fair values in the currency banking portfolios is described in Section 9 below.

All gold financial assets in these portfolios are designated as loans and receivables and all gold financial liabilities are designated as financial liabilities measured at amortised cost.

B. Investment portfolios

These comprise assets, liabilities and derivatives relating principally to the investment of the Bank's equity.

The Bank holds most of its equity in financial instruments denominated in the constituent currencies of the SDR, which are managed by comparison to a fixed duration benchmark of bonds.

Currency assets in investment portfolios, with the exception of cash and notice accounts (Sections 6 and 7 below) and those in more actively traded portfolios, are designated as available for sale.

The currency investment assets maintained in more actively traded portfolios are trading assets and as such are designated as held at fair value through profit and loss.

The remainder of the Bank's equity is held in gold. The Bank's own gold holdings are designated as available for sale.

6. Cash and sight accounts

Cash and sight accounts are included in the balance sheet at their principal value plus accrued interest where applicable.

7. Notice accounts

Notice accounts are short-term monetary assets, including balances at futures clearing brokers. These typically have notice periods of three days or less and are included under the balance sheet heading "Loans and advances". They are considered cash equivalents for the purposes of the statement of cash flows.

Due to their short-term nature, these financial instruments are designated as loans and receivables. They are included in the balance sheet at their principal value plus accrued interest. Interest is included in interest income on an accruals basis.

8. Sight and notice deposit account liabilities

Sight and notice deposit accounts are short-term monetary liabilities. They typically have notice periods of three days or less and are included under the balance sheet heading "Currency deposits".

Due to their short-term nature, these financial instruments are designated as financial liabilities measured at amortised cost. They are included in the balance sheet at their principal value plus accrued interest. Interest is included in interest expense on an accruals basis.

9. Use of fair values in the currency banking portfolios

In operating its currency banking business, the Bank acts as a market-maker in certain of its currency deposit liabilities. As a result of this activity, the Bank incurs realised profits and losses on these liabilities.

In accordance with the Bank's risk management policies, the market risk inherent in this activity is managed on an overall fair value basis, combining all the relevant assets, liabilities and derivatives in its currency banking portfolios. The realised and unrealised profits or losses on currency deposit liabilities are thus largely offset by realised and unrealised losses or profits on the related currency banking assets and derivatives, or on other currency deposit liabilities.

To reduce the accounting inconsistency that would otherwise arise from recognising realised and unrealised gains and losses on different bases, the Bank designates the relevant assets, liabilities and derivatives in its currency banking portfolios as held at fair value through profit and loss.

10. Securities purchased under resale agreements

Securities purchased under resale agreements ("reverse repurchase agreements") are recognised as collateralised loan transactions by which the Bank lends cash and receives an irrevocable commitment from the counterparty to return the cash, plus interest, at a specified date in the future. As part of these agreements, the Bank receives collateral in the form of securities to which it has full legal title, but must return equivalent securities to the counterparty at the end of the agreement, subject to the counterparty's repayment of the cash. As the Bank does not acquire the risks or rewards associated with ownership of these collateral securities, they are not recognised as assets in the Bank's balance sheet.

The collateralised loans relating to securities purchased under resale agreements are currency assets. The accounting treatment is determined by whether the transaction involves currency assets held at fair value through profit and loss (Section 11 below) or currency investment assets available for sale (Section 13 below).

11. Currency assets held at fair value through profit and loss

Currency assets include treasury bills, securities purchased under resale agreements, loans and advances, and government and other securities.

As described in Section 9 above, the Bank designates all of the relevant assets in its currency banking portfolios as held at fair value through profit and loss. These currency assets are initially included in the balance sheet on a trade date basis. The accrual of interest and amortisation of premiums paid and discounts received are included in the profit and loss account under "Interest income" on an effective interest rate basis. After initial measurement, the currency assets are revalued to fair value, with all realised and unrealised movements in fair value included under "Net valuation movement".

12. Currency deposit liabilities held at fair value through profit and loss

All currency deposit liabilities, with the exception of sight and notice deposit account liabilities, are designated as held at fair value through profit and loss.

These currency deposit liabilities are initially included in the balance sheet on a trade date basis. The accrual of interest to be paid and amortisation of premiums received and discounts paid are included under the profit and loss account heading "Interest expense" on an effective interest rate basis.

After initial measurement, the currency deposit liabilities are revalued to fair value, with all realised and unrealised movements in fair value included under "Net valuation movement".

13. Currency investment assets available for sale

Currency assets include treasury bills, securities purchased under resale agreements, loans and advances, and government and other securities.

The Bank designates as available for sale all of the relevant assets in its currency investment portfolios, except for those assets in the Bank's more actively traded investment portfolios.

Available for sale investment assets are initially included in the balance sheet on a trade date basis. The accrual of interest and amortisation of premiums paid and discounts received are included in the profit and loss account under "Interest income" on an effective interest rate basis.

After trade date, the currency investment assets are revalued to fair value, with unrealised movements included in the securities revaluation account, which is reported under the balance sheet heading "Other equity accounts". The movement in fair value is included in the statement of comprehensive income under the heading "Net movement on revaluation of available for sale securities". Realised profits on disposal are included in the profit and loss account under "Net gain on sales of available for sale securities".

14. Short positions in currency assets

Short positions in currency assets are included in the balance sheet under the heading "Other liabilities" at fair value on a trade date basis.

15. Gold

Gold comprises gold bar assets held in custody at central banks and sight accounts denominated in gold. Gold is considered by the Bank to be a financial instrument.

Gold is included in the balance sheet at its weight in gold (translated at the gold market price and USD exchange rate into SDR). Purchases and sales of gold are accounted for on a settlement date basis. Forward purchases or sales of gold are treated as derivatives prior to the settlement date.

The treatment of realised and unrealised gains or losses on gold is described in Section 17 below.

16. Gold loans

Gold loans comprise fixed-term gold loans. Gold loans are included in the balance sheet on a trade date basis at their weight in gold (translated at the gold market price and USD exchange rate into SDR) plus accrued interest.

Accrued interest on gold loans is included in the profit and loss account under "Interest income" on an effective interest rate basis.

17. Realised and unrealised gains or losses on gold

The treatment of realised and unrealised gains or losses on gold depends on the designation as described below:

A. Banking portfolios, comprising gold deposits and related gold banking assets

The Bank designates gold loans in its banking portfolios as loans and receivables and gold deposits as financial liabilities measured at amortised cost. The gold derivatives included in the portfolios are designated as held at fair value through profit and loss.

Gains or losses on derivative transactions in gold are included in the profit and loss account under "Net foreign exchange movement" as net transaction gains or losses.

Gains or losses on the retranslation of the net position in gold in the banking portfolios are included under "Net foreign exchange movement" as net translation gains or losses.

B. Investment portfolios, comprising gold investment assets

The Bank's own holdings of gold are designated and accounted for as available for sale assets.

Unrealised gains or losses on the Bank's gold investment assets over their deemed cost are taken to the gold revaluation account in equity, which is reported under the balance sheet heading "Other equity accounts". The movement in fair value is included in the statement of comprehensive income under the heading "Net movement on revaluation of gold investment assets".

For gold investment assets held on 31 March 2003 (when the Bank changed its functional and presentation currency from the gold franc to the SDR) the deemed cost is approximately SDR 151 per ounce, based on the value of USD 208 per ounce that was applied from 1979 to 2003 following a decision by the Bank's Board of Directors, translated at the 31 March 2003 exchange rate.

Realised gains or losses on disposal of gold investment assets are included in the profit and loss account as "Net gain on sales of gold investment assets".

18. Gold deposits

Gold deposits comprise unallocated sight and fixed-term deposits of gold from central banks.

Unallocated gold deposits provide customers with a general claim on the Bank for delivery of gold of the same weight and quality as that delivered by the customer to the Bank, but do not provide the right to specific gold bars. Unallocated gold deposits are included in the balance sheet on a trade date basis at their weight in gold (translated at the gold market price and USD exchange rate into SDR) plus accrued interest. Accrued interest on gold deposits is included in the profit and loss account under "Interest expense" on an effective interest rate basis.

Allocated (or "earmarked") gold deposits provide depositors with a claim for delivery of the specific gold bars deposited by the customer with the Bank on a custody basis. Beneficial ownership and risk remain with the customer. As such, allocated gold deposit liabilities and the related gold bar assets are not included on the Bank's balance sheet. They are disclosed as off-balance sheet items (see note 26).

19. Securities sold under repurchase agreements

Securities sold under repurchase agreements ("repurchase agreements") are recognised as collateralised deposit transactions by which the Bank receives cash and provides an irrevocable commitment to return the cash, plus interest, at a specified date in the future. As part of these agreements, the BIS transfers legal title of collateral securities to the counterparty. At the end of the contract the counterparty must return equivalent securities to the Bank, subject to the Bank's repayment of the cash. Because the BIS retains the risks and rewards associated with ownership of these securities, they continue to be recognised as assets in the Bank's balance sheet.

Where the repurchase agreement is associated with currency assets available for sale, the collateralised deposit transaction is designated as a financial liability measured at amortised cost.

Where the repurchase agreement is associated with the management of currency assets held at fair value through profit and loss, the collateralised deposit transaction is designated as a financial instrument held at fair value through profit and loss.

The collateralised deposits relating to securities sold under repurchase agreements are initially included in the balance sheet on a trade date basis. The accrual of interest is included in the profit and loss account under "Interest expense" on an effective interest rate basis. After initial measurement, the transactions designated as held at fair value through profit and loss are revalued to fair value with all unrealised movements in fair value included under "Net valuation movement".

20. Derivatives

Derivatives are used either to manage the Bank's market risk or for trading purposes. They are designated as financial instruments held at fair value through profit and loss.

Derivatives are initially included in the balance sheet on a trade date basis. Where applicable, the accrual of interest and amortisation of premiums and discounts are included in the profit and loss account under "Interest income" on an effective interest rate basis.

After trade date, derivatives are revalued to fair value, with all realised and unrealised movements in value included under "Net valuation movement".

Derivatives are included as either assets or liabilities, depending on whether the contract has a positive or a negative fair value for the Bank.

Where a derivative contract is embedded within a host contract which is not accounted for as held at fair value through profit and loss, it is separated from the host contract for accounting purposes and treated as though it were a standalone derivative as described above.

21. Valuation policy

The Bank's designation of each financial instrument determines their valuation basis and accounting treatment. The majority of the financial instruments on the balance sheet are included at fair value. The BIS defines fair value as the exit price of an orderly transaction between market participants on the measurement date.

The Bank considers published price quotations in active markets as the best evidence of fair value. Where no published price quotations exist, the BIS determines fair values using a valuation technique appropriate to the particular financial instrument. Such valuation techniques may involve using market prices of recent arm's length market transactions in similar instruments or may make use of financial models. Where financial models are used, the Bank aims at making maximum use of observable market inputs as appropriate, and relies as little as possible on its own estimates. Such valuation models comprise discounted cash flow analyses and option pricing models.

The Bank values its positions at their exit price, so that assets are valued at the bid price and liabilities at the offer price. Derivative financial instruments are valued on a bid-offer basis, with valuation reserves, where necessary, included in derivative financial liabilities. Financial assets and liabilities that are not valued at fair value are included in the balance sheet at amortised cost.

22. Impairment of financial assets

Financial assets, other than those designated as held at fair value through profit and loss, are assessed for indications of impairment at each balance sheet date. A financial asset is impaired when there is objective evidence that the estimated future cash flows of the asset have been reduced as a result of one or more events that occurred after the initial recognition of the asset. Evidence of impairment could include significant financial difficulty, default or probable bankruptcy / financial reorganisation of the counterparty or issuer.

Impairment losses are recognised to the extent that a decline in fair value below amortised cost is considered significant or prolonged. Impairment of currency assets is included in the profit and loss account under "Net valuation movement", with impairment of gold loans included under "Interest income". If the amount of the impairment loss decreases in a subsequent period, the previously recognised impairment loss is reversed through profit and loss to the extent that the carrying amount of the investment does not exceed that which it would have been had the impairment not been recognised.

23. Accounts receivable and accounts payable

Accounts receivable and accounts payable are principally very short-term amounts relating to the settlement of financial transactions. They are initially recognised at fair value and subsequently included in the balance sheet at amortised cost.

24. Land, buildings and equipment

The cost of the Bank's buildings and equipment is capitalised and depreciated on a straight line basis over the estimated useful lives of the assets concerned, as follows:

- Buildings – 50 years
- Building installations and machinery – 15 years
- Information technology equipment – up to 4 years
- Other equipment – 4 to 10 years

The Bank's land is not depreciated. The Bank undertakes an annual review of impairment of land, buildings and equipment. Where the carrying amount of an asset is greater than its estimated recoverable amount, the asset is written down to the lower value.

25. Provisions

Provisions are recognised when the Bank has a present legal or constructive obligation as a result of events arising before the balance sheet date and it is probable that economic resources will be required to settle the obligation, provided that a reliable estimate can be made of the amount of the obligation. Best estimates and assumptions are used when determining the amount to be recognised as a provision.

26. Taxation

The Bank's special legal status in Switzerland is set out principally in its Headquarters Agreement with the Swiss Federal Council. Under the terms of this document the Bank is exempted from virtually all direct and indirect taxes at both federal and local government level in Switzerland.

Similar agreements exist with the government of the People's Republic of China for the Asian Office in Hong Kong SAR and with the Mexican government for the Americas Office.

However, some income and gains received by the Bank may be subject to tax imposed in the country of origin. Such income and gains are recognised on a gross basis with the corresponding tax recognised as an expense.

27. Post-employment benefit obligations

The Bank operates three post-employment benefit arrangements, respectively, for staff pensions, Directors' pensions, and health and accident insurance for current and former staff members. An independent actuarial valuation is performed annually for each arrangement.

A. Staff pensions

The Bank provides a final salary defined benefit pension arrangement for its staff, based on a fund without a separate legal personality from the BIS, out of which benefits are paid. The fund assets are administered by the Bank for the sole benefit of current and former members of staff who participate in the arrangement. The Bank remains ultimately liable for all benefits due under the arrangement.

The liability in respect of the staff pension fund is based on the present value of the defined benefit obligation less the fair value of the fund assets, both at the balance sheet date. The defined benefit obligation is calculated using the projected unit credit method. The present value of the defined benefit obligation is determined from the estimated future cash outflows. The rate used to discount the cash flows is determined by the Bank based on the market yield of highly rated corporate debt securities in Swiss francs which have terms to maturity approximating the terms of the related liability.

The amount charged to the profit and loss account represents the sum of the current service cost of the benefits accruing for the year under the scheme, and interest at the discount rate on the net of the defined benefit obligation less the fair value of the fund assets. Past service costs from plan amendments are immediately recognised through profit or loss. Gains and losses arising from re-measurement of the obligations, such as experience adjustments (where the actual outcome is different from the actuarial assumptions previously made) and changes in actuarial assumptions are charged to other comprehensive income in the year in which the re-measurement is applied. They are not subsequently included in profit and loss in future years.

B. Directors' pensions

The Bank provides an unfunded defined benefit arrangement for Directors' pensions. The liability, defined benefit obligation and amount charged to the profit and loss account in respect of the Directors' pension arrangement are calculated on a similar basis to that used for the staff pension fund.

C. Post-employment health and accident benefits

The Bank provides an unfunded post-employment health and accident benefit arrangement for its staff. The liability, benefit obligation and amount charged to the profit and loss account in respect of the health and accident benefit arrangement are calculated on a similar basis to that used for the staff pension fund.

28. Statement of cash flows

The Bank's statement of cash flows is prepared using an indirect method. It is based on the movements in the Bank's balance sheet, adjusted for changes in financial transactions awaiting settlement.

Cash and cash equivalents consist of cash and sight and notice accounts with banks, which are very short-term financial assets that typically have notice periods of three days or less.

1. Cash and sight accounts

The Bank holds cash and sight accounts predominantly with central banks. Cash and cash equivalents as shown in the statement of cash flows comprise cash and sight accounts as well as notice accounts, which are disclosed under "Loans and advances". The balances are analysed in the table below:

As at 31 March

SDR millions	**2016**	2015
Balance at central banks	25,729.9	11,333.9
Balance at commercial banks	117.1	41.4
Total cash and sight accounts	**25,847.0**	11,375.3
Notice accounts	531.9	528.7
Total cash and cash equivalents	**26,378.9**	11,904.0

2. Gold and gold loans

The composition of the Bank's gold holdings was as follows:

As at 31 March

SDR millions	**2016**	2015
Gold	9,834.8	12,639.9
Gold loans	3,342.0	1,515.6
Total gold and gold loan assets	**13,176.8**	14,155.5
Comprising:		
Gold investment assets	2,944.6	2,998.3
Gold banking assets	10,232.2	11,157.2

3. Currency assets

Currency assets comprise the following products:

Treasury bills are short-term debt securities issued by governments on a discount basis.

