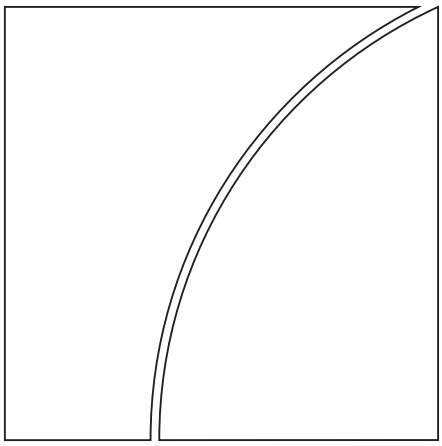
BANK FOR INTERNATIONAL SETTLEMENTS



86th Annual Report

1 April 2015–31 March 2016

Basel, 26 June 2016

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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.

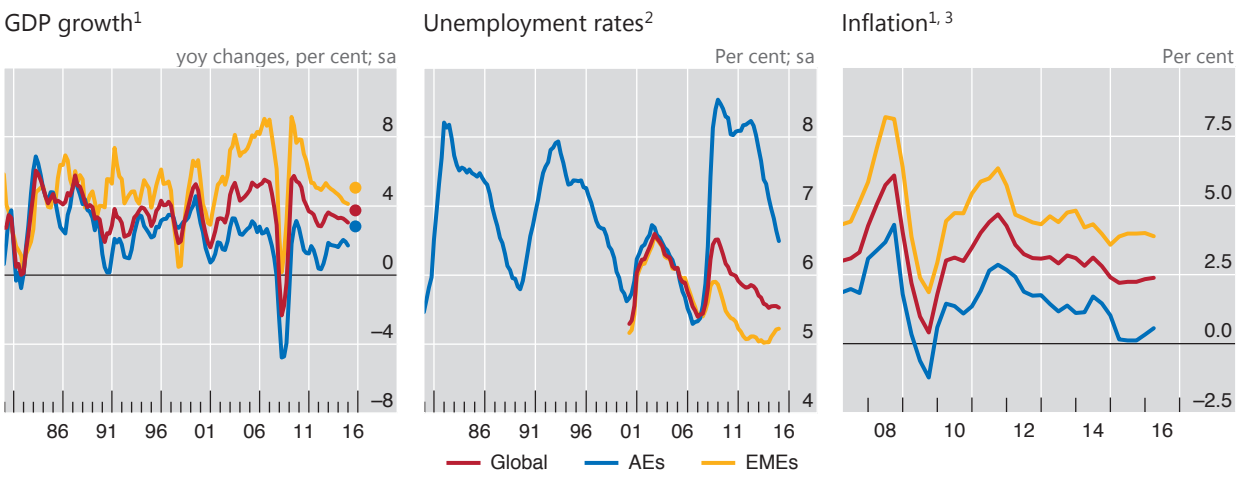
I. When the future becomes today

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.

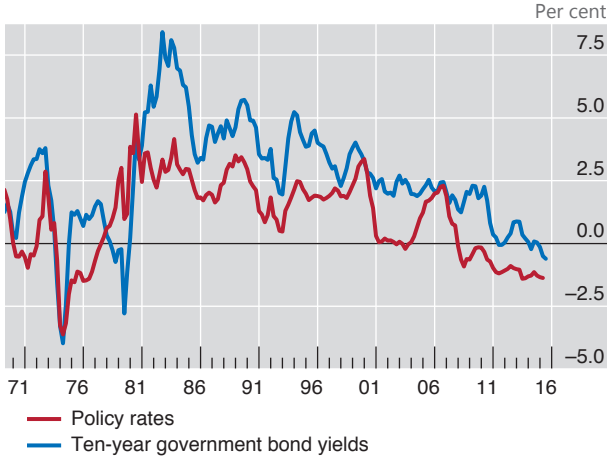
Interpreting the evolution of the global economy is fraught with difficulties, but it is necessary if we are to identify possible remedies. As we have in recent Annual Reports, we offer an interpretation using a lens that focuses on financial, global and medium-term aspects. We suggest that the current 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

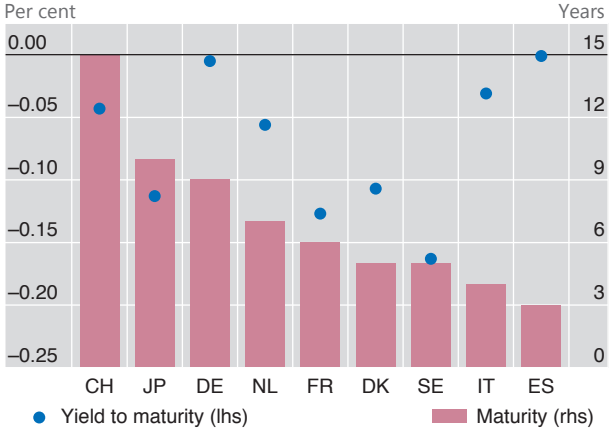
Interest rates remain exceptionally and persistently low

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.

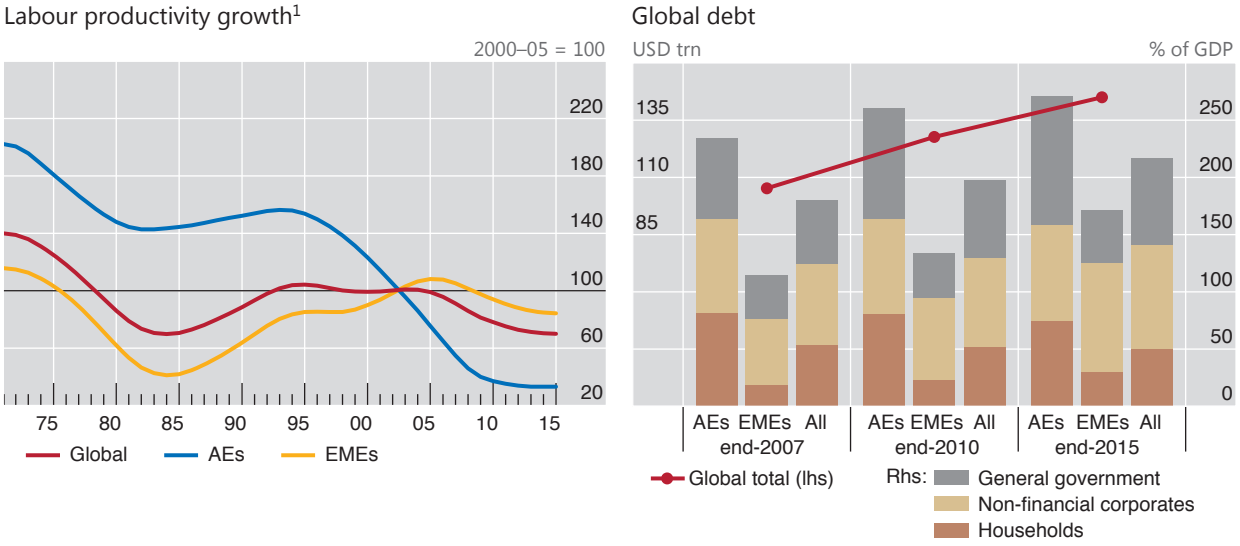
Inflation stayed generally subdued, except in some EMEs – notably in Latin America – that experienced sharp currency depreciations (Chapter IV). In the largest advanced economies that are home to international currencies, underlying (core) inflation, while remaining below targets, moved up even as headline 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.

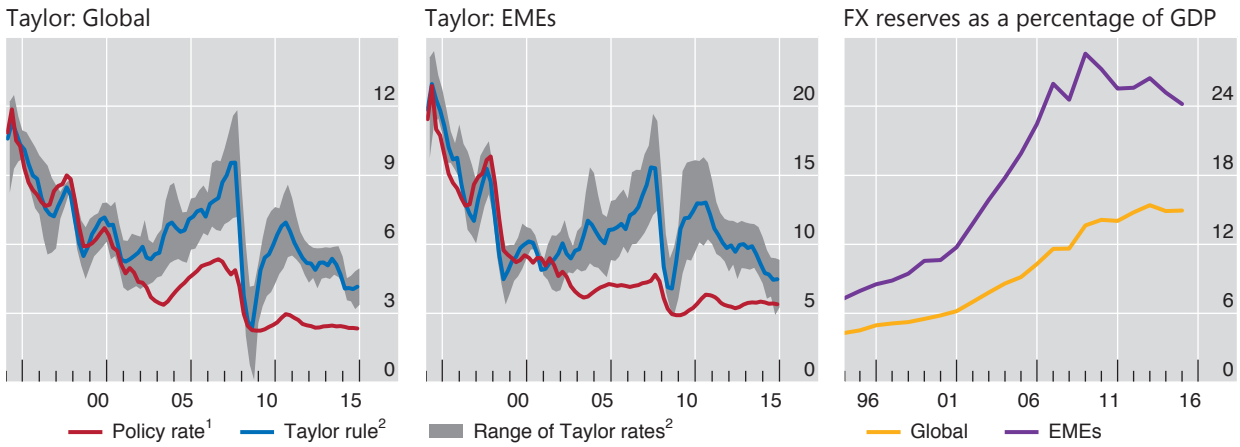
The corresponding effects on productivity growth can be substantial. Taking, say, a five-year boom and five post-crisis years together, the cumulative impact would amount to a loss of some 4 percentage points. Put differently, for the period 2008–13, the loss could equal about 0.5 percentage points per 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.

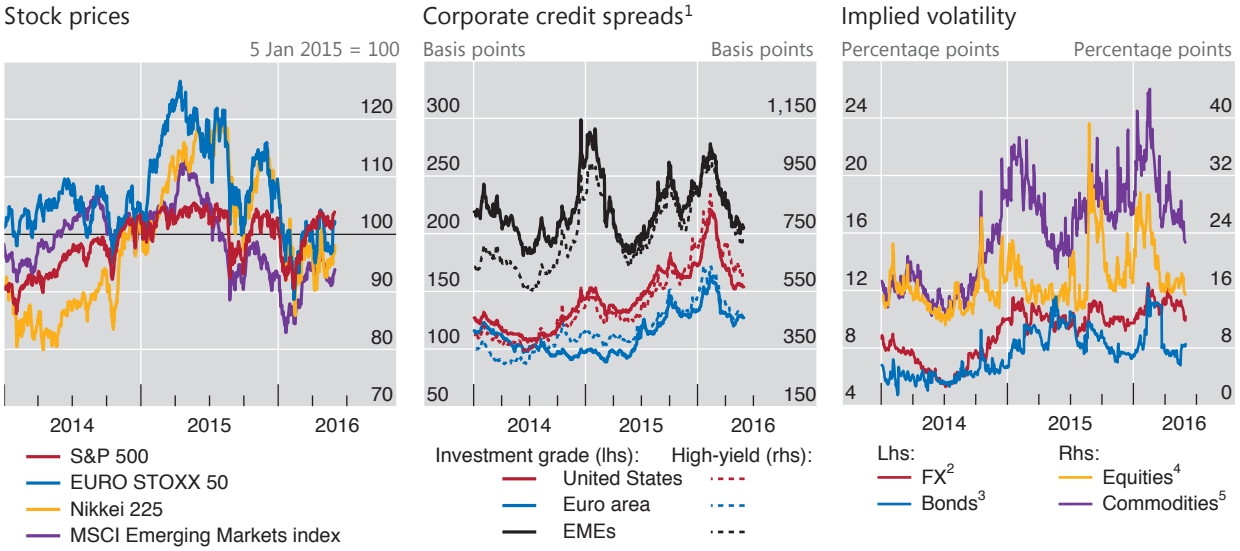
The first section reviews market developments during the past year. The second looks more closely at market valuations, with an emphasis on the role of very low nominal and real interest rates and market liquidity conditions in fixed income markets. The third explores the factors behind the emergence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

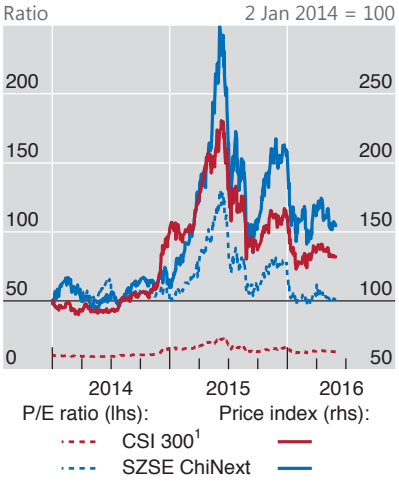
Concerns about China quickly spread to other economies and asset prices in August and early September. EME currencies weakened against the dollar (Graph II.2, right-hand panel) while the euro and yen strengthened. Equity prices plunged, particularly in EMEs (Graph II.1, left-hand panel). Credit spreads 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

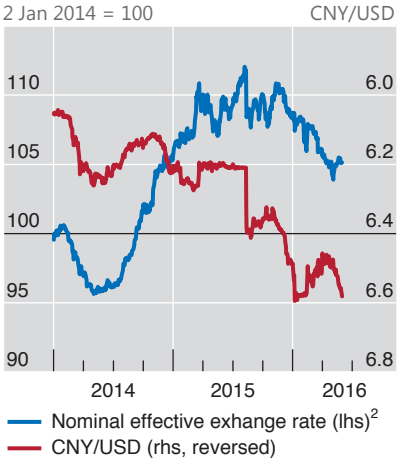
Chinese equities nosedive and renminbi depreciates

Graph II.2

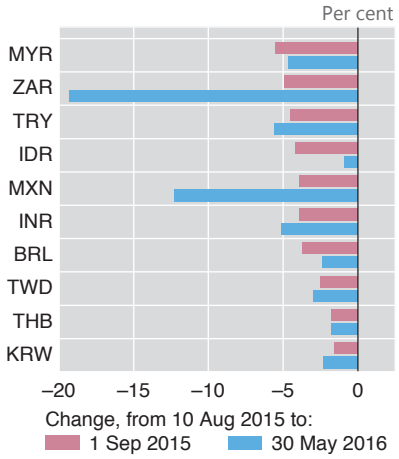
Stock market indices and valuations



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.

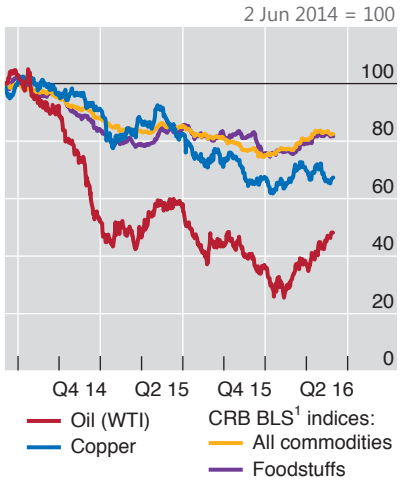
[1] Shanghai Shenzhen CSI 300 Index. [2] BIS nominal effective exchange rate broad index; a decline indicates a depreciation of the currency in trade-weighted terms. [3] US dollars per unit of local currency; a decline indicates a depreciation of the local currency.

Sources: Bloomberg; BIS; BIS calculations.

