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Chapter 10

Globalisation, financial innovation and crises

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Chapter 10 highlights the usefulness of the framework of financial accounts and balance sheets for understanding financial globalisation, innovation and crises. Developing further on Chapter 7, it provides a more in-depth analysis of countries' fragilities when it comes to financial exposures. The chapter offers a wider perspective on the build-up of financial risks over time and the contributing roles of international finance and globalisation. It shows how the framework of financial accounts and balance sheets can be mobilised to analyse financial crises, drawing in particular on recent episodes of stress and considering the impact of leverage and financial innovation. After underlining the importance of integrating a micro, entity-level perspective in the macro approach of financial accounts and balance sheets, this chapter concludes by reviewing the international efforts undertaken to enhance countries' statistical frameworks in response to the 2007-09 economic and financial crisis.

1. Introduction

Globalisation and financial innovation are two very different, though intertwined, phenomena. The pendulum towards globalisation has been characterised by specific periods in economic history, with more or less abrupt and prolonged reversals. On the other hand, financial innovation appears to be relentless, though with years of varying acceleration, as driven by the necessities and political impacts of trade and reactions to new regulations and technological opportunities.

The above developments go hand in hand with financial crises. These crises can arise from purely internal (domestic) imbalances, or they can be driven by a combination of internal and external factors. This chapter will start from the latter, as a follow-up to Chapter 7. Countries' fragilities are most apparent when internal sectoral imbalances require external financing from the Rest of the World. The discussion then moves on to show that essentially internal imbalances with no direct impacts on the balance of payments can also lead to major international reactions via financial markets. Leverage and the related successions of booms and busts are often at the heart of the build-up and evolution of crises. The degree of (un)awareness of such imbalances and the reversal of expectations can play a key role as a trigger of crises.

The increased complexity driven by financial innovation, specifically the transition from an "originate-to-hold" banking model to an "originate-to-distribute" banking model, is another challenge of recent years. This shift was made possible by the combined effects of information technology and deregulation. It also led to the emergence of a "shadow banking" sector, which is much less regulated and difficult to capture via statistics. Financial crises have relevant and often long lasting effects on the "real" economy, including economic growth. It is therefore important to closely monitor the information in financial accounts and balance sheets, as they can provide early warnings and forward-looking indicators for policy makers to address possible risks and vulnerabilities.

2. Countries' fragilities and international crises

The external financing of sectoral imbalances

As analysed in Chapter 1, the framework of financial accounts and balance sheets allows for a reconciliation between the "real" economy and its financing,

both at the global level and within countries. A key element is the role played by the Rest of the World in acting as a borrower/lender of funds in the case of imbalances in the sum of resident sectors' financing. This feature explains why the globalisation of financial markets has traditionally been seen as a positive way to bridge the gap between saving and investment in specific sectors and countries, leading to better economic outcomes. This has been indeed the reasoning behind development economics: mature economies should generate an excess of saving compared to their investment needs, and this excess of saving should be mirrored by their current account surpluses and therefore by net financial outflows to other countries. In turn these funds should provide finance for more profitable investment in less developed countries where saving is not so abundant, resulting in their progressive "catching up" towards the more advanced countries.

Under this model, the global economy would be characterised by a group of advanced countries with large current account surpluses, while the developing world would have an underlying, or "structural", current account deficit matched by "sustainable" financial inflows. A famous example relates to the British Empire, which benefited from inflows of foreign capital during the initial phase of its industrial revolution in the 18th century and then became progressively a net exporter of capital, financing the expansion of new colonies during the 19th century and up until First World War (Brezis, 1995). As a result, the United Kingdom ran a significant current account surplus from 1850 to 1910, expanding its ownership of foreign assets by providing finance to developing regions, and receiving income in return. In line with this reasoning, countries such as Australia and Canada were considered as able to sustain relatively large current account deficits, because those current account deficits would mirror the high investment opportunities of these "new" countries.

There are, however, three caveats with this development economics approach. One is that the global economy has been characterised by sizeable and lasting exceptions to the situation described above. The United States, for example, though leading the advanced economies in terms of economic productivity, has displayed sizeable and continuous current account deficits over the past few decades. Another exception is that a number of rapidly emerging economies, especially in Asia (e.g. China), have experienced over the past few decades (and especially before the 2007-09 economic and financial crisis, during the 2000s) sizeable current account surpluses and have built very large external reserves, instead of recording current account deficits.

The second caveat is that analysis cannot be limited to the level of the country as a whole: the sectoral counterparts of the Rest of the World financing balance are also very important. Residents have to remunerate (and repay at some point) external financial inflows, which are often denominated in foreign currencies for less advanced economies (the "original sin" view, as put forward by

Eichengreen et al., 2002). The ideal situation is that these flows serve to balance the funding deficits of domestic sectors with the highest investment opportunities and possibilities to generate revenues in foreign currencies – often, the non-financial corporations in the tradeable sector. If, on the contrary, external funding serves to balance the needs of households or the government and is mainly used for current consumption, the situation is more fragile as the future servicing of external liabilities may be harder to ensure. Hence, and as explained in Box 10.1, observers have often focussed on the risks posed by a "twin deficits" situation, when large current account deficits reflect unsustainable government spending and/or disequilibria in the net lending of the private sector.

Box 10.1. **The link between the current account balance and the resident economy**

Looking at the country as a whole, one can compute the aggregate balance of the domestic sectors and derive the flows and positions of the domestic economy with the Rest of the World. In the following, we slightly rewrite equations (1) to (3) in Box 8.1, as follows:

(1') $Y = C_{hh} + C_{gov} + I_{private} + I_{gov} + (X - M)$

Where:

Y = Gross Domestic Product (GDP)

C_{hh}/C_{gov} = Final consumption by households (hh) and government (gov), respectively

$I_{private}/I_{gov}$ = Investments (in non-financial assets) by the private sector (private) and government (gov), respectively

X = Exports

M = Imports

(2') $Y + W - DI_{gov} - C_{hh} = C_{gov} - DI_{gov} + I_{private} + I_{gov} + (X - M) + W$

Where:

W = Balance of primary and secondary income transactions with the Rest of the World

DI_{gov} = Disposable Income of government, i.e. current receipts minus current expenditures (excluding government consumption)

Since $(Y + W - DI_{gov} - C_{hh})$ equals private saving ($S_{private}$), whereas $(DI_{gov} - C_{gov})$ equals government saving (S_{gov}), equation (2') can be rewritten as follows:

(3') $(S_{private} - I_{private}) + (S_{gov} - I_{gov}) = (X - M) + W$

Equation (3') above highlights that the current account balance is equal to the saving minus investments in non-financial assets of the private sector ($S_{private} - I_{private}$) and the government sector ($S_{gov} - I_{gov}$), respectively. For the country as a whole, it is equal to total saving, i.e. public and private saving, minus investments. One immediately sees that if the surplus of saving over investments for the private sector and/or the government declines, then the current account position will diminish as well. In turn, disregarding net capital transactions, the evolution of the current account balance will be reflected in the financial

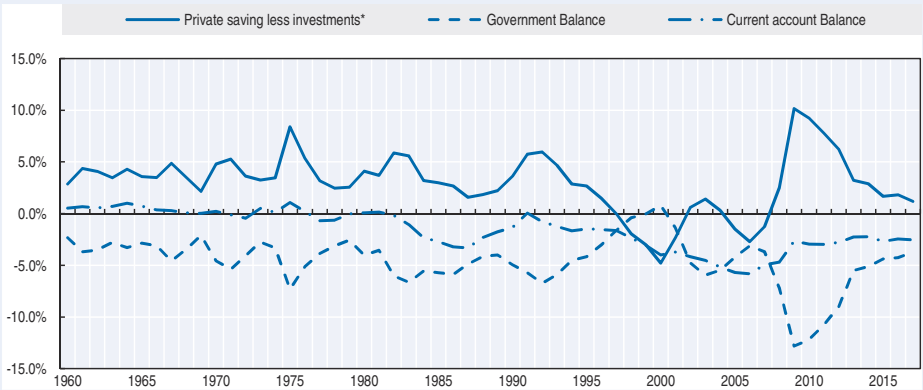
Box 10.1. **The link between the current account balance and the resident economy** *(cont.)*

accounts, since a net current account deficit has to be funded by net financial inflows into the country and/or a variation in its holdings of foreign reserves. Of course, the above assumes that all other things remain equal. In reality, the situation is more complicated because the relevant variables interact. For example, if the government saves less, the deterioration in the country's current account position may be (partially) offset by increasing private saving (if, for example, economic agents are "Ricardian" and anticipate a future increase in taxes).

This simple framework has been often used to explain the features of the global economy in recent decades. One famous example was the twin deficit hypothesis that was put forward to explain the situation of the US economy in the 1980s and 1990s, marked by large government deficits which were mirrored by current account deficits (and net financial inflows into the US economy); see Figure 10.1. However the relationship was not

Figure 10.1. **US current account, saving minus investments of the private sector and government, 1960-2017**

Percentage of GDP



* Private saving less investments is calculated as a residual.

Source: Adapted from OECD (2016), *OECD Economic Outlook, Volume 2016* (database), *http://dx.doi.org/10.1787/eco_outlook-v2016-1-en*.

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permanent,and in fact the 2000s were marked by a strong improvement in the government balance, while the current account deficit widened significantly, reflecting a sharp deterioration in the balance of private saving and investments. Another example, this time of a "twin surplus", was the savings glut analysis in the 2000s, whereby the high private savings registered in a number of emerging Asian economies such as China were "matched" by persistently high current account surpluses. These surpluses were mirrored by net financial outflows, mostly invested in advanced economies' assets, resulting in a sharp expansion in the foreign exchange reserves held by emerging Asia.

A last caveat concerns the fact that external balances do not add up at the global level. The reporting of imports and exports do not match across countries; therefore, the sum of all countries' current account positions is not equal to zero as it should be. Indeed, the global economy has been characterised by an annual "current account surplus" of around 300 billion USD on average since the early 2010s, i.e. around 0.4% of world GDP, according to the IMF. By definition, this large statistical discrepancy underscores the uncertainty of any analysis on how domestic imbalances are matched by external financial flows.

Trigger of current account crises

The interrelationship between financial imbalances of domestic sectors and the external position of a country, as analysed above, has put emphasis on the role of international financial flows in triggering episodes of financial stress. Such crises typically occur when investors revise their expectations, leading to a sudden reversal in financial flows and/or a sharp tightening in the country's financing conditions, in turn constraining domestic spending.

Two generations of explanations have been particularly popular to explain this type of foreign exchange-related crises. The first is the balance of payments crisis, as explained by Krugman (1979): if authorities want to maintain an exchange rate that is not deemed sustainable because of weak domestic fundamentals, speculative attacks will eventually exhaust the stock of the country's foreign exchange reserves. Typically, there will be ups and downs in expectations, because speculators' psychology may be subject to reversals, for example in connection with the ability of governments to mobilise alternative funds, such as gold, or following concerted international actions (e.g. IMF programmes). Ultimately, however, the exchange rate may prove unsustainable because of accumulated external imbalances and/or spiralling domestic debt levels, putting into question the ability of the resident sectors to honour their liabilities. Short debt maturity and any foreign currency denomination of domestic debt will exacerbate the problems, since debt burdens would soar in domestic currency terms in case of devaluation. A number of such crises took place in developing regions in the 1980s and 1990s, especially when tighter global monetary conditions and/or weakening currencies exposed the underlying vulnerabilities of these economies and led investors to question the sustainability of their external lending.

Second generation crises, as explained by Obstfeld (1994), rely on the same type of analysis but with the difference that international investors may react to other factors as opposed to just "fundamentals". In particular, even a sound economy may be judged vulnerable because of its exposures to international finance and its inability to face potential shocks. Moreover, investors' expectations can interact with policy makers' behaviour to become self-fulfilling. For instance, even in the absence of imbalances ex ante, the

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exchange rate may be attacked if market participants believe that – to defend it – the authorities will tighten policy so much that the economy will suffer. Authorities may even not want to resist attacks in the first place, knowing that ultimately they will be defeated. This framework has been used to analyse the speculative attacks on the European Monetary System (EMS) in the early 1990s, especially when the pound sterling had to exit the European Exchange Rate Mechanism on 16 September 1992 (the "black Wednesday").

In both cases, the crisis can be seen as intrinsically linked to the external position of the country. There is little fragility if the domestic funding needs of specific sectors can be covered by savings from other domestic sectors. What matters is the financing of the economy as a whole, and hence its external position vis-à-vis the Rest of the World, both in terms of flows – a too large current account deficit may not be easily financed because of the limited availability of international financing in a specific year – and even more so in terms of stocks. The key element to be considered from a long-term perspective is the accumulation of the external liabilities of the country and (foreign) investors' confidence that they will be repaid (see also Box 10.2). The crisis occurs when these investors take the view that the country as a whole will be unable to service its external debt or to withstand capital outflows. It can break out very suddenly, even if it is the result of imbalances that have been building up for years.