Securities purchased under resale agreements ("reverse repurchase agreements") are recognised as collateralised loan transactions. Interest receivable on the transaction is fixed at the start of the agreement. During the term of the agreement the Bank monitors the fair value of the loan and related collateral securities, and may call for additional collateral (or be required to return collateral) based on movements in market value.

Loans and advances comprise fixed-term loans to commercial banks, advances and notice accounts. Advances relate to committed and uncommitted standby facilities which the Bank provides for its customers. Notice accounts are very short-term financial assets, typically having a notice period of three days or less.

Government and other securities are debt securities issued by governments, international institutions, other public sector institutions, commercial banks and corporates. They include commercial paper, certificates of deposit, fixed and floating rate bonds, covered bonds and asset-backed securities.

The tables below analyse the Bank's holdings of currency assets:

As at 31 March 2016

SDR millions	Fair value through profit and loss	Available for sale	Amortised cost	Total
Treasury bills	**39,578.6**	**–**	**–**	**39,578.6**
Securities purchased under resale agreements	**55,340.0**	**878.6**	**–**	**56,218.6**
Loans and advances	**16,805.5**	**–**	**531.9**	**17,337.4**
Government and other securities				
Government	29,582.1	13,985.6	–	43,567.7
Financial institutions	10,966.0	692.2	–	11,658.2
Other	11,776.8	125.7	–	11,902.5
	52,324.9	**14,803.5**	**–**	**67,128.4**
Balance at end of year	**164,049.0**	**15,682.1**	**531.9**	**180,263.0**

As at 31 March 2015

SDR million	Fair value through profit and loss	Available for sale	Amortised cost	Total
Treasury bills	33,926.0	–	–	33,926.0
Securities purchased under resale agreements	48,230.3	773.3	–	49,003.6
Loans and advances	17,437.5	–	528.7	17,966.2
Government and other securities				
Government	39,065.7	14,959.8	–	54,025.5
Financial institutions	13,641.2	197.3	–	13,838.5
Other	13,009.9	36.3	–	13,046.2
	65,716.8	15,193.4	–	80,910.2
Balance at end of year	165,310.6	15,966.7	528.7	181,806.0

Note 15A provides further analysis of the securities revaluation account. Note 22 provides further analysis of the net gain on sales of securities available for sale.

4. Derivative financial instruments

The main types of derivative instruments used by the Bank for economic hedging and trading purposes are:

Interest rate and bond futures are contractual agreements to receive or pay a net amount based on changes in interest rates or bond prices at a future date. Futures contracts are settled daily with the exchange. Associated margin payments are settled by cash or marketable securities.

Currency and gold options are contractual agreements under which the seller grants the purchaser the right, but not the obligation, to either buy (call option) or sell (put option), by or on a set date, a specific amount of a currency or gold at a predetermined price. In consideration, the seller receives a premium from the purchaser.

Currency and gold swaps, cross-currency swaps and interest rate swaps are bilateral contractual agreements to exchange cash flows related to currencies, gold or interest rates (for example, fixed rate for floating rate). Cross-currency interest rate swaps involve the exchange of cash flows related to a combination of interest rates and foreign exchange rates. Except for certain currency and gold swaps and cross-currency interest rate swaps, no exchange of principal takes place.

Currency and gold forwards are bilateral contractual agreements involving the exchange of foreign currencies or gold at a future date. This includes undelivered spot transactions.

Forward rate agreements are bilateral interest rate forward contracts that result in cash settlement at a future date for the difference between a contracted rate of interest and the prevailing market rate.

Swaptions are bilateral options under which the seller grants the purchaser the right, but not the obligation, to enter into a currency or interest rate swap at a predetermined price by or on a set date. In consideration, the seller receives a premium from the purchaser.

The Bank sells products to its customers which contain embedded derivatives (see note 8). The gold currency options embedded in gold dual currency deposits are included within derivatives as currency and gold options.

The Bank recognises all derivative contracts in its name, including where the economic benefit lies with a third party. In such circumstances, the Bank recognises both an external contract and an exactly offsetting derivative transaction with the beneficial party.

As at 31 March	**2016**			2015		
	Notional amounts	Fair values		Notional amounts	Fair values	
SDR millions		Assets	Liabilities		Assets	Liabilities
Bond futures	895.8	0.9	(1.0)	2,910.7	1.5	(1.6)
Cross-currency swaps	1,251.0	4.8	(40.0)	583.5	56.8	–
Currency and gold forwards	4,380.7	21.9	(42.9)	1,486.5	6.7	(8.6)
Currency and gold options	1,170.4	0.2	(2.7)	1,247.1	0.1	(0.7)
Currency and gold swaps	124,721.0	486.0	(2,738.5)	126,527.1	5,228.8	(802.4)
Forward rate agreements	12,837.8	6.3	(1.9)	25,078.0	7.1	(4.4)
Interest rate futures	12,220.7	–	(0.1)	9,511.6	0.5	(0.2)
Interest rate swaps	247,718.5	1,165.2	(1,075.1)	269,846.2	1,657.2	(1,344.3)
Total derivative financial instruments	**405,195.9**	**1,685.3**	**(3,902.2)**	437,190.7	6,958.7	(2,162.2)

5. Accounts receivable and other assets

As at 31 March

SDR millions	**2016**	2015
Financial transactions awaiting settlement	10,201.7	2,335.5
Other assets	14.2	9.9
Total accounts receivable and other assets	**10,215.9**	2,345.4

"Financial transactions awaiting settlement" relates to short-term receivables, typically due in three business days or less, where transactions have been effected but cash has not yet been received.

6. Land, buildings and equipment

For the financial year ended 31 March				2016	2015
SDR millions	Land	Buildings	IT and other equipment	Total	Total
Historical cost					
Balance at beginning of year	**46.4**	**275.5**	**64.4**	**386.3**	412.6
Capital expenditure	–	4.7	13.4	18.1	14.1
Disposals and retirements	–	(2.9)	(5.5)	(8.4)	(40.4)
Balance at end of year	**46.4**	**277.3**	**72.3**	**396.0**	386.3
Depreciation					
Balance at beginning of year	**–**	**155.3**	**36.9**	**192.2**	216.4
Depreciation	–	8.9	6.6	15.5	16.2
Disposals and retirements	–	(2.7)	(5.4)	(8.1)	(40.4)
Balance at end of year	**–**	**161.5**	**38.1**	**199.6**	192.2
Net book value at end of year	**46.4**	**115.8**	**34.2**	**196.4**	194.1

The net book value of IT and other equipment at 31 March 2016 includes intangible assets, comprising computer software, of SDR 23.8 million (2015: SDR 18.6 million). The depreciation charge for the financial year ended 31 March 2016 includes an additional charge for impairment of SDR 0.2 million (2015: nil). The amount of retired assets removed from the historical cost and accumulated depreciation for the year ended 31 March 2016 was SDR 5.2 million (2015: SDR 39.6 million).

7. Gold deposits

Gold deposit liabilities placed with the Bank originate entirely from central banks. They are all designated as financial liabilities measured at amortised cost.

8. Currency deposits

Currency deposits comprise the following products:

Sight and notice deposit accounts are very short-term financial liabilities, typically having a notice period of three days or less.

Medium-Term Instruments (MTIs) are fixed rate investments at the Bank issued with initial quarterly maturities of between one and 10 years.

Callable MTIs (CMTIs) are MTIs that are callable at the option of the Bank at an exercise price of par. At 31 March 2016 all options on outstanding CMTIs had expired (in 2015 all options on CMTIs had expired). The balance sheet total for CMTIs includes the fair value of the embedded interest rate option.

FIXBIS are fixed rate investments at the Bank for any maturities between one week and one year.

FRIBIS are floating rate investments at the Bank with maturities of one year or longer for which the interest rate is reset in line with prevailing market conditions.

Fixed-term deposits are fixed rate investments at the Bank, typically with an initial maturity of less than one year.

Dual Currency Deposits (DCDs) are fixed-term deposits that are repayable on the maturity date either in the original currency or at a fixed amount in a different currency at the option of the Bank. The balance sheet total for DCDs includes the fair value of the embedded foreign exchange option. These deposits all mature between April 2016 and May 2016 (2015: in April 2015 and June 2015).

The Bank acts as the sole market-maker in certain of its currency deposit liabilities and has undertaken to repay some of these financial instruments at fair value, in whole or in part, at one to two business days' notice.

The amount the Bank is contractually obliged to pay at maturity in respect of its total currency deposits including interest accrued to 31 March 2016 is SDR 178,433.9 million (2015: SDR 176,649.4 million).

Sight and notice deposit accounts are included on an amortised cost basis, while all other deposits are included at their fair value.

Currency deposits are analysed in the table below:

As at 31 March

SDR millions	**2016**	2015
Repayable at one to three days' notice		
Sight and notice deposit accounts	26,176.9	21,955.0
Medium-Term Instruments (MTIs)	36,700.2	51,052.9
Callable MTIs (CMTIs)	730.6	1,814.2
Fixed-Rate Investments at the BIS (FIXBIS)	47,626.5	50,534.3
	111,234.2	125,356.4
Other currency deposits		
Floating Rate Investments of the BIS (FRIBIS)	121.0	181.2
Fixed-term deposits	67,028.3	50,913.8
Dual Currency Deposits (DCDs)	407.0	390.6
	67,556.3	51,485.6
Balance at end of year	**178,790.5**	176,842.0

9. Securities sold under repurchase agreements

Securities sold under repurchase agreements ("repurchase agreements") are analysed in the table below:

As at 31 March

SDR millions	**2016**	2015
Held at amortised cost	878.6	773.3
Held at fair value through profit and loss	569.1	–
Total securities sold under repurchase agreements	**1,447.7**	773.3

Further information on collateral is provided in note 3C of the "Risk management" section.

10. Accounts payable

Accounts payable consist of financial transactions awaiting settlement, relating to short-term payables where transactions have been effected but cash has not yet been transferred.

11. Other liabilities

The Bank's other liabilities consist of:

As at 31 March

SDR millions	**2016**	2015
Post-employment benefit obligations (see note 12)		
Staff pensions	503.2	347.6
Directors' pensions	10.8	10.2
Health and accident benefits	555.0	498.7
Payable to former shareholders	0.4	0.4
Other	19.6	20.3
Balance at end of year	**1,089.0**	877.2

12. Post-employment benefit obligations

The Bank operates three post-employment arrangements:

1. A defined benefit pension arrangement for its staff in the event of retirement, disability or death. Under this arrangement, benefits accrue according to years of participation and pensionable remuneration. These benefits are paid out of a fund, without separate legal personality. Contributions are made to this fund by the Bank and by staff and the fund is the beneficial owner of assets on which it receives a return. These assets are administered by the Bank for the sole benefit of participants in the arrangement. Except as shown in this note, these assets are not recognised as assets of the Bank. The Bank remains ultimately liable for all benefits due under the arrangement.

2. An unfunded defined benefit arrangement for its Directors, whose entitlement is based on a minimum service period of 49 months.

3. An unfunded post-employment health and accident benefit arrangement for its staff and their dependents. Employees who leave the Bank after becoming eligible for early retirement benefits from the pension arrangement are eligible for post-employment health and accident benefits.

All three arrangements operate in Swiss francs and are valued annually by an independent actuary. During 2016/17, the Bank expects to make contributions of SDR 33.0 million to its post-employment arrangements.

A. Amounts recognised in the balance sheet

As at 31 March	Staff pensions			Directors' pensions			Post-employment health and accident benefits		
SDR millions	**2016**	2015	2014	**2016**	2015	2014	**2016**	2015	2014
Present value of obligations	(1,551.4)	(1,468.7)	(1,398.6)	(10.8)	(10.2)	(8.8)	(555.0)	(498.7)	(431.4)
Fair value of fund assets	1,048.2	1,121.1	1,062.1	–	–	–	–	–	–
Liability at end of year	**(503.2)**	(347.6)	(336.5)	**(10.8)**	(10.2)	(8.8)	**(555.0)**	(498.7)	(431.4)

B. Present value of defined benefit obligations

The reconciliation of the opening and closing amounts of the present value of the benefit obligations is as follows:

As at 31 March	Staff pensions			Directors' pensions			Post-employment health and accident benefits		
SDR millions	**2016**	2015	2014	**2016**	2015	2014	**2016**	2015	2014
Present value of obligations at beginning of year	(1,468.7)	(1,398.6)	(1,370.7)	(10.2)	(8.8)	(8.9)	(498.7)	(431.4)	(478.9)
Employee contributions	(6.7)	(6.6)	(6.5)	–	–	–	–	–	–
Benefit payments	41.8	49.4	35.8	0.5	0.4	0.5	3.0	2.9	2.9
Net current service cost	(56.3)	(61.5)	(63.6)	(0.6)	(0.4)	(0.5)	(24.3)	(12.1)	(18.2)
Interest cost on obligations at opening discount rate	(11.4)	(27.3)	(24.1)	(0.1)	(0.2)	(0.1)	(3.9)	(8.5)	(8.5)
Actuarial gain / (loss) arising from experience adjustments	12.5	30.3	21.3	–	–	0.4	(5.3)	(41.2)	41.0
Actuarial gain / (loss) arising from changes in demographic assumptions	(4.3)	19.5	(5.6)	–	(0.2)	–	(2.2)	30.9	26.1
Actuarial gain / (loss) arising from changes in financial assumptions	(70.7)	(45.0)	65.1	(0.6)	(0.8)	0.3	(27.7)	(30.3)	24.3
Past service costs	–	–	7.0	–	–	–	–	–	–
Foreign exchange differences	12.4	(28.9)	(57.3)	0.2	(0.2)	(0.5)	4.1	(9.0)	(20.1)
Present value of obligations at end of year	**(1,551.4)**	(1,468.7)	(1,398.6)	**(10.8)**	(10.2)	(8.8)	**(555.0)**	(498.7)	(431.4)

The following table shows the weighted average duration of the defined benefit obligations for the Bank's three post-employment benefit arrangements:

As at 31 March	Staff pensions			Directors' pensions			Post-employment health and accident benefits		
Years	**2016**	2015	2014	**2016**	2015	2014	**2016**	2015	2014
Weighted average duration	**18.3**	18.2	18.4	**13.4**	13.0	12.3	**23.6**	23.7	22.1

C. Amounts recognised in the profit and loss account

For the financial year ended 31 March	Staff pensions			Directors' pensions			Post-employment health and accident benefits		
SDR millions	**2016**	2015	2014	**2016**	2015	2014	**2016**	2015	2014
Net current service cost	(56.3)	(61.5)	(63.6)	(0.6)	(0.4)	(0.5)	(24.3)	(12.1)	(18.2)
Reduction in past service cost	–	–	7.0	–	–	–	–	–	–
Interest cost on net liability	(2.6)	(6.3)	(6.7)	(0.1)	(0.2)	(0.1)	(3.9)	(8.5)	(8.5)
Total included in operating expense	**(58.9)**	(67.8)	(63.3)	**(0.7)**	(0.6)	(0.6)	**(28.2)**	(20.6)	(26.7)

D. Re-measurement of defined benefit obligations recognised in other comprehensive income

For the financial year ended 31 March	Staff pensions			Directors' pensions			Post-employment health and accident benefits		
SDR millions	**2016**	2015	2014	**2016**	2015	2014	**2016**	2015	2014
Return on plan assets in excess of opening discount rate	(65.8)	30.5	26.9	–	–	–	–	–	–
Actuarial gains and losses arising from experience adjustments	12.5	30.3	21.3	–	–	0.4	(5.3)	(41.2)	41.0
Actuarial gains and losses arising from changes in demographic assumptions	(4.3)	19.5	(5.6)	–	(0.2)	–	(2.2)	30.9	26.1
Actuarial gains and losses arising from changes in financial assumptions	(70.7)	(45.0)	65.1	(0.6)	(0.8)	0.3	(27.7)	(30.3)	24.3
Foreign exchange gains and losses on items in other comprehensive income	0.6	(2.0)	(9.2)	0.1	–	(0.2)	1.2	(1.8)	(7.3)
Amounts recognised in other comprehensive income	**(127.7)**	33.3	98.5	**(0.5)**	(1.0)	0.5	**(34.0)**	(42.4)	84.1

E. Analysis of movement on fair value of fund assets for staff pensions

The reconciliation of the opening and closing amounts of the fair value of fund assets for the staff pension arrangement is as follows:

For the financial year ended 31 March

SDR millions	**2016**	2015	2014
Fair value of fund assets at beginning of year	1,121.1	1,062.1	978.2
Employer contributions	29.0	28.2	27.8
Employee contributions	6.7	6.6	6.5
Benefit payments	(41.8)	(49.4)	(35.8)
Interest income on plan assets calculated on opening discount rate	8.8	21.0	17.4
Return on plan assets in excess of opening discount rate	(65.8)	30.5	26.9
Foreign exchange differences	(9.8)	22.1	41.1
Fair value of fund assets at end of year	**1,048.2**	1,121.1	1,062.1

F. Composition and fair value of assets for the pension fund

The table below analyses the assets of the pension fund and the extent to which the fair values of those assets have been calculated using quoted prices in active markets. The pension fund does not invest in financial instruments issued by the Bank.