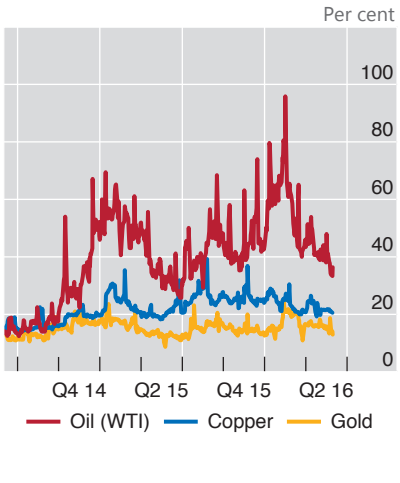
Commodity price rout continues and commodity producers suffer

Graph II.3

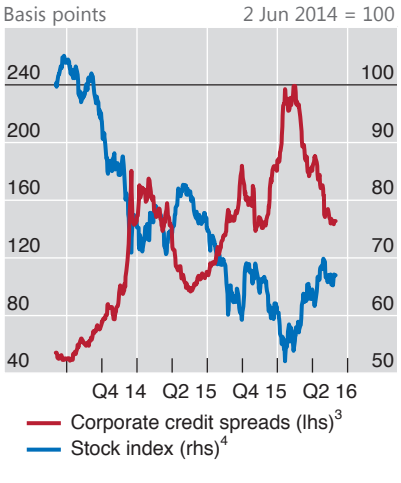
Commodity prices drop



Commodity implied volatility fluctuates[2]



Energy sector underperforms

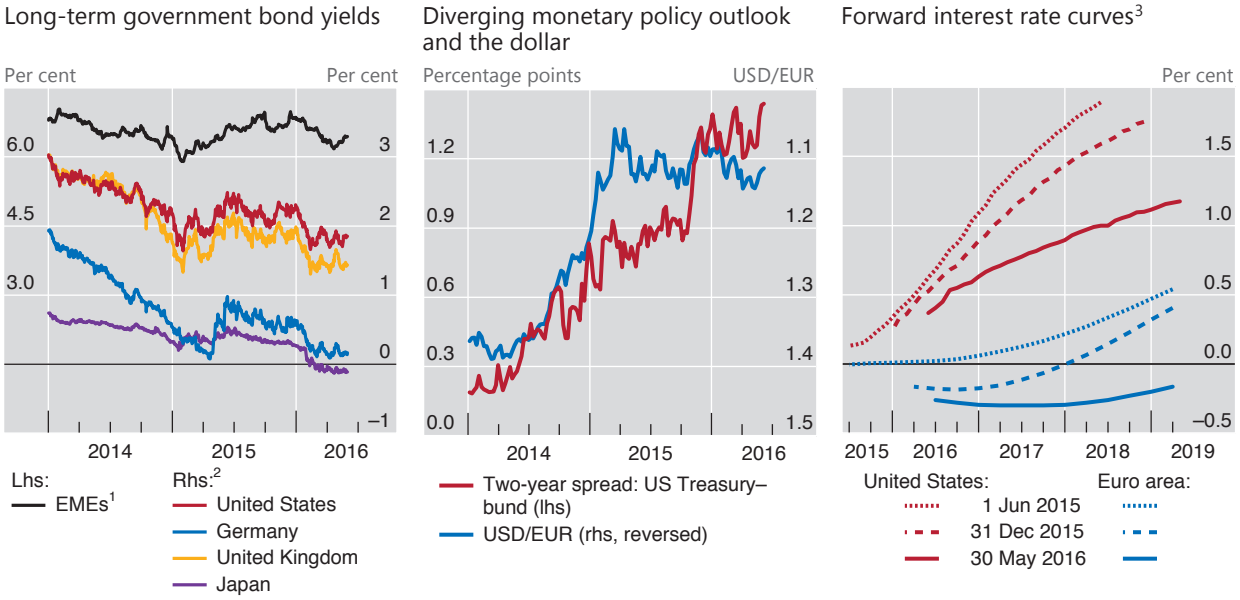


[1] Commodity Research Bureau – Bureau of Labor Statistics. [2] Implied volatility of at-the-money options on commodity futures contracts on oil, copper and gold. [3] Difference between the option-adjusted spreads of investment grade debt of energy sector corporates and the overall corporate sector; 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.

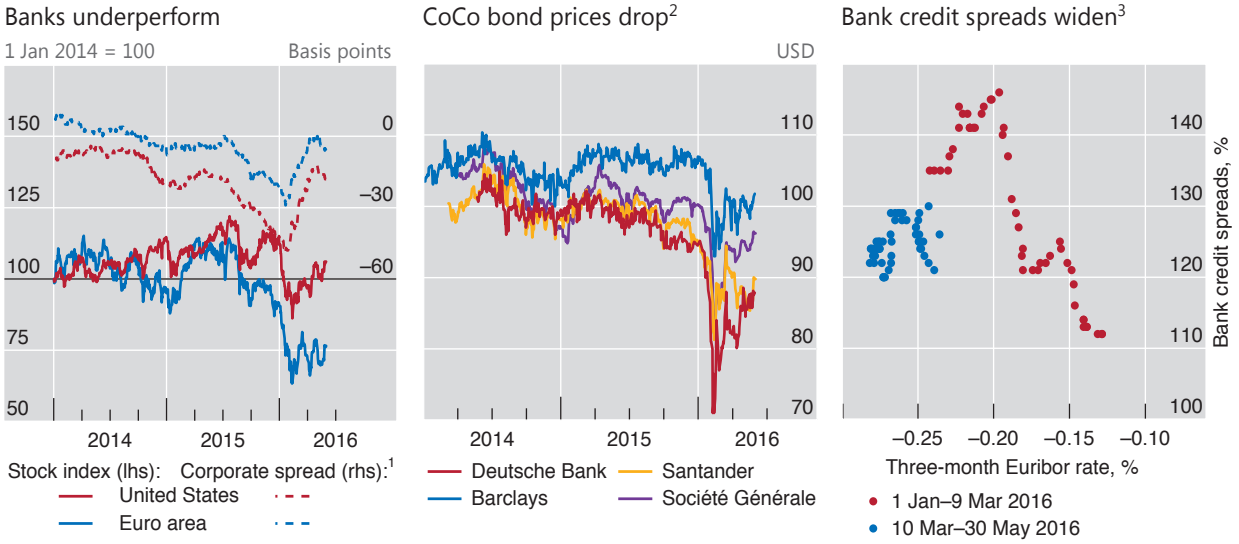
The new year nevertheless brought a second bout of turbulence. The triggering event was again economic news about China, as weak data signalled a sharper than anticipated growth slowdown. Moreover, the arrival of fresh data soon led to a downgrade in growth estimates for a number of other countries. 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).

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.

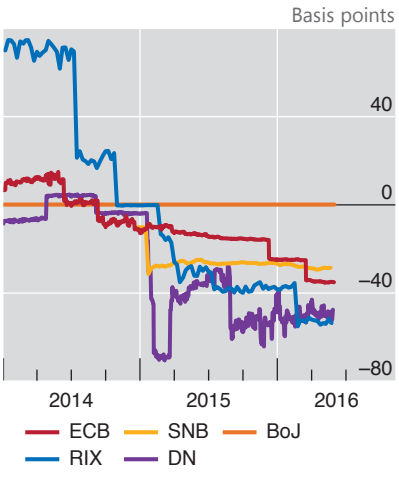
In contrast to what happened in money markets, the effect of negative policy rates on exchange rates was not uniform and in some cases coincided with bouts of volatility. After the introduction of negative policy rates, the DN, which maintains a nearly fixed exchange rate vis-à-vis the euro, saw the 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.

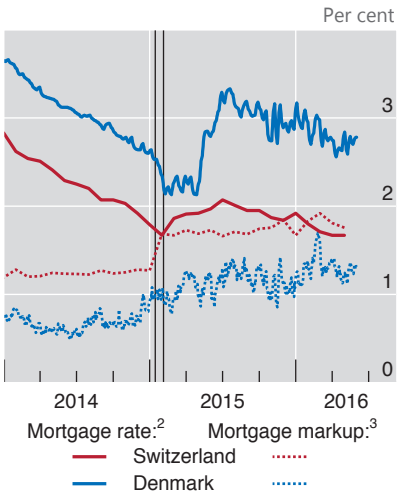
Negative policy rates: implementation and transmission

Graph II.A

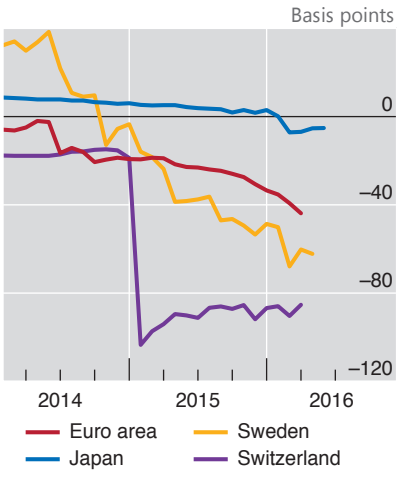
Average remuneration of central bank liabilities[1]



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.

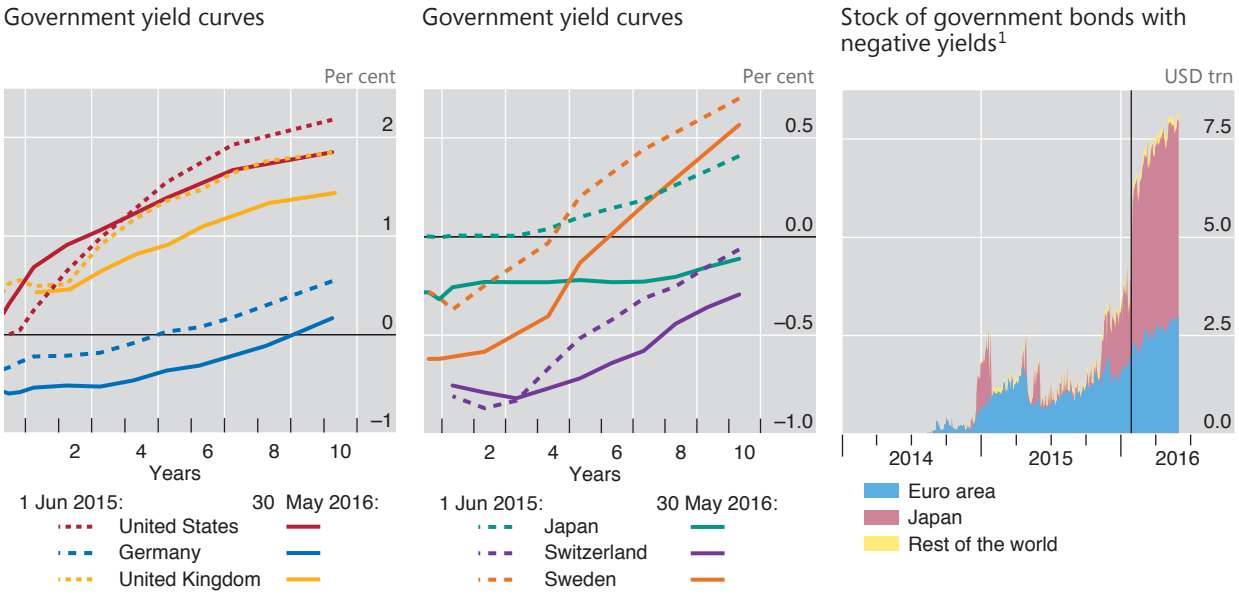
So far, negative policy rates have not led to an abnormal jump in the demand for cash. However, anecdotal evidence suggests that both financial and non-financial firms have started adapting to the new environment and are seeking to adopt innovations that would reduce the costs associated with physical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

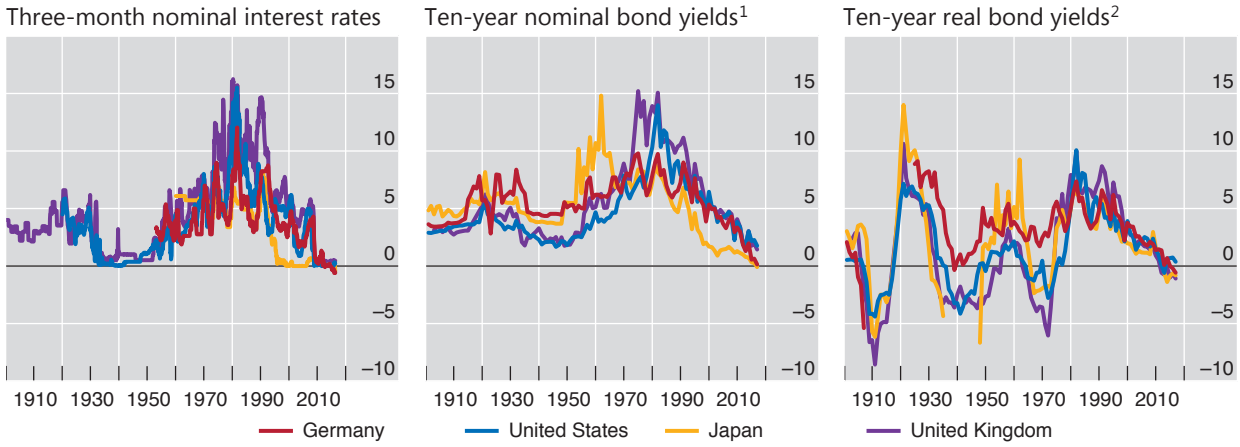
Sudden jumps in term premia led to sharp yield increases in the second quarter of 2015, in particular in the euro area (Graph II.8, centre panel). Euro area and US term premia estimates then stabilised before edging down again in the second half of the year. By contrast with historical experience, where 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



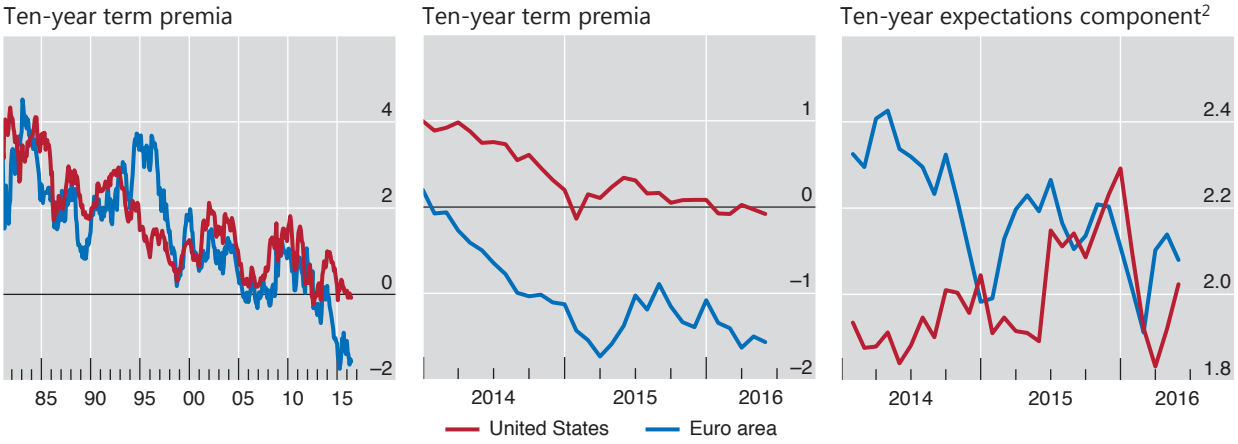
[1] The hyperinflationary years of 1922–23 are excluded for Germany. [2] The hyperinflationary episodes for Germany and Japan are not shown. Prior to 2006, nominal 10-year yields minus average inflation rates during the next 10 years; from 2006 onwards, 10-year index-linked bond yields.

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.

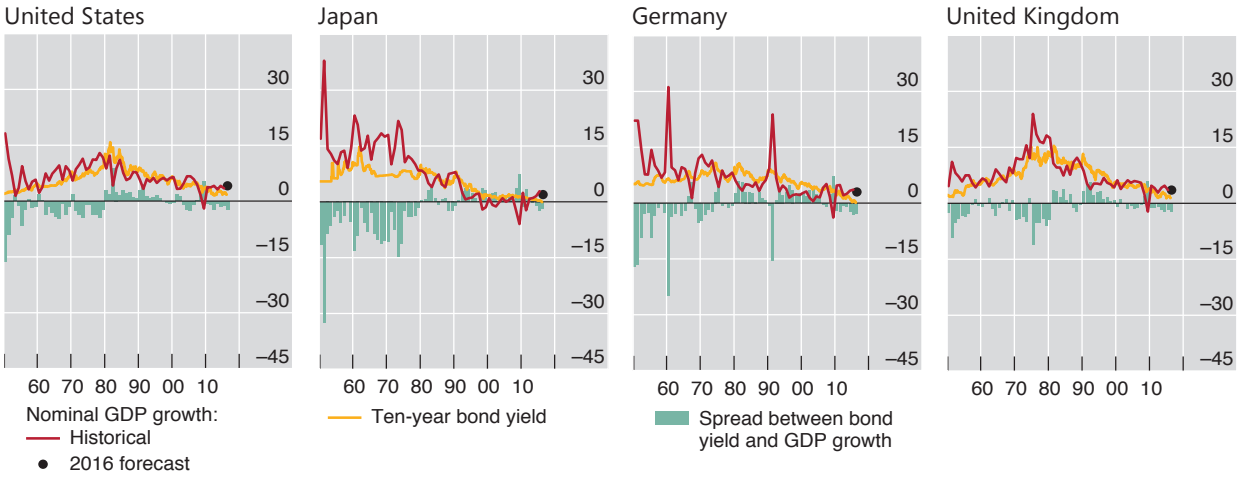
Comparing long-term bond yields with the evolution of nominal GDP suggests that yields are indeed currently on the low side. Over the past 65 years or so, the broad trends in nominal GDP growth and 10-year bond yields have lined up reasonably well across the United States, Japan, Germany and the United 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.