To sum up, international financial flows can be a key trigger of current account crises either because they may lead to the build-up of external imbalances that at some point become unsustainable, or because they provide room for self-fulfilling attacks. As a consequence, the academic and market literature focus largely on "traditional" external indicators for assessing country risks: for instance, current account balances, short-term external funding needs, stocks of foreign exchange reserves (in particular compared to the amounts needed to cover countries' imports), exchange rate positions, etc. Policy recommendations, especially in international fora, have been along similar lines: the focus is to prevent the build-up of current account deficits deemed to be too large, while surplus countries are seen as insulated from financial risks and receive little pressure to adjust. One telling example has been the accumulation of large official foreign exchange reserves after the Asian crisis at the end of the 1990s: this war chest has been widely considered as an effective line of defence against the risk of future episodes of financial stress.

International finance and contagion effects beyond balance of payments crises

The exclusive focus on a country's balance of payments has been questioned over the past few decades, especially in the light of three major

Box 10.2. **Assessing external debt sustainability**

The assessment of the sustainability of the external position of a country can schematically be looked upon from a pure accounting perspective. As shown in Chapter 7, the net foreign liabilities (NFL) of a country are equal to (the inverse of) its net international investment position (IIP), which is the total foreign assets held by its residents minus their total liabilities incurred towards non-residents. One can write the following:

$$-(IIP_{t+1}) = NFL_{t+1} = NFL_t + \Delta NFL_{t+1}$$

where ΔNFL_{t+1} represents the change in the countries' net liabilities occurred in year t + 1, which – apart from revaluations, other changes in the volume of assets and liabilities, and some capital transfers – equals the current account balance (CA).

Similarly to public debt sustainability exercises, and defining "GDP_t" as the GDP in nominal terms for year t, "g" as its growth rate (small compared to 1), and "nfl" and "ca" as the NFL/GDP and the CA/GDP ratios respectively, one can arrive at the following equation:

$$nfl_{t+1} * (1+g) = nfl_t + ca_{t+1}$$

Hence, in a steady state, the ratio of net foreign liabilities, as a percentage of GDP, will be stable and equal to "nfl", if:

$$ca = nfl * g$$

The above thus provides a rule of thumb for evaluating whether the current account deficits expected for a country will put its foreign liabilities-to-GDP ratio on an unsustainable path. For instance, if the foreign net liabilities already represent 60% of GDP and the long-term nominal growth rate is 5%, then the country can register a yearly increase in its foreign liabilities – i.e. a permanent current account deficit – representing 3% of GDP, while still keeping a stable net external liabilities-to-GDP ratio, all other things being equal.

However, this simplified approach faces a number of challenges. The first is the adequate measurement of the total assets and liabilities of the country. While this is already far from easy for say the public sector (see Chapter 6), it is even more complicated for the country as a whole. In fact, numbers on IIPs are constantly and sometimes markedly revised, depending on the latest source data collected and/or on the valuation methods applied. Secondly, as noted before, the increase in net liabilities registered by a country in a given year does not solely reflects its current account deficit, but also other items such as capital transfers (e.g. public debt write-off in the case of the poorest countries). Thirdly, revaluations can have a very significant impact, and they can diverge markedly across the components of a country's assets and liabilities. The price of financial instruments (e.g. equity shares versus bonds) may evolve in opposite directions, and their currency composition and hence their valuation in the country's domestic currency may differ substantially.

A telling example is the US IIP, which has deteriorated over the past few decades but much less than what a simple accumulation of US current account deficits would suggest; see Figure 10.2. This in particular reflects valuation effects, especially those stemming from exchange rate movements and the idiosyncratic role played by the US Dollar (USD). US holdings of foreign assets have a relatively diversified currency portfolio, not least because

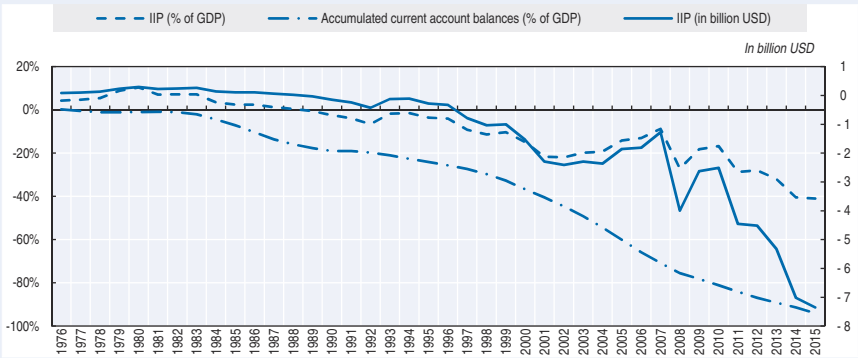
Box 10.2. **Assessing external debt sustainability** *(cont.)*

these assets comprise a significant amount of US Foreign Direct Investment (FDI) in a variety of countries. In contrast, the vast majority of US foreign liabilities are denoted in USD, reflecting the primary role played by the USD in international markets as well as the safe haven status of the US economy. As a consequence, when the USD is weakening vis-à-vis other major currencies, the value of US foreign assets in USD goes up, and the US IIP position improves. This effect is amplified over time as, irrespective of the level of the IIP (which is the net difference between assets and liabilities), the stocks of both foreign assets and liabilities have been increasing markedly with economic globalisation. For example, the value of US foreign liabilities now represents almost twice the level of US GDP, and any valuation effect on this large stock of liabilities will thus have a multiplied impact on the comparatively much smaller net IIP position.

In addition, the US situation underlines a number of puzzling elements that relativize any analysis one can make regarding the sustainability of a country's external position (Heath, 2007). The US net primary income balance has remained in positive territory (and slightly higher than the deficit in its secondary income balance), despite the fact that the US IIP is quite negative (around minus 45% of GDP at the end of 2016). This could suggest that a significant stock of US assets abroad, especially intangible assets, are inadequately captured by statistics (the "dark matter hypothesis"; cf. Hausmann and Sturzenegger [2005]). On the other hand, it shows that the income yield on US assets, which are relatively more invested in equity, is much higher that the income yield on US liabilities, which mostly consist of debt instruments. But a rather puzzling element in this respect is that, even for the same kind of investments such as foreign direct investment (FDI), investments in the US persistently earn lower yields than US investments abroad. This can reflect a variety of factors, such as the maturity of the investments, risk appetites, market share strategy, and the impact of tax incentives on the reporting of affiliates' incomes (e.g. intra-firm transfer pricing).

Figure 10.2. **US external position, 1976-2015**

Percentage of GDP



Source: Adapted from IMF (2016), *International Financial Statistics* (database), *http://data.imf.org/?sk=5DABAFF2-C5AD-4D27-A175-1253419C02D1*.

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episodes. First was the long-lasting financial crisis that hit Japan at the beginning of the 1990s following a period of strong economic performance and large current accounts surpluses. This crisis was not characterised by a sudden reversal in financial flows and sharp exchange rate adjustments, but rather by the prolonged weakness of the Japanese economy following boom years that were driven by excessive risk-taking especially by domestic financial institutions.

Secondly, and similarly, the traditional current account crisis model did not adequately explain the 1997-98 Asian crisis. Some countries in the region did have important fragilities in terms of government deficits and high external debts, as a consequence of which international financial flows suddenly dried up when investors realised that, for example, Thailand's banks and Korean Chaebols had accumulated excessive foreign exchange exposures. However, the root of this crisis was more fundamentally due to excessive domestic lending and a concomitant deterioration in the quality of financial assets, exacerbated by moral hazard problems related to implicit public guarantees. Moreover, tensions that originated in Southeast Asia quickly reverberated in other, a priori unrelated, regions of the world such as Latin America and Russia.

Thirdly, the 2007-09 economic and financial crisis was primarily marked by the collapse of large financial institutions causing systemic, economy-wide disturbances (see Box 10.3). Excessive current account imbalances certainly played an important role for specific countries under attack, such as Iceland, Greece and Spain (which had current account deficits in 2008 of 23%, 14% and 9% of GDP, respectively). Moreover, large financial inflows in the United States facilitated the financing of sizeable current account deficits and in particular contributed to buoyant household spending and the related housing bubble. Yet flows directly related to balance of payments imbalances were only one of the various factors that played a role in the crisis.

Indeed, looking back in history, current account deficits do not necessarily coincide with the build-up of financial imbalances. Some of the most damaging financial crises have occurred in surplus countries – most spectacularly in the United States before the Great Depression of the 1930s (Borio et al., 2014). The exclusive focus on current account imbalances has sometimes even been misleading, as it encouraged pressure on current account surplus countries to expand domestic demand even at times that financial fragilities were building up, as in the case of Japan before the 1990s.

From this perspective, international finance can contribute to financial crises in a broader way than just through the external financing channel. In particular, contagion can arise through perception, spillovers and psychological effects. First, the reversal of investors' perceptions can trigger destabilising

Box 10.3. **The 2007-09 economic and financial crisis and its consequences – Main episodes**

The 2007-09 economic and financial crisis had several phases and led to various periods of financial stress, especially following the contagion to Euro Area sovereign debt in the early 2010s. The following are the main episodes of the crisis (see Carnot et al. [2011] for a more detailed summary of the various events).

The financial boom (first half of the 2000s): threefold rise in US house prices from the mid-1990s to 2006; sharp increase in subprime lending; financial innovation; marked decline in US private savings.

The peak of the bubble (end 2006/May 2007): sudden increase in mortgage delinquency rates; subprime lender bankruptcies; wider spreads on home equity Collateralised Debt Obligations (CDOs); growing signs of volatility in global financial markets.

First stage of the crisis (June 2007/first half 2008): asset-backed securities downgrades by rating agencies; closure of hedge funds and freeze of investment funds; start of the dislocation in interbank money markets; warning of US-related losses by Germany's IKB Deutsche Industriebank AG preceding the first US interest rate cut (17 August 2007); public support for Northern Rock (United Kingdom) and government-sponsored enterprises (United States); co-ordinated action by advanced economies' central banks.

Global loss of confidence (September/October 2008): general shock caused by Lehman Brothers' bankruptcy (15 September 2008); US support for AIG; severe disruptions in interbank money markets and foreign exchange swap markets; co-ordinated set-up of central bank foreign exchange swap lines; US Troubled Asset Relief Program (TARP) to remove bad assets from banks; government interventions to support large banks all over the world; sharp devaluation of the ISK (Icelandic króna), and the IMF programme in Hungary; G7 pledge to take "all necessary steps" and save key banks from collapse (October 2008).

General economic downturn and economic stabilisation (end 2008/end 2009): G20 launch of a far-reaching reform plan for the financial system; bold central bank interventions (Federal Reserve expansion of unconventional policy measures including purchases of US Treasury, ECB purchase of covered bonds); the US Great Recession that began in December 2007 ends in June 2009, and large US financial firms start to repay government aid.

Contagion to sovereigns in the Euro Area (end-2009/2012): lowering of Greece's rating (December 2009); spillovers to Ireland and Portugal (mid-January 2010); sharp rise in the spreads of the Euro Area sovereign debt Credit Default Swaps (CDS); EU/IMF fiscal packages and ECB direct purchases of securities; establishment of European stability mechanisms and reorganisation of the European banking system; implementation of the Basel III framework for banks'

Box 10.3. **The 2007-09 economic and financial crisis and its consequences – Main episodes** *(cont.)*

capital and liquidity; Comprehensive Monetary Easing in Japan (5 October 2010) and Quantitative Easing Part 2 in the United States (3 November 2010); widening of the debt crisis to large Euro Area countries such as Spain and Italy in 2011/12; introduction of the Swiss exchange-rate peg to the Euro (2011); ECB announcement to do "whatever it takes to preserve the Euro" (July 2012); boost for emerging markets provided by very accommodative global financial conditions, with the risk of a build-up in domestic vulnerabilities.

Progressive calm in global markets (early 2013/2015): several policy actions in the Euro Area; rescue of Cyprus[1, 2]; termination of the bailout programmes for Ireland, Spain and Portugal; early signals of potential reduction in US monetary stimulus (the summer 2013 "taper tantrum"); ECB introduction of negative interest rates (mid 2014) followed by Switzerland (end 2014); Swiss peg abandoned in 2015; despite renewed Greek concerns in summer 2015, general signs of stabilisation in advanced economies.