As at 31 March	**2016**			2015		
SDR millions	Quoted in active market	Unquoted	Total	Quoted in active market	Other	Total
Cash (including margin accounts)	32.0	–	32.0	14.9	–	14.9
Debt securities	269.2	–	269.2	325.0	–	325.0
Fixed income funds	175.8	–	175.8	212.5	–	212.5
Equity funds	404.6	35.1	439.7	452.2	36.5	488.7
Real estate funds	17.7	41.8	59.5	17.4	8.0	25.4
Commodity-linked notes	–	50.3	50.3	–	54.2	54.2
Derivative instruments	–	21.7	21.7	(0.2)	0.6	0.4
Total	**899.3**	**148.9**	**1,048.2**	1,021.8	99.3	1,121.1

G. Principal actuarial assumptions used in these financial statements

As at 31 March	**2016**	2015
Applicable to staff pension and post-employment health and accident benefit arrangements		
Discount rate	0.60%	0.80%
Applicable to Directors' pension arrangements		
Discount rate	0.40%	0.80%
Applicable to staff and Directors' pension arrangements		
Assumed increase in pensions payable	0.80%	0.80%
Applicable to staff pension arrangement		
Assumed salary increase rate	2.80%	2.80%
Applicable to Directors' pension arrangement		
Assumed Directors' pensionable remuneration increase rate	0.80%	0.80%
Applicable to post-employment health and accident benefit arrangement		
Long-term medical cost inflation assumption	4.00%	4.00%

The assumed increases in staff salaries, Directors' pensionable remuneration and pensions payable incorporate an inflation assumption of 0.80% at 31 March 2016 (2015: 0.80%).

H. Life expectancies

The life expectancies, at age 65, used in the actuarial calculations for the staff pension arrangement are:

As at 31 March

Years	**2016**	2015
Current life expectancy of members aged 65		
Male	20.1	20.0
Female	22.4	22.3
Life expectancy of members aged 65 projected forward in 10 years' time		
Male	21.1	21.0
Female	23.3	23.2

I. Sensitivity analysis of significant actuarial assumptions

The Bank is exposed to risks from these obligations and arrangements including investment risk, interest rate risk, foreign exchange risk, longevity risk and salary risk.

Investment risk is the risk that plan assets will not generate returns at the expected level.

Interest rate risk is the exposure of the post-employment benefit obligations to adverse movements in interest rates including credit spreads. A decrease in interest rates will increase the present value of these obligations. However, in the case of the staff pension arrangement this may be offset, either fully or partly, by an increase in value of the interest-bearing securities held by the fund.

Foreign exchange risk is the exposure of the post-employment benefit obligations to adverse movements in exchange rates between the Swiss franc, which is the operating currency of the post-employment benefit arrangements, and the SDR, which is the functional currency of the Bank.

Longevity risk is the risk that actual outcomes differ from actuarial estimates of life expectancy.

Salary risk is the risk that higher than expected salary rises increase the cost of providing a salary-related pension.

The table below shows the estimated impact on the defined benefit obligations resulting from a change in key actuarial assumptions (see the tables in notes 12G and 12H):

As at 31 March	**Staff pensions** Increase / (decrease) in defined benefit obligation	
SDR millions	**2016**	2015
Discount rate		
Increase by 0.5%	(131.9)	(123.4)
Decrease by 0.5%	150.5	142.5
Rate of salary increase		
Increase by 0.5%	41.9	39.7
Decrease by 0.5%	(38.8)	(36.7)
Rate of pension payable increase		
Increase by 0.5%	100.8	95.5
Decrease by 0.5%	(91.5)	(86.7)
Life expectancy		
Increase by 1 year	60.5	55.8
Decrease by 1 year	(59.0)	(51.4)

As at 31 March	**Directors' pensions** Increase / (decrease) in defined benefit obligation	
SDR millions	**2016**	2015
Discount rate		
Increase by 0.5%	(0.7)	(0.6)
Decrease by 0.5%	0.8	0.7
Rate of pension payable increase		
Increase by 0.5%	0.6	0.6
Decrease by 0.5%	(0.6)	(0.5)
Life expectancy		
Increase by 1 year	0.6	0.6
Decrease by 1 year	(0.6)	(0.5)

As at 31 March	Post-employment health and accident benefits Increase / (decrease) in defined benefit obligation	
SDR millions	**2016**	2015
Discount rate		
Increase by 0.5%	(59.9)	(53.9)
Decrease by 0.5%	70.5	63.3
Medical cost inflation rate		
Increase by 0.5%	139.4	124.5
Decrease by 0.5%	(101.6)	(92.3)
Life expectancy		
Increase by 1 year	35.0	30.9
Decrease by 1 year	(33.3)	(29.9)

The above estimates were arrived at by changing each assumption individually, holding other variables constant. They do not include any correlation effects that may exist between variables.

13. Share capital

The Bank's share capital consists of:

As at 31 March		
SDR millions	**2016**	2015
Authorised capital: 600,000 shares, each of SDR 5,000 par value, of which SDR 1,250 is paid up	3,000.0	3,000.0
Issued capital: 559,125 shares	2,795.6	2,795.6
Paid-up capital (25%)	**698.9**	698.9

The number of shares eligible for dividend is:

As at 31 March	**2016**	2015
Issued shares	559,125	559,125
Shares held in treasury	(1,000)	(1,000)
Outstanding shares eligible for dividend	**558,125**	558,125

Shares held in treasury consist of 1,000 shares of the Albanian issue which were suspended in 1977.

14. Statutory reserves

The Bank's Statutes provide for application of the Bank's annual net profit, by the Annual General Meeting at the proposal of the Board of Directors, to three specific reserve funds: the legal reserve fund, the general reserve fund and the special dividend reserve fund; the remainder of the net profit after payment of any dividend is generally allocated to the free reserve fund.

Legal reserve fund. This fund is currently fully funded at 10% of the Bank's paid-up capital.

General reserve fund. After payment of any dividend, 5% of the remainder of the Bank's annual net profit currently must be allocated to the general reserve fund.

Special dividend reserve fund. A portion of the remainder of the annual net profit may be allocated to the special dividend reserve fund, which shall be available, in case of need, for paying the whole or any part of a declared dividend. Dividends are normally paid out of the Bank's net profit.

Free reserve fund. After the above allocations have been made, any remaining unallocated net profit is generally transferred to the free reserve fund.

Receipts from the subscription of the Bank's shares are allocated to the legal reserve fund as necessary to keep it fully funded, with the remainder being credited to the general reserve fund.

The free reserve fund, general reserve fund and legal reserve fund are available, in that order, to meet any losses incurred by the Bank. In the event of liquidation of the Bank, the balances of the reserve funds (after the discharge of the liabilities of the Bank and the costs of liquidation) would be divided among the Bank's shareholders.

The table below analyses the movements in the Bank's statutory reserves over the last two years:

SDR millions	Legal reserve fund	General reserve fund	Special dividend reserve fund	Free reserve fund	Total statutory reserves
Balance at 31 March 2014	**69.8**	**3,606.0**	**184.0**	**10,420.6**	**14,280.4**
Allocation of 2013/14 profit	–	15.0	–	284.3	299.3
Balance at 31 March 2015	**69.8**	**3,621.0**	**184.0**	**10,704.9**	**14,579.7**
Allocation of 2014/15 profit	–	20.9	–	396.4	417.3
Balance at 31 March 2016	**69.8**	**3,641.9**	**184.0**	**11,101.3**	**14,997.0**

At 31 March 2016 statutory reserves included share premiums of SDR 1,059.6 million (2015: SDR 1,059.6 million).

In accordance with Article 51 of the Bank's Statutes, the following profit allocation will be proposed at the Bank's Annual General Meeting:

SDR millions	**2016**
Net profit	**412.9**
Proposed dividend:	
SDR 215 per share on 558,125 shares	(120.0)
Profit available for allocation	**292.9**
Proposed transfers to reserves:	
General reserve fund	(14.6)
Free reserve fund	(278.3)
Balance after allocation to reserves	–

15. Other equity accounts

Other equity accounts comprise the revaluation accounts for available for sale assets (gold and currency investment assets) as well as the re-measurement gains or losses on defined benefit obligations.

As at 31 March

SDR millions	**2016**	2015
Securities revaluation account	251.7	234.9
Gold revaluation account	2,431.0	2,467.4
Re-measurement of defined benefit obligations	(411.2)	(249.0)
Total other equity accounts	**2,271.5**	2,453.3

A. Securities revaluation account

This account contains the difference between the fair value and the amortised cost of the Bank's currency investment assets. The movements in the securities revaluation account were as follows:

For the financial year ended 31 March

SDR millions	**2016**	2015
Balance at beginning of year	234.9	132.4
Net gain on sales	(79.7)	(52.0)
Fair value and other movements	96.5	154.5
Net movement on revaluation of currency investment assets	**16.8**	102.5
Balance at end of year	**251.7**	234.9

The table below analyses the balance in the securities revaluation account, which relates to government and other securities:

SDR millions	Fair value of assets	Historical cost	Securities revaluation account	Gross gains	Gross losses
As at 31 March 2016	15,682.1	15,430.4	**251.7**	252.7	(1.0)
As at 31 March 2015	15,966.7	15,731.8	234.9	237.2	(2.3)

B. Gold revaluation account

The movements in the gold revaluation account were as follows:

For the financial year ended 31 March

SDR millions	**2016**	2015
Balance at beginning of year	2,467.4	2,437.5
Net gain on sales	(84.3)	(65.6)
Gold price movement	47.9	95.5
Net movement on revaluation of gold investment assets	**(36.4)**	29.9
Balance at end of year	**2,431.0**	2,467.4

C. Re-measurement of defined benefit obligations

This account contains the gains and losses from re-measurement of the Bank's post-employment benefit obligations.

For the financial year ended 31 March

SDR millions	**2016**	2015
Balance at beginning of year	(249.0)	(238.9)
Staff pension	(127.7)	33.3
Directors' pension	(0.5)	(1.0)
Post-employment health and accident insurance	(34.0)	(42.4)
Net movement on the re-measurement of defined benefit obligations	**(162.2)**	(10.1)
Balance at end of year	**(411.2)**	(249.0)

Note 12D provides further analysis of the re-measurement of the Bank's post-employment benefit obligations.

16. Interest income

For the financial year ended 31 March

SDR millions	**2016**	2015
Currency assets available for sale		
Securities purchased under resale agreements	1.8	1.6
Government and other securities	162.3	184.9
	164.1	186.5
Currency assets held at fair value through profit and loss		
Treasury bills	80.9	95.7
Securities purchased under resale agreements	62.6	78.4
Loans and advances	91.2	111.3
Government and other securities	548.6	660.9
	783.3	946.3
Assets designated as loans and receivables		
Sight and notice accounts	0.4	0.5
Gold investment assets	6.7	1.6
Gold banking assets	0.2	0.7
	7.3	2.8
Derivative financial instruments held at fair value through profit and loss	**818.0**	423.5
Interest income on liabilities	**31.4**	9.2
Total interest income	**1,804.1**	1,568.3

17. Interest expense

For the financial year ended 31 March

SDR millions	**2016**	2015
Liabilities held at fair value through profit and loss		
Currency deposits	**748.3**	741.3
Liabilities designated as financial liabilities measured at amortised cost		
Sight and notice deposit accounts	46.1	39.6
Gold deposits	–	0.6
Securities sold under repurchase agreements	1.4	1.1
	47.5	41.3
Interest expense on assets	**179.5**	32.6
Total interest expense	**975.3**	815.2

18. Net valuation movement

The net valuation movement arises entirely on financial instruments designated as held at fair value through profit and loss. There were no credit losses due to restructuring or default in the financial years ended 31 March 2016 and 31 March 2015.

For the financial year ended 31 March

SDR millions	**2016**	2015
Currency assets		
Unrealised valuation movements on currency assets	(188.8)	32.5
Realised gains on currency assets	63.0	56.2
	(125.8)	88.7
Currency liabilities		
Unrealised valuation movements on financial liabilities	118.8	(62.1)
Realised losses on financial liabilities	(104.2)	(53.5)
	14.6	(115.6)
Valuation movements on derivative financial instruments	**(191.7)**	(70.9)
Net valuation movement	**(302.9)**	(97.8)

19. Net fee and commission income

For the financial year ended 31 March

SDR millions	**2016**	2015
Net third-party asset management fee income	12.7	9.9
Other fee income	2.3	3.8
Other fees, withholding taxes and commission expenses	(9.9)	(7.9)
Net fee and commission income	**5.1**	5.8

20. Foreign exchange movement

For the financial year ended 31 March

SDR millions	**2016**	2015
Net transaction gain	13.9	7.1
Net translation movement	(15.1)	31.7
Net foreign exchange movement	**(1.2)**	38.8

21. Operating expense

The following table analyses the Bank's operating expense in Swiss francs (CHF), the currency in which most expenditure is incurred:

For the financial year ended 31 March

CHF millions	**2016**	2015
Board of Directors		
Directors' fees	2.1	2.1
Pensions to former Directors	0.9	0.9
Travel, external Board meetings and other costs	1.9	1.2
	4.9	4.2
Management and staff		
Remuneration	129.4	128.7
Pensions	79.7	93.8
Other personnel-related expense	57.4	46.9
	266.5	269.4
Office and other expense	**73.2**	70.8
BIS administrative expense	**344.6**	344.4
Direct contributions to hosted organisations	15.2	11.8
Total administrative expenses	**359.8**	356.2
Administrative expense in SDR millions	265.4	258.4
Depreciation in SDR millions	15.5	16.2
Operating expense in SDR millions	**280.9**	274.6

The average number of full-time equivalent employees during the financial year ended 31 March 2016 was 573 (2015: 572). In addition, at 31 March 2016, the Bank was the legal employer of 67 staff members (2015: 61) working in the secretariats of the Financial Stability Board (FSB), the International Association of Deposit Insurers (IADI) and the International Association of Insurance Supervisors (IAIS).

The Bank makes direct contributions, which include salary and post-employment costs and other related expenses, towards the operational costs of the FSB, IADI and the IAIS, and these amounts are shown under "Direct contributions to hosted organisations". The Bank also provides logistical, administrative and staffing-related support for these organisations, the cost of which is included within the Bank's regular administrative expense categories.

22. Net gain on sales of available for sale securities

For the financial year ended 31 March

SDR millions	**2016**	2015
Disposal proceeds	7,041.9	6,367.4
Amortised cost	(6,962.2)	(6,315.4)
Net gain on sales of available for sale securities	**79.7**	52.0
Comprising:		
Gross realised gains	80.8	55.7
Gross realised losses	(1.1)	(3.7)

23. Net gain on sales of gold investment assets

For the financial year ended 31 March

SDR millions	**2016**	2015
Disposal proceeds	103.7	80.1
Deemed cost	(19.4)	(14.5)
Net gain on sales of gold investment assets	**84.3**	65.6

24. Dividend per share

For the financial year ended 31 March	**2016**	2015
Net profit for the financial year (SDR millions)	412.9	542.9
Weighted average number of shares entitled to dividend	558,125	558,125
Dividend per share (SDR per share)	215.0	225.0
Total dividend (SDR millions)	**120.0**	125.6

The Bank's dividend policy requires that the dividend be set at a sustainable level which should vary over time in a predictable fashion. The policy also requires that the dividend reflect the Bank's capital needs and its prevailing financial circumstances, with a payout ratio of between 20% and 30% in most years.

The proposed dividend for 2016 represents a payout ratio of 29% of net profit (2015: 23%).