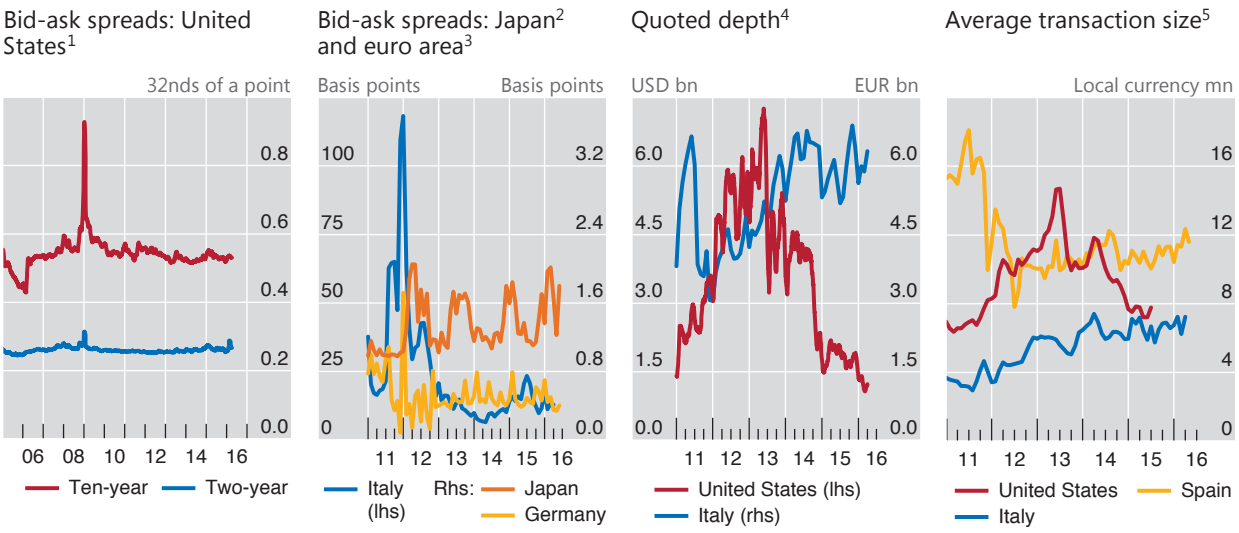
Most indicators do not show a significant structural decline of liquidity in fixed income markets, or indeed most other markets, in recent years. For one, bid-ask spreads, defined as the gaps between the prices at which dealers are willing to buy and sell securities, have been rather stable and tight 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).

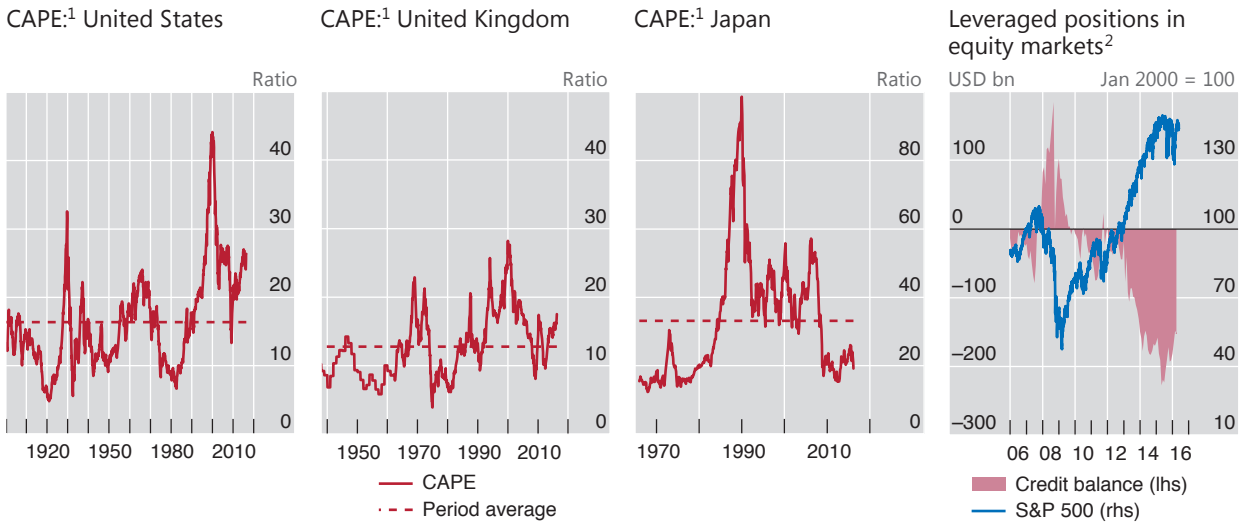
① This quotation is from Committee on the Global Financial System, "Fixed income market liquidity", *CGFS Papers*, no 55, January 2016. ② See R Riordan and A Schrimpf, "Volatility and evaporating liquidity during the bund tantrum", *BIS Quarterly Review*, September 2015, pp 10–11. ③ US Department of 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

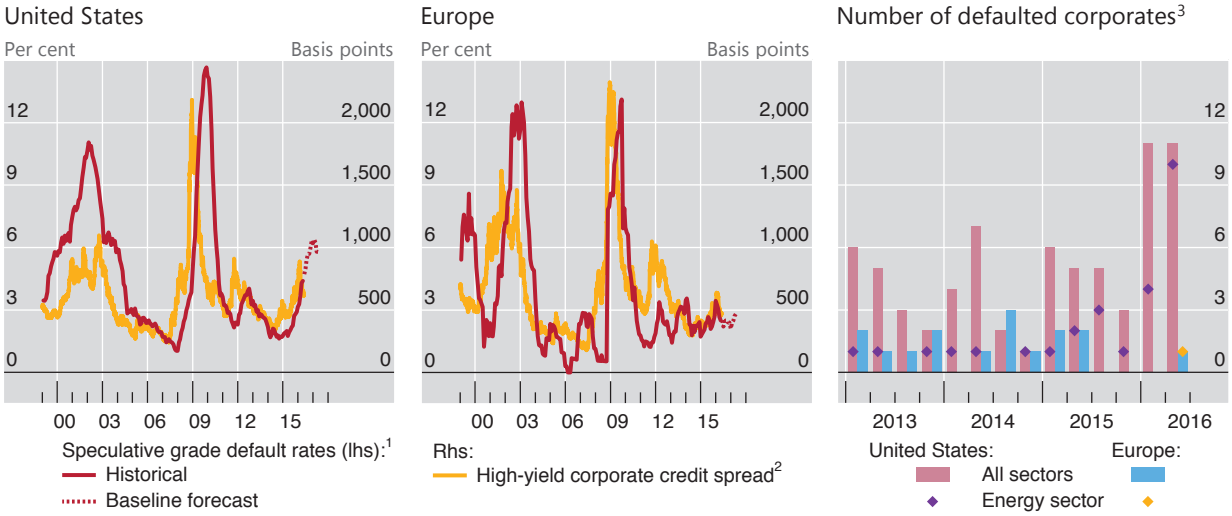


[1] CAPE = cyclically adjusted price/earnings ratio; calculated as the country's representative real equity price index divided by the 10-year trailing average of real earnings. [2] Credit balance is calculated as the sum of free credit cash accounts and credit balances in margin accounts minus margin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

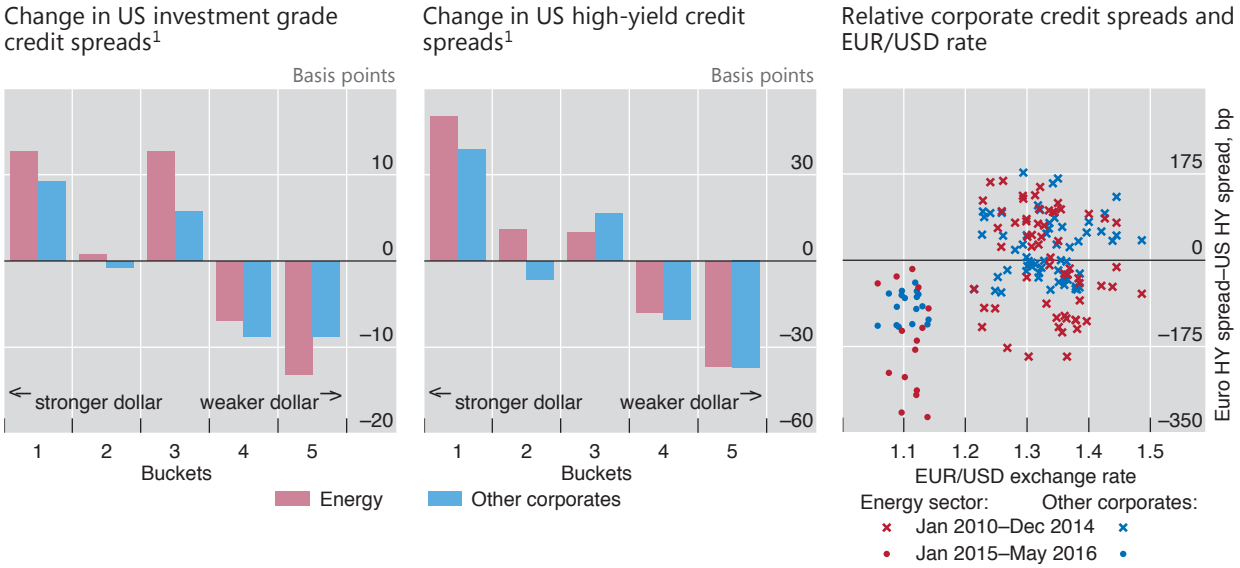
One possible explanation behind this pattern could be changing perceptions of the growth outlook – and hence of corporate credit quality – resulting from exchange rate swings. Similarly, a stronger dollar goes hand in hand with tighter US financial conditions (Chapter III). Another possibility is that 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).

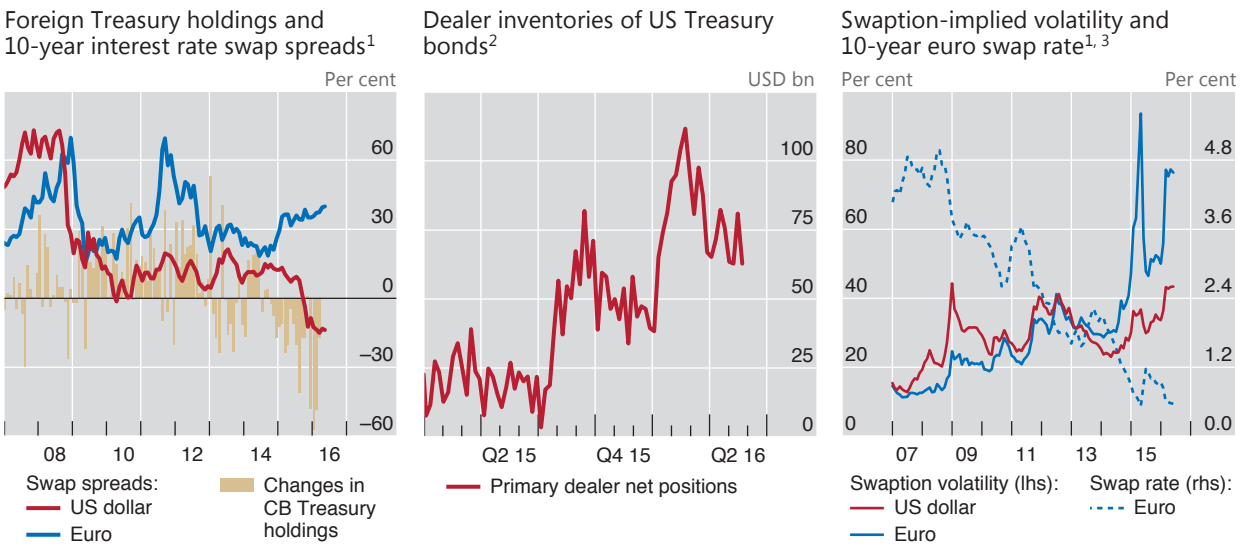
These anomalies reflect a combination of factors.

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

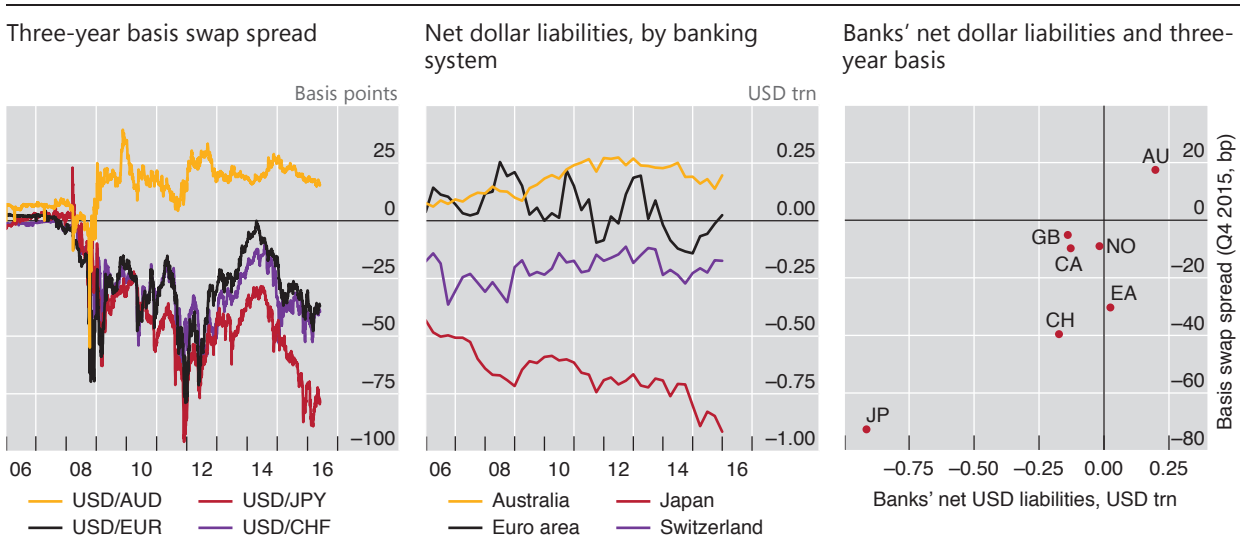
One of the most puzzling recent anomalies has been the re-emergence of the cross-currency basis (the basis) or, equivalently, the widespread violation of covered interest rate parity (CIP). With a non-zero basis, cross-currency swap counterparties face interest rates that do not match prevailing cash 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

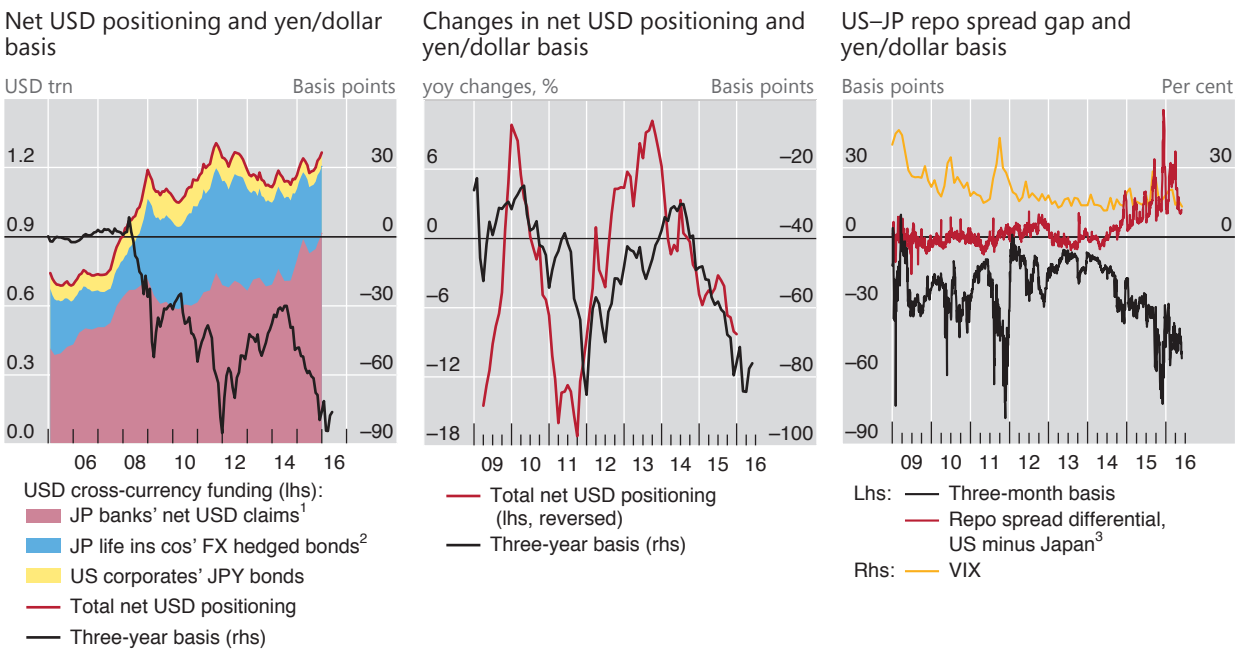
supplying US dollars via swaps to Australian institutional investors that need to borrow dollars to hedge their dollar bonds. As a result, some BIS reporting national banking systems have more on-balance sheet dollar liabilities than dollar assets, eg Australian banks, while others have more assets than 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.