Start of monetary policy normalisation (end 2015/2017): growing vulnerabilities in emerging market economies following years of rapid credit expansion as well as the combination of an appreciating USD and lower commodity prices since mid-2014; Chinese devaluation in August 2015 and signs of volatility in financial markets; Japan's move to negative interest rates; and further unconventional monetary stimulus by the ECB in the beginning of 2016; first rise in US interest rates since the crisis in December 2015, setting the stage for a gradual withdrawal of the very accommodative global monetary conditions in the course of 2016-17.

financial flows out of a country even if its current account position is balanced. For instance, foreign exchange exposures can be concentrated in a specific sector for which the related currency/maturity mismatches might be hard to deal with – consider the case of foreign-indebted corporates mainly selling their products in domestic markets. There are also limits to how far other agents' foreign assets can be mobilised to "cover" the funding needs of a specific sector. A case in point are official reserves, considered by many observers as useful to protect against potential destabilising financial outflows; yet authorities may be reluctant to use these "war chests" to cover private funding gaps, because of technical challenges (the maturity and currency denomination of the various instruments may differ) as well as moral hazard concerns. Moreover, selling external assets to cover liabilities in times of stress may be difficult in practice, not least due to liquidity issues. From this perspective, looking at external positions on a net terms basis presents the risk of overlooking the underlying fragilities related to the overall stock of assets and liabilities in case of a sudden change in investors' perceptions.

A second important element is due to spillover effects reflecting the impact of so-called "push factors". These push factors are associated with the origins of financial flows, in contrast to the traditional analysis of international crises that focuses on countries' specific fundamentals or "pull factors", associated with the destination of international financial flows. The key idea behind the push factors analysis is that international investors can react irrespective of the idiosyncratic situation of a particular country. Push factors therefore have a lot to do with the state of the global financial system, for instance when there is a general tightening in spreads in international bond markets (see below) or when global portfolios are rebalanced. Contagions across countries will then reflect similar decisions taken by investors on the basis of similar rationales, such as the reliance on specific commodities, the level of trade links and the existence of common exposures to a variety of risks (Tirolle, 2002). However, contagions may also result from more complex elements, such as the impact of random events on global expectations; information biases, for instance when "noisy signals" become the basis of investment decisions; and various cumulative chain reactions, via links in the payment systems, the interbank market, or the complex network of global debtor-creditor relations (Goodhart and Illing, 2002). From this perspective, contagion is purely triggered by the financial context and can arise from the overlapping claims that different regions or sectors have on one another (Allen and Gale, 2007). The global integration of financial markets is likely to have reinforced these dynamics, with growing "common factors" driving financial flows, risk premiums and asset prices all together.

Yet a third, related element is the role played by psychological factors, which can be instrumental in triggering contagion effects across sectors and borders. In fact, there is significant evidence that market participants tend to behave in a correlated manner, with typical herd behaviour (e.g. buying when prices go up), collective irrational enthusiasm for the latest trends (e.g. the Dutch tulip mania of the 17th century), and the importance of moral hazard issues (e.g. the incentive for economic agents to take excessive risks as they anticipate that in case of problems they will benefit from public support). A recent example was the general complacency during the US house price boom in the 2000s, characterised by weak lending standards and lenient underwriting practices. As argued by Robert Shiller (2008), the over-valuation of real estate in those circumstances was brought on by a "contagion of bad thinking". Americans as a whole became convinced that fundamentals driving the real estate market, such as personal income, the cost of building and the ratio of home values to rent, no longer mattered.

All the contagion effects above may be particularly powerful for emerging markets that are often considered as part of the same asset class: as a result, any country-specific shock can lead to a general modification of investors' portfolio allocation, impacting other countries irrespective of their own

economic situation. But contagion effects are not confined to the developing world. The 1982 Latin American debt crisis led to significant problems in the US banking system. Similarly, tensions that originated in the US subprime markets during the 2000s quickly reverberated in the global financial system, in particular in Europe, after the 2007-09 economic and financial crisis.

3. Assessing the build-up of financial risks in a globalised world

Sovereign debt, banking crises, and the impact of globalisation

Traditionally, a financial crisis used to be associated with sovereign default, with government unable to repay its debt. In closed economies, the way out of such crises was by finding a possibility of repudiating or rescheduling the obligations of the government vis-à-vis its resident investors. However, in modern history sovereign debt crises have typically occurred with a significant part of the public debt held by non-resident investors. Indeed, globalisation has allowed investors to diversify their portfolios across countries, reducing home bias. From this perspective, episodes of financial stress have increasingly entailed an external component, as they involve foreign creditors at least to some extent. In case of a sovereign default, international investors, for instance, have to collectively agree on a rescheduling of the government debt – as is done in the context of the Paris Club for public sector creditors or of the London Club for commercial banks. All in all, external current account crises and sovereign debt crises are often mixed.

Sovereign debt crises are also tightly intertwined with another type of crisis referred to as a "banking crisis" (see IMF, 2015). The reason is that banks usually have large holdings of domestic government debt securities in their books, so any concern about the position of the government can quickly adversely affect banks' balance sheets. Conversely, governments are seen as exposed to any failure of their domestic banks, either because of formal commitments (deposit insurance schemes) or because of investors' perception that they would offer support in case of stress. Laeven and Valencia (2013) estimate that around 40% of crises are "pure currency crises", 10% are "pure debt crises", and 30% are "pure banking crises", the rest being "twin crises" and "triplet crises". Obviously, such classifications can be quite arbitrary, depending in particular on the various thresholds applied. But they nevertheless underline the sheer diversity of the episodes of stress that can occur and the importance of their financial stability dimension.

Globalisation is likely to have reinforced these interactions. Empirical evidence shows that government debt as well as banking crises are particularly severe when they involve foreign funding. Moreover, economic development has led to a sharp expansion of the financial liabilities incurred

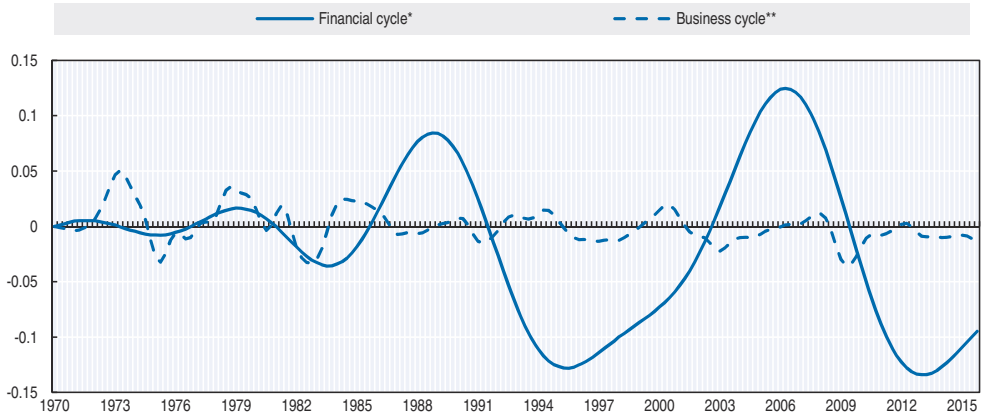
by all sectors, including private sectors. Indeed, one can distinguish three forces that have driven the expansion of international financial links with the globalisation of economic activity (BIS, 2017c): one was the need to finance the expansion in cross-border trade (that is, to deal with the settlement of trade transactions); the second was the financing arrangements related to the fragmentation of production across countries in global value chains (GVCs); and a third was the increasing need for managing balance sheet positions at a global level. As a result, financial openness has substantially outpaced real trade openness since the late 1980s, especially for advanced economies. One implication is that financial fragilities can occur in different regions and various sectors of the economy (e.g. the government, financial corporations, households, non-financial corporations) and have system-wide consequences, leading to financial instability.

A framework for assessing the build-up of vulnerabilities during financial cycles

Whatever the characteristics of financial stress episodes, a key element to consider is the role played by the financial cycle (BIS, 2015a). The financial cycle is defined as a succession of long-lasting episodes of financial booms and busts, and characterised by a much wider amplitude and length compared to "traditional" business cycles; see Figure 10.3 for the US case. Needless to say, the financial accounts framework is a key instrument to assess this financial cycle in general and the episodes of crises in particular, because it is a useful tool to capture the evolution of leverage by economic sector (Dembiermont et al., 2013).

The upward phase of the financial cycle starts with a boom in credit and asset prices. As a result, private sector debt-to-GDP ratios rise sharply, supporting spending and output. Excessively favourable financial conditions are instrumental in driving these boom episodes. They often take the form of very low credit spreads and volatility, aggressive risk-taking among investors, and interest rates that are well below their "equilibrium" levels. Another common feature is "liquidity illusion", as market liquidity often appears ample in boom times, before vanishing quickly during episodes of stress. A key issue is that these financial forces can be self-amplifying, with a feedback loop between overly optimistic perceptions of risk and value, on the one hand, and weak financing constraints, on the other hand. The financial system is thus said to be "pro-cyclical" – this refers to the progressive build-up of financial fragility and how aggregate risk evolves over time (Crockett, 2000). An important driver of this pro-cyclicality is that higher asset prices boost the value of collaterals, making borrowing easier and supporting leverage-financed spending – one will often refer to positive "wealth" effects in this context, which can be very powerful, in particular when they concern the impact of housing valuations on household spending.[3]

Figure 10.3. **Financial and business cycles in the United States, 1970-2016**



* The financial cycle as measured by frequency-based (bandpass) filters capturing medium-term cycles in real credit, the credit-to-GDP ratio and real house prices.

** The business cycle as measured by a frequency-based (bandpass) filter capturing fluctuations in real GDP over a period from one to eight years.

Source: Adapted from Drehmann et al. (2012), "Characterising the financial cycle: don't lose sight of the medium term!", *www.bis.org/publ/work380.htm*.

StatLink *http://dx.doi.org/10.1787/888933589276*

The process, however, goes into reverse as increased leverage gradually leads to a negative drag on disposable income from increasing debt service burdens. At some point, investors start to realise that balance sheets have become excessively overstretched and that financial imbalances cannot be sustained any more. This turning point – also called a "Minsky moment" (Minsky, 1982) – can be quite rapid, as it depends on the change in perceptions of the accumulated fragilities. The ensuing financial bust is precipitated by a general deleveraging and sharp corrections in asset prices. This, in turn, makes borrowing more difficult and further depresses demand, reinforcing pressures on asset prices: the downward phase of the financial cycle is therefore also very pro-cyclical. In the end, demand takes significant time to normalise because of the lagged impact of accumulated debt and of the necessity to repair balance sheets.

Apart from its pro-cyclicality, systemic risk has a second, "cross-sectional" dimension. This relates to how financial risk is distributed within the system at a given point in time. It explains why an apparently idiosyncratic shock, instead of being limited to the failure of an individual firm, can propagate itself within the entire financial system, both within a country and across borders. Such a system-wide propagation can result from two main aspects (Caruana, 2010).

First of all, economic agents' balance sheets are interconnected, so that a shock hitting one institution can quickly spread to the other connected institutions that are otherwise sound. This raises the risk of "bank-run" type episodes, when suspicions about the soundness of a counterparty can quickly

spill over and lead to the paralysis of the financial system. The Herstatt German bank was a good example of that mechanism. When this bank had to suddenly stop its operations in 1974, some of its counterparties had already undertaken transactions with it and were unable to collect their payments.

A second aspect of the "cross-sectional" dimension of systemic risk is that non-directly connected institutions can be affected by the same shock because of their common exposures, for example if they are similarly exposed to a specific asset class, such as the US housing subprime mortgage loans in the 2000s. A variety of financial factors, such as asset prices, market liquidity and funding conditions, can drive such common exposures effects. One irony is that efforts to reduce bilateral interconnections may lead market participants to diversify their activities so much that, ultimately, they display a more homogeneous profile and become more exposed to the risk of common exposures.

International finance adding fuel to the fire?

International finance has largely contributed to the development of these two key aspects of the financial system, that is, the pro-cyclicality of systemic risk and the importance of system-wide common exposures/interlinkages. In fact, it is no coincidence that the amplitude and length of financial cycles seem to have increased considerably since the financial liberalisation undertaken in the 1970s. This has generated a so-called "excess financial elasticity" in the global system (BIS, 2015a), for three main reasons.

First, there has been the growing importance for domestic economies of global financial flows, which can move freely across currencies and borders (Heath, 2015). In particular, the financial liberalisation initiated in the 1980s has made funding easier and cheaper[4] to obtain for a wider range of borrowers. For example, emerging market economies are nowadays much more integrated into the global financial system than ever before. The result, however, is that financial interconnections have increased across countries, facilitating the propagation of systemic risk around the globe. Looking at the 28 major financial centres (including China) representing over 80% of global GDP, the Financial Stability Board (FSB) estimates that total financial assets represented USD 321 trillion in 2016, i.e. about five times total GDP (FSB, 2017).