25. Exchange rates

The following table shows the principal exchange rates and prices used to translate balances in foreign currency and gold into SDR:

	Spot rate as at 31 March		Average rate for the financial year	
	2016	2015	**2016**	2015
USD	**0.710**	0.725	**0.717**	0.674
EUR	**0.808**	0.778	**0.791**	0.852
JPY	**0.00632**	0.00604	**0.00597**	0.00614
GBP	**1.022**	1.076	**1.081**	1.085
CHF	**0.740**	0.747	**0.737**	0.725
Gold (per ounce)	**876.9**	860.7	**824.9**	839.8

26. Off-balance sheet items

The following items are not included in the Bank's balance sheet:

As at 31 March

SDR millions	**2016**	2015
Gold bars held under earmark arrangements	12,487.5	12,256.4
Nominal value of securities:		
Securities held under safe custody arrangements	4,977.2	4,733.0
Securities held under collateral pledge agreements	38.1	38.9
Net asset value of portfolio management mandates:		
BISIPs	11,041.0	9,618.0
Dedicated mandates	4,187.6	4,019.7

Gold bars held under earmark arrangements comprise specific gold bars which have been deposited with the Bank on a custody basis. They are included at their weight in gold (translated at the gold market price and the USD exchange rate into SDR). At 31 March 2016 gold bars held under earmark amounted to 443 tonnes of gold (2015: 443 tonnes).

Portfolio management mandates include BIS Investment Pools (BISIPs) and dedicated mandates.

The BISIPs are a range of open-ended investment funds created by the Bank and managed using entities that do not have a separate legal personality from the Bank. The Bank has an agency relationship with the BISIPs, such that the assets of the BISIPs are held in the name of the BIS, but the economic benefit lies with central bank customers. The Bank does not invest for its own account in the BISIPs.

Dedicated mandates are portfolios which are managed by the Bank in accordance with investment guidelines set by the customer. They are held for the financial benefit of the central bank customer.

For both the BISIPs and the dedicated mandates, the Bank is remunerated by a management fee which is included within net fee and commission income in the profit and loss account.

27. Commitments

The Bank provides a number of committed standby facilities for its customers on a collateralised or uncollateralised basis. At 31 March 2016 all of the outstanding commitments were collateralised and amounted to SDR 3,121.6 million (2015: SDR 3,096.5 million). The BIS is committed to supporting the operations of the Financial Stability Board (FSB), the International Association of Deposit Insurers (IADI) and the International Association of Insurance Supervisors (IAIS). In each case, the Bank has a separate agreement specifying the terms of support and commitment. The Bank is the legal employer of FSB, IADI and IAIS staff, with the regular ongoing staff costs borne by each association. The commitment by the BIS to IADI is subject to an annual budgetary decision of the Board. The agreement with the FSB is under an initial five-year term ending in January 2018. The agreement with the IAIS is under a five-year term ending in 2019.

28. Fair value hierarchy

The Bank categorises its financial instrument fair value measurements using a hierarchy that reflects the observability of inputs used in measuring that value. A valuation level is assigned according to the least observable input that is significant to the fair value measurement in its entirety. The fair value hierarchy used by the Bank comprises the following levels:

Level 1 – Instruments valued using unadjusted quoted prices in active markets for identical financial instruments.

Level 2 – Instruments valued with valuation techniques using inputs which are observable for the financial instrument either directly (ie as a price) or indirectly (ie derived from prices for similar financial instruments). This includes observable interest rates, spreads and volatilities.

Level 3 – Instruments valued using valuation techniques where the inputs are not observable in financial markets.

At 31 March 2016 the Bank had no financial instruments categorised as level 3 (31 March 2015: nil).

As at 31 March 2016

SDR millions	Level 1	Level 2	Total
Financial assets held at fair value through profit and loss			
Treasury bills	31,792.1	7,786.5	39,578.6
Securities purchased under resale agreements	–	55,340.0	55,340.0
Fixed-term loans	–	16,805.5	16,805.5
Government securities	40,077.9	12,247.0	52,324.9
Derivative financial instruments	1.9	1,683.4	1,685.3
Financial assets designated as available for sale			
Government securities	14,395.9	407.6	14,803.5
Securities purchased under resale agreements	–	878.6	878.6
Total financial assets accounted for at fair value	**86,267.8**	**95,148.6**	**181,416.4**
Financial liabilities held at fair value through profit and loss			
Currency deposits	–	(152,613.6)	(152,613.6)
Securities sold under repurchase agreements	–	(569.1)	(569.1)
Derivative financial instruments	(2.1)	(3,900.1)	(3,902.2)
Total financial liabilities accounted for at fair value	**(2.1)**	**(157,082.8)**	**(157,084.9)**

As at 31 March 2015

SDR millions	Level 1	Level 2	Total
Financial assets held at fair value through profit and loss			
Treasury bills	26,869.2	7,056.8	33,926.0
Securities purchased under resale agreements	–	48,230.3	48,230.3
Fixed-term loans	–	17,437.5	17,437.5
Government and other securities	48,124.3	17,592.5	65,716.8
Derivative financial instruments	3.2	6,955.5	6,958.7
Financial assets designated as available for sale			
Government and other securities	14,937.4	256.0	15,193.4
Securities purchased under resale agreements	–	773.3	773.3
Total financial assets accounted for at fair value	89,934.1	98,301.9	188,236.0
Financial liabilities held at fair value through profit and loss			
Currency deposits	–	(154,887.0)	(154,887.0)
Derivative financial instruments	(3.0)	(2,159.2)	(2,162.2)
Total financial liabilities accounted for at fair value	(3.0)	(157,046.2)	(157,049.2)

A. Transfers between levels in the fair value hierarchy

Of the assets categorised as level 1 at 31 March 2016, SDR 1,443.7 million related to assets that were categorised as level 2 at 31 March 2015. Of the assets categorised as level 2 at 31 March 2016, SDR 1,141.5 million related to assets that had been categorised as level 1 at 31 March 2015. The transfer of assets between levels 1 and 2 reflected specific market conditions existing at the reporting dates that affected the observability of the market prices as defined above. No liabilities were transferred between fair value hierarchy levels.

B. Assets and liabilities measured at fair value level 3

During the financial years ended 31 March 2016 and 31 March 2015 the Bank did not classify any assets or liabilities as level 3 in the fair value hierarchy.

C. Financial instruments not measured at fair value

The Bank accounts for certain financial instruments at amortised cost. Using the same valuation techniques for amortised cost financial instruments as are applied to fair valued financial instruments, the Bank estimates that their fair values would be materially the same as the carrying values shown in these financial statements for both 31 March 2016 and 31 March 2015. If these instruments were included in the fair value hierarchy, the valuation of "Gold loans" and "Securities sold under repurchase agreements" would be considered level 2. All other amortised cost financial instruments would be considered level 1.

D. Impact of changes in the Bank's creditworthiness

The fair value of the Bank's liabilities may be affected by any change in its creditworthiness. If the Bank's creditworthiness deteriorated, the value of its liabilities should decrease, and the change in value would be reflected as a valuation movement in the profit and loss account. The Bank regularly assesses its creditworthiness as part of its risk management processes. The Bank's assessment of its creditworthiness did not indicate a change which could have had an impact on the fair value of the Bank's liabilities during the period under review.

E. The valuation of financial assets and liabilities

Certain of the Bank's financial assets and financial liabilities are valued using valuation techniques which require estimation of appropriate valuation parameters. Changes in estimates of these parameters could significantly affect the reported fair values. The valuation impact of a 1 basis point change in spread assumptions of key financial instruments is shown in the table below:

For the financial year ended 31 March

SDR millions	**2016**	2015
Treasury bills	1.4	1.0
Securities purchased under resale agreements	0.2	0.3
Loans and advances	0.3	0.2
Government and other securities	10.8	12.2
Currency deposits	8.8	12.4
Derivative financial instruments	0.8	3.0

29. Geographical analysis

A. Total liabilities

As at 31 March

SDR millions	**2016**	2015
Africa and Europe	76,999.3	73,071.4
Asia-Pacific	100,801.6	89,360.3
Americas	23,762.9	21,801.2
International organisations	11,442.0	14,329.0
Balance at end of year	**213,005.8**	198,561.9

B. Off-balance sheet items

As at 31 March

SDR millions	**2016**			2015		
	Gold bars held under earmark	Nominal value of securities	Net asset value of portfolio management mandates	Gold bars held under earmark	Nominal value of securities	Net asset value of portfolio management mandates
Africa and Europe	4,579.8	–	3,379.1	4,495.1	–	2,843.1
Asia-Pacific	4,724.8	4,977.2	9,637.8	4,637.4	4,733.0	8,981.7
Americas	3,182.9	38.1	2,211.7	3,123.9	38.9	1,812.9
Total	**12,487.5**	**5,015.3**	**15,228.6**	12,256.4	4,771.9	13,637.7

C. Credit commitments

As at 31 March

SDR millions	**2016**	2015
Africa and Europe	242.4	233.5
Asia-Pacific	2,879.2	2,863.0
Total	**3,121.6**	3,096.5

A geographical analysis of the Bank's assets by default risk is provided in the "Risk management" section in note 3B under "Default risk by geographical region".

30. Related parties

The Bank considers the following to be its related parties:

- the members of the Board of Directors;
- the senior officials of the Bank;
- close family members of the above individuals;
- the Bank's post-employment benefit arrangements; and
- central banks whose Governor is a member of the Board of Directors and institutions that are connected with these central banks.

A listing of the members of the Board of Directors and senior officials is shown in the sections of the Annual Report entitled "Board of Directors" and "BIS Management". Note 12 provides details of the Bank's post-employment benefit arrangements.

A. Related party individuals

Note 21 provides details of the total compensation of the Board of Directors.

The total compensation of the senior officials recognised in the profit and loss account amounted to:

For the financial year ended 31 March

CHF millions	**2016**	2015
Salaries, allowances and medical cover	8.0	7.5
Post-employment benefits	2.2	2.2
Total compensation	**10.2**	9.7
SDR equivalent	7.5	7.0

The Bank offers personal deposit accounts for all staff members and its Directors. The accounts bear interest at a rate determined by the Bank based on the rate offered by the Swiss National Bank on staff accounts. The movements and total balance on personal deposit accounts relating to members of the Board of Directors and the senior officials of the Bank were as follows:

For the financial year ended 31 March

CHF millions	**2016**	2015
Balance at beginning of year	18.9	18.3
Deposits taken and other inflows	3.7	3.9
Withdrawals and other outflows	(8.0)	(3.3)
Balance at end of year	**14.6**	18.9
SDR equivalent	10.8	14.1
Interest expense on deposits in CHF millions	**0.1**	0.4
SDR equivalent	0.1	0.3

Balances related to individuals who are appointed as members of the Board of Directors or as senior officials of the Bank during the financial year are included in the table above as other inflows. Balances related to individuals who ceased to be members of the Board of Directors or senior officials of the Bank during the financial year are included in the table above as other outflows.

In addition, the Bank operates a blocked personal deposit account for certain staff members who were previously members of the Bank's savings fund, which closed on 1 April 2003. The terms of these blocked accounts are such that staff members cannot make further deposits or withdrawals and the balances are paid out when they leave the Bank. The accounts bear interest at a rate determined by the Bank based on the rate offered by the Swiss National Bank on staff accounts plus 1%. The total balance of blocked accounts at 31 March 2016 was SDR 12.9 million (2015: SDR 14.4 million). They are reported under the balance sheet heading "Currency deposits".

B. Related party customers

The BIS provides banking services to its customers, which are predominantly central banks, monetary authorities and international financial institutions. In fulfilling this role, the Bank, in the normal course of business, enters into transactions with customers which are related parties (as defined above). These transactions include making advances, and taking currency and gold deposits. It is the Bank's policy to enter into transactions with related party customers on similar terms and conditions to transactions with other, non-related party customers. The following tables show balances relating to these transactions. The Bank believes these are representative of the general level of business undertaken with related party customers during the year.

Balances with related party customers

As at 31 March	**2016**			2015		
	Balance sheet total	Balance with related parties		Balance sheet total	Balance with related parties	
SDR millions / percentages	*SDR millions*	*SDR millions*	*%*	*SDR millions*	*SDR millions*	*%*
Assets						
Cash	25,847.0	**25,538.7**	98.8	11,375.3	11,330.3	99.6
Gold and gold loans	13,176.8	**12,067.2**	91.6	14,155.5	13,973.9	98.7
Securities purchased under resale agreements	56,218.6	**1,609.3**	2.9	49,003.6	3,513.0	7.2
Government and other securities	67,128.4	**1,227.6**	1.8	80,910.2	163.7	0.1
Derivative assets	1,685.3	**11.6**	0.7	6,958.7	177.9	2.6
Liabilities						
Currency deposits	(178,790.5)	**(70,537.9)**	39.5	(176,842.0)	(76,741.6)	43.4
Gold deposits	(10,227.6)	**(7,491.2)**	73.2	(9,857.3)	(7,352.5)	74.6
Derivative liabilities	(3,902.2)	**(64.1)**	1.6	(2,162.2)	(8.5)	0.4

Main profit and loss items arising from transactions with related party customers

For the financial year ended 31 March	**2016**			2015		
	Profit and loss total	Balance with related parties		Profit and loss total	Balance with related parties	
SDR millions / percentages	*SDR millions*	*SDR millions*	*%*	*SDR millions*	*SDR millions*	*%*
Interest income	1,804.1	**38.1**	2.1	1,568.3	11.1	0.7
Interest expense	(975.3)	**(395.7)**	40.6	(815.2)	(372.9)	45.7

31. Contingent liabilities

In the opinion of the Bank's Management there were no significant contingent liabilities at 31 March 2016 (31 March 2015: nil).

Capital adequacy

1. Capital adequacy frameworks

As an international financial institution that is overseen by a Board composed of Governors of major central banks and that has no national supervisor, the Bank is committed to maintaining its superior credit quality and financial strength, in particular in situations of financial stress.

The Bank continuously assesses its capital adequacy based on an annual capital planning process that focuses on two elements: an economic capital framework and a financial leverage framework. The disclosures in this section related to credit, market, operational and liquidity risk are based on the Bank's own assessment of capital adequacy derived in accordance with these two BIS frameworks. Regulatory capital ratios are not used as indicators of BIS capital adequacy because key aspects of the business model for the BIS banking activities are not adequately captured. In the main, these relate to the high level of solvency targeted by the Bank as well as the way regulatory capital ratios reflect portfolio concentrations and interest rate risk in the banking book.

To facilitate comparability, the Bank has implemented a framework that is consistent with the revised *International Convergence of Capital Measurement and Capital Standards* (Basel II framework) issued by the Basel Committee on Banking Supervision (BCBS) in June 2006. Following that framework, the Bank discloses a Tier 1 capital ratio (Pillar 1), risk-weighted assets and more detailed related information. In addition, the Bank calculates for reference a Common Equity Tier 1 capital ratio, leverage ratio and Liquidity Coverage Ratio taking account of banking supervisory recommendations related to Basel III. The Bank maintains a capital position substantially in excess of the regulatory minimum requirement in order to ensure its superior credit quality.

2. Economic capital

The Bank's economic capital methodology relates its risk-taking capacity to the amount of economic capital needed to absorb potential losses arising from its exposures. The risk-taking capacity is defined as allocatable economic capital that is derived following a prudent assessment of the components of the Bank's equity, which are set out in the table below:

As at 31 March

SDR millions	**2016**	2015
Share capital	698.9	698.9
Statutory reserves per balance sheet	14,997.0	14,579.7
Less: shares held in treasury	(1.7)	(1.7)
Share capital and reserves	**15,694.2**	15,276.9
Securities revaluation account	251.7	234.9
Gold revaluation account	2,431.0	2,467.4
Re-measurement of defined benefit obligations	(411.2)	(249.0)
Other equity accounts	**2,271.5**	2,453.3
Profit and loss account	**412.9**	542.9
Total equity	**18,378.6**	18,273.1

Allocatable economic capital is determined following a prudent evaluation of the Bank's equity components for their loss absorption capacity and sustainability. The components of capital with long-term risk-bearing capacity are the Bank's Tier 1 capital and the sustainable portion of the securities and gold revaluation reserves ("sustainable supplementary capital"). Only this "allocatable capital" is available for allocation to the various categories of risk. The portion of revaluation reserves that is considered more transitory in nature is assigned to the "capital filter" together with the profit accrued during the financial period under review.