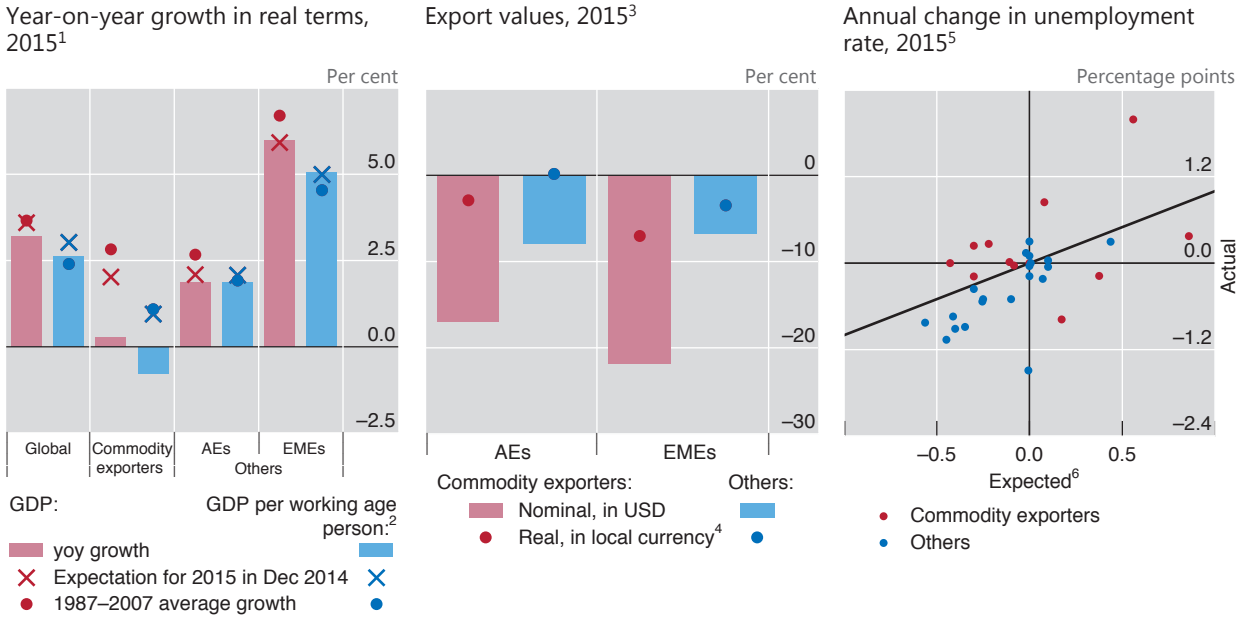
[1] See J Caruana, "Credit, commodities and currencies", lecture at the London School of Economics and Political Science, 5 February 2016.

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.

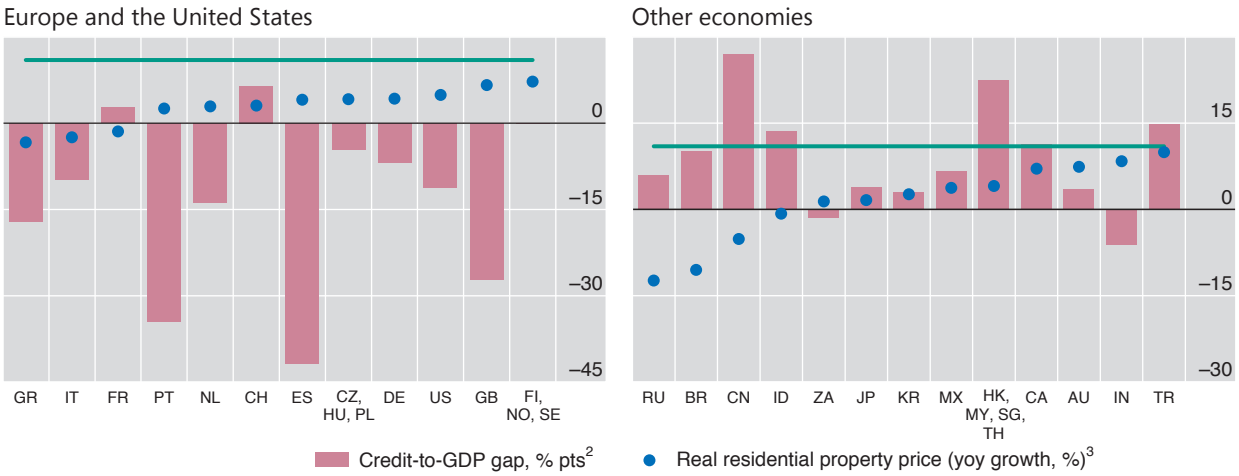
In countries at the centre of the financial crisis, including the United States, the United Kingdom and Spain, growth remained moderate in the wake of the balance sheet recession, but the financial cycle generally turned up. In the United States, growth was 2.4% in 2015 and continued at a similar pace 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.

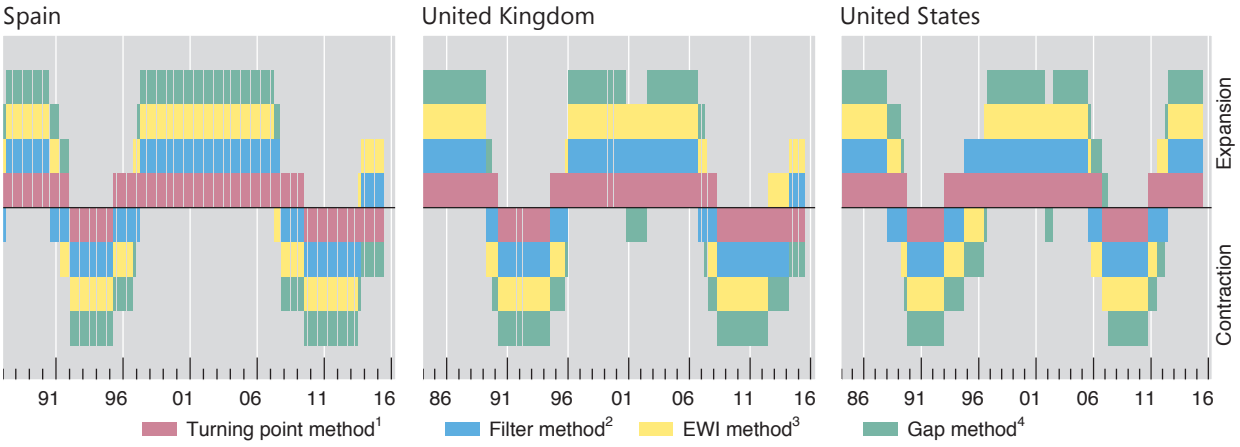
The *filter method* uses a statistical filter to extract cyclical fluctuations of real credit, the credit-to-GDP ratio and real property prices and combines them into a single series.② Specifics differ, but Drehmann et al (2012), for instance, rely on a bandpass filter to extract cyclical fluctuations 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).

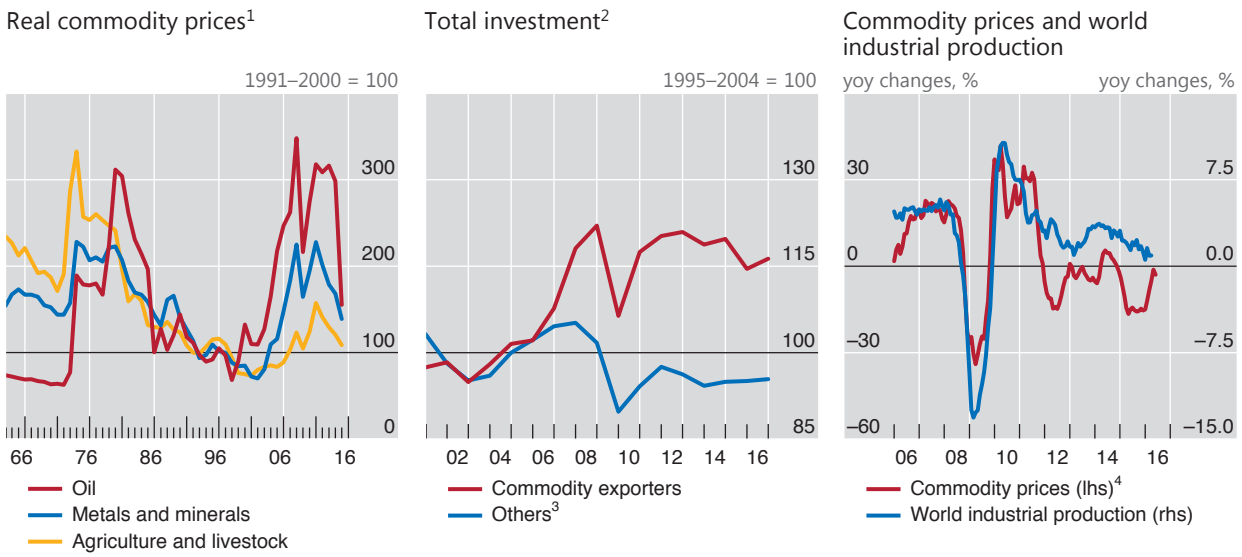
Large shifts in relative prices require big adjustments

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

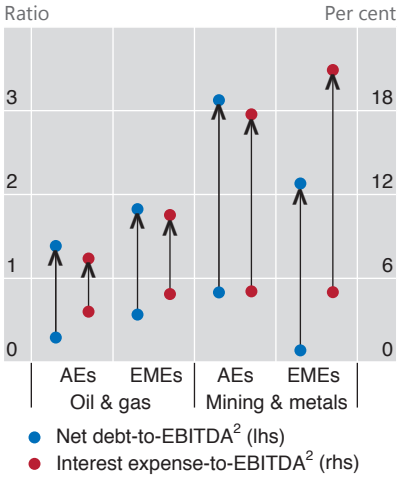
For the world as a whole, the net impact of lower commodity prices induced by a cheaper and more ample supply of a key production input should be positive. But the size and timing are uncertain and depend on demand patterns.

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

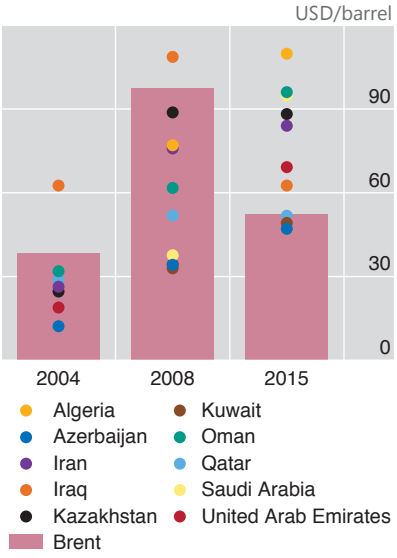
Risks have built up for commodity producers

Graph III.4

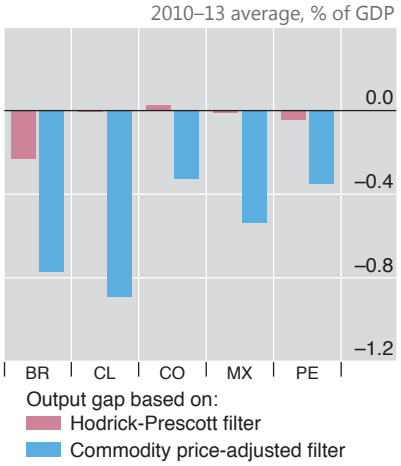
Changes in company financial ratios from 2007 to 2015[1]



Fiscal break-even oil price



Cyclical adjustments to headline fiscal balances[3]



[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.

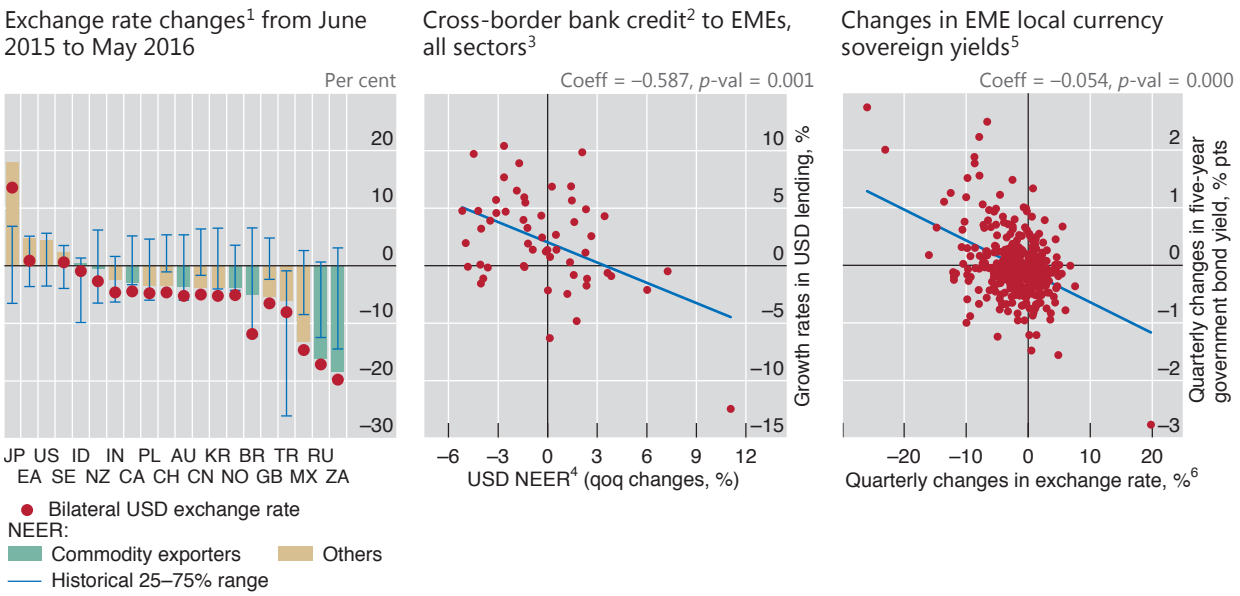
These exchange rate shifts may affect macroeconomic outcomes through at least two channels. The first works through changes in balance sheets and financial risk-taking.[3] A depreciation tends to weaken the balance sheets of entities that have net foreign currency liabilities. This may induce spending 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

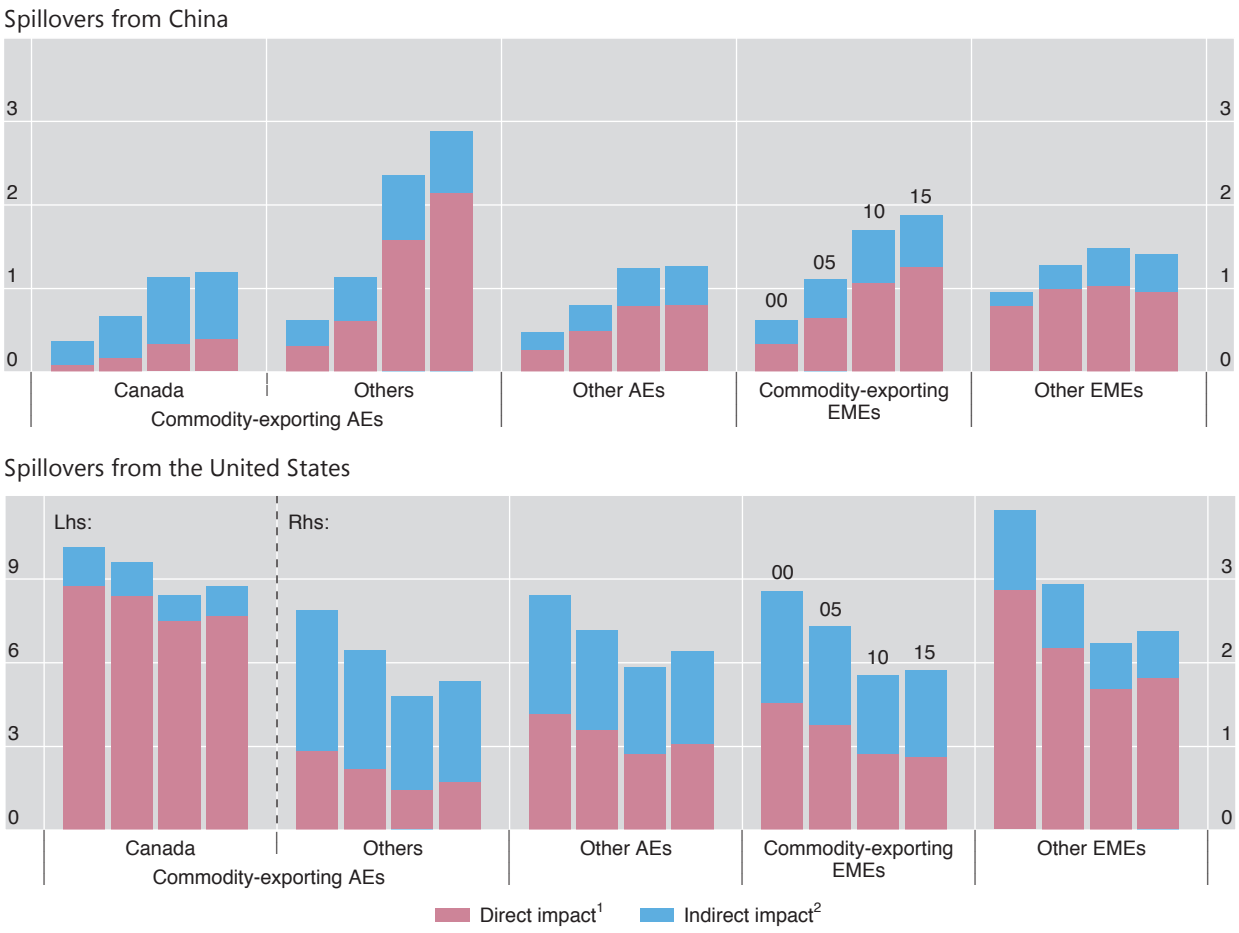
Increased trade is an important channel of greater spillovers from EMEs to advanced economies. EMEs now account for around 45% of global trade, up from just over 30% in 2000. The intensity of spillovers will depend on the size and nature of an economy's trade flows. Of particular note, China's rapid 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.