Two important financial intermediation phases have been particularly powerful in the recent decades. The first phase was mainly characterised in the second half of the 20th century by the expansion of cross-border operations of internationally active commercial banks. The international banking statistics (IBS) collected by the Bank for International Settlements (BIS) show that the outstanding amount of banks' global cross-border claims has steadily increased, from about 5 trillion USD in the mid-1970s to around 30 trillion USD

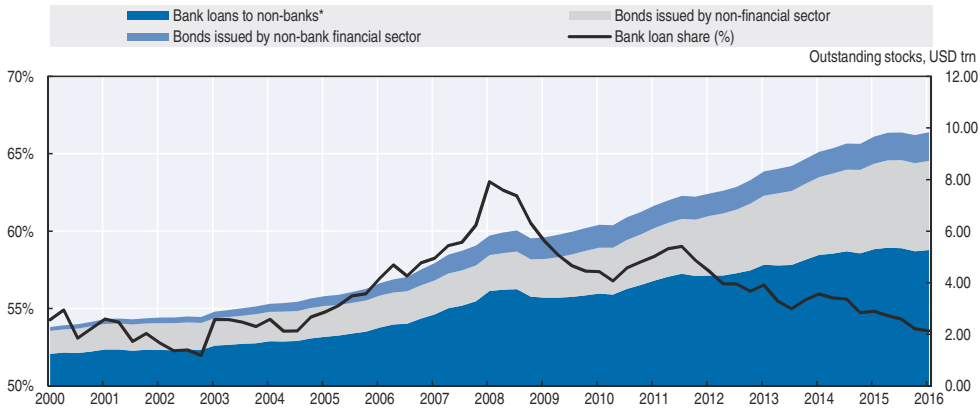
in the late 2000s, after which the outstanding amount has roughly stabilised around the latter level and actually declined as a share of global GDP (BIS, 2015b). The second phase has entailed a shift from bank lending to market finance, with the sharp expansion of international debt securities issued by financial and non-financial corporations. This reflects, in particular, the increased debt issuance by emerging market borrowers in advanced economies and/or offshore centres, either directly or through their controlled affiliates. The outstanding amount of international debt securities, as estimated by the BIS, now represents more than 20 trillion USD, compared to just 5 trillion at the beginning of the 2000s. A telling example of this globalisation of financial markets is China, which by the mid-2010s had become the world's 8th largest borrower in terms of cross-border bank claims and the 11th largest borrower as measured by the issuance of international debt securities by its nationals.

Secondly, financial systems worldwide have changed markedly and have become extremely diversified in terms of actors and products, allowing for a greater interaction with the "real economy". Housing finance has in particular evolved dramatically, through the development of securitisation and the increased ability to take credit by pledging home equity as collateral. Another key factor has been the deepening of bond markets, facilitating firms' access to capital market funding and widening the investor base. Yet another important aspect has been financial innovation with the development of new instruments, complex financial engineering and the diversification of the credit intermediation chain that is no longer limited to "traditional" banking financial intermediaries (see below).

Thirdly, the globalisation of the financial system has heightened the likelihood for financial imbalances to occur simultaneously across countries due to the common influence of global factors. This highlights the powerful role played by "global liquidity", a concept that can be understood as the degree of ease of financing in global financial markets. Credit is obviously among the key indicators to be considered for estimating this global liquidity. In particular, the BIS has constructed three indicators of global liquidity by drawing on national data and its own international banking and financial statistics: banks' international claims, banks' total claims on the private non-financial sectors, and total credit by currency of denomination. The concept of "global liquidity" refers to a property of the system as a whole, resulting from the global interaction of private investors, financial institutions and monetary authorities, which in turn is setting the tone in countries' domestic credit and market liquidity conditions. A key element supporting these transmission mechanisms is the role played by international funding currencies, which are increasingly used outside the issuing country's borders (McCauley et al., 2015). For example, the USD-denominated debt of non-bank borrowers that are not US residents has steadily increased in recent years, to around 10 trillion USD; see Figure 10.4.

As a consequence, US monetary conditions are increasingly affecting borrowers located outside the US economy. Another important channel is the role of exchange rate policies, explicit or implicit. For instance, if the US financing conditions are accommodative, other countries may be tempted to reduce their interest rate differentials vis-à-vis the US to avoid an excessive appreciation of their own currencies. By importing de facto the US monetary stance irrespective of the situation of their economies, these countries run the risk of having inadequate domestic financial conditions, leading to the subsequent build-up of financial vulnerabilities.

Figure 10.4. **USD credit to non-banks outside the United States**



* Bank loans include cross-border and locally extended loans to non-banks outside the United States. For China, locally extended loans are derived from national data on total local lending in foreign currencies on the assumption that 80% are denominated in USD. For other non-BIS reporting countries, local USD loans to non-banks are proxied by all BIS reporting banks' gross cross-border USD loans to banks in the country. Bonds issued by US national non-bank financial sector entities resident in the Cayman Islands have been excluded.

Source: BIS (2017a), *Locational Banking Statistics* (database), *www.bis.org/statistics/bankstats.htm?m=6%7C31%7C69*; IMF (2017), *International Financial Statistics* (database), *http://data.imf.org/?sk=5DABAFF2-C5AD-4D27-A175-1253419C02D1*; Thomson Reuters (2017), *DataStream* (database), *https://financial.thomsonreuters.com/en/products/tools-applications/trading-investment-tools/datastream-macroeconomic-analysis.html*.

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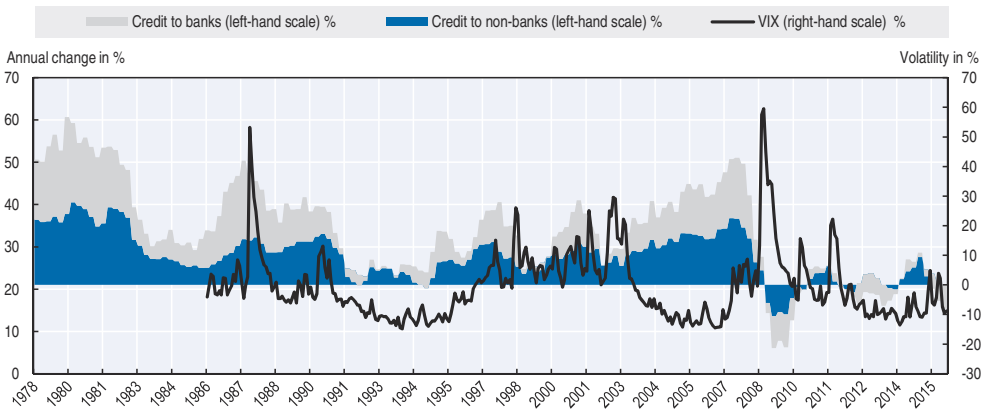
What are the implications of financial globalisation for systemic risk? As regards its system-wide dimension, the development of international finance is likely to have multiplied the potential channels allowing for contagion effects. The enormous expansion of investment funds means that portfolio reallocations at the global level can lead to large swings in asset prices across borders. The role of large and complex financial institutions operating globally has also reinforced these effects. The result is that global financial conditions can easily pass through to domestic economies in a simultaneous way and trigger seemingly unrelated domestic financial fragilities.

As regards the pro-cyclical dimension of systemic risk, external sources of credit expansion, especially in foreign currency, appear to be playing a key role in encouraging procyclicality as they often provide the marginal source of funding feeding episodes of financial booms. As can be seen in Figure 10.5, growth in international bank credit to both banks and non-bank borrowers has tended to be very strong in the upward phase of the financial cycle (for instance during the 2000s), characterised by buoyant financial conditions and subdued volatility in markets (here measured through the VIX Index, a barometer of investor sentiment and market volatility derived from stock option prices). Episodes of financial stress such as in 2008-09, on the contrary, are characterised by a surge in volatility and the drying up of international bank credit. The high procyclicality of international financing flows may explain why attention has focused so much on external positions to explain financial crises. As financial booms often involve excessive spending, the fact that cheap external funding is available can facilitate and exacerbate the build-up of domestic fragilities. In other words, international finance can add fuel to the fire. One telling example is the evolution of the US housing boom prior to the 2007-09 economic and financial crisis, characterised by a decline in households' saving and an increase in residential investment (Palumbo and Parker, 2009). As a result, the US household sector moved from a net lending position in the 1990s to a net borrowing position in the 2000s, with a very large expansion of its liabilities (mainly mortgage debt). This was mostly financed by a sharp expansion in the net lending provided by the Rest of the World.

Figure 10.5. **The relationship between financial markets volatility and international bank credit, 1978-2016**



Source: Bloomberg, BIS (2017a), *Locational Banking Statistics* (database), *www.bis.org/statistics/bankstats.htm*.

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4. Analysing the impacts of leverage and financial innovation on economic growth and policy

The central role played by leverage

Debt has a central role in the build-up of crises, and the ability to reduce leverage has a central role in ending crises. Certainly, the level of necessary debt reduction after a boom can differ significantly, both across sectors and times. But a general feature is that the longer deleveraging is postponed, the more difficulties the economy faces to return to a steady-state growth path. From this perspective, gaining time and postponing necessary adjustments often has to be paid back in terms of a longer period of sub-par growth and more persistent financial fragilities.

As regards the non-financial private sector, a common pattern is that its debt as a percentage of GDP expands rapidly in the boom years preceding a financial crisis. This trend quickly reverses after the bust as balance sheets have to be repaired. Yet the rhythm of this deleveraging can vary markedly, depending in particular on policy incentives to ensure that debt is repaid by debtors and/or written off by creditors. To favour private debt reduction once the crisis hits, it is usually necessary to proceed to a full restructuring of the financial sector itself. The key is to make lenders recognise the true quality of their assets, restructure their accumulated stocks of "bad debts", and raise adequate capital to cover the resulting losses. This often requires strong public interventions to guarantee deposits (partially to avoid bank runs and panic reactions), to close the weakest institutions, and to force the other institutions to clean their books – often by providing public support like guarantees, purchases of illiquid assets, provision of direct loans, recapitalisation of ailing institutions (and even nationalisation, at least temporarily), or the setting up of ad hoc public-guaranteed defeasance structures tasked to take over impaired assets.

Turning to the public sector, its financial position usually deteriorates sharply after the bust and for several years in crisis-hit economies. This reflects the strain on public finances that comes from bailing out the financial system, as well as the effect of lower economic growth and increasing unemployment on the income and expenditure of government. This can lead to a fast and protracted expansion of government debt-to-GDP ratios, which can in turn bring its own risks in terms of financial stability. Examples of the latter are the long-lasting difficulties experienced by a number of Euro Area countries in the early 2010s that had let their public debt soar after the 2007-09 economic and financial crisis. The reason is that sound public finances are a key factor anchoring the stability of the financial system and the economy as a whole, not least due to the benchmark role played by the yields on government debt securities for most financial market prices. Hence, there is a clear trade-off between the need for some government support to accompany

the deleveraging of the private sector, and the necessity to preserve the credibility of fiscal authorities.

At the level of the economy as a whole, the picture after a financial crisis will depend on the combination of private (usually down) and public (usually up) leverage patterns. In aggregate, total debt may remain quite high even many years after the bust. However, history shows that different scenarios can happen (Dembiermont et al., 2015). A widely recognised example of successful deleveraging occurred in a number of Nordic countries that saw a collapse in their banking systems in the early 1990s. In both Finland and Sweden, private sector debt came down quickly after the crisis, reflecting strong policy actions. This was accompanied by a sharp deterioration in government accounts. However, this situation was temporary and the public debt trajectory was able to correct downwards rapidly once most of the deleveraging of the private sector had been completed.

A rather opposite example relates to the situation in Japan at the beginning of the 1990s. Private sector deleveraging was quite muted after the collapse of the asset price bubble, and was mainly concentrated in the non-financial corporate sector. Household debt as a percentage of GDP continued to rise slightly several years after the crisis and was not corrected afterwards. The restructuring of the financial system was delayed over a long period of time, with banks continuing to keep a large amount of bad debts in their books. Japan's public debt rose, though less rapidly initially than it did in the Nordic cases, reflecting the slower repairing of banks' balance sheets. But in the end, the government debt position worsened over a much longer period of time and ended up at a much larger level.