As at 31 March

SDR millions	**2016**	2015
Share capital and reserves	15,694.2	15,276.9
Re-measurement of defined benefit obligations	(411.2)	(249.0)
Tier 1 capital	**15,283.0**	15,027.9
Sustainable supplementary capital	1,917.0	1,772.1
Allocatable capital	**17,200.0**	16,800.0
Capital filter	1,178.6	1,473.1
Total equity	**18,378.6**	18,273.1

As part of the annual capital planning process, Management allocates economic capital to risk categories within the amount of allocatable capital. As a first step, capital is assigned to an "economic capital cushion" that provides an additional margin of safety and is sufficient to sustain a potential material loss without the need to reduce the capital allocation to individual risk categories or to liquidate any holdings of assets. The level of the economic capital cushion is determined based on stress tests that explore extreme but still plausible default events. Allocations are then made to each category of financial risk (ie credit, market and "other risks") as well as operational risk. "Other risks" are risks that have been identified but that are not taken account of in the economic capital utilisation calculations, and include model risk and residual basis risk. Reflecting the high level of solvency targeted by the Bank, the economic capital framework measures economic capital to a 99.995% confidence level assuming a one-year horizon, except for settlement risk (included in the utilisation for credit risk) and other risks. The amount of economic capital set aside for settlement risk and other risks is based on an assessment by Management. The Bank's economic capital framework is subject to regular review and calibration.

The following table summarises the Bank's economic capital allocation and utilisation for credit risk, market risk, operational risk and other risks:

As at 31 March

	2016		2015	
SDR millions	Allocation	Utilisation	Allocation	Utilisation
Insolvency and transfer risk	9,100.0	7,789.1	8,800.0	8,102.7
FX settlement risk	300.0	300.0	300.0	300.0
Credit risk	9,400.0	8,089.1	9,100.0	8,402.7
Market risk	4,000.0	3,491.1	3,900.0	3,434.7
Operational risk	1,200.0	1,200.0	1,200.0	1,200.0
Other risks	300.0	300.0	300.0	300.0
Economic capital cushion	2,300.0	2,300.0	2,300.0	2,300.0
Total economic capital	**17,200.0**	**15,380.2**	16,800.0	15,637.4

3. Financial leverage

The Bank complements its capital adequacy assessment with a prudently managed financial leverage framework. The Bank monitors its financial leverage using a ratio that compares the BIS adjusted common equity with its total exposure. However, to reflect the scope and nature of its banking activities, the definition of the BIS adjusted common equity limits the recognition of revaluation reserves to the proportion of the gold and securities revaluation reserves that is considered sustainable ("sustainable supplementary capital"). Further, the exposure measure is supplemented by the inclusion of committed and uncommitted facilities, and pension fund assets.

The table below shows the calculation of the Bank's financial leverage ratio:

As at 31 March

SDR millions	**2016**	2015
Share capital and reserves	15,694.2	15,276.9
Sustainable supplementary capital	1,917.0	1,772.1
Share capital, reserves and sustainable supplementary capital	**17,611.2**	17,049.0
Re-measurement losses on defined benefit obligations	(411.2)	(249.0)
Intangible assets	(23.8)	(18.6)
Prudential adjustments	**(435.0)**	(267.6)
Total BIS adjusted common equity (A)	**17,176.2**	16,781.4
Total balance sheet assets	**231,384.4**	216,835.0
Derivatives	(498.1)	(609.3)
Securities purchased under resale agreements	–	20.9
Committed and uncommitted facilities	4,427.2	4,295.4
Pension fund assets	1,048.2	1,121.1
Exposure adjustments	**4,977.3**	4,828.1
Total BIS exposure (B)	**236,361.7**	221,663.1
BIS leverage ratio (A) / (B)	**7.3%**	7.6%

The Bank also calculates a leverage ratio that is consistent with Basel III recommendations. The Bank's Basel III leverage ratio differs from the BIS leverage ratio in using Common Equity Tier 1 as its capital measure instead of BIS adjusted common equity as defined above. The calculation of Common Equity Tier 1 capital is included in note 4B. At 31 March 2016 the Bank's Basel III leverage ratio stood at 7.6% (2015: 8.0%).

4. Capital ratios

The economic capital framework and the financial leverage framework described above are the main tools used for assessing the Bank's capital adequacy. Risk-weighted assets, minimum capital requirements and capital ratios are disclosed to facilitate comparability. Guidance issued by the BCBS includes several approaches for calculating risk-weighted assets and the corresponding minimum capital requirements. In principle, the minimum capital requirements are determined by taking 8% of the risk-weighted assets.

For credit risk, the Bank has adopted the advanced internal ratings-based approach for the majority of its exposures. Under this approach, the risk weighting for a transaction is determined by the relevant Basel II risk weight function using the Bank's own estimates for key inputs. Expected loss is calculated for credit risk exposures subject to the advanced internal ratings-based approach. The expected loss is calculated at the balance sheet date taking into account any impairment provision which is reflected in the Bank's financial statements. The Bank had no impaired financial assets at 31 March 2016 (2015: nil). In accordance with the requirements of the Basel framework, the expected loss is compared with the impairment provision and any shortfall is deducted from the Bank's Tier 1 capital. For securitisation exposures and relevant other assets, the Bank has adopted the standardised approach. Under this approach, risk weightings are mapped to exposure types.

Risk-weighted assets for market risk are derived following an internal models approach. For operational risk, the advanced measurement approach is used. Both these approaches rely on value-at-risk (VaR) methodologies.

More details on the assumptions underlying the calculations are provided in the sections on credit risk, market risk and operational risk.

A. Tier 1 capital ratio

The following table summarises the relevant exposure types and approaches as well as the risk-weighted assets and related minimum capital requirements for credit risk, market risk and operational risk under the Basel II framework:

As at 31 March		**2016**			2015		
SDR millions	Approach used	Amount of exposure	Risk-weighted assets (A)	Minimum capital requirement (B)	Amount of exposure	Risk-weighted assets (A)	Minimum capital requirement (B)
Credit risk							
Exposure to sovereigns, banks and corporates	Advanced internal ratings-based approach, where (B) is derived as (A) x 8%	155,351.0	11,244.4	899.6	148,838.8	11,531.8	922.5
Securitisation exposures and other assets	Standardised approach, where (B) is derived as (A) x 8%	540.1	277.0	22.2	1,023.5	371.3	29.7
Market risk							
Exposure to foreign exchange risk and gold price risk	Internal models approach, where (A) is derived as (B) / 8%	–	8,226.0	658.1	–	9,894.5	791.6
Operational risk							
	Advanced measurement approach, where (A) is derived as (B) / 8%	–	10,476.9	838.2	–	10,396.6	831.7
Total			**30,224.3**	**2,418.1**		32,194.2	2,575.5

The capital ratio measures capital adequacy by comparing the Bank's Tier 1 capital with its risk-weighted assets. The Tier 1 capital ratio, consistent with the Basel II framework, is provided in the table below:

As at 31 March

SDR millions	**2016**	2015
Share capital and reserves	15,694.2	15,276.9
Re-measurement losses on defined benefit obligations	(411.2)	(249.0)
Tier 1 capital	**15,283.0**	15,027.9
Expected loss	(22.7)	(22.2)
Tier 1 capital net of expected loss (A)	**15,260.3**	15,005.7
Total risk-weighted assets (B)	**30,224.3**	32,194.2
Tier 1 capital ratio (A) / (B)	**50.5%**	46.6%

B. Common Equity Tier 1 capital ratio

To facilitate comparability, information on risk-weighted assets and related minimum capital requirements calculated under the Basel III framework is provided in the following table. Credit risk-weighted assets differ, mainly due to the asset value correlation multiplier for large financial institutions. Basel III risk-weighted assets relating to market risk are calculated as the sum of the Basel II market risk-weighted assets (presented in the previous section) and market risk-weighted assets derived from a stressed VaR.

As at 31 March		**2016**			2015		
SDR millions	Approach used	Amount of exposure	Risk-weighted assets (A)	Minimum capital requirement (B)	Amount of exposure	Risk-weighted assets (A)	Minimum capital requirement (B)
Credit risk							
Exposure to sovereigns, banks and corporates	Advanced internal ratings-based approach, where (B) is derived as (A) x 8%	155,351.0	12,415.2	993.2	148,838.8	12,831.8	1,026.6
Securitisation exposures and other assets	Standardised approach, where (B) is derived as (A) x 8%	540.1	277.0	22.2	1,023.5	371.3	29.7
Market risk							
Exposure to foreign exchange risk and gold price risk	Internal models approach, where (A) is derived as (B) / 8%	–	24,639.7	1,971.2	–	27,867.9	2,229.4
Operational risk							
	Advanced measurement approach, where (A) is derived as (B) / 8%	–	10,476.9	838.2	–	10,396.6	831.7
Total			**47,808.8**	**3,824.8**		51,467.6	4,117.4

The Common Equity Tier 1 capital ratio calculated under the Basel III framework is set out in the table below:

As at 31 March		
SDR millions	**2016**	2015
Share capital and reserves	15,694.2	15,276.9
Revaluation reserves	2,682.7	2,702.3
Share capital, reserves and revaluation reserves	**18,376.9**	17,979.2
Re-measurement losses on defined benefit obligations	(411.2)	(249.0)
Expected loss	(22.7)	(22.2)
Intangible assets	(23.8)	(18.6)
Prudential adjustments	**(457.7)**	(289.8)
Total Common Equity Tier 1 capital (A)	**17,919.2**	17,689.4
Total risk-weighted assets (B)	**47,808.8**	51,467.6
Common Equity Tier 1 capital ratio (A) / (B)	**37.5%**	34.4%

Risk management

1. Risks faced by the Bank

The Bank supports its customers, predominantly central banks, monetary authorities and international financial institutions, in the management of their reserves and related financial activities.

Banking activities form an essential element of meeting the Bank's objectives and ensure its financial strength and independence. The BIS engages in banking activities that are customer-related as well as activities that are related to the investment of its equity, each of which may give rise to financial risk comprising credit risk, market risk and liquidity risk. The Bank is also exposed to operational risk.

Within the risk frameworks defined by the Board of Directors, the Management of the Bank has established risk management policies designed to ensure that risks are identified, appropriately measured and controlled as well as monitored and reported.

2. Risk management approach and organisation

The Bank maintains superior credit quality and adopts a prudent approach to financial risk-taking, by:

- maintaining an exceptionally strong capital position;
- investing its assets predominantly in high credit quality financial instruments;
- seeking to diversify its assets across a range of sectors;
- adopting a conservative approach to its tactical market risk-taking and carefully managing market risk associated with the Bank's strategic positions, which include its gold holdings; and
- maintaining a high level of liquidity.

A. Organisation

Under Article 39 of the Bank's Statutes, the General Manager is responsible to the Board for the management of the Bank, and is assisted by the Deputy General Manager. The Deputy General Manager is responsible for the Bank's independent risk control and compliance functions. The General Manager and the Deputy General Manager are supported by senior management advisory committees.

The key advisory committees are the Executive Committee, the Finance Committee and the Compliance and Operational Risk Committee. The first two committees are chaired by the General Manager and the third by the Deputy General Manager, and all include other senior members of the Bank's Management. The Executive Committee advises the General Manager primarily on the Bank's strategic planning and the allocation of resources, as well as on decisions related to the broad financial objectives for the banking activities and operational risk management. The Finance Committee advises the General Manager on the financial management and policy issues related to the banking business, including the allocation of economic capital to risk categories. The Compliance and Operational Risk Committee acts as an advisory committee to the Deputy General Manager and ensures the coordination of compliance matters and operational risk management throughout the Bank.

The independent risk control function for financial risks is performed by the Risk Control unit. The independent operational risk control function is shared between Risk Control, which maintains the operational risk quantification, and the Compliance and Operational Risk Unit. Both units report directly to the Deputy General Manager.

The Bank's compliance function is performed by the Compliance and Operational Risk Unit. The objective of this function is to provide reasonable assurance that the activities of the Bank and its staff conform to applicable laws and regulations, the BIS Statutes, the Bank's Code of Conduct and other internal rules, policies and relevant standards of sound practice.

The Compliance and Operational Risk Unit identifies and assesses compliance risks and guides and educates staff on compliance issues. The Head of the Compliance and Operational Risk Unit also has a direct reporting line to the Audit Committee, which is an advisory committee to the Board of Directors.

The Finance unit and the Legal Service complement the Bank's risk management. The Finance unit operates an independent valuation control function, produces the Bank's financial statements and controls the Bank's expenditure by setting and monitoring the annual budget. The objective of the independent valuation control function is to ensure that the Bank's valuations comply with its valuation policy and procedures. The Finance unit reports to the Deputy General Manager and the Secretary General.

The Legal Service provides legal advice and support covering a wide range of issues relating to the Bank's activities. The Legal Service has a direct reporting line to the General Manager.

The Internal Audit function reviews internal control procedures and reports on how they comply with internal standards and industry best practices. The scope of internal audit work includes the review of risk management procedures, internal control systems, information systems and governance processes. Internal Audit has reporting lines to the General Manager and the Deputy General Manager, and to the Audit Committee.

B. Risk monitoring and reporting

The Bank's financial and operational risk profile, position and performance are monitored on an ongoing basis by the relevant units. Financial risk and compliance reports aimed at various management levels are provided regularly to enable Management to adequately assess the Bank's risk profile and financial condition.

Management reports financial and risk information to the Board of Directors on a monthly and a quarterly basis. Furthermore, the Audit Committee receives regular reports from Internal Audit, the Compliance and Operational Risk Unit and the Finance unit. The Banking and Risk Management Committee, another advisory committee to the Board, receives regular reports from the Risk Control unit. The preparation of reports is subject to comprehensive policies and procedures, thus ensuring strong controls.

C. Risk methodologies

The Bank revalues virtually all of its financial instruments to fair value on a daily basis and reviews its valuations monthly, taking into account necessary adjustments for impairment. It uses a comprehensive range of quantitative methodologies for valuing financial instruments and for measuring risk to its net profit and equity. The Bank reassesses its quantitative methodologies in the light of its changing risk environment and evolving best practice.

The Bank's model validation policy defines the roles and responsibilities and processes related to the implementation of new or materially changed risk and valuation models.

A key methodology used by the Bank to measure and manage risk is the calculation of economic capital based on value-at-risk (VaR) techniques. VaR expresses the statistical estimate of the maximum potential loss on the current positions of the Bank measured to a specified level of confidence and a specified time horizon. VaR models depend on statistical assumptions and the quality of available market data and, while forward-looking, they extrapolate from past events. VaR models may underestimate potential losses if changes in risk factors fail to align with the distribution assumptions. VaR figures do not provide any information on losses that may occur beyond the assumed confidence level.

The Bank's economic capital framework covers credit risk, market risk, operational risk and other risks. As part of the annual capital planning process, the Bank allocates economic capital to the above risk categories commensurate with principles set by the Board and taking account of the business strategy. Reflecting the high level of solvency targeted by the Bank, the economic capital framework measures economic capital to a 99.995% confidence level assuming a one-year holding period. An additional amount of economic capital is set aside for settlement risk (included in the utilisation for credit risk) and "other risks" based on Management's assessment of risks which are not reflected in the economic capital calculations. Moreover, capital is also allocated to an "economic capital cushion" that is based on stress tests that explore extreme but still plausible default events. The economic capital cushion provides an additional margin of safety to sustain a potential material loss without the need to reduce the capital allocated to individual risk categories or to liquidate any holdings of assets.

The management of the Bank's capital adequacy is complemented by a comprehensive stress testing framework, and a prudent financial leverage framework. The stress testing framework supplements the Bank's risk assessment including its VaR and economic capital calculations for financial risk. The Bank's key market risk factors and credit exposures are stress-tested. The stress testing includes the analysis of severe historical and adverse hypothetical macroeconomic scenarios, as well as sensitivity tests of extreme but still plausible movements of the key risk factors identified. The Bank also performs stress tests related to liquidity risk. The financial leverage framework focuses on a ratio that sets the BIS adjusted common equity in relation to its total balance sheet exposure.

3. Credit risk

Credit risk arises because a counterparty may fail to meet its obligations in accordance with the agreed contractual terms and conditions. A financial asset is considered past due when a counterparty fails to make a payment on the contractual due date.

The Bank manages credit risk within a framework and policies set by the Board of Directors and Management. These are complemented by more detailed guidelines and procedures at the level of the independent risk control function.