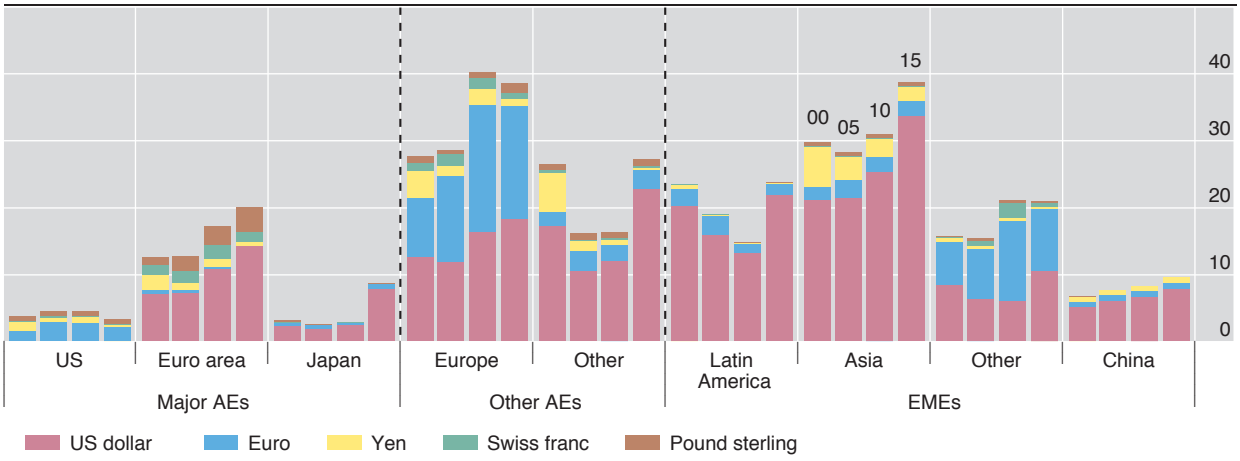
Trade spillovers can also occur through a third country that imports intermediate inputs used in the production of its own exports. As a result, for many advanced and commodity-exporting EMEs the indirect impact of a reduction in US imports is large relative to the direct effect (the blue bars are large 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

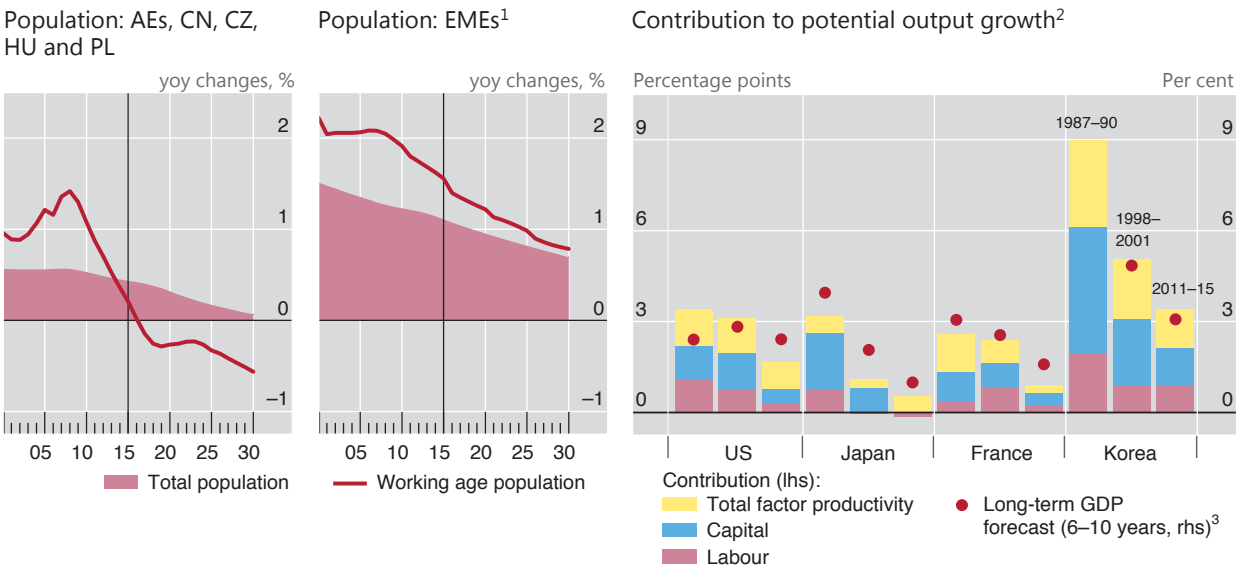
[11] For a broad discussion of secular stagnation, see the papers in C Teulings and R Baldwin (eds), *Secular stagnation: facts, causes and cures*, VoxEU, August 2014.

[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

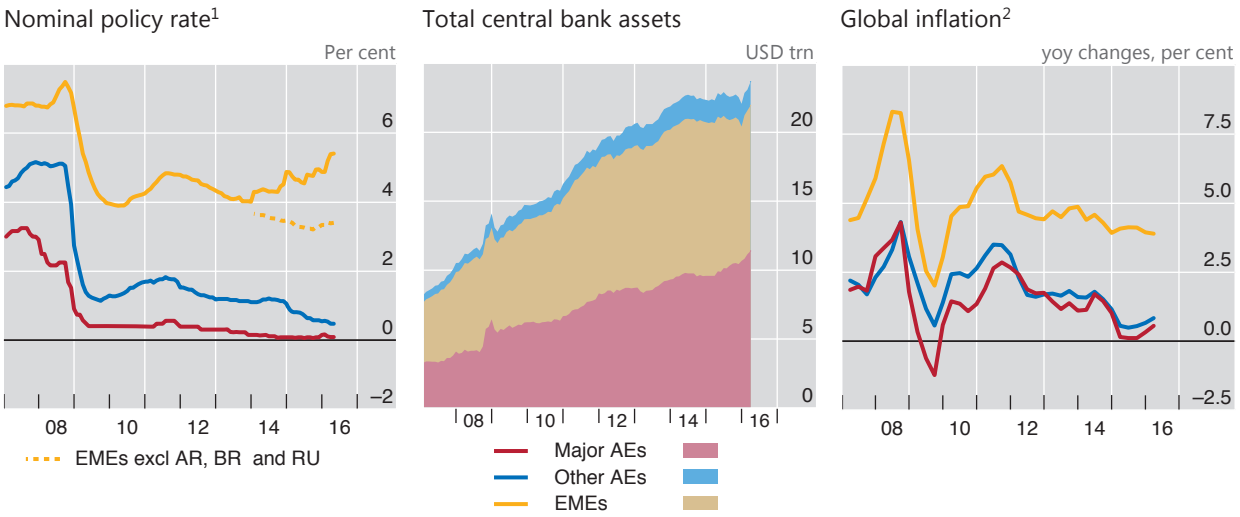
Central banks held nominal policy rates very low (Graph IV.1) amid increased prospects of a further delay in normalisation. The size of central bank balance sheets remained near historical highs, and some are poised to expand further. This transpired against the backdrop of low headline inflation, moderate 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.

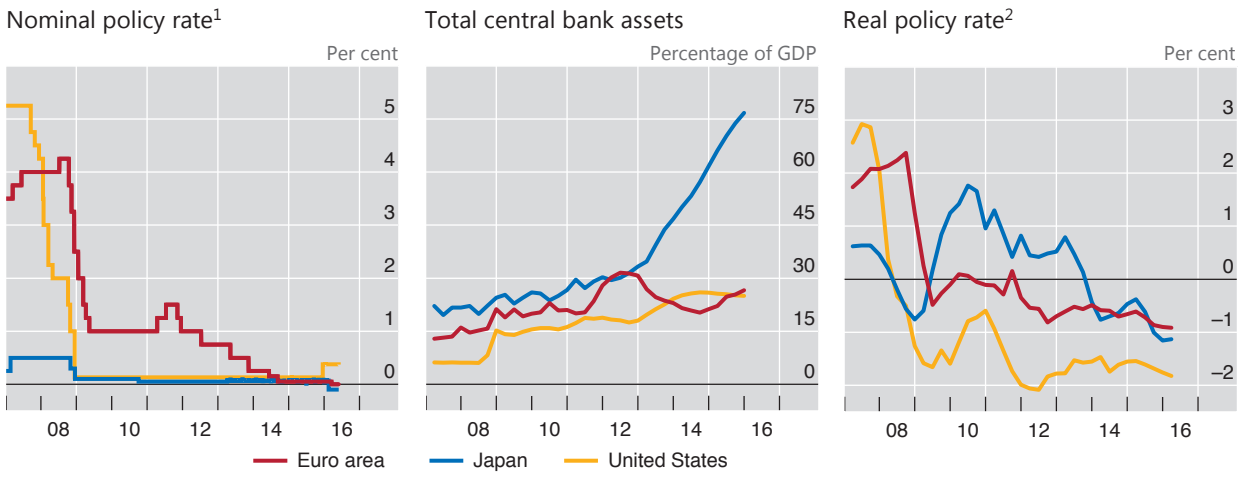
Sources: IMF, *International Financial Statistics* and *World Economic Outlook*; Datastream; national data; BIS calculations.

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.

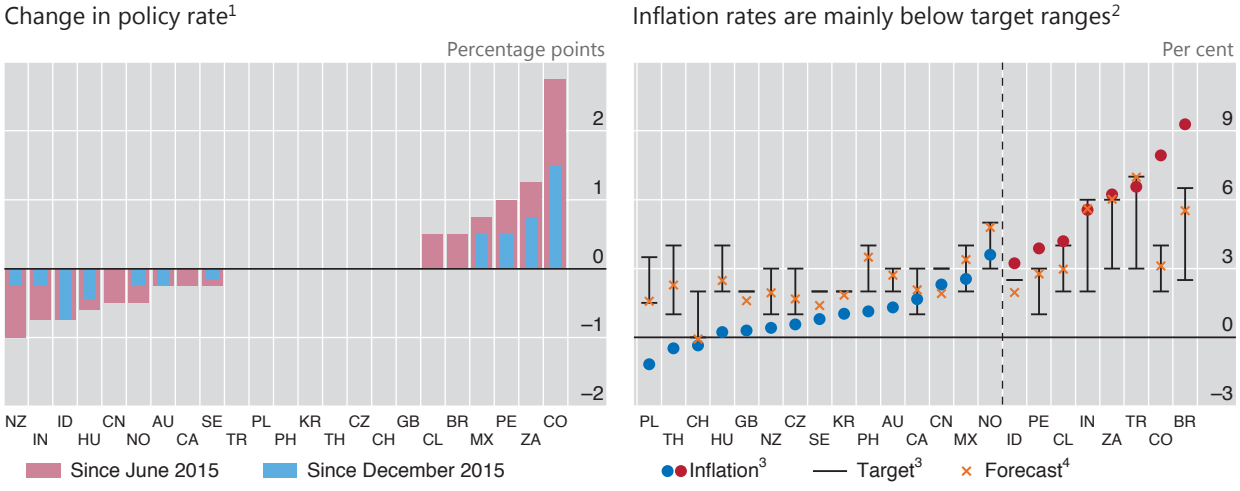
The Bank of Japan eased policy to achieve its 2% inflation target. With downside inflation risks emerging, especially from lower oil prices, weak external demand and yen appreciation, it enhanced its Quantitative and Qualitative Monetary Easing (QQE) programme in December and January. Its balance sheet 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

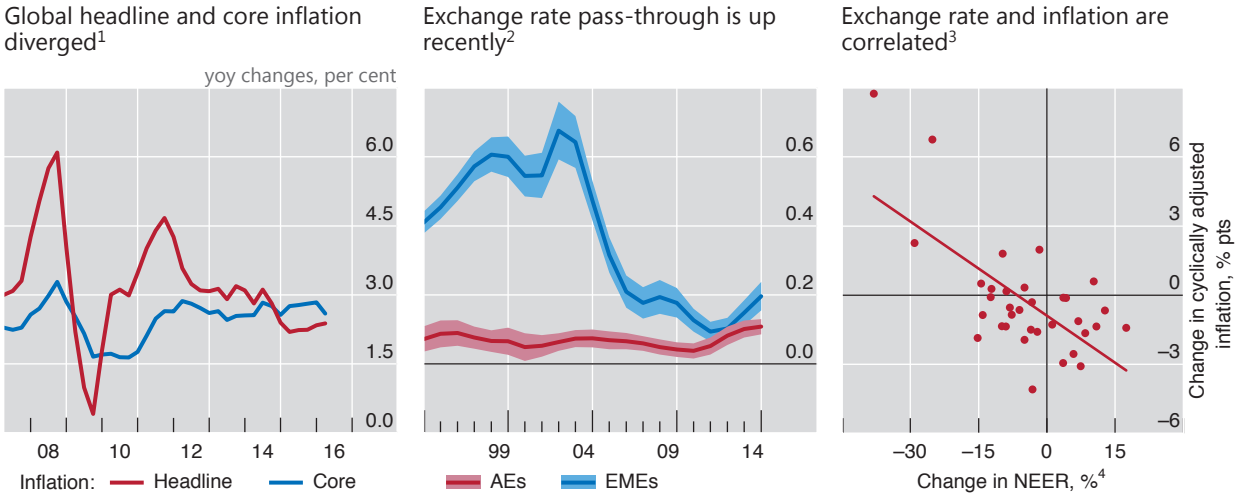
In the period under review, inflation continued to be driven by a complex mix of near-term, cyclical and secular factors (see also the detailed discussion in the *85th Annual Report*).

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

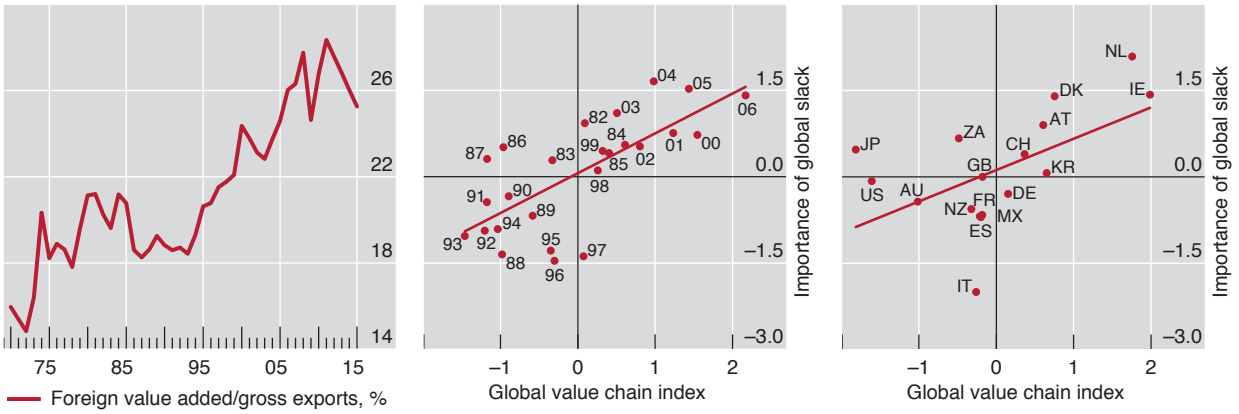
The rise of global value chains (GVCs) has made them a key channel through which the drivers of domestic inflation have become more global. GVCs are supply chains in which different stages of production are strategically dispersed and coordinated around the globe.① Their growth has transformed the nature 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

The growth in GVCs has increased… …the relevance of global gaps over time… …and across countries



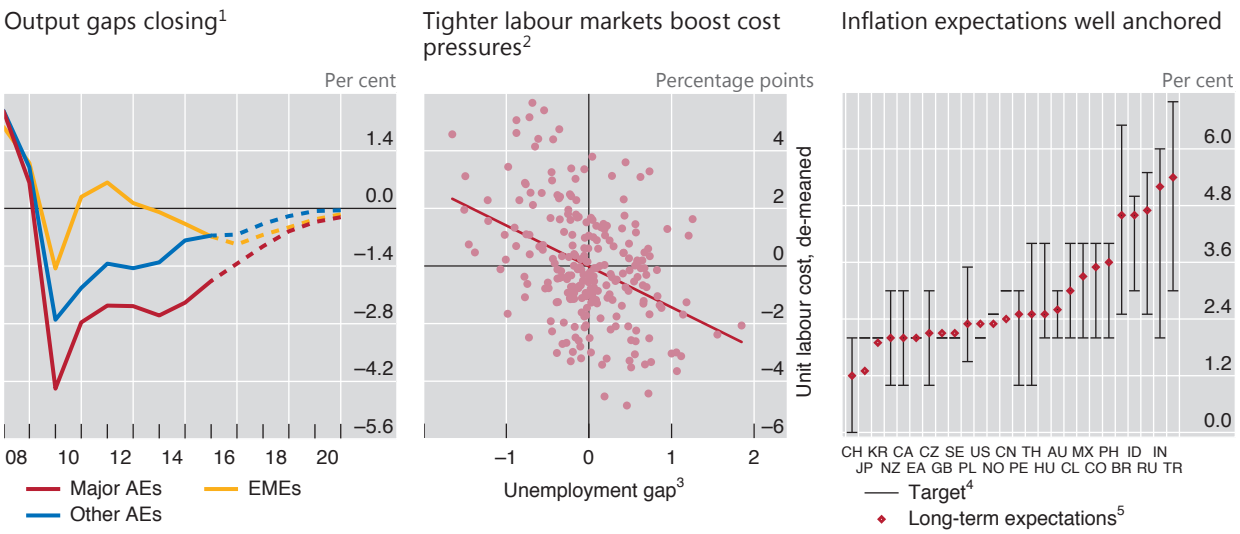
GVCs = global value chains.