Turning now to the last economic and financial crisis in 2007-09, the picture is still relatively mixed. Almost ten years after the bust, overall debt reduction seems to have only just started; see Figure 10.6. Total debt in the non-financial sector of the advanced economies affected by the crisis has expanded significantly since 2007, by about 35 percentage points of GDP. There are certainly important differences between countries, with, for example, a somewhat quicker pay-down of debt in the United States and the United Kingdom. In aggregate, however, the debt dynamics of the advanced economies have resembled more the pattern of those of Japan than of the Nordic countries in the early 1990s. Aggregate private debt has barely stabilised since the 2007-09 economic and financial crisis, let alone started to be corrected downwards, even in the corporate sector. And government debt has continued to rise steadily, in a manner reminiscent of Japan's trend deterioration in the 1990s, and unlike the large but temporary deterioration followed by a rapid improvement in fiscal positions experienced by the Nordic states during the same period.

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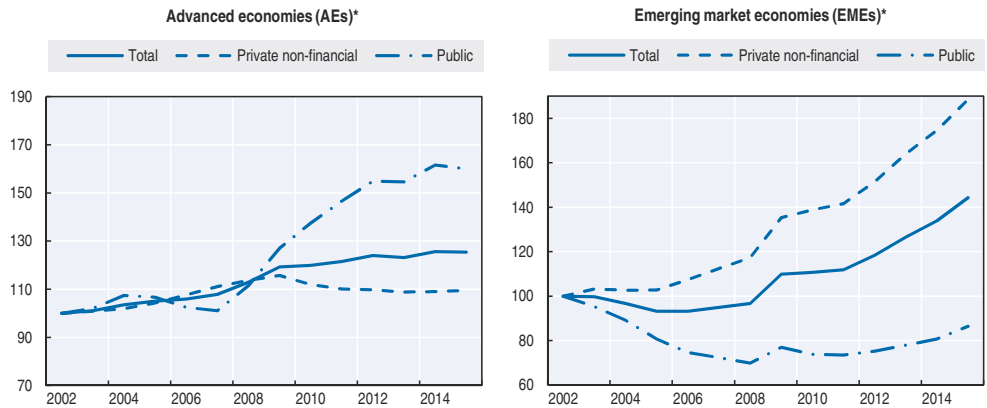
Figure 10.6. **Private and public debt patterns before and after the 2007-09 economic and financial crisis, 2002-15**

2002 = 100



* Regional aggregates calculated by using PPP weights; valuation at market prices, except EMEs' public debt in nominal terms.

Source: Adapted from BIS (2017b), *Credit to the Non-financial Sector* (database), *www.bis.org/statistics/totcredit.htm?m=6%7C326*.

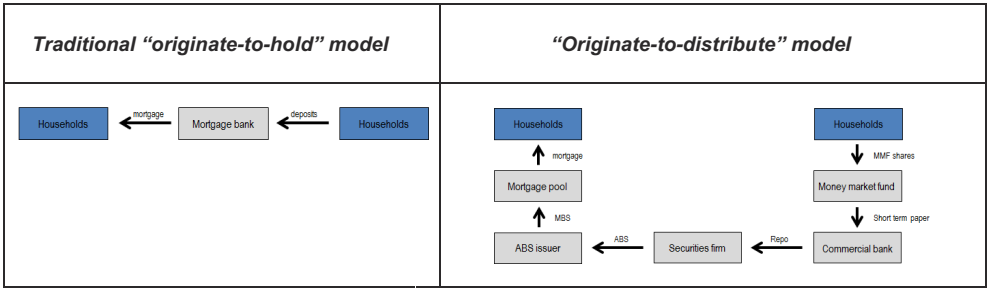
StatLink http://dx.doi.org/10.1787/888933589333

Financial innovation and the need to address complexity

The 2007-09 economic and financial crisis underscored the importance of innovation in the financial system, which is constantly and rapidly evolving in ways that are difficult to follow, especially for policy makers. The first important development from this perspective has been the banks' move from their traditional "originate-to-hold" intermediation model towards the "originate-to-distribute" model, in which banks resell loans via securitisation (this is also discussed in Chapter 3).

Adrian and Shin (2013) define the traditional "originate-to-hold" model as a "short intermediation chain", with the stylised representation pertaining to the mortgage market presented in Figure 10.7 (left panel). To put it simply, the bank is directly intermediating between the households who have deposits and those who need to borrow to buy a house. A similar stylised diagram underlines the "long intermediation chain" for the "originate to distribute" model (right panel). In that case, creditors place their savings in some investment funds, which in turn invest in commercial banks. Such investments can have a very short-term nature, as households are typically able to withdraw their savings from institutions such as money market funds quite easily. The system thus leads to significant maturity transformation, as banks invest their short-term funds in structures of composite (and often complex) financial products (asset backed securities, or ABSs) issued by the ABS issuers repackaging individual mortgage loans.

Figure 10.7. **Two types of financial intermediation chains**



Source: Adrian and Shin (2010), "The changing nature of financial intermediation and the financial crisis of 2007-09".

It has been claimed that this new, long intermediation chain presents several advantages: for example, securitisation may enable dispersion of credit risk (since the investor is exposed to the risks of several mortgages bundled in a specific ABS product) and promote more efficient maturity transformation (since the short-term deposits by creditor households are at the end funding long-term loans for mortgage borrowers). However, as highlighted by Adrian and Shin (2010), the evidence observed during the 2007-09 economic and financial crisis points the other way. Firstly, instead of mixing the risk profiles of various assets they held, investors were able to buy specific high-yielding "tranches" whose credit quality was concentrated on highly indebted agents, for example, US households with low credit ratings borrowing in "subprime markets". Secondly, the length and complexity of the originate-to-distribute chain led to a sharp disconnection between the perceived quality of the ABS products and the value of the underlying mortgages. And thirdly, financial intermediaries were more intertwined than expected, especially as the process relied on unsustainable maturity transformation (i.e., investors were forced to sell their ABS products when they faced a drying up in their short-term financing, triggering a downward spiral of asset prices). This in fact reflected investors' "liquidity illusion" before the crisis, when they (wrongly) thought that the complex assets were liquid and could be easily exchanged; as it turned out, these assets could only be sold with large discounts.

The expansion of leverage, combined with banks' move to the new originate-to-distribute model, has favoured the expansion of "shadow banking" entities. This category comprises all entities outside the regulated banking system that perform core banking functions and are therefore very active in providing leverage-based maturity and liquidity transformation (Kodres, 2013). As seen in Chapter 3, the framework of financial accounts and balance sheets

can be mobilised to track these entities which are outside the "traditional" area covering banks, insurers, pension funds, etc. Although in practice the identification of these entities may be challenging and differs across countries, it is estimated that the total assets of the "other financial intermediaries" (OFIs) sector represented USD 92 trillion in 2016 for the major jurisdictions analysed by the FSB. This represented 29% of global financial assets (estimated at USD 321 trillion), compared to 42% for "traditional" banks, 7% for central banks, 9% for pension funds and 9% for insurance corporations (FSB, 2017).

Another, more pertinent, measure of the shadow banking sector has been developed by the FSB. This measure only includes the non-bank financial entities that are considered by authorities to be involved in credit intermediation where risks for financial stability may occur. This "narrow measure" of shadow banking is estimated to represent, in terms of the value of assets, around one-third of the OFIs' size in 2016; that is, USD 34 trillion and 69% of the GDP of the 27 major advanced and emerging economies covered by the FSB (China being excluded from this narrow measure).

To conduct such an exercise, the FSB schematically differentiates five main types of economic functions performed by shadow banks (FSB, 2017). The first is the management of client cash pools, by, for example, real estate investment funds which pool investors' funds to purchase assets and have features that make them susceptible to runs. A second is the provision of loans dependent on short-term funding, by, for example, so-called finance companies that issue commercial paper and use the proceeds to extend credit to households. A third is the intermediation of market activities, realised through short-term funding and/or the secured funding of client assets, performed by, for example, broker dealers. A fourth is the facilitation of credit creation, by, for example, credit insurance companies and financial guarantors. And a fifth is credit intermediation based on securitisation and funding of financial entities, by securitisation vehicles such as Special Purpose Vehicles (SPVs).

The developments in non-bank credit intermediation, as analysed above, would have been impossible without the major advances in information technology and the financial innovations observed in recent decades. Computers not only store and process vast amounts of information, they also make it possible to "slice and dice" portfolios and to transfer them more easily from one entity to another. Technology and financial innovation have therefore spurred an increase in the number of entities participating in financial transactions and multiplied the links that connect them in ever broader networks.

In any case, the old-fashioned assumption that there are specific sectors specialised in lending to distinct borrowing sectors is not relevant anymore. For instance, most deposit-taking institutions now act as both lenders and

borrowers. Combined with the growing importance of the less regulated area of shadow banks, this has led to an increasingly opaque and complex network of interconnected financial relationships across a wide range of institutions, markets and instruments. In turn, the interactions between the financial sphere and the real economy have become more diversified, more complex to analyse, and presumably also more conducive to financial risk-taking by various agents. Needless to say, this reinforces the usefulness of having comprehensive financial accounts and balance sheets that facilitate the measurement and understanding of such interactions.

This is particularly important since increased complexity and global interconnectedness in financial markets can generate strong co-movements in crisis periods which in turn make systemic crises more probable. As pointed out in Haldane (2009), "… the past twenty years have resulted in a financial system with high and rising degrees of interconnection, a long-tailed degree distribution and small world properties. That is an unholy trinity. From a stability perspective, it translates into a robust-yet-fragile system, susceptible to a loss of confidence in the key financial hubs and with rapid international transmission of disturbances".

Indeed, the challenges that increased complexity raises are enormous. The 2007-09 economic and financial crisis highlighted the difficulties of the determination of appropriate market prices, suggesting that the efficient market hypothesis cannot be respected since prices are not able to reflect the vast and complex amount of information to be considered. It also underscored the weakness of the traditional national accounts frameworks that rely on the representative agent model, which considers identically all decision-makers of a certain type (for example, the typical consumer), at least at the aggregate level. In reality, a key component of financial exposures is counterparty risk, implying that the impact of an exposure to a group of heterogeneous agents is not the same as the sum of the individual exposures to them. Furthermore, it highlighted the importance of non-linear dynamics, with sudden shifts in the state of the economy leading to opposite outcomes, and of extreme events. Complexity may furthermore prevent clear and transparent information, thus undermining trust and creating obstacles to the normal flow of transactions. This is precisely what happened in 2008 when the interbank market froze because many of the major banks refused to lend to each other in the absence of information on the true quality and value of their assets. This was a key issue because of the role played by trust in financial markets, in which various parties – e.g. financial institutions, households, and corporations – have to agree on reciprocal commitments with current as well as future implications.

Looking ahead, while some observers think that globalisation may already have peaked,[5] information technology and ensuing financial innovation have probably still a very long way to go. This suggests a potential for further

complexity in financial intermediation patterns, with radically new and unpredictable stress scenarios. On the other hand, the recent recognition of the need to regulate and streamline the financial sector may well end up delivering more simplicity and transparency. New financial technology, or "Fintech", may also lead to a revolution in the ways financial services are provided to agents in the real economy (Wolf, 2016).

Impact of financial crises on growth

A major lesson of history is that the collapse of financial cycles usually causes devastating and long-lasting economic damage – much more pronounced compared to "traditional" business cycles recessions. The bursting of the booms is often characterised by deep recessions, weak subsequent recoveries (i.e. lower post-recession growth rates) and permanent losses in terms of potential output. This was clearly true in the 2007-09 economic and financial crisis, echoing what had been observed during the Great Depression in the United States at the end of the 1920s, as well as the financial crisis in Japan in the 1990s. According to the OECD, potential GDP for the OECD area is currently increasing by around 1.5% per year, compared to 2% on average in the 2000s. In parallel, the rate of accumulation of productive capital stock has weakened significantly in major advanced economies.

The reason behind the relatively high damages caused by financial busts is due to the long-lasting consequences of the fragilities developed during their preceding boom phases. The financial sector is usually broken by the impact of collapsing asset prices and high defaults, implying that it is no more in position to play its role to intermediate savings among economic agents. Households and/or corporations are usually left with large debt overhangs and asset quality problems after the bust, constraining their spending. Government finances are also in a poor state, limiting the room for any stimulus. All these elements explain why post financial busts' cyclical recoveries are usually weak.

Perhaps more importantly, the financial cycle can adversely interact with long-term growth prospects. Easing financing conditions in boom years often lead to long-lasting resource misallocations, in both capital and labour (BIS, 2015a). The reason is that resources tend to be diverted to the parts of the economy that are boosted by credit expansion, and not necessarily in those areas which are the most productive. This results in a long-lasting drag on the long-term factors driving economic growth. For instance, credit booms associated with buoyant housing prices are often characterised with sizeable resource shifts from tradeable to non-tradeable sectors, such as real estate and the construction industry. It is only after the boom that one realises that the investments made were diverted to non-productive assets, lowering long-term productivity prospects. Moreover, balance sheets have to be repaired after the bust, limiting the supply of finance to new investments and constraining capital

accumulation down the road. Furthermore, as workers become redundant – especially in the previously booming, low-productivity sectors – they are unable to shift easily to other areas, leading to a long-lasting increase in structural unemployment and/or a fall in participation rates. The combination of all these elements explains why potential growth patterns are usually much weaker after the crisis, compared to the pre-crisis economic performance, which had been artificially inflated by the unsustainable credit-based expansion.