A. Credit risk assessment

Credit risk is continuously controlled at both a counterparty and an aggregated level. As part of the independent risk control function, individual counterparty credit assessments are performed subject to a well defined internal rating process, involving 18 rating grades. As part of this process, counterparty financial statements and market information are analysed. The rating methodologies depend on the nature of the counterparty. Based on the internal rating and specific counterparty features, the Bank sets a series of credit limits covering individual counterparties and countries. Internal ratings are assigned to all counterparties. In principle, the ratings and related limits are reviewed at least annually. The main assessment criterion in these reviews is the ability of the counterparties to meet interest and principal repayment obligations in a timely manner.

Credit risk limits at the counterparty level are approved by the Bank's Management and fit within a framework set by the Board of Directors.

On an aggregated level, credit risk, including default and country transfer risk, is measured, monitored and controlled based on the Bank's economic capital calculation for credit risk. To calculate economic capital for credit risk, the Bank uses a portfolio VaR model. Management limits the Bank's overall exposure to credit risk by allocating an amount of economic capital to credit risk.

B. Default risk

The following tables show the exposure of the Bank to default risk, without taking into account any collateral held or other credit enhancements available to the Bank. Credit risk is mitigated through the use of collateral and legally enforceable netting or setoff agreements. The corresponding assets and liabilities are not offset on the balance sheet.

The exposures set out in the tables below are based on the carrying value of the assets on the balance sheet as categorised by sector, geographical region and credit quality. The carrying value is the fair value of the financial instruments, including derivatives, except in the case of very short-term financial instruments (sight and notice accounts) and gold, which are shown at amortised cost net of any impairment charge. Commitments are reported at their notional amounts. Gold and gold loans exclude gold bar assets held in custody, and accounts receivable do not include unsettled liability issues, because these items do not represent credit exposures of the Bank.

The vast majority of the Bank's assets are invested in securities issued by governments and financial institutions rated A– or above by at least one of the major external credit assessment institutions. Limitations on the number of high-quality counterparties in these sectors mean that the Bank is exposed to single-name concentration risk.

The Bank conducts an annual review for impairment at the date of each balance sheet. At 31 March 2016 the Bank did not have any financial assets that were considered to be impaired (2015: nil). At 31 March 2016 no financial assets were considered past due (2015: nil). No credit loss was recognised in the current period (2015: nil).

Default risk by asset class and issuer type

The following tables show the exposure of the Bank to default risk by asset class and issuer type, without taking into account any collateral held or other credit enhancements available to the Bank. "Public sector" includes international and other public sector institutions.

As at 31 March 2016

SDR millions	Sovereign and central banks	Public sector	Banks	Corporate	Securitisation	Total
On-balance sheet exposures						
Cash and sight accounts	25,729.9	–	117.1	–	–	25,847.0
Gold and gold loans	2,246.7	–	1,109.6	–	–	3,356.3
Treasury bills	37,533.9	2,044.7	–	–	–	39,578.6
Securities purchased under resale agreements	1,609.3	–	46,077.8	8,531.5	–	56,218.6
Loans and advances	491.1	514.3	16,332.0	–	–	17,337.4
Government and other securities	43,567.5	10,415.9	5,123.6	7,692.5	328.9	67,128.4
Derivative financial instruments	177.5	11.9	1,495.2	0.7	–	1,685.3
Accounts receivable	6.1	0.5	27.7	7.5	–	41.8
Total on-balance sheet exposure	**111,362.0**	**12,987.3**	**70,283.0**	**16,232.2**	**328.9**	**211,193.4**
Commitments						
Undrawn secured facilities	3,121.6	–	–	–	–	3,121.6
Total commitments	**3,121.6**	**–**	**–**	**–**	**–**	**3,121.6**
Total exposure	**114,483.6**	**12,987.3**	**70,283.0**	**16,232.2**	**328.9**	**214,315.0**

As at 31 March 2015

SDR millions	Sovereign and central banks	Public sector	Banks	Corporate	Securitisation	Total
On-balance sheet exposures						
Cash and sight accounts	11,333.9	–	41.4	–	–	11,375.3
Gold and gold loans	–	–	181.6	–	–	181.6
Treasury bills	33,439.4	486.6	–	–	–	33,926.0
Securities purchased under resale agreements	3,513.0	–	39,012.0	6,478.6	–	49,003.6
Loans and advances	1,407.8	819.2	15,739.2	–	–	17,966.2
Government and other securities	54,025.6	11,883.6	6,381.3	7,797.8	821.9	80,910.2
Derivative financial instruments	293.7	124.7	6,539.3	1.0	–	6,958.7
Accounts receivable	2.9	–	0.2	6.8	–	9.9
Total on-balance sheet exposure	104,016.3	13,314.1	67,895.0	14,284.2	821.9	200,331.5
Commitments						
Undrawn secured facilities	3,096.5	–	–	–	–	3,096.5
Total commitments	3,096.5		–		–	3,096.5
Total exposure	107,112.8	13,314.1	67,895.0	14,284.2	821.9	203,428.0

Default risk by geographical region

The following tables represent the exposure of the Bank to default risk by asset class and geographical region, without taking into account any collateral held or other credit enhancements available to the Bank. The Bank has allocated exposures to regions based on the country of incorporation of each legal entity to which the Bank has exposures.

As at 31 March 2016

SDR millions	Africa and Europe	Asia-Pacific	Americas	International institutions	Total
On-balance sheet exposures					
Cash and sight accounts	21,876.7	3,963.7	6.6	–	25,847.0
Gold and gold loans	3,300.2	–	56.1	–	3,356.3
Treasury bills	10,472.6	20,111.5	6,949.8	2,044.7	39,578.6
Securities purchased under resale agreements	52,975.8	–	3,242.8	–	56,218.6
Loans and advances	11,623.3	4,436.2	763.7	514.2	17,337.4
Government and other securities	33,494.2	7,883.6	19,216.1	6,534.5	67,128.4
Derivative financial instruments	1,280.8	217.2	179.9	7.4	1,685.3
Accounts receivable and other assets	39.9	1.7	0.2	–	41.8
Total on-balance sheet exposure	**135,063.5**	**36,613.9**	**30,415.2**	**9,100.8**	**211,193.4**
Commitments					
Undrawn secured facilities	242.4	2,879.2	–	–	3,121.6
Total commitments	**242.4**	**2,879.2**	**–**	**–**	**3,121.6**
Total exposure	**135,305.9**	**39,493.1**	**30,415.2**	**9,100.8**	**214,315.0**

As at 31 March 2015

SDR millions	Africa and Europe	Asia-Pacific	Americas	International institutions	Total
On-balance sheet exposures					
Cash and sight accounts	8,313.0	3,057.0	5.3	–	11,375.3
Gold and gold loans	181.6	–	–	–	181.6
Treasury bills	10,061.8	19,776.0	3,601.6	486.6	33,926.0
Securities purchased under resale agreements	45,490.6	–	3,513.0	–	49,003.6
Loans and advances	11,418.7	4,552.4	1,489.6	505.5	17,966.2
Government and other securities	43,798.6	8,814.3	20,840.2	7,457.1	80,910.2
Derivative financial instruments	5,124.6	655.4	1,178.7	–	6,958.7
Accounts receivable	8.8	0.9	0.2	–	9.9
Total on-balance sheet exposure	124,397.7	36,856.0	30,628.6	8,449.2	200,331.5
Commitments					
Undrawn secured facilities	233.5	2,863.0	–	–	3,096.5
Total commitments	233.5	2,863.0	–	–	3,096.5
Total exposure	124,631.2	39,719.0	30,628.6	8,449.2	203,428.0

Default risk by counterparty / issuer rating

The following tables show the exposure of the Bank to default risk by class of financial asset and counterparty / issuer rating, without taking into account any collateral held or other credit enhancements available to the Bank. The ratings shown reflect the Bank's internal ratings expressed as equivalent external ratings.

As at 31 March 2016

SDR millions	AAA	AA	A	BBB	BB and below	Unrated	Total
On-balance sheet exposures							
Cash and sight accounts	19,153.4	1,492.9	5,200.1	0.3	0.3	–	25,847.0
Gold and gold loans	–	2,246.7	1,109.6	–	–	–	3,356.3
Treasury bills	2,568.7	11,919.2	21,630.2	3,460.5	–	–	39,578.6
Securities purchased under resale agreements	–	10,140.8	35,739.1	10,338.7	–	–	56,218.6
Loans and advances	721.4	–	15,622.1	497.1	496.8	–	17,337.4
Government and other securities	15,385.6	37,181.1	13,416.9	1,112.2	32.6	–	67,128.4
Derivative financial instruments	0.5	53.7	1,589.8	26.4	3.8	11.1	1,685.3
Accounts receivable	–	0.2	28.2	0.6	1.1	11.7	41.8
Total on-balance sheet exposure	**37,829.6**	**63,034.6**	**94,336.0**	**15,435.8**	**534.6**	**22.8**	**211,193.4**
Commitments							
Undrawn secured facilities	–	930.8	952.4	996.0	242.4	–	3,121.6
Total commitments	**–**	**930.8**	**952.4**	**996.0**	**242.4**	**–**	**3,121.6**
Total exposure	**37,829.6**	**63,965.4**	**95,288.4**	**16,431.8**	**777.0**	**22.8**	**214,315.0**

As at 31 March 2015

SDR millions	AAA	AA	A	BBB	BB and below	Unrated	Total
On-balance sheet exposures							
Cash and sight accounts	8,268.1	48.1	3,057.8	1.0	0.3	–	11,375.3
Gold and gold loans	–	–	181.6	–	–	–	181.6
Treasury bills	3,746.7	7,001.1	19,314.5	3,863.7	–	–	33,926.0
Securities purchased under resale agreements	–	9,991.6	30,334.2	8,677.8	–	–	49,003.6
Loans and advances	813.9	–	16,363.3	426.6	362.4	–	17,966.2
Government and other securities	22,906.1	40,599.6	15,796.9	1,607.6	–	–	80,910.2
Derivative financial instruments	111.5	129.6	6,385.9	320.4	1.6	9.7	6,958.7
Accounts receivable	–	0.2	0.2	0.4	0.7	8.4	9.9
Total on-balance sheet exposure	35,846.3	57,770.2	91,434.4	14,897.5	365.0	18.1	200,331.5
Commitments							
Undrawn secured facilities	–	925.7	946.9	990.3	233.6	–	3,096.5
Total commitments	–	925.7	946.9	990.3	233.6	–	3,096.5
Total exposure	35,846.3	58,695.9	92,381.3	15,887.8	598.6	18.1	203,428.0

C. Credit risk mitigation

Netting

Netting agreements give the Bank a legally enforceable right to net transactions with counterparties under potential future conditions, notably an event of default. Such master netting or similar agreements apply to counterparties with whom the Bank conducts most of its derivative transactions, as well as to counterparties used for repurchase and reverse repurchase agreement transactions. Where required, netting is applied when determining the amount of collateral to be requested or provided, but the Bank does not settle assets and liabilities on a net basis during the normal course of business. As such, the amounts shown on the Bank's balance sheet are the gross amounts.

Collateral

The Bank mitigates credit risk by requiring counterparties to provide collateral. The Bank receives collateral in respect of most derivative contracts, reverse repurchase agreements and for advances made under collateralised facility agreements. During the term of these transactions, further collateral may be called or collateral may be released based on the movements in value of both the underlying instrument and the collateral that has been received. The Bank is required to provide collateral in respect of repurchase agreements.

For derivative contracts and reverse repurchase agreements, the Bank accepts as collateral high-quality sovereign, state agency and supranational securities and, in a limited number of cases, cash. For advances made under collateralised facility agreements, collateral accepted includes currency deposits with the Bank as well as units in the BIS Investment Pools.

Under the terms of its collateral arrangements, the Bank is permitted to sell ("re-hypothecate") collateral received on derivative contracts and reverse repurchase agreements, but upon expiry of the transaction must return equivalent financial instruments to the counterparty. At 31 March 2016 the Bank had not sold any of the collateral it held (2015: nil).

The fair value of collateral held which the Bank had the right to sell was:

As at 31 March

SDR millions	**2016**	2015
Collateral held in respect of:		
Derivatives	247.6	4,003.7
Securities purchased under resale agreements	40,423.5	38,825.4
Total	**40,671.1**	42,829.1

Financial assets and liabilities subject to netting or collateralisation

The tables below show the categories of assets and liabilities which are subject to collateralisation and for which netting agreements potentially apply, eg in the event of default of a counterparty.

The amount of collateral required is usually based on valuations performed on the previous business day, whereas the Bank's balance sheet reflects the valuations of the reporting date. Due to this timing difference, the valuation of collateral can be higher than the valuation of the underlying contract in the Bank's balance sheet. The amount of the collateral obtained is also impacted by thresholds, minimum transfer amounts and valuation adjustments ("haircuts") specified in the contracts. In these tables, the mitigating effect of collateral has been limited to the balance sheet value of the underlying net asset.

As at 31 March 2016		Effect of risk mitigation				Analysed as:	
SDR millions	Gross carrying amount as per balance sheet	Adjustments for settlement date effects	Enforceable netting agreements	Collateral (received) / provided (limited to balance sheet value)	Exposure after risk mitigation	Amounts not subject to risk mitigation agreements	Amounts subject to risk mitigation agreements
Financial assets							
Securities purchased under resale agreements	56,218.6	(14,456.4)	–	(41,762.2)	–	–	–
Advances	496.8	–	–	(496.8)	–	–	–
Derivative financial assets	1,685.3	–	(1,357.8)	(168.6)	158.9	106.9	52.0
Financial liabilities							
Securities sold under repurchase agreements	(1,447.7)	203.0	–	1,244.7	.	.	.
Derivative financial liabilities	(3,902.2)	–	1,357.8	–	.	.	.

As at 31 March 2015		Effect of risk mitigation				Analysed as:	
SDR millions	Gross carrying amount as per balance sheet	Adjustments for settlement date effects	Enforceable netting agreements	Collateral (received) / provided (limited to balance sheet value)	Exposure after risk mitigation	Amounts not subject to risk mitigation agreements	Amounts subject to risk mitigation agreements
Financial assets							
Securities purchased under resale agreements	49,003.6	(6,813.4)	–	(42,169.2)	21.0	–	21.0
Advances	1,413.1	–	–	(1,413.1)	–	–	–
Derivative financial assets	6,958.7	–	(2,001.8)	(3,961.1)	995.8	81.8	914.0
Financial liabilities							
Securities sold under repurchase agreements	(773.3)	–	–	773.1	.	.	.
Derivative financial liabilities	(2,162.2)	–	2,001.8	–	.	.	.

D. Economic capital for credit risk

The Bank determines economic capital for credit risk, except for settlement risk, using a VaR methodology on the basis of a portfolio VaR model, assuming a one-year time horizon and a 99.995% confidence level. The amount of economic capital for settlement risk included in the credit risk utilisation reflects an amount assessed by Management.

For the financial year	**2016**				2015			
SDR millions	Average	High	Low	At 31 March	Average	High	Low	At 31 March
Economic capital utilisation for credit risk	8,498.9	9,182.0	7,785.6	**8,089.1**	8,124.1	8,970.1	7,372.6	8,402.7

E. Minimum capital requirements for credit risk

Exposure to sovereigns, banks and corporates

For the calculation of risk-weighted assets for exposures to banks, sovereigns and corporates, the Bank has adopted an approach that is consistent with the advanced internal ratings-based approach.

As a general rule, under this approach risk-weighted assets are determined by multiplying the credit risk exposures with risk weights derived from the relevant Basel II risk weight function using the Bank's own estimates for key inputs. These estimates for key inputs are also relevant to the Bank's economic capital calculation for credit risk.

The credit risk exposure for a transaction or position is referred to as the exposure at default (EAD). The Bank determines the EAD as the notional amount of on- and off-balance sheet credit exposures, except for securities and derivative contracts. The EAD for derivatives is calculated using an approach consistent with the internal models method proposed under the Basel II framework. In line with this methodology, the Bank calculates effective expected positive exposures that are then multiplied by a factor alpha as set out in the framework.

Key inputs to the risk weight function are a counterparty's estimated one-year probability of default (PD) as well as the estimated loss-given-default (LGD) and maturity for each transaction.

Due to the high credit quality of the Bank's investments and the conservative credit risk management process at the BIS, the Bank is not in a position to estimate PDs and LGDs based on its own default experience. The Bank calibrates each counterparty PD estimate through a mapping of internal rating grades to external credit assessments taking external default data into account. Similarly, LGD estimates are derived from external data. Where appropriate, these estimates are adjusted to reflect the risk-reducing effects of collateral obtained giving consideration to market price volatility, re-margining and revaluation frequency. The recognition of the risk-reducing effects of collateral obtained for derivative contracts, reverse repurchase agreements and collateralised advances is accounted for in calculating the EAD.