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.

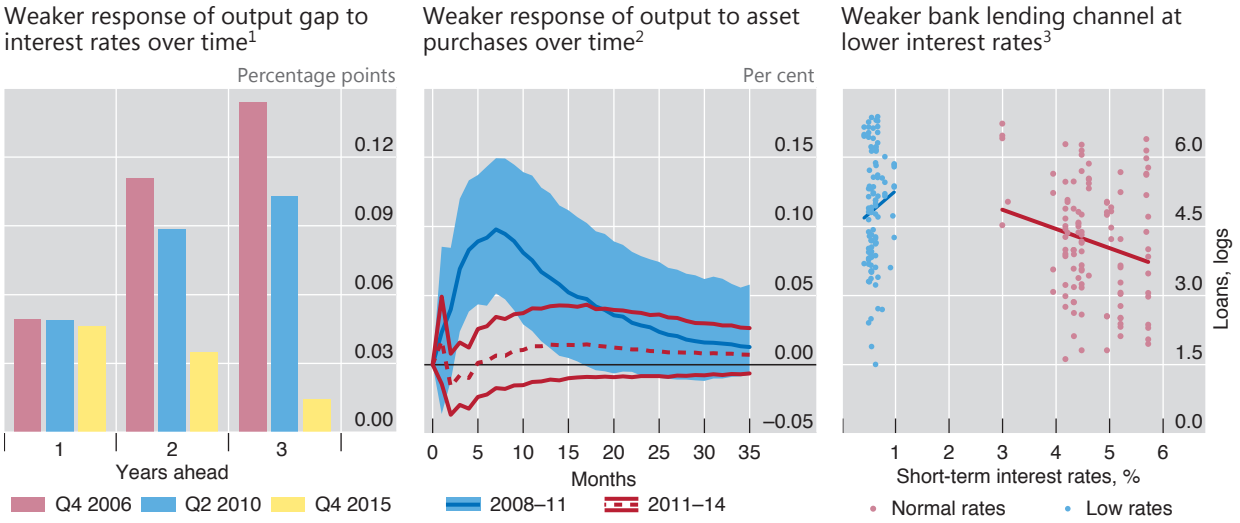
Shifting from domestic to external monetary policy channels

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.

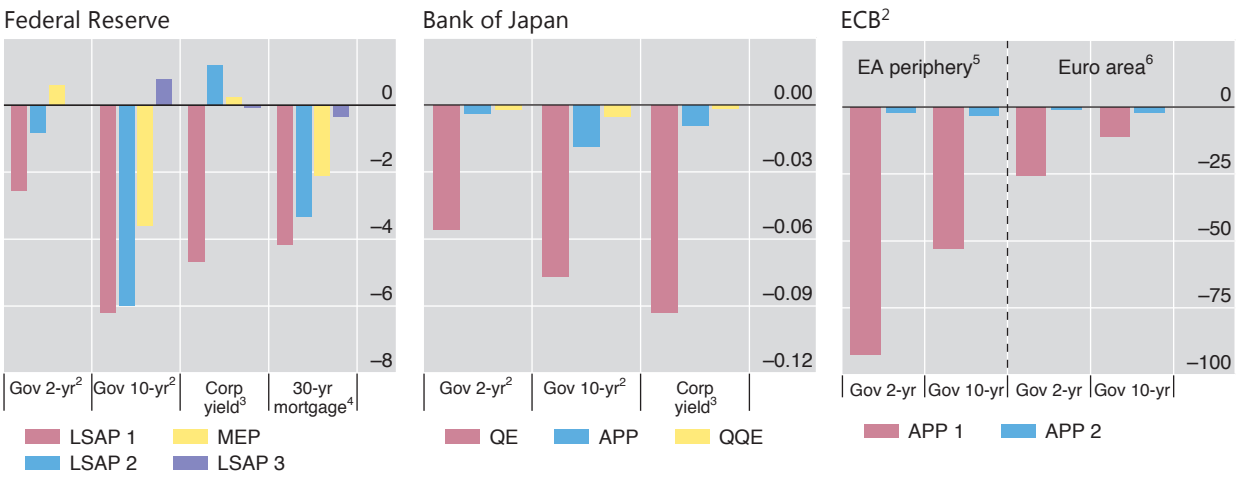
...and the rising prominence of external channels

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.

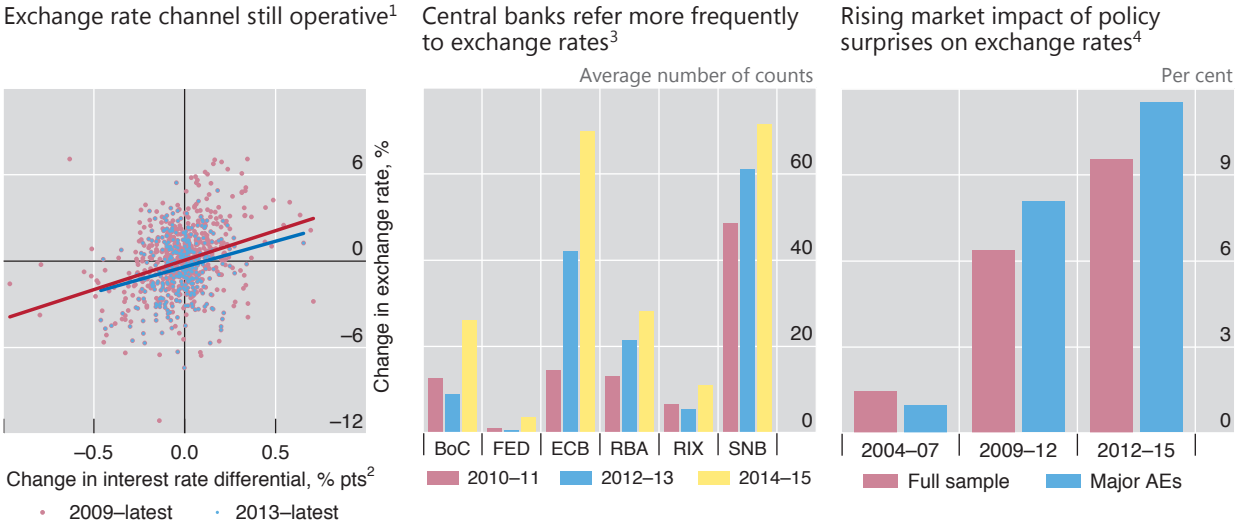
Indeed, shifts in the monetary policy stance continue to influence exchange rates. The relationship between exchange rates and interest rate differentials over the past few years has been fairly stable (Graph IV.8, left-hand panel). Monetary policy decisions have loomed large in medium-term currency 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]

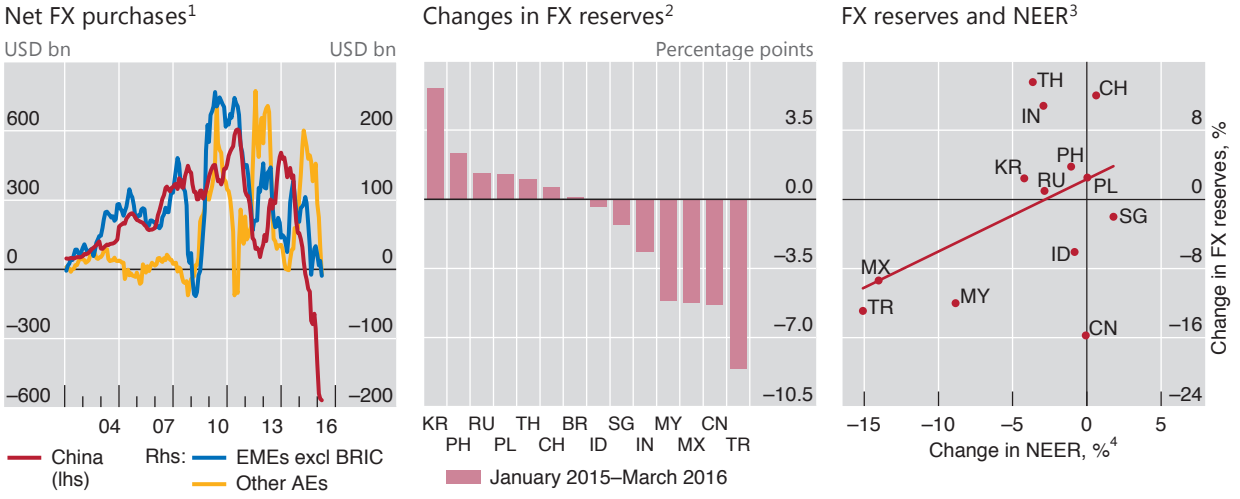
As a result, the exchange rate has not only redistributed global demand, but has also affected the stance of monetary policy at the global level. This arguably has contributed to financial imbalances in those countries that have been experiencing financial booms, notably many EMEs (Chapter III). And 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.

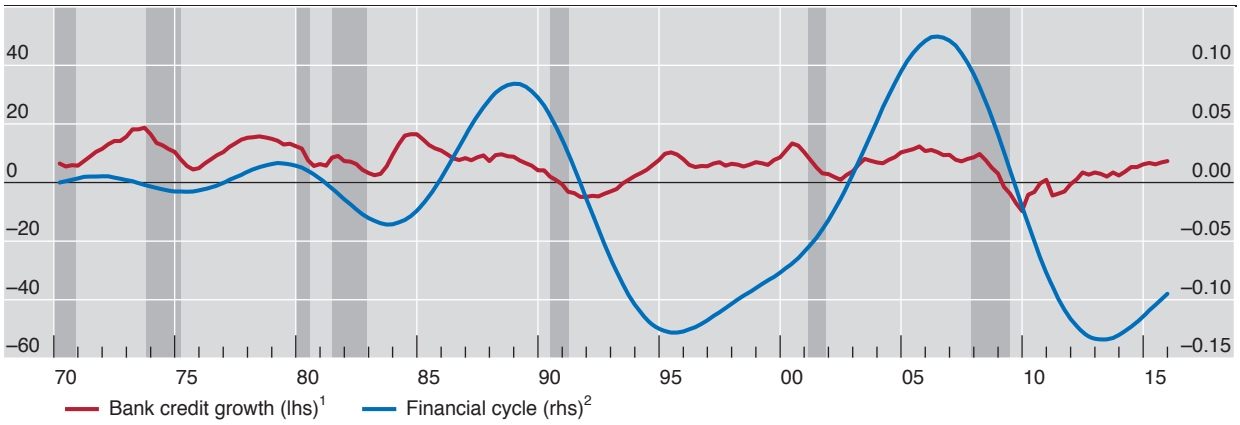
Clearly, as long as monetary policy cannot completely undo the costs of a crisis by "cleaning up" afterwards (ie point (iii) above) and it can reduce its probability or magnitude (ie point (ii) above), then leaning would produce some benefits. Intuitively, it would then pay to sacrifice *at the margin* 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

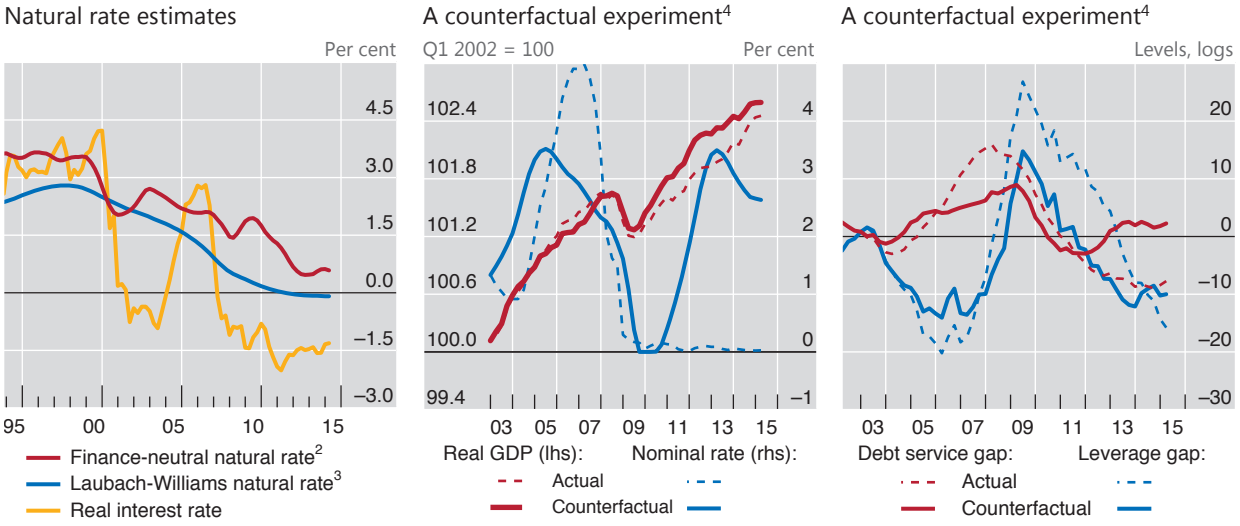
The simulations suggest that a monetary policy which takes financial developments *systematically* into account at all times can dampen the financial cycle, leading to significant output gains (Graph IV.C, centre panel). According to the simulations, implementing the policy starting in 2003 could have 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).

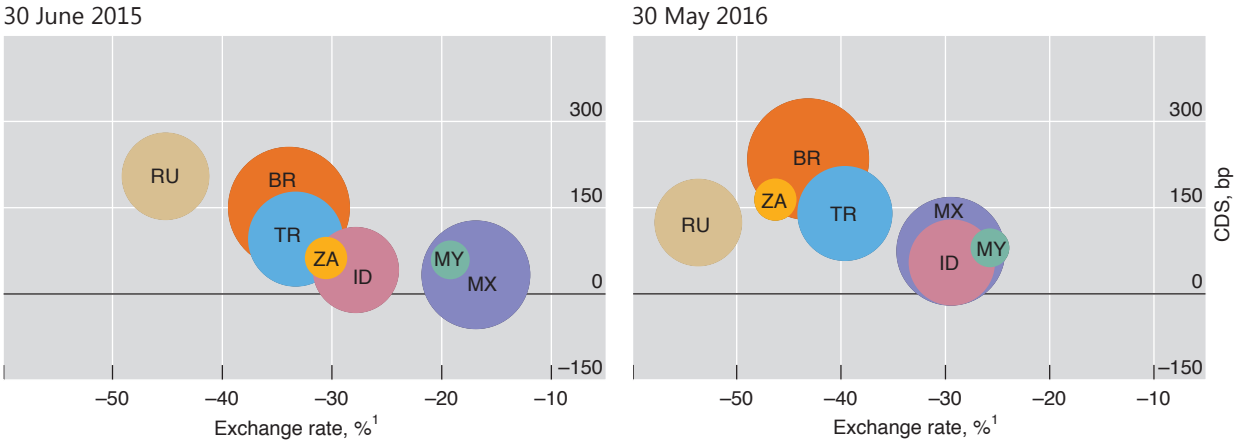
The previous discussion suggests that the influence of central banks whose currencies are used extensively abroad (ie international currencies) extends well beyond national borders.[3] This is not only because the rest of the world can borrow heavily in those currencies, but also because even financial 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.