Policy implications

From the above, one may wonder about the implications of financial crises for the conduct of government policies. A key implication is the long-lasting consequences of the bust on the state of government finance. This was particularly true after the 2007-09 economic and financial crisis: government debt in advanced economies expanded markedly after 2007, from 75% of GDP for the OECD economies as a whole to 115% in 2015. Yet this deterioration was not unprecedented: fiscal positions had indeed also worsened significantly after the Japanese financial crisis in the 1990s as well as after the Asian crisis.

Interestingly, deterioration in fiscal positions is often less affected by government interventions to rescue the financial system than by the indirect impact of adverse developments in economic activity (i.e. lower economic growth and increasing unemployment). One recent example is related to the impact of the 2007-09 economic and financial crisis in the Euro Area. It is estimated that from 2008 to 2014, the accumulated gross costs for supporting the financial sector, as triggered by the crisis, amounted to about 8% of GDP – and almost half of that has already been recovered (ECB, 2015). There were certainly significant disparities across countries, with costs estimated at around 20% of GDP for Ireland, Greece and Cyprus.[6] But the main message is that these "direct" costs accounted for a very small part (one fifth) of the overall increase in government debt registered during the same period for the Euro Area as a whole.

This recent example is apparently confirmed by more general studies looking at various episodes of financial crises. For instance, a recent report by the IMF (2015) recognises that a comprehensive indicator of the impact of banking crises on public finances is the change in gross public debt, but it can be useful to clearly distinguish between the "direct" and the "indirect" fiscal costs – see Table 10.1.

Moreover, the IMF study also shows that, based on a panel of banking crises observed between 1970 and 2011, the overall median increase in government debt and in the direct fiscal costs associated with banking crises were about 12% of GDP and 7% of GDP, respectively. Again, there is significant variety across countries. For example, it is estimated that the direct fiscal costs

Table 10.1. **Fiscal Cost of Banking Crises**

Type of Fiscal Costs	Examples
Direct	• Bank recapitalisations • Asset purchases • Calls on government guarantees • Depositor payouts • Central bank recapitalisation
Indirect	• Revenue effect from lower growth and the decline in asset prices • Expenditure effect from automatic stabilisers • Discretionary fiscal policy (revenue and expenditure) in response to increasing economic slack • Mark effects on borrowing costs • Effects through exchange rate changes

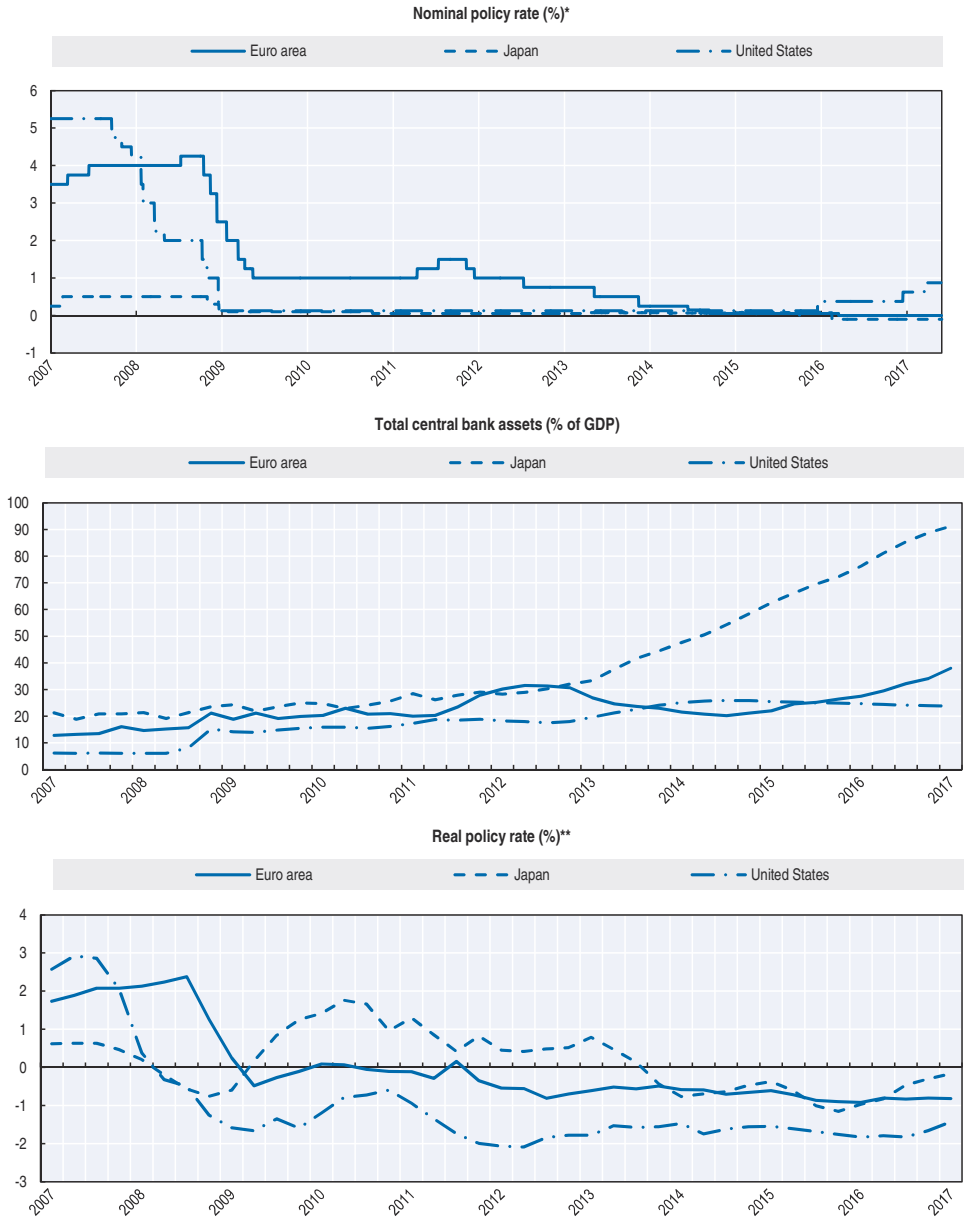
Source: IMF (2015), "From banking to sovereign stress: implications for public debt", *www.imf.org/external/np/pp/eng/2014/122214.pdf*.

of the 1997 Indonesian crisis amounted to more than 50% of GDP, and accounted for almost the entire change in the government debt observed there. In contrast, the direct cost (less than 20% of GDP) of the 1997 Japanese crisis represented only about one-third of the change in public debt. Similarly, in the Nordic countries the 1991 crisis' direct costs represented only about 5 to 10% of GDP, a very small impact compared to the change in public debt incurred by their governments at that time (see also Honohan and Klingebiel, 2003). Needless to say, it is important to emphasise the sheer uncertainty related to the measurement of government interventions in the case of a crisis, not least due to the lack of transparent information as well as the usage of "creative accounting".[7]

Perhaps a more peculiar feature of the 2007-09 economic and financial crisis was the impact on monetary policy. First, central banks in major advanced economies lowered their policy rates close to zero, and some of them even decided to set negative interest rates. For the OECD as a whole, short-term interest rates have stayed at very low levels since the crisis – the unweighted average short-term interest rate was close to 0% in 2015, down from 3½% in 2007 in the G3 (i.e. United States, Euro Area and Japan). This extreme degree of monetary accommodation was accompanied by very low market interest rates along the entire yield curves: G3 long-term interest rates averaged around 1% in 2015, compared to 3½% in 2007. Secondly, the crisis had a very large impact on central banks' balance sheets following their decisions to embark in large-scale non-conventional policies. In fact, the amount of total central bank assets has grown from less than 10 trillion USD at the beginning of the 2007-09 economic and financial crisis to almost 25 trillion in 2017 – with the balance sheets of the central banks of the United States, the Euro Area and Japan representing around 25%, 40% and 90% of GDP, respectively (see Figure 10.8).

A third key lesson from past financial crises is the recognition of the importance for public policies to deal with the pro-cyclicality of the financial

Figure 10.8. **Policy rates and central bank assets: Euro Area, Japan and United States, 2007-17**



* Policy rate or closest alternative.

** Nominal policy rate less inflation excluding food and energy; for Japan, also adjusted for a consumption tax hike adjustment for 2014 and 2015.

Source: BIS (2017c), *87th Annual Report 1 April 2016-31 March 2017*, *www.bis.org/publ/arpdf/ar2017e.pdf*.

StatLink http://dx.doi.org/10.1787/888933589352

system and the need to constrain upfront the build-up of financial vulnerabilities. Fiscal policies should be more prudent in boom years: government accounts are artificially flattered by strong leverage-based growth which cannot be sustained; and the ex-ante build-up of some room to manoeuvre might prove useful once the bust occurs and balance sheets have to be repaired. Turning to monetary policy, authorities should better integrate in their framework the adverse effects of booming asset prices and excessive leverage, even if inflation appears well controlled. Lastly, the supervision of financial corporations should have a systemic or "macro-prudential" orientation. Indeed, since the 2007-09 economic and financial crisis, a number of ambitious macro-prudential frameworks have been implemented with the aim of i) strengthening the resilience of the financial system; and ii) mitigating financial booms and thereby the subsequent busts. These frameworks rely on a wide range of instruments, such as maximum loan-to-value or debt-to-income ratios, adjustments to capital requirements and through-the-cycle provisioning rules (Gadanecz and Jayaram, 2016).

5. Integrating micro information in the financial accounts perspective

The legacy of the 2007-09 economic and financial crisis: greater institution-level supervisory requirements

The 2007-09 economic and financial crisis has triggered a swift and ambitious set of reforms to strengthen the global financial system, with a primary focus on individual financial institutions. This means that the "macro-based" framework of financial accounts and balance sheets needs to be complemented with an institution-based approach to allow for a comprehensive analysis of the financial system. This is particularly true for banking entities. The Basel Committee on Banking Supervision (BCBS), which is hosted by the BIS and represents national banking supervisors, has developed a comprehensive Basel III Framework in recent years (BCBS, 2011).[8] The aim is to improve the banking sector's ability to absorb shocks arising from financial and economic stress; enhance risk management and governance; and strengthen banks' transparency and disclosures. In doing so, the Framework has both a micro and a macro perspective. At the bank-level, stricter micro-prudential regulation aims to raise the resilience of individual institutions to periods of stress. At the macro level, a macro-prudential overlay aims to address system-wide risks that can build up across the financial sector at a point in time as well as the pro-cyclical amplification of these risks over time. These two micro and macro perspectives to supervision are complementary, as greater resilience at the individual bank level reduces the risk of system-wide shocks.