The table below details the calculation of risk-weighted assets. The exposures are measured taking netting and collateral benefits into account. The total amount of exposures reported in the table as at 31 March 2016 includes SDR 118.9 million for interest rate contracts (2015: SDR 184.5 million) and SDR 283.5 million for FX and gold contracts (2015: SDR 1,229.5 million). In line with the Basel II framework, the minimum capital requirement is determined as 8% of risk-weighted assets.

As at 31 March 2016

Internal rating grades expressed as equivalent external rating grades	Amount of exposure	Exposure-weighted PD	Exposure-weighted average LGD	Exposure-weighted average risk weight	Risk-weighted assets
SDR millions / percentages	*SDR millions*	*%*	*%*	*%*	*SDR millions*
AAA	37,006.0	0.01	35.7	2.4	879.5
AA	54,277.8	0.02	39.6	6.4	3,496.3
A	58,498.3	0.04	48.4	9.1	5,296.6
BBB	5,518.4	0.17	51.1	27.6	1,525.0
BB and below	50.5	1.20	53.4	93.1	47.0
Total	**155,351.0**				**11,244.4**

As at 31 March 2015

Internal rating grades expressed as equivalent external rating grades	Amount of exposure	Exposure-weighted PD	Exposure-weighted average LGD	Exposure-weighted average risk weight	Risk-weighted assets
SDR millions / percentages	*SDR millions*	*%*	*%*	*%*	*SDR millions*
AAA	34,886.4	0.01	35.6	2.9	1,024.7
AA	52,401.7	0.02	39.6	7.0	3,662.2
A	55,387.4	0.04	48.6	9.4	5,227.3
BBB	6,154.7	0.16	50.8	26.2	1,610.7
BB and below	8.6	1.32	50.7	80.3	6.9
Total	148,838.8				11,531.8

At 31 March 2016 the minimum capital requirement for credit risk related to exposures to sovereigns, banks and corporates amounted to SDR 899.6 million (2015: SDR 922.5 million).

The table below summarises the impact of collateral arrangements on the amount of credit exposure after taking netting into account:

SDR millions	Amount of exposure after taking netting into account	Benefits from collateral arrangements	Amount of exposure after taking into account netting and collateral arrangements
As at 31 March 2016	213,873.1	58,522.1	**155,351.0**
As at 31 March 2015	204,224.3	55,385.5	148,838.8

Securitisation exposures

The Bank invests in highly rated securitisation exposures based on traditional, ie non-synthetic, securitisation structures. Given the scope of the Bank's activities, risk-weighted assets under the Basel II framework are determined according to the standardised approach for securitisation. Under this approach, external credit assessments of the securities are used to determine the relevant risk weights. External credit assessment institutions used for this purpose are Moody's Investors Service, Standard & Poor's and Fitch Ratings. Risk-weighted assets are then derived as the product of the market values of the exposures and the associated risk weights. In line with the Basel II framework, the minimum capital requirement is determined as 8% of risk-weighted assets.

The following table shows the Bank's investments in securitisation analysed by type of securitised assets:

As at 31 March 2016

SDR millions	External rating	Amount of exposures	Risk weight	Risk-weighted assets
Residential mortgage-backed securities	A	–	50%	–
Securities backed by other receivables (government-sponsored)	AAA	328.9	20%	65.8
Total		**328.9**		**65.8**

As at 31 March 2015

SDR millions	External rating	Amount of exposures	Risk weight	Risk-weighted assets
Residential mortgage-backed securities	A	17.5	50%	8.8
Securities backed by other receivables (government-sponsored)	AAA	804.4	20%	160.9
Total		821.9		169.7

At 31 March 2016 the minimum capital requirement for securitisation exposures amounted to SDR 5.3 million (2015: SDR 13.6 million).

4. Market risk

The Bank is exposed to market risk through adverse movements in market prices. The main components of the Bank's market risk are gold price risk, interest rate risk and foreign exchange risk. The Bank measures market risk and calculates economic capital based on a VaR methodology using a Monte Carlo simulation technique. Risk factor volatilities and correlations are estimated, subject to an exponential weighting scheme, over a six-year observation period. Furthermore, the Bank computes sensitivities to certain market risk factors.

In line with the Bank's objective of maintaining its superior credit quality, economic capital is measured at the 99.995% confidence level assuming a one-year holding period. The Bank calculates the economic capital utilisation for market risk on the basis of a stressed market data set. The Bank's Management manages market risk economic capital usage within a framework set by the Board of Directors. VaR limits are supplemented by operating limits.

To ensure that models provide a reliable measure of potential losses over the one-year time horizon, the Bank has established a comprehensive regular backtesting framework, comparing daily performance with corresponding VaR estimates. The results are analysed and reported to Management.

The Bank also supplements its market risk measurement based on VaR modelling and related economic capital calculations with a series of stress tests. These include severe historical scenarios, adverse hypothetical macroeconomic scenarios and sensitivity tests of gold price, interest rate and foreign exchange rate movements.

A. Gold price risk

Gold price risk is the exposure of the Bank's financial condition to adverse movements in the price of gold.

The Bank is exposed to gold price risk principally through its holdings of gold investment assets, which amount to 104 tonnes (2015: 108 tonnes). These gold investment assets are held in custody or placed on deposit with commercial banks. At 31 March 2016 the Bank's net gold investment assets amounted to SDR 2,944.6 million (2015: SDR 2,998.3 million), approximately 16% of its equity (2015: 16%). The Bank sometimes also has small exposures to gold price risk arising from its banking activities with central and commercial banks. Gold price risk is measured within the Bank's VaR methodology, including its economic capital framework and stress tests.

B. Interest rate risk

Interest rate risk is the exposure of the Bank's financial condition to adverse movements in interest rates including credit spreads. The Bank is exposed to interest rate risk through the interest-bearing assets relating to the management of its equity held in its investment portfolios and investments relating to its banking portfolios. The investment portfolios are managed using a fixed-duration benchmark of bonds.

The Bank measures and monitors interest rate risk using a VaR methodology and sensitivity analyses taking into account movements in relevant money market rates, government bond yields, swap rates and credit spreads.

The tables below show the impact on the Bank's equity of a 1% upward shift in the relevant yield curve per time band:

As at 31 March 2016

SDR millions	Up to 6 months	6 to 12 months	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	Over 5 years	Total
Euro	(1.3)	(5.5)	(33.5)	1.5	(45.6)	(48.3)	(74.0)	(206.7)
Japanese yen	1.5	(0.3)	0.2	(0.2)	–	–	–	1.2
Pound sterling	(1.6)	(0.8)	(10.4)	(17.0)	(19.7)	(5.8)	–	(55.3)
Swiss franc	7.5	(0.4)	(0.8)	(0.2)	–	–	1.4	7.5
US dollar	(2.7)	(12.2)	(37.8)	(56.5)	(51.3)	(59.2)	(7.7)	(227.4)
Other currencies	1.0	0.2	(1.2)	(1.0)	(1.0)	(0.6)	0.1	(2.5)
Total	**4.4**	**(19.0)**	**(83.5)**	**(73.4)**	**(117.6)**	**(113.9)**	**(80.2)**	**(483.2)**

As at 31 March 2015

SDR millions	Up to 6 months	6 to 12 months	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	Over 5 years	Total
Euro	(6.5)	(13.5)	(11.6)	(28.8)	(40.5)	(36.5)	(12.6)	(150.0)
Japanese yen	(1.1)	(1.8)	0.1	(0.1)	–	–	–	(2.9)
Pound sterling	(1.2)	(1.6)	(8.5)	(15.6)	(20.0)	(6.8)	0.3	(53.4)
Swiss franc	5.7	(1.1)	(1.3)	(1.2)	(0.3)	–	3.5	5.3
US dollar	(1.7)	(13.0)	(40.8)	(49.3)	(66.1)	(63.6)	(3.1)	(237.6)
Other currencies	–	0.2	(0.7)	(1.4)	(1.8)	(1.3)	(0.4)	(5.4)
Total	(4.8)	(30.8)	(62.8)	(96.4)	(128.7)	(108.2)	(12.3)	(444.0)

C. Foreign exchange risk

The Bank's functional currency, the SDR, is a composite currency comprising fixed amounts of USD, EUR, JPY and GBP. Currency risk is the exposure of the Bank's financial condition to adverse movements in exchange rates. The Bank is exposed to foreign exchange risk primarily through the assets relating to the management of its equity. The Bank is also exposed to foreign exchange risk through managing its customer deposits and through acting as an intermediary in foreign exchange transactions. The Bank reduces its foreign exchange exposures by matching the relevant assets to the constituent currencies of the SDR on a regular basis, and by limiting currency exposures arising from customer deposits and foreign exchange transaction intermediation.

The following tables show the Bank's assets and liabilities by currency and gold exposure. The net foreign exchange and gold position in these tables therefore includes the Bank's gold investments. To determine the Bank's net foreign exchange exposure, the gold amounts need to be removed. The SDR-neutral position is then deducted from the net foreign exchange position excluding gold to arrive at the net currency exposure of the Bank on an SDR-neutral basis.

As at 31 March 2016

SDR millions	SDR	USD	EUR	GBP	JPY	CHF	Gold	Other currencies	Total
Assets									
Cash and sight accounts	–	5.6	13,066.4	3.6	3,842.9	8,606.0	–	322.5	25,847.0
Gold and gold loans	–	2.8	–	–	–	–	13,174.0	–	13,176.8
Treasury bills	–	6,486.4	10,900.5	507.6	19,660.0	–	–	2,024.1	39,578.6
Securities purchased under resale agreements	–	4,821.6	39,462.2	10,103.7	1,831.1	–	–	–	56,218.6
Loans and advances	514.2	7,453.0	5,158.2	1,476.1	5.6	(2.6)	–	2,732.9	17,337.4
Government and other securities	–	31,211.5	22,081.3	6,323.8	1,328.0	–	–	6,183.8	67,128.4
Derivative financial instruments	(1,035.6)	(2,773.4)	5,017.6	(852.7)	3.1	639.2	–	687.1	1,685.3
Accounts receivable	–	7,971.2	211.5	87.5	–	9.0	–	1,936.7	10,215.9
Land, buildings and equipment	184.5	–	–	–	–	11.9	–	–	196.4
Total assets	**(336.9)**	**55,178.7**	**95,897.7**	**17,649.6**	**26,670.7**	**9,263.5**	**13,174.0**	**13,887.1**	**231,384.4**
Liabilities									
Gold deposits	–	–	–	–	–	–	(10,227.6)	–	(10,227.6)
Currency deposits	(2,048.6)	(135,519.5)	(19,604.2)	(11,849.9)	(1,791.2)	(359.1)	–	(7,618.0)	(178,790.5)
Securities sold under repurchase agreements	–	(569.1)	(878.6)	–	–	–	–	–	(1,447.7)
Derivative financial instruments	3,588.4	89,641.8	(57,575.9)	(3,820.3)	(22,362.5)	(8,297.1)	(0.1)	(5,076.5)	(3,902.2)
Accounts payable	–	(1,810.2)	(12,811.7)	(301.6)	(1,421.1)	–	–	(1,204.2)	(17,548.8)
Other liabilities	–	(0.5)	–	–	–	(1,087.4)	–	(1.1)	(1,089.0)
Total liabilities	**1,539.8**	**(48,257.5)**	**(90,870.4)**	**(15,971.8)**	**(25,574.8)**	**(9,743.6)**	**(10,227.7)**	**(13,899.8)**	**(213,005.8)**
Net currency and gold position	**1,202.9**	**6,921.2**	**5,027.3**	**1,677.8**	**1,095.9**	**(480.1)**	**2,946.3**	**(12.7)**	**18,378.6**
Adjustment for gold	–	–	–	–	–	–	(2,946.3)	–	(2,946.3)
Net currency position	**1,202.9**	**6,921.2**	**5,027.3**	**1,677.8**	**1,095.9**	**(480.1)**	**–**	**(12.7)**	**15,432.3**
SDR-neutral position	(1,202.9)	(6,661.9)	(4,864.5)	(1,615.0)	(1,088.0)	–	–	–	**(15,432.3)**
Net currency exposure on SDR-neutral basis	**–**	**259.3**	**162.8**	**62.8**	**7.9**	**(480.1)**	**–**	**(12.7)**	**–**

As at 31 March 2015

SDR millions	SDR	USD	EUR	GBP	JPY	CHF	Gold	Other currencies	Total
Assets									
Cash and sight accounts	–	39.2	41.0	0.8	3,047.6	8,233.8	–	12.9	11,375.3
Gold and gold loans	–	0.9	–	–	–	–	14,154.6	–	14,155.5
Treasury bills	–	2,135.2	10,307.2	62.4	17,403.6	–	–	4,017.6	33,926.0
Securities purchased under resale agreements	–	5,686.7	27,415.5	14,832.7	1,068.6	–	–	0.1	49,003.6
Loans and advances	505.6	9,830.0	3,565.1	1,564.7	428.1	(2.1)	–	2,074.8	17,966.2
Government and other securities	–	33,771.5	29,973.7	6,988.2	4,205.8	–	–	5,971.0	80,910.2
Derivative financial instruments	2,744.9	79,188.3	(38,215.4)	(8,693.4)	(18,067.8)	(3,541.8)	(1,295.7)	(5,160.4)	6,958.7
Accounts receivable	–	1,133.0	1,096.0	43.1	–	6.7	–	66.6	2,345.4
Land, buildings and equipment	184.6	–	–	–	–	9.6	–	(0.1)	194.1
Total assets	3,435.1	131,784.8	34,183.1	14,798.5	8,085.9	4,706.2	12,858.9	6,982.5	216,835.0
Liabilities									
Gold deposits	–	–	–	–	–	–	(9,857.3)	–	(9,857.3)
Currency deposits	(3,614.6)	(130,280.1)	(22,739.9)	(10,853.9)	(1,590.7)	(377.8)	–	(7,385.0)	(176,842.0)
Securities sold under repurchase agreements	–	–	(478.0)	(295.3)	–	–	–	–	(773.3)
Derivative financial instruments	244.7	8,057.1	(564.4)	(1,715.3)	(5,012.6)	(3,823.2)	(0.4)	651.9	(2,162.2)
Accounts payable	–	(2,135.6)	(5,372.9)	(58.4)	(483.1)	–	–	0.1	(8,049.9)
Other liabilities	–	(0.6)	–	–	–	(876.3)	–	(0.3)	(877.2)
Total liabilities	(3,369.9)	(124,359.2)	(29,155.2)	(12,922.9)	(7,086.4)	(5,077.3)	(9,857.7)	(6,733.3)	(198,561.9)
Net currency and gold position	65.2	7,425.6	5,027.9	1,875.6	999.5	(371.1)	3,001.2	249.2	18,273.1
Adjustment for gold	–	–	–	–	–	–	(3,001.2)	–	(3,001.2)
Net currency position	65.2	7,425.6	5,027.9	1,875.6	999.5	(371.1)	–	249.2	15,271.9
SDR-neutral position	(65.2)	(7,272.0)	(5,006.8)	(1,816.9)	(1,111.0)	–	–	–	(15,271.9)
Net currency exposure on SDR-neutral basis	–	153.6	21.1	58.7	(111.5)	(371.1)	–	249.2	–

D. Economic capital for market risk

The Bank measures market risk based on a VaR methodology using a Monte Carlo simulation technique taking correlations between risk factors into account. Economic capital for market risk is also calculated following this methodology measured to the 99.995% confidence level and assuming a one-year holding period. The Bank calculates the economic capital utilisation for market risk on the basis of a stressed market data set. The stressed data set is subject to regular review and calibrated to take account of the Bank's key market risk exposures and market risk drivers.