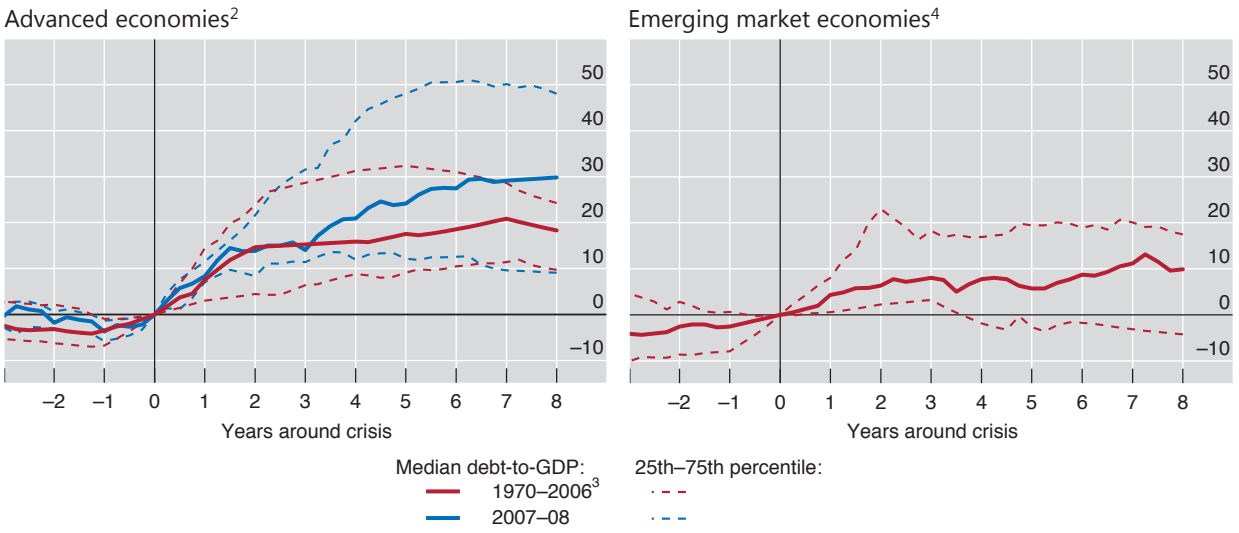
Bailout costs can be quite large, but are difficult to estimate precisely, even ex post. Depending on the method and time horizon, estimates vary widely. Moreover, over time, countries may be able to recover some or most of the initial costs, in some cases even making a small net profit, provided they 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.

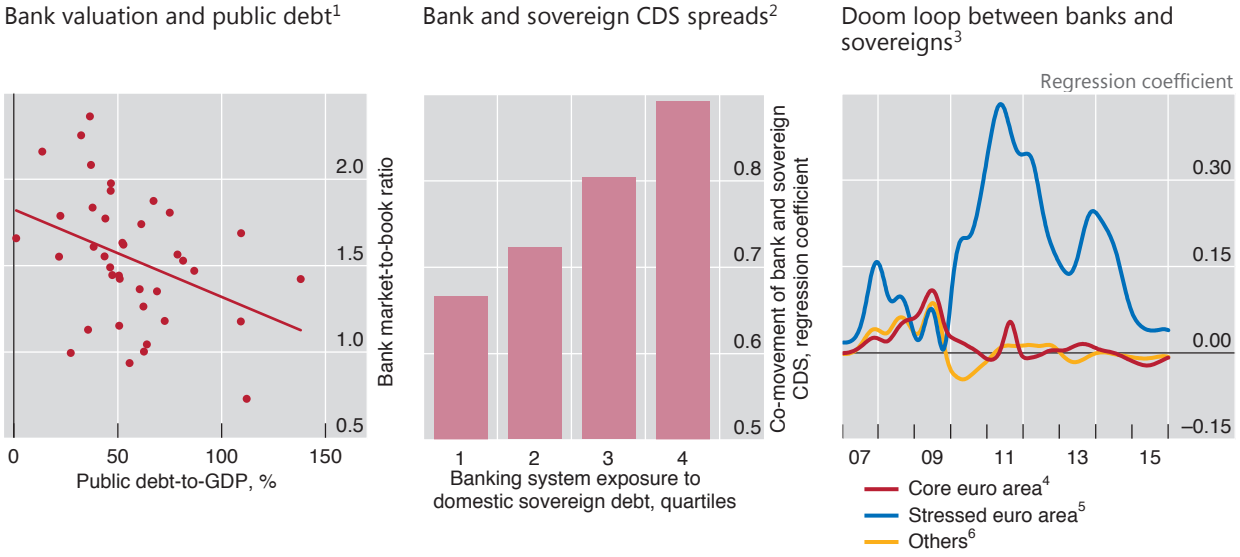
[8] Short-term debt issuance usually increases steeply during episodes of fiscal stress, reflecting both the risk of default and higher future inflation. This increases rollover risks for the sovereign.

[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



[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

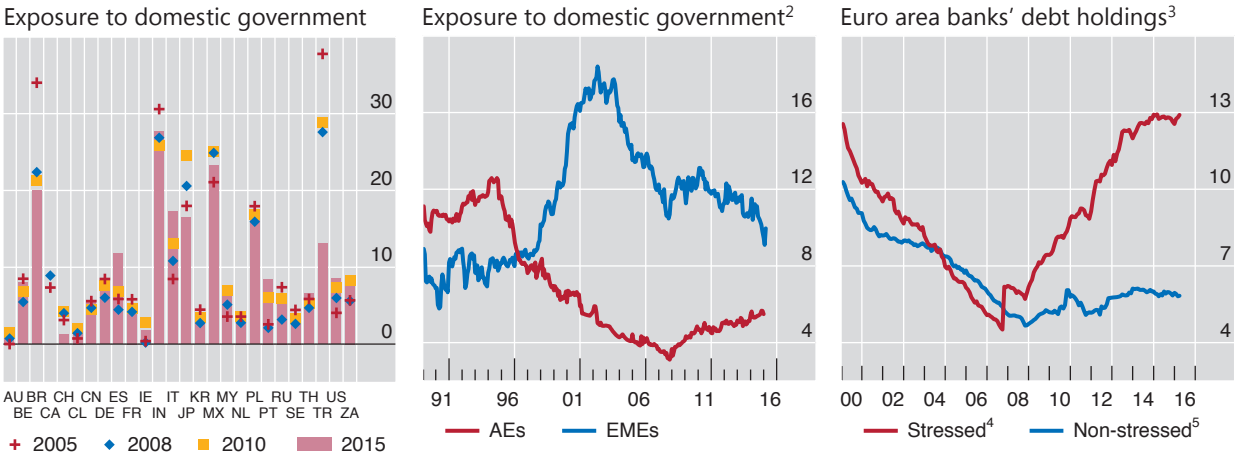
Banks' exposures to the domestic sovereign differ significantly across countries. For example, as a share of bank assets, exposures are now relatively large in Brazil, India, Italy, Japan and Mexico, but small in Canada, Chile, Sweden and Switzerland (Graph V.3, left-hand panel). In general, they tend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

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

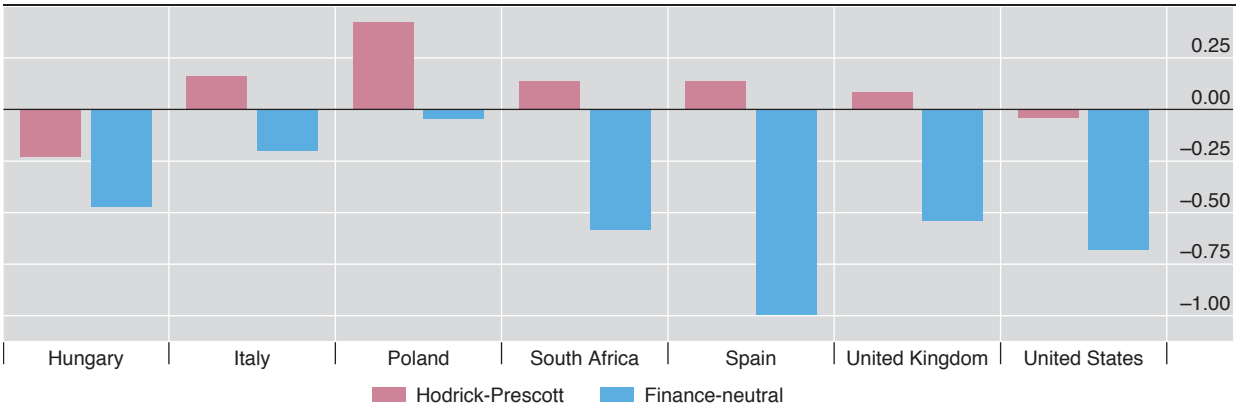
where Y and Y^* denote, respectively, actual and potential output; T_i are revenues from different types of tax (personal and corporate income taxes, social security contributions and indirect taxes); G is primary government expenditure; and X is non-tax revenues. Tax revenues and government expenditure 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.

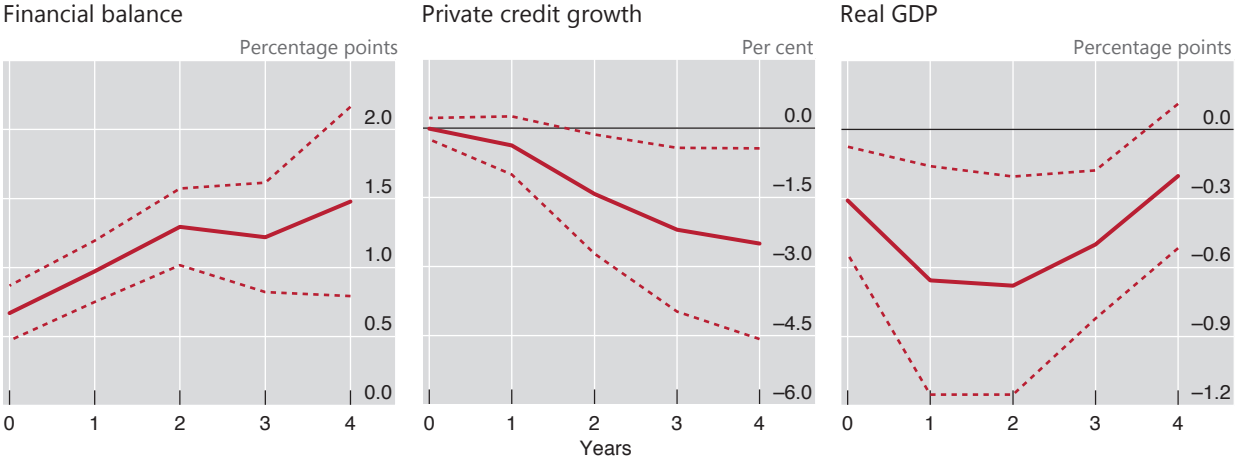
① See M Obstfeld, "On keeping your powder dry: fiscal foundations of financial and price stability", *Monetary and Economic Studies*, vol 31, November 2013. ② See P D'Erasmo, E Mendoza and J Zhang, "What is sustainable public debt?", *Handbook of Macroeconomics*, vol 2, forthcoming. ③ See B Eichengreen 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



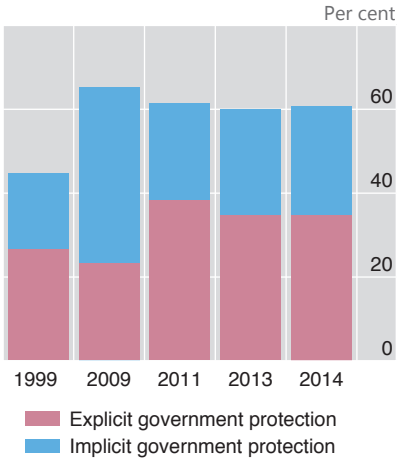
The dotted lines represent 90% confidence bands around point estimates (solid line).

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.

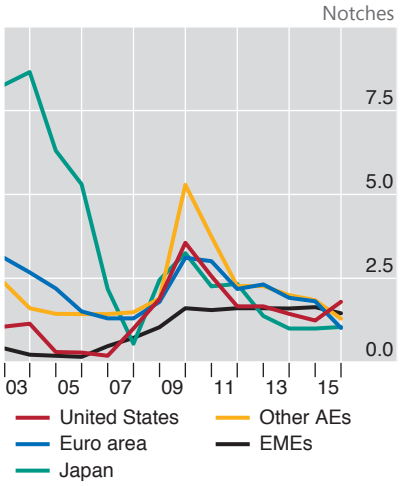
Government subsidies encourage private sector leverage

Graph V.5

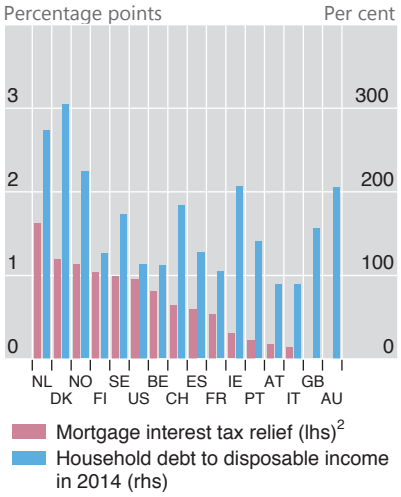
Share of US private sector financial liabilities subject to government protection



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).

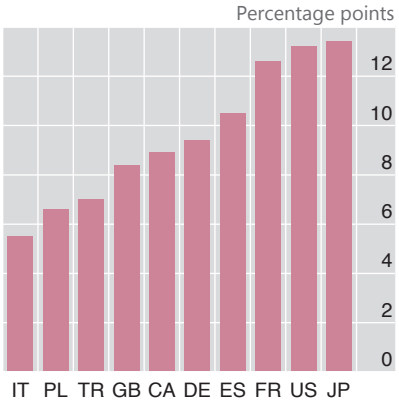
Evidence indicates that such tax advantages can have significant effects on firms' leverage (Box V.C). Firms tend to have higher leverage in countries with higher effective tax rates on corporate income (Graph V.6, centre panel). As with mortgage debt, the significant dispersion of corporate leverage, 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.

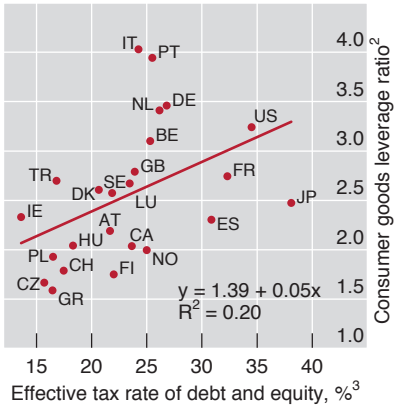
Corporate sector taxes and leverage

Graph V.6

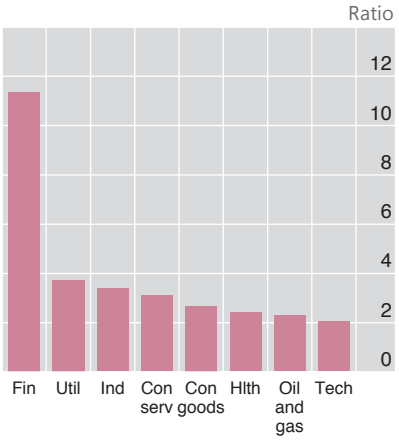
Difference between the marginal tax rates on new equity and debt[1]



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.