The Basel III Framework has several aspects to improve the strength of the entire banking sector (see a summary in Table 10.2). Its key element is the

Table 10.2. **Basel Committee on Banking Supervision reforms Basel III**

Basel III capital and liquidity standard	Requirement*	Description
Minimum capital requirement	Minimum equity of 4.5% of risk-weighted assets (RWAs)	Requires banks to have minimum level of equity in relation to their assets; based on a risk-based approach: a bank's capital requirement depends on weights reflecting the riskiness of its assets
Capital conservation buffer	Equity of 2.5%	Limits a bank's discretionary distributions when the buffer is not complete
Counter-cyclical buffer	Equity range of 0-2.5%	Needs to be established during times of rapid credit growth to limit the build-up of financial fragilities
Capital loss absorption at the point of non-viability	Prudential treatment of a bank's total loss-absorbing capacity (TLAC), considering in particular the liabilities issued by other G-SIBs	Aims to reduce the risk of contagion within the financial system should a G-SIB enter resolution
Non-risk based leverage ratio	Test minimum requirement of 3% for the ratio of Capital-to-Exposure measure	Ensures a minimum amount of regulatory capital in relation to a bank's balance sheet size (including off-balance sheet exposures); serves as a backstop to risk-based capital requirement
Loss absorbency requirements	Equity range of 1% to 2.5%, depending on systemic importance	Apply to systemic banks, which need to have more capital compared to a non-systemic bank with the same exposures
Liquidity coverage ratio (LCR)	Minimum requirement of a 100% threshold	Minimum liquid assets to withstand a 30-day stressed funding scenario
Net stable funding ratio (NSFR)	Ratio of available-to-required amount of stable funding ≥ 100%	Longer-term structural ratio designed to address liquidity mismatches

* For the precise definitions related to this table, especially regarding the concepts of equity and assets considered, see: *www.bis.org/bcbs/basel3/b3summarytable.pdf*; for the phase-in arrangements of Basel III capital and liquidity requirements (including the exact dates for introducing the minimum standards that have yet to be calibrated), see *www.bis.org/bcbs/basel3/basel3_phase_in_arrangements.pdf*.

minimum capital requirement which constitutes Pillar 1 of the Framework. A bank should have a minimum level of equity defined in relation to its assets, based on a risk-based approach. The level of capital required depends on "weights" reflecting the nature of the risks of the respective assets; for instance, a mortgage loan guaranteed by the value of the housing collateral would be considered as safer than an uncollateralised loan, so the risk weight for the first type of loans would be lower, all other things being equal. This is complemented by a clause to ensure that specific capital instruments can be written off or converted to common equity, if the bank is judged to be non-viable. An example of such a capital instrument is contingent convertible bonds, or "CoCos", which can be converted from debt obligations to equity, if needed. In addition, a capital conservation buffer is added to the capital requirement with the effect of limiting a bank's discretionary distributions (that is, reducing the possibility of paying dividends) when the capital set aside for this buffer is not sufficient. Furthermore, a counter-cyclical buffer has to be set up at time of rapid credit growth to limit the build-up of financial fragilities (that is, more capital would be required during the upward phase of the credit cycle). All these capital

requirements are reinforced by rules regarding the supervisory requirements related to specific risks, for instance those related to the holding of (complex) securitised products. Moreover, a non-risk based leverage ratio serves as a backstop to the risk-based capital requirement, to ensure a minimum amount of regulatory capital in relation to the balance sheet size of a given bank. Furthermore, specific additional loss absorbency requirements are set for "systemic" banks, which would need to have more capital compared to a non-systemic bank with the same exposures. There are also regulatory measures related to liquidity, with requirements for banks to have minimum high quality assets in case of stress, a "liquidity coverage ratio", and a "net stable funding ratio" to address liquidity mismatches.

The above liquidity and capital requirements are supplemented by a wide range of actions that supervisors may request when reviewing banks' risk management (this supervisory review constitutes Pillar 2 of the Framework), as well as specific disclosure requirements to be fulfilled by the institutions themselves in order to enhance market discipline (Pillar 3). In particular, the framework provides incentives for banks to assess the implications of "extreme" events. In this respect, "stress testing" has become an important risk management tool for banks in the Basel capital and liquidity frameworks. It supplements other risk management approaches and measures, and aims to provide an indication of how much capital might be needed to absorb losses should large shocks occur. Supervisors in many jurisdictions have been increasingly supporting the use of such stress tests since the 2007-09 economic and financial crisis.

Supervisory requirements are also progressively developed for other type of financial institutions, such as insurance companies. Here again the approach tries to combine micro-level requirements and the due consideration of macro, system-wide risks. One difficulty, however, is in developing a "common" approach for dealing with institutions that belong to different sectors and which have different business models and risk profiles, e.g. commercial banks, asset managers, insurance companies, central counterparties (CCPs)[9], etc. Another difficulty is the fact that a number of financial intermediaries are much less regulated or are imperfectly captured by the statistical apparatus. Even large non-financial corporations can play a key role in financial markets, for instance when acting as counterparts to financial systemic institutions. Another issue is the need for cross-border and cross-sector co-operation so as to properly regulate large financial institutions that operate across borders and sectors.

The impact of globalisation and the need for corporate group-level information

In addition to the impact of the 2007-09 economic and financial crisis with respect to national financial corporations, the growing globalisation of

economic activity beyond and across national borders has also raised the need for data at the level of global entities. This primarily reflects the development of multinational enterprises (MNEs) and their large cross-border activities, for instance in terms of foreign direct investment (FDI). One issue is that internationally operating companies contribute to a growing part of countries' exports and imports of goods and services. This reflects the increasing opportunities to organise production chains globally, leading to a rise in cross-border flows exchanged within the same conglomerate. In addition, international companies behave globally, as they "…allocate resources, price intra-company transactions, and bill transactions in a manner that is designed to reduce their global tax burden. As a result, national accounts measures based on MNEs' business records may not accurately reflect the underlying behaviour of the real economy in the countries where they operate" (United Nations Economic Commission for Europe, 2011). A case in point is that the financing of investments may be completely disconnected from the country in which these investments are actually made, reflecting decisions made by head offices based on group-level factors (e.g. strategy, cost of financing, risk appetite). In addition, the difficulty in identifying the allocation of output and value added attributable to a particular national economy can distort the related measures of economic activity in the national accounts and balance of payment statistics. An example of the latter is the extraordinary economic growth of 26.3% registered for Ireland in 2016, which was mainly driven by the relocation of intellectual property products and related economic activities.

From this perspective, globalisation is changing the nature of the statistical information that is necessary to monitor economic developments. The growing role played by large and complex internationally-active institutions emphasises the importance of focussing on the global economy as a whole, which cannot be solely analysed through aggregated, country-based statistics. A significant part of corporations' domestic activities are now governed by parent companies located abroad, rather than by the (resident) reporting institutional units. Symmetrically, residents' actions are increasingly influencing the actions of other "controlled" agents located in other sectors and/or countries.

The issue is that the controlling and controlled units forming a corporate group usually belong to different economies and different sectors. Therefore, the aggregation of group-level information cannot be consistent with the traditional residency-based framework of the national accounts. This framework records assets and liabilities of the economic units that are resident in a specific economic territory, information that is progressively losing its relevance in the era of globalisation. It is necessary to capture the claims and liabilities of groups' affiliates that can have an important impact at the level of the parent company, since the parent company is accountable for the business of all the entities under its control and ultimately bears the related risks. That

requires consolidated group-level, risk-based data, an approach which is often described as "nationality-based". The information of the various institutional units belonging to a group characterised by a specific "nationality" has to be consolidated independently of the residency of each of these units (Inter-Agency Group on Economic and Financial Statistics, 2015).

In order to construct such nationality-based statistics, one needs to access granular, institution-level data. A number of data sets have been developed along these lines. The BIS consolidated International Banking Statistics (IBS) comprise data on internationally active banks' foreign claims broken down by nationality of the reporting parent banks at the top level of consolidation, and by country of residence of the counterparties. They build on measures used by banks in their internal risk management systems and are broadly consistent with the consolidation scope followed by banking supervisors. In particular, one part of the IBS is presented on an ultimate risk basis, i.e. claims are attributed to the country where the final counterparty resides (taking account of risk transfer mechanisms such as guarantees). For simplicity's sake, the nationality concept is not only applied here at the reporting bank group level but also at the level of the counterparties of the reporting bank, as a consequence of which the positions of each initial (immediate) borrower are reassessed to take into account the transfer of risks to the ultimate borrower.

With regard to non-financial corporations, the OECD has been developing a framework to harmonise and integrate the statistics on FDI and multinational enterprises. The aim is to also have financial measures consolidated at the group level. This is done by netting investments between the affiliates of a group from the group's total assets. This not only removes funds that go into and out of affiliates simultaneously (so-called "funds-in-transit"), but also eliminates funds that are invested by one affiliate in another affiliate on behalf of the same controlling entity ("round-tripping"). The objective is to show the assets controlled by corporate parent entities in each country in aggregate, and stripped of intra-firm positions between their affiliates.

How can micro-data help?

The impact of globalisation and the development of institution-level supervisory requirements call for mobilising new types of information. Certainly, the "macro" lens of the financial accounts and balance sheets has proved particularly useful to analyse the financial system and its interactions with the real economy. Yet globalisation and the supervisory responses to the 2007-09 economic and financial crisis call for developing new statistical frameworks to adequately combine micro- and macro-level information. The need, as summarised by Borio (2013), is to have "good information about the system as a whole and the individual institutions within it – that is, we need to see the forest as well as the trees within it". From this perspective, micro-data

can add significant value to the macro-framework of financial accounts and balance sheets.

A key objective is to include granular information that is relevant from a macro perspective. Aggregated data is not enough since financial fragilities can arise at the level of specific institutions (e.g. Lehman Brothers), financial market segments (e.g. derivatives) or instruments (e.g. US subprime mortgage loans), and may have implications for the financial system as a whole. Such micro-level information can have a systemic importance but be masked by "traditional" macro, aggregated indicators. Hence, when assessing financial stability fragilities, it is essential to understand what lies behind the macro level. Countrywide indicators can reflect the homogeneous situation of a group of economic agents or, on the contrary, the combination of idiosyncratic positions. Non-linearity effects mean that, on average, the implication of an aggregate number will differ from the implication of the sum of individual situations. Actual exposures at the micro-level are hard to capture in the aggregated national accounts framework, because sectoral aggregation can mask specific situations that matter for assessing systemic risk, such as heterogeneous business models across specific financial institutions (especially the degree of leveraged financial intermediation they provide), the complexity of the balance sheet, maturity and liquidity mismatches, type (and riskiness) of financial instruments, exposure diversification and importance of counterparty risk, degree of guarantees (collaterals), and impact of potential correction in asset values.

Three main contributions of micro-data have been highlighted in this context and are relevant to enhance the financial accounts framework. A first and primary contribution is to further enhance the quality of macro statistics: the objective is to use the richness of granular data sources to enhance the accuracy and details of "traditional" macro statistics. Some countries have even launched interesting initiatives to base the entire compilation of their financial accounts and balance sheets on exhaustive micro-datasets, and there is a growing policy awareness of the richness of existing administrative datasets that could be better mobilised.[10] A second contribution relates to having an improved understanding of the distribution of economic indicators; to judge, for instance, how aggregated figures for the banking sector may cover a wide range of situations depending on particular sub-groups that may have very large exposures compared to average positions in the sector ("fat tails"). A third contribution of micro-data relates to economic understanding: micro statistics can trigger a paradigm shift in the knowledge frontier by highlighting the usefulness of having different frameworks for analysing the functioning of the economy. As noted above, of particular interest is the possibility provided by institution-level data to analyse the actions of multinational groups and compute "macro" aggregates that are not solely based on the residency basis but also on a nationality basis.

6. Addressing the information gaps highlighted by the 2007-09 economic and financial crisis

The detailed monitoring of global systemically important institutions (G-SIFIs)

Micro-data are not only useful to enrich the financial accounts framework, but they can also be an important source of complementary information, for two reasons. One is the need to look at "pure" micro information to assess the situation of a specific institution or market, e.g. the balance sheet composition of a large bank considered as having (global) systemic importance. As of November 2016, 30 financial institutions were identified by the BCBS and the FSB as Global Systemically Important Banks (G-SIBs), which had to meet additional requirements to hold additional capital (see Table 10.3). According to estimates by Berger et al. (2015), the G-SIBs account for around half of all the publicly traded bank assets worldwide.

A second contribution is related to policy assessment. Micro information can be instrumental in tracking individual responses to public policy decisions and, in turn, the overall impact of these policies, especially for financial markets. This dimension has become particularly relevant with the increase in supervisory requirements initiated in response to the 2007-09 economic and financial crisis. Financial supervisors have indeed been at the forefront of the initiatives to collect institution-level information to address systemic risk in their own jurisdictions. At the global level, a number of actions have been initiated in particular to collect internationally comparable institution-level data that could be shared for analysis to the various authorities (see also Box 10.4). The focus has been on having information for consolidated financial conglomerates, i.e. the headquarters and their affiliates, irrespective of the location of the residency of these affiliates. This has called for specific arrangements to ensure international co-operation and data sharing.

Three important channels have been highlighted in this endeavour. The first relates to governance. Because of confidentiality, the data to be collected have to be closely monitored by the senior authorities supervising the major financial centres, who decide to share institution-level information deemed relevant for the stability of the global financial system. Strict procedures have to be set up to ensure the accuracy, confidentiality, completeness and timeliness of these statistics, which could have the potential to move prices in financial markets if they were disclosed. A second issue is comparability. A particular effort has been made to coordinate banks' compliance with reporting guidelines so as to achieve international comparability. One problem, however, is that accounting standards continue to differ across regions; while some convergence is being called for by the international community, the concrete application of these standards in each domestic jurisdiction is often judgement-based and may

still leave substantial room for differences across countries. A third issue concerns how to collect consistent group-level information when the group is made of various entities located in different countries, acting in different sectors, and using various legal structures. All of this puts a premium on developing some kind of identifier to avoid double counting.