The Bank measures its gold price risk relative to changes in the USD value of gold. The foreign exchange risk component, resulting from changes in the USD exchange rate versus the SDR, is included in the measurement of foreign exchange risk. The table below shows the key figures of the Bank's exposure to market risk in terms of economic capital utilisation over the past two financial years:

For the financial year	**2016**				2015			
SDR millions	Average	High	Low	At 31 March	Average	High	Low	At 31 March
Economic capital utilisation for market risk	3,310.7	3,539.6	3,132.9	**3,491.1**	3,282.6	3,509.8	3,074.3	3,434.7

The table below provides a further analysis of the Bank's economic capital utilisation for market risk by category of risk:

For the financial year	**2016**				2015			
SDR millions	Average	High	Low	At 31 March	Average	High	Low	At 31 March
Gold price risk	2,030.8	2,323.6	1,871.2	**2,227.1**	2,111.1	2,278.1	1,960.7	2,125.5
Interest rate risk	2,485.8	2,662.9	2,311.9	**2,402.2**	2,356.4	2,680.3	2,017.3	2,562.2
Foreign exchange risk	843.3	973.2	653.8	**669.1**	895.9	985.5	789.6	912.0
Diversification effects	(2,049.2)	(2,346.9)	(1,782.3)	**(1,807.3)**	(2,080.8)	(2,446.2)	(1,878.4)	(2,165.0)
Total				**3,491.1**				3,434.7

E. Minimum capital requirements for market risk

For the calculation of minimum capital requirements for market risk under the Basel II framework, the Bank has adopted a banking book approach consistent with the scope and nature of its business activities. Consequently, market risk-weighted assets are determined for gold price risk and foreign exchange risk, but not interest rate risk. The related minimum capital requirement is derived using the VaR-based internal models method. Under this method, VaR calculations are performed using the Bank's VaR methodology, assuming a 99% confidence level and a 10-day holding period.

The actual minimum capital requirement is derived as the higher of the VaR on the calculation date and the average of the daily VaR measures on each of the preceding 60 business days (including the calculation date) subject to a multiplication factor of three plus a potential add-on depending on backtesting results. For the period under consideration, the number of backtesting outliers observed remained within the range where no add-on is required. The table below summarises the market risk development relevant to the calculation of minimum capital requirements and the related risk-weighted assets over the reporting period.

As at 31 March	**2016**			2015		
SDR millions	VaR	Risk-weighted assets (A)	Minimum capital requirement (B)	VaR	Risk-weighted assets (A)	Minimum capital requirement (B)
Market risk, where (A) is derived as (B) / 8%	219.4	8,226.0	**658.1**	263.9	9,894.5	791.6

5. Operational risk

Operational risk is defined by the Bank as the risk of financial loss, or damage to the Bank's reputation, or both, resulting from one or more risk causes, as outlined below:

- Human factors: insufficient personnel, lack of requisite knowledge, skills or experience, inadequate training and development, inadequate supervision, loss of key personnel, inadequate succession planning, or lack of integrity or ethical standards.
- Failed or inadequate processes: a process is poorly designed or unsuitable, or is not properly documented, understood, implemented, followed or enforced.
- Failed or inadequate systems: a system is poorly designed, unsuitable or unavailable, or does not operate as intended.
- External events: the occurrence of an event having an adverse impact on the Bank but outside its control.

Operational risk includes legal risk, but excludes strategic risk.

The Bank's operational risk management framework, policies and procedures comprise the management and measurement of operational risk, including the determination of the relevant key parameters and inputs, business continuity planning and the monitoring of key risk indicators.

The Bank has established a procedure of immediate reporting for operational risk-related incidents. The Compliance and Operational Risk Unit develops action plans with the respective units and follows up on their implementation on a regular basis.

For the measurement of operational risk economic capital and operational risk-weighted assets, the Bank has adopted a VaR approach using a Monte Carlo simulation technique that is consistent with the advanced measurement approach proposed under the Basel II framework. In line with the assumptions of the Basel II framework, the quantification of operational risk does not take reputational risk into account. Internal and external loss data, scenario estimates and control self-assessments to reflect changes in the business and control environment of the Bank are key inputs in the calculations. In quantifying its operational risk, the Bank does not take potential protection it may obtain from insurance into account.

A. Economic capital for operational risk

Consistent with the parameters used in the calculation of economic capital for financial risk, the Bank measures economic capital for operational risk to the 99.995% confidence level assuming a one-year holding period. The table below shows the key figures of the Bank's exposure to operational risk in terms of economic capital utilisation over the past two financial years:

For the financial year	**2016**				2015			
SDR millions	Average	High	Low	At 31 March	Average	High	Low	At 31 March
Economic capital utilisation for operational risk	1,200.0	1,200.0	1,200.0	**1,200.0**	1,200.0	1,200.0	1,200.0	1,200.0

B. Minimum capital requirements for operational risk

In line with the key parameters of the Basel II framework, the calculation of the minimum capital requirement for operational risk is determined assuming a 99.9% confidence level and a one-year time horizon. The table below shows the minimum capital requirements for operational risk and related risk-weighted assets:

As at 31 March	**2016**			2015		
SDR millions	VaR	Risk-weighted assets (A)	Minimum capital requirement (B)	VaR	Risk-weighted assets (A)	Minimum capital requirement (B)
Operational risk, where (A) is derived as (B) / 8%	838.2	10,476.9	**838.2**	831.7	10,396.6	831.7

6. Liquidity risk

Liquidity risk arises when the Bank may not be able to meet expected or unexpected current or future cash flows and collateral needs without affecting its daily operations or its financial condition.

The Bank's currency and gold deposits, principally from central banks and international institutions, comprise 89% (2015: 94%) of its total liabilities. At 31 March 2016 currency and gold deposits originated from 167 depositors (2015: 166 depositors). Within these deposits, there are significant individual customer concentrations, with five customers each contributing in excess of 5% of the total on a settlement date basis (2015: four customers).

Outstanding balances in the currency and gold deposits from central banks, international organisations and other public institutions are the key drivers of the size of the Bank's balance sheet. The Bank is exposed to funding liquidity risk mainly because of the short-term nature of its deposits and because it undertakes to repurchase at fair value certain of its currency deposit instruments at one or two business days' notice. In line with the Bank's objective to maintain a high level of liquidity, it has developed a liquidity management framework, including a ratio, based on conservative assumptions for estimating the liquidity available and the liquidity required.

A. Maturity profile of cash flows

The following tables show the maturity profile of cash flows for assets and liabilities. The amounts disclosed are the undiscounted cash flows to which the Bank is committed. Options are included in the table at fair value and are shown in the "Up to 1 month" category.

As at 31 March 2016

SDR millions	Up to 1 month	1 to 3 months	3 to 6 months	6 to 12 months	1 to 2 years	2 to 5 years	5 to 10 years	Over 10 years	Total
Assets									
Cash and sight accounts	25,847.0	–	–	–	–	–	–	–	25,847.0
Gold and gold loans	10,846.2	585.1	–	1,755.6	–	–	–	–	13,186.9
Treasury bills	6,209.4	13,918.6	8,710.5	9,846.8	–	–	–	–	38,685.3
Securities purchased under resale agreements	33,583.8	7,933.9	242.1	–	–	–	–	–	41,759.8
Loans and advances	5,406.9	9,111.1	2,614.2	27.6	–	–	–	–	17,159.8
Government and other securities	2,622.7	3,482.1	12,018.0	14,778.3	10,389.7	21,898.0	2,550.4	40.6	67,779.8
Total assets	**84,516.0**	**35,030.8**	**23,584.8**	**26,408.3**	**10,389.7**	**21,898.0**	**2,550.4**	**40.6**	**204,418.6**
Liabilities									
Gold deposits	(10,198.7)	(28.9)	–	–	–	–	–	–	(10,227.6)
Currency deposits									
Deposit instruments repayable at 1–2 days' notice	(14,238.8)	(18,088.1)	(10,620.8)	(14,592.2)	(13,238.7)	(12,219.5)	(66.1)	–	(83,064.2)
Other currency deposits	(58,332.2)	(13,950.4)	(6,417.8)	(8,436.4)	(650.1)	–	–	–	(87,786.9)
Securities sold under repurchase agreements	(1,041.6)	(202.9)	–	–	–	–	–	–	(1,244.5)
Total liabilities	**(83,811.3)**	**(32,270.3)**	**(17,038.6)**	**(23,028.6)**	**(13,888.8)**	**(12,219.5)**	**(66.1)**	**–**	**(182,323.2)**
Derivatives									
Net cash flows									
Options and interest rate contracts	(3.0)	22.9	(5.5)	113.8	13.7	(38.1)	(6.0)	–	97.8
Gross cash flows									
Interest rate contracts									
Inflows	80.2	29.9	3.4	77.3	536.9	510.9	–	–	1,238.6
Outflows	(75.5)	(28.7)	–	(74.9)	(544.8)	(524.5)	–	–	(1,248.4)
Subtotal	4.7	1.2	3.4	2.4	(7.9)	(13.6)	–	–	(9.8)
Currency and gold contracts									
Inflows	73,473.9	36,669.6	12,211.7	14,267.4	–	–	–	–	136,622.6
Outflows	(74,426.1)	(37,186.8)	(12,485.2)	(14,605.9)	–	–	–	–	(138,704.0)
Subtotal	(952.2)	(517.2)	(273.5)	(338.5)	–	–	–	–	(2,081.4)
Total derivatives	**(950.5)**	**(493.1)**	**(275.6)**	**(222.3)**	**5.8**	**(51.7)**	**(6.0)**	**–**	**(1,993.4)**
Total future undiscounted cash flows	**(245.8)**	**2,267.4**	**6,270.6**	**3,157.4**	**(3,493.3)**	**9,626.8**	**2,478.3**	**40.6**	**20,102.0**

As at 31 March 2015

SDR millions	Up to 1 month	1 to 3 months	3 to 6 months	6 to 12 months	1 to 2 years	2 to 5 years	5 to 10 years	Over 10 years	Total
Assets									
Cash and sight accounts	11,375.3	–	–	–	–	–	–	–	11,375.3
Gold and gold loans	12,639.9	827.5	–	691.0	–	–	–	–	14,158.4
Treasury bills	4,752.7	15,038.4	7,598.0	5,583.9	–	–	–	–	32,973.0
Securities purchased under resale agreements	28,140.9	13,535.3	517.0	–	–	–	–	–	42,193.2
Loans and advances	9,079.8	8,799.4	93.4	–	–	–	–	–	17,972.6
Government and other securities	3,312.7	4,593.7	12,261.5	21,397.8	12,860.2	25,582.6	2,020.7	–	82,029.2
Total assets	69,301.3	42,794.3	20,469.9	27,672.7	12,860.2	25,582.6	2,020.7	–	200,701.7
Liabilities									
Gold deposits	(9,857.3)	–	–	–	–	–	–	–	(9,857.3)
Currency deposits									
Deposit instruments repayable at 1–2 days' notice	(9,814.2)	(17,307.7)	(18,554.9)	(21,340.4)	(18,456.3)	(18,009.0)	(120.6)	–	(103,603.1)
Other currency deposits	(40,084.7)	(13,764.9)	(8,002.0)	(9,726.5)	–	–	–	–	(71,578.1)
Securities sold under repurchase agreements	(773.3)	–	–	–	–	–	–	–	(773.3)
Total liabilities	(60,529.5)	(31,072.6)	(26,556.9)	(31,066.9)	(18,456.3)	(18,009.0)	(120.6)	–	(185,811.8)
Derivatives									
Net cash flows									
Options and interest rate contracts	4.8	63.8	85.4	93.6	87.3	(14.4)	(2.8)	–	317.7
Gross cash flows									
Interest rate contracts									
Inflows	80.1	44.7	0.5	352.8	108.1	–	–	–	586.2
Outflows	(65.1)	(40.5)	–	(323.1)	(97.7)	–	–	–	(526.4)
Subtotal	15.0	4.2	0.5	29.7	10.4	–	–	–	59.8
Currency and gold contracts									
Inflows	50,590.8	45,399.2	17,316.7	17,662.3	–	–	–	–	130,969.0
Outflows	(49,588.7)	(44,529.8)	(15,770.1)	(16,561.6)	–	–	–	–	(126,450.2)
Subtotal	1,002.1	869.4	1,546.6	1,100.7	–	–	–	–	4,518.8
Total derivatives	1,021.9	937.4	1,632.5	1,224.0	97.7	(14.4)	(2.8)	–	4,896.3
Total future undiscounted cash flows	9,793.7	12,659.1	(4,454.5)	(2,170.2)	(5,498.4)	7,559.2	1,897.3	–	19,786.2

The table below shows the contractual expiry date of the credit commitments as at the balance sheet date:

Contractual expiry date *SDR millions*	Up to 1 month	1 to 3 months	3 to 6 months	6 to 12 months	1 to 2 years	2 to 5 years	5 to 10 years	Maturity undefined	Total
As at 31 March 2016	–	–	242.4	–	–	–	–	2,879.2	**3,121.6**
As at 31 March 2015	–	–	233.5	–	–	–	–	2,863.0	3,096.5

B. Liquidity ratio

The Bank has adopted a liquidity risk framework taking into account regulatory guidance issued by the BCBS related to the Liquidity Coverage Ratio (LCR). The framework is based on a liquidity ratio that compares the Bank's available liquidity to a liquidity requirement over a one-month time horizon assuming a stress scenario. In line with the Basel III liquidity framework, the underlying stress scenario combines an idiosyncratic and a market crisis. However, the liquidity ratio differs in construction from the LCR to reflect the nature and scope of the BIS banking activities – in particular, the short-term nature of the Bank's assets and liabilities. Within the Bank's liquidity framework, the Board of Directors has set a limit for the Bank's liquidity ratio which requires the liquidity available to be at least 100% of the potential liquidity requirement.

The table below provides information on the development of the Bank's liquidity ratio for the last two years:

For the financial year	**2016**				2015			
Percentages	Average	High	Low	At 31 March	Average	High	Low	At 31 March
Liquidity ratio	140.0%	164.2%	112.6%	**140.2%**	161.8%	178.0%	144.7%	153.2%

The liquidity available is determined as the cash inflow from financial instruments over a one-month horizon, along with potential additional liquidity which could be generated from the disposal of highly liquid securities, or by entering into sale and repurchase agreements for a part of the Bank's remaining unencumbered high-quality liquid securities. In calculating the amount of potential additional liquidity an assessment is performed to identify securities which are of high credit quality and highly liquid. This is followed by a projection of the amounts that could reasonably be generated through selling these securities or entering into repurchase transactions.

The Bank determines the liquidity required as the sum of the cash outflow from financial instruments over a one-month horizon, the estimated early withdrawal of currency deposits and the estimated drawings of undrawn facilities. As regards currency deposits, it is assumed that all deposits that mature within the time horizon are not rolled over and that a proportion of non-maturing currency deposits is withdrawn from the Bank prior to contractual maturity. At 31 March 2016, the estimated outflow of currency deposits in response to the stress scenario amounted to 49.8% (2015: 41.3%) of the total stock of currency deposits. Moreover, it is assumed that undrawn facilities committed by the Bank would be fully drawn by customers, along with a proportion of undrawn uncommitted facilities.

The table below shows the Bank's estimated liquidity available, liquidity required and the resulting liquidity ratio:

As at 31 March

SDR billions	**2016**	2015
Liquidity available		
Estimated cash inflows	74.1	55.8
Estimated liquidity from sales of highly liquid securities	51.7	56.2
Estimated sale and repurchase agreements	3.0	5.4
Total liquidity available (A)	**128.8**	117.4
Liquidity required		
Estimated withdrawal of currency deposits	84.5	71.7
Estimated drawings of facilities	5.1	4.9
Estimated other outflows	2.3	–
Total liquidity required (B)	**91.9**	76.6
Liquidity ratio (A) / (B)	**140.2%**	153.2%

For reference, the Bank also calculates an LCR following the principles set out in the guidance issued by the BCBS. At 31 March 2016 the Bank's LCR stood at 208.5% (2015: 262.7%).

Independent auditor's report

To the Board of Directors and to the General Meeting
of the Bank for International Settlements, Basel

We have audited the accompanying financial statements of the Bank for International Settlements (pages 177–245), which comprise the balance sheet as at 31 March 2016, the related profit and loss account, statement of comprehensive income, the statement of cash flows and movements in the Bank's equity for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility

Management is responsible for the preparation and fair presentation of the financial statements in accordance with the accounting principles described in the financial statements and the Statutes of the Bank. This responsibility includes designing, implementing and maintaining an internal control system relevant to the preparation of financial statements that are free from material misstatement, whether due to fraud or error. Management is further responsible for selecting and applying appropriate accounting policies and making accounting estimates that are reasonable in the circumstances.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with International Standards on Auditing. Those Standards require that we comply with ethical responsibilities and plan and perform the audit to obtain reasonable assurance whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers the internal control system relevant to the entity's preparation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements for the year ended 31 March 2016 give a true and fair view of the financial position of the Bank for International Settlements and of its financial performance and its cash flows for the year then ended in accordance with the accounting principles described in the financial statements and the Statutes of the Bank.

Ernst & Young

Victor Veger John Alton

Zurich, 9 May 2016

Printed in Switzerland Werner Druck & Medien AG, Basel