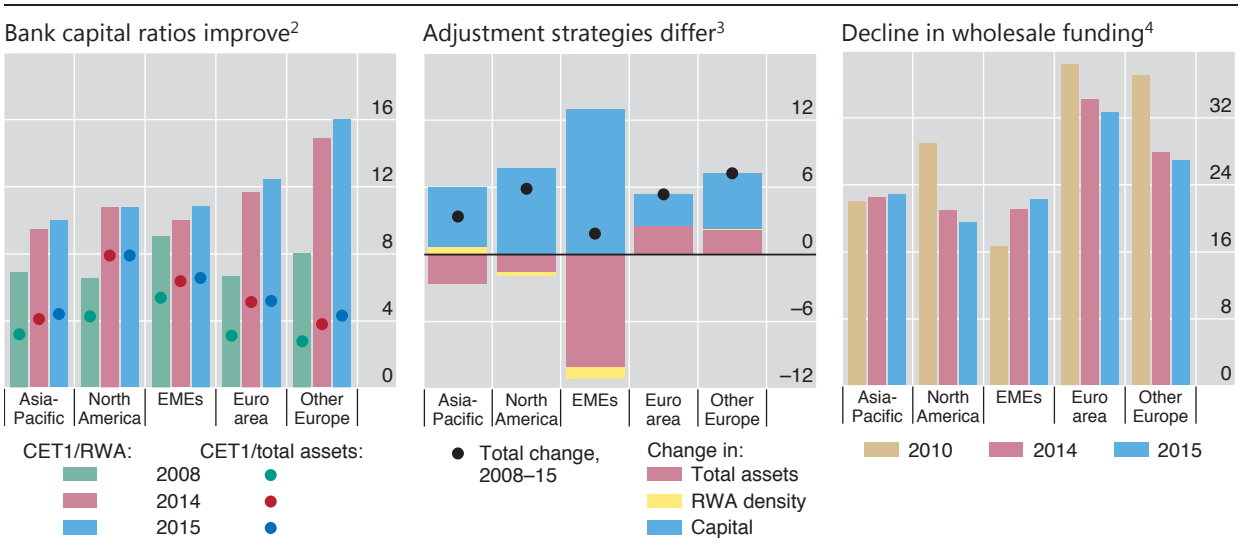
Banks have opted for different adjustment strategies to improve capital ratios, reflecting the varied economic environment they faced (Graph VI.1, centre panel). While retained earnings have represented an important source of capital for most banks, capital ratios in Europe, for example, have tended 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

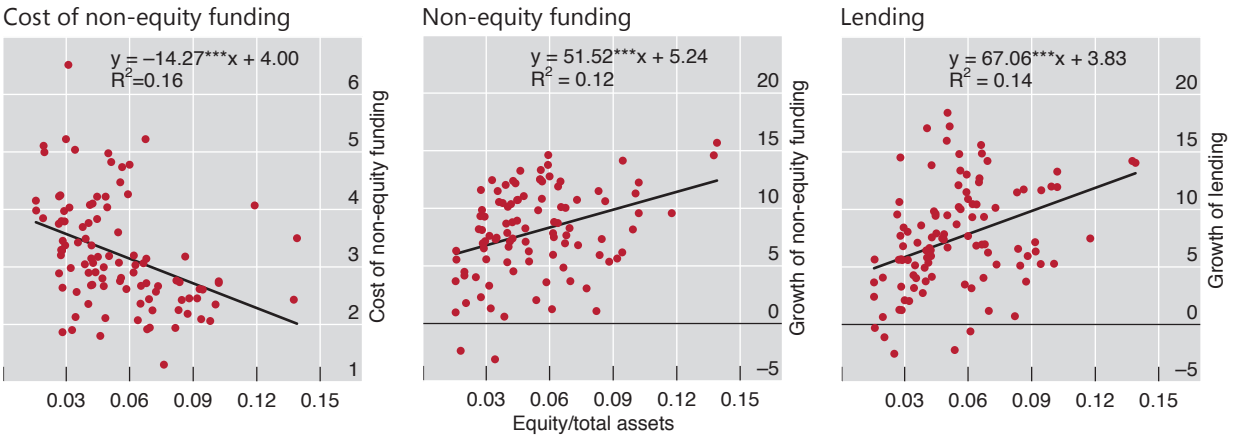
Discussions of the macroeconomic impact of higher bank capital sometimes presume that higher bank capital increases total (equity plus debt) funding costs, which then translate into higher lending spreads and less lending. The argument invokes observed deviations from the Modigliani-Miller (MM) theorem,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

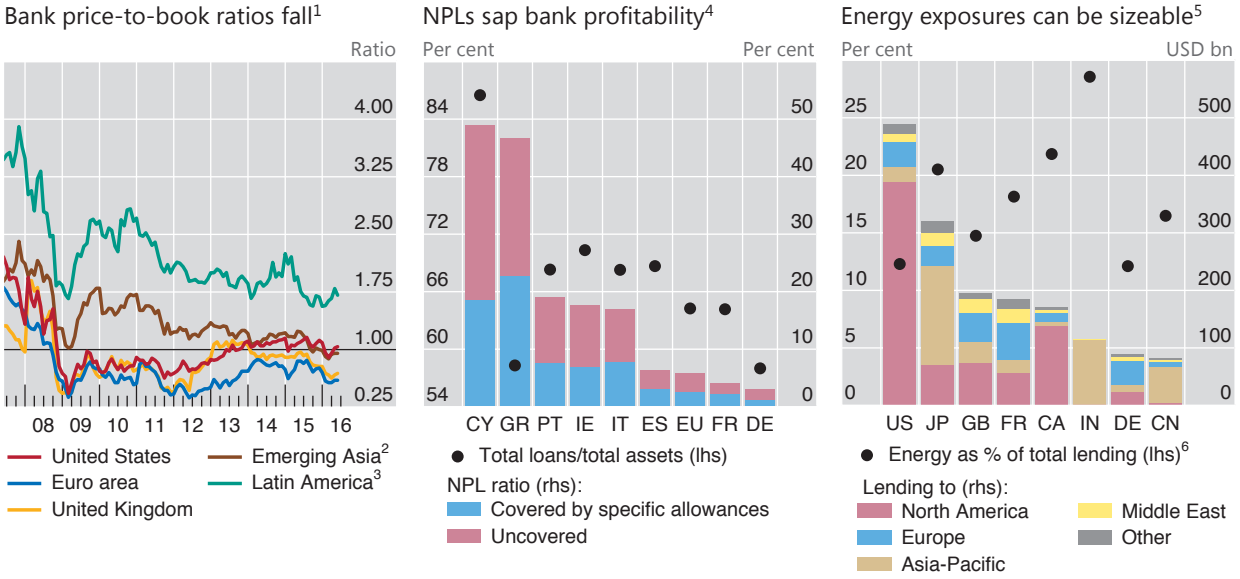
Sources: Gambacorta and Shin (2016); Bankscope.

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.

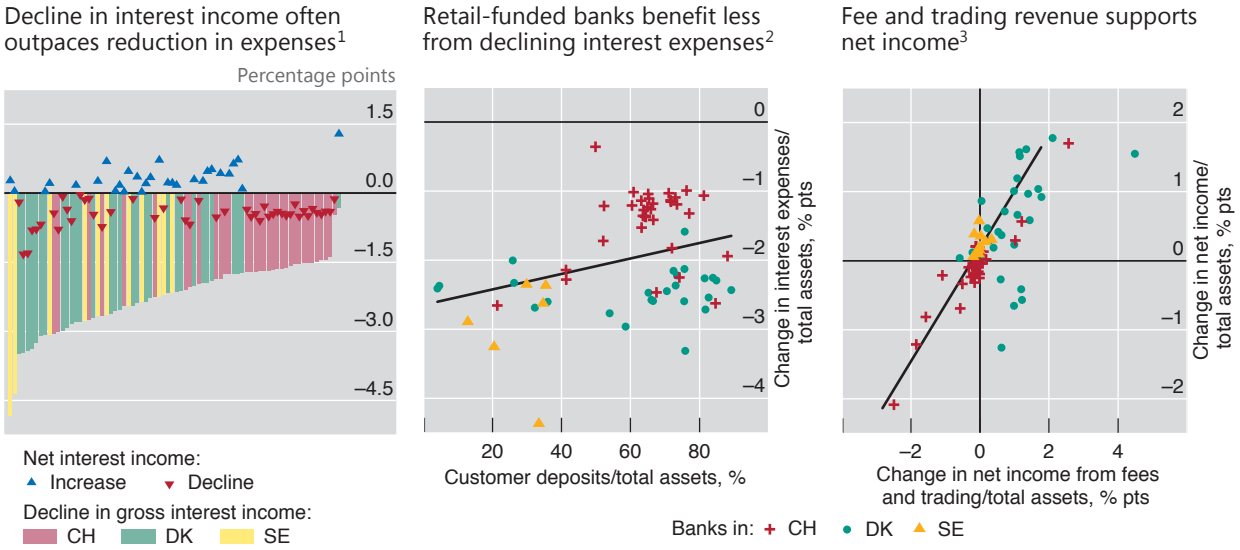
Sources: SNL; BIS calculations.

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).

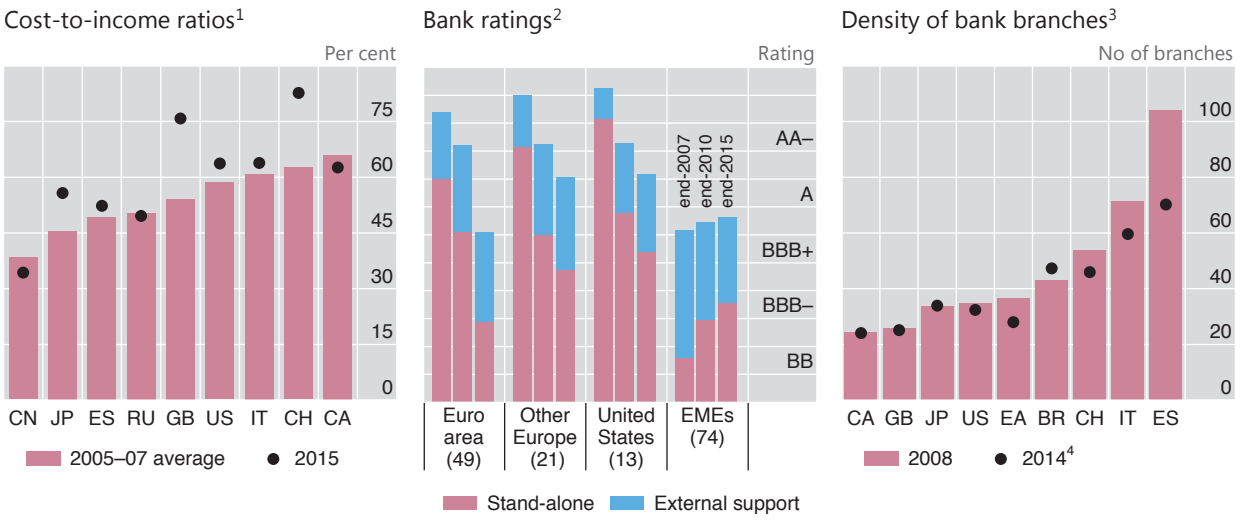
Exposures to commodity risks extend beyond EME banks. A number of regional financial institutions in Canada and the United States, in particular, have a relatively high concentration of lending to the energy sector. And internationally active banks had energy-related syndicated loan commitments (including 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.

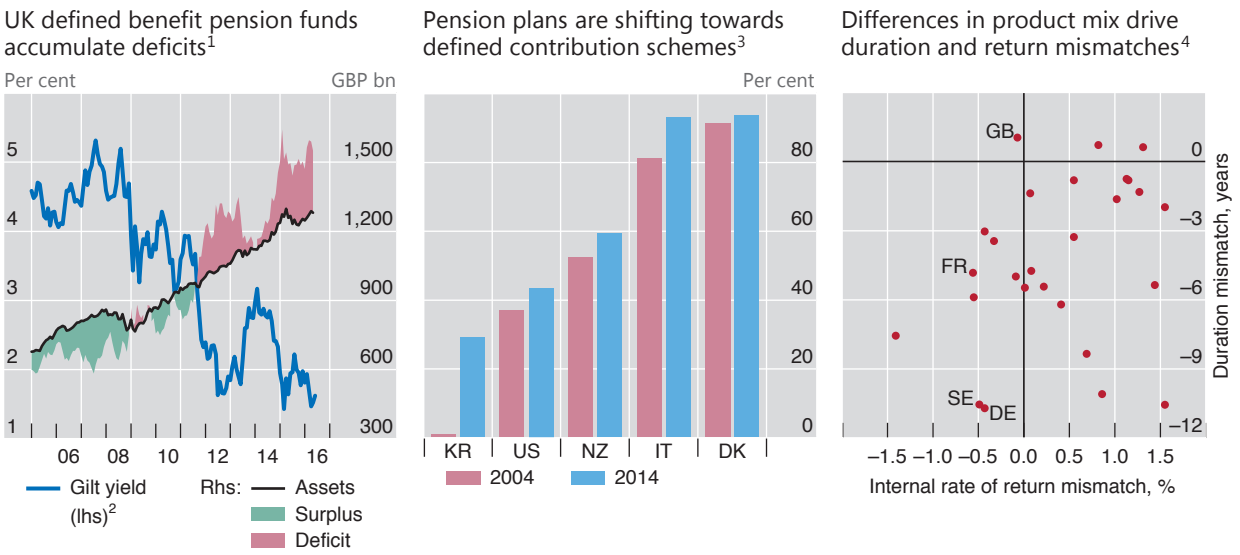
Recent developments in DB pension schemes illustrate some of these balance sheet pressures. Given the discounting of projected financial obligations with market yields and the underlying duration mismatches, lower interest rates have boosted pension fund liabilities relative to assets, generating large 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

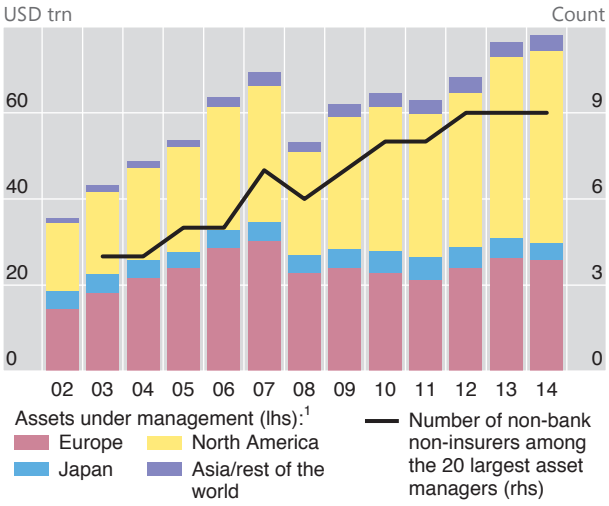
[5] See D Domanski, H S Shin and V Sushko, "The hunt for duration: not waving but drowning?", *BIS Working Papers*, no 519, October 2015.

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

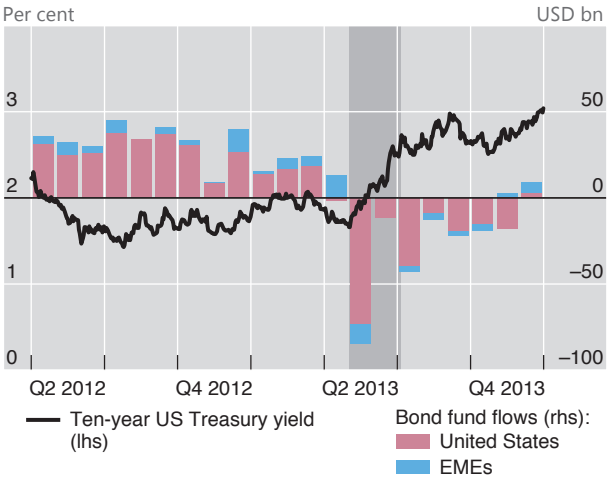
Market activity and liquidity risks continue to migrate to new players

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]

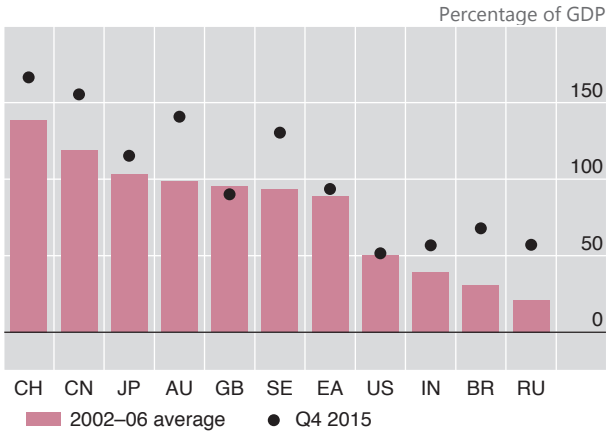
The resulting range of estimates suggests that there is ample room for the BCBS to make its final calibration decisions. The net economic benefits (measured

[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.

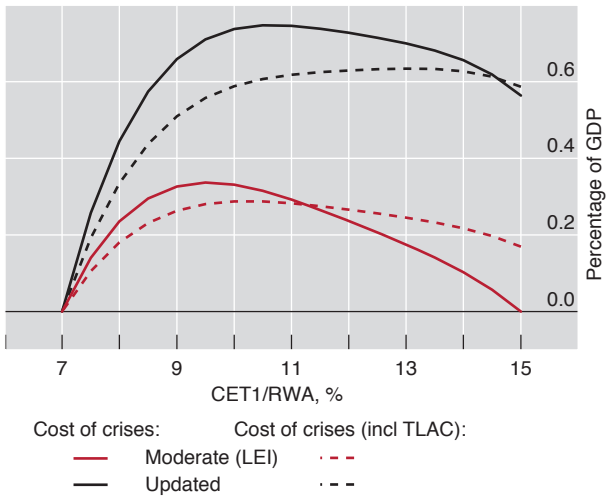
Additional bank capital yields sizeable economic benefits

Graph VI.7

Bank lending-to-GDP ratios have increased[1]



Expected net marginal benefits[2]



[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.