Table 10.3. **Allocation of the Global Systemically Important Banks and required levels of additional capital buffers (as of November 2016)**

Bucket	G-SIB in alphabetical order within each bucket
5 **(3.5%)**	(Empty)
4 **(2.5%)**	Citigroup JP Morgan Chase
3 **(2.0%)**	Bank of America BNP Parisbas Deutsche Bank HSBC
2 **(1.5%)**	Barclays Credit Suisse Goldman Sachs Industrial and Commercial Bank of China Limited Mitsubishi UFJ FG Wells Fargo
1 **(1.0%)**	Agricultural Bank of China Bank of China Bank of New York Mellon China Construction Bank Groupe BPCE Groupe Crédit Agricole ING Bank Mizuho FG Morgan Stanley Nordea Royal Bank of Scotland Santander Société Générale Standard Chartered State Street Sumitomo Mitsui FG UBS Unicredit Group

Note: The bucket approach is defined in BCBS (2013); numbers in parentheses are the required level of additional common equity loss absorbency as a percentage of risk-weighted assets that applies to each G-SIB; see Box 10.4 and *www.fsb.org/wp-content/uploads/2016-list-of-global-systemically-important-banks-G-SIBs.pdf*.

The latter challenge is indeed common for all global data collections involving institution-level data. A particular initiative endorsed by global authorities since the 2007-09 economic and financial crisis has been the requirement that market participants be identified by the recently introduced

Box 10.4. **The collection of data on global systemically important institutions in the BIS-hosted International Data Hub**

At the international level, the collection of micro-data for global systemic institutions has been promoted by the Financial Stability Board (FSB), and is being conducted with the operational support of the International Data Hub (IDH) set by the BIS (see FSB [2011] for the initial overview of this project).

Actual data have started to be collected for a subset of the global systemically important banks (G-SIBs) that have been characterised as having "systemic importance" by the FSB and the Basel Committee on Banking Supervision (see BCBS, 2013). The data encompass a variety of micro indicators – based on banks' assets (exposures), liabilities (funding), and off-balance sheet figures (contingent positions) – aiming at assessing interlinkages among the institutions surveyed as well as with their key counterparties ("network effects"), and the concentration of these institutions in specific sectors and markets ("size effects"), with various frequencies.

In terms of analytics, the value of different combinations of these micro-data will depend on circumstances, e.g. the need for monitoring a single institution, or the exposures of a number of institutions to a given counterparty or risk factor, etc. Making sense of the data and presenting them in a synthetic way requires the development of ad hoc analytical tools and metrics to capture "micro specific" situations that are of system-wide relevance. For instance, the purpose of the IDH data collection is not to simply consolidate the micro-data collected and analyse the aggregated situation of all G-SIBs taken together; it is rather to filter the (large) amount of data available and extract the specific information deemed important for macro financial stability analyses at a specific point of time.

The set-up of the Hub was organised along three phases. Phase I, started in 2013, involved the collection of simple I-I ("Institution-to-Institution") bilateral data to measure the G-SIBs' exposures to their major counterparts; for example, the claims of Bank X on Bank Y. It also comprised I-A ("Institution-to-Aggregate") data to assess the concentration of the exposures of G-SIBs to specific sectors and markets; for example, the claims of Bank X on the resident non-financial sector in country A. These latter I-A data are in fact the institution-level data underlying the Consolidated Banking Statistics (CBS) collected by the BIS; for instance, the data reported by Bank X in the example above will be a subset of the CBS for the claims of all banks headquartered in Bank X's country on the non-financial sector in country A. The I-A data collected by the IDH have progressively become more detailed, in parallel with the implementation of the enhancements of the CBS. In particular, more granular information has been made available in terms of instrument and counterparty sector breakdowns.

Phase II, launched in 2014, again focused on I-I bilateral data, but this time on the largest funding providers (bank and non-banks) of individual banks, as well as on their funding structures (e.g. the use of wholesale funding). With the decision to start implementing Phase III in 2015, additional I-A information covering reporting banks' consolidated balance sheet will be provided after 2017, with cross-breakdowns by counterparty country and sector, and by instrument, currency and maturity.

Legal Entity Identifier (LEI). The LEI is a 20-digit reference code to uniquely identify legally distinct entities that engage in financial transactions. As of 2017, around 500 000 active entities from almost all countries in the world had obtained LEIs from the around 30 operational LEI issuers. Work is ongoing to develop principles and standards for facilitating the identification of parent relationships between entities using LEIs. Certainly, there are many difficulties, including the ability to share granular data and the need to collect and make sense of very large amounts of information. But the aim is to allow for the consolidation of institution-level data using different perimeters. This work will also be facilitated by further progress expected in the standardisation of reporting financial operations – including the definition of a unique transaction identifier (UTI) and unique product identifier (UPI).

The G20 Data Gaps Initiative

While this was not, by far, the main cause of the 2007-09 economic and financial crisis, public authorities have realised that important information had been missing on the financial system, and that further statistics are needed. Therefore, a key element of the policy response after the crisis was to enhance the availability of financial statistics. In 2009, the International Monetary Fund (IMF) and the Financial Stability Board (FSB) issued *The Financial Crisis and Information Gaps* report to explore information gaps and provide appropriate proposals for strengthening data collection (IMF and FSB, 2009). This initial Data Gaps Initiative (DGI-I), endorsed by the G-20, comprised 20 recommendations focussing on three key statistical domains: i) the build-up of risks in the financial sector; ii) international financial network connections; and iii) vulnerabilities to shocks. One part of these recommendations aimed at developing the relevant conceptual and statistical frameworks; a second part was focussed on extending, developing and improving existing statistics.

From the onset, this effort was clearly inserted within the general framework of financial accounts and balance sheets. Indeed, a key objective was to develop "integrated sectoral financial accounts", so as to complete the traditional national accounts framework by presenting information on financial flows and positions. In particular, recommendation #15 of the first DGI Initiative invited international organisations to "develop a strategy to promote the compilation and dissemination of the balance sheet approach (BSA), flow of funds, and sectoral data more generally". In this context, the challenge posed by the lack of data was clearly recognised, especially for households and non-financial corporations. To this end it was also recommended that "data on non-bank financial institutions should be a particular priority".

This initial phase of the DGI highlighted the limited availability of reliable and timely statistical data in various domains. Moreover, it also showed that imperfect statistical harmonisation at the international level challenges the

collection of comparable data across jurisdictions, in particular at the entity level. To address these challenges, the international community decided to launch in 2016 the second phase of the DGI (DGI-2) in order to implement "the regular collection and dissemination of comparable, timely, integrated, high quality, and standardized statistics for policy use" over the next five years (IMF and FSB, 2015). Three main areas were identified as a priority: i) the monitoring of risks in the financial sector; ii) the assessment of interlinkages (in terms of vulnerabilities, interconnections and spillovers); and iii) the adequate communication of official statistics (see the "Going further" section at the end of this chapter for the precise list of recommendations). The collection of more granular data was recognised as of particular importance so as to "help straddle the divide between micro and macro analysis".

As with the first phase, the second phase entails considerations that are specifically targeted to financial accounts and balance sheets, with two particular areas of action (Heath and Bese Goksu, 2016). One recommendation is related to the shadow banking sector, whose monitoring can be greatly enhanced through the provision of sectoral accounts data. A second recommendation is a more general one, to "Compile and disseminate, on a quarterly and annual frequency, sectoral accounts flows and balance sheet data, based on the internationally agreed template, including (…) other (nonbank) financial corporations sector, and develop from-whom to-whom matrices for both transactions and stocks to support balance sheet analysis."

Key points

- Countries' fragilities have been traditionally related to the external financing of sectoral imbalances. However, the build-up of domestic financial imbalances and consequent international contagion can be quite independent from current account deficits.
- Since the 2007-09 economic and financial crisis, attention has increasingly focussed on the risks posed by the functioning of the financial system, and in particular on the risk of systemic crises resulting from its pro cyclicality and interconnectedness. While international finance can exacerbate such systemic risks, greater attention needs to be devoted to balance sheet positions and in particular to the developments in credit observed during financial cycles' booms, often characterised by rapid financial innovation.
- A key policy response after the 2007-09 economic and financial crisis was to strengthen the capacity of the financial system to withstand episodes of financial stress; in particular, financial institutions are being asked to set up higher and better-quality capital buffers.
- The conceptual framework of the macro financial accounts and balance sheets is instrumental to address these issues; yet it can be usefully complemented by the collection of micro-data, especially to properly monitor and regulate global systemically important institutions.
- Such statistical efforts are being pursued in the context of the Data Gaps Initiative, supported by the major international organisations and endorsed by the G-20, in order to address the information gaps highlighted by the 2007-09 economic and financial crisis.

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Going further

Recommendations of the DGI-2

The 2007-09 economic and financial crisis revealed some gaps in the availability of key information for policy making and for the timely assessment of risks across countries. Given that the G-20 economies are among the world's largest advanced and emerging economies, representing about 85 percent of global GDP, it was considered important to close the most important data gaps for these economies. In 2009, the IMF and the FSB consulted widely with users, and the data gaps identified through this consultation process resulted in 20 recommendations for the improvement of statistics: the G-20 Data Gaps Initiative (DGI). These recommendations included in the DGI were subsequently endorsed by the Finance Ministers and Central Bank Governors of the G-20 economies. The main message was the need to strengthen the analytical and conceptual framework for financial stability analysis and global monitoring of financial stability risks. In addition, the evidence of increasingly global financial transmission mechanisms and strong feedbacks between the financial sector and the real economy were considered very important topics for further investigation.

In 2015, another round of consultations with users resulted in a slightly revised set of 20 recommendations, referred to as the second phase of the G-20 Data Gaps Initiative (DGI-2). While the same range of recommendations is maintained in DGI-2, the focus has shifted to more specific objectives with the intention of compiling and disseminating increasingly consistent datasets across the G-20 economies. More and more, the templates for compiling and collecting internationally comparable macroeconomic statistics, as agreed under the umbrella of the DGI, have become a worldwide standard going beyond the G-20 economies.

The 20 recommendations of the DGI-2 are listed below. For more details, refer to IMF and FSB (2015).

1. *Monitoring and Reporting*: Staffs of the FSB and IMF report back to G-20 Finance Ministers and Central Bank Governors by June 2010 on progress, with a concrete plan of action, including a timetable, to address each of the outstanding recommendations. Therefore, staffs of FSB and IMF to provide updates on progress once a year. Financial stability experts, statisticians, and supervisors should work together to ensure that the program is successfully implemented.
2. *Financial Soundness Indicators*: The G-20 economies to report the seven Financial Soundness Indicators (FSIs) expected from SDDS Plus adherent economies, on a quarterly frequency. G-20 economies are encouraged to report the core and expanded lists of FSIs, with a particular focus on other (non-bank) financial corporations. The IMF to coordinate the work and monitor progress.

3. *Concentration and Distribution Measures (CDM)*: The IMF to investigate the possibility of regular collection of CDMs for FSIs. G-20 economies to support the work of the IMF.
4. *Data for Global Systemically Important Financial Institutions*: The G-20 economies to support the International Data Hub at the BIS to ensure the regular collection and appropriate sharing of data about global systemically important banks (G-SIBs). In addition, the FSB, in close consultation with the IMF and relevant supervisory and standard setting bodies, to investigate the possibility of a common data template for global systemically important non-bank financial institutions starting with insurance companies. This work will be undertaken by a working group comprised of representatives from FSB member jurisdictions, relevant international agencies, supervisory and standard setting bodies, and will take due account of the confidentiality and legal issues.
5. *Shadow Banking*: The G-20 economies to enhance data collection on the shadow banking system by contributing to the FSB monitoring process, including through the provision of sectoral accounts data. FSB to work on further improvements of the conceptual framework and developing standards and processes for collecting and aggregating consistent data at the global level.
6. *Derivatives*: BIS to review the derivatives data collected for the International Banking Statistics (IBS) and the semi-annual over-the-counter (OTC) derivatives statistics survey, and the FSB, in line with its 2014 feasibility study on approaches to aggregate OTC derivatives data, to investigate the legal, regulatory, governance, technological, and cost issues that would support a future FSB decision on the potential development of a mechanism to aggregate and share at global level OTC derivatives data from Trade Repositories (TR). The G-20 economies to support this work as appropriate.
7. *Securities Statistics*: G-20 economies to provide on a quarterly frequency debt securities issuance data to the BIS consistent with the Handbook on Security Statistics (HSS) starting with sector, currency, type of interest rate, original maturity and, if feasible, market of issuance. Reporting of holdings of debt securities and the sectoral from-whom-to-whom data prescribed for SDDS Plus adherent economies would be a longer term objective. BIS, with the assistance of the Working Group on Securities Databases, to monitor regular collection and consistency of debt securities data.
8. *Sectoral Accounts*: The G-20 economies to compile and disseminate, on a quarterly and annual frequency, sectoral accounts flows and balance sheet data, based on the internationally agreed template, including data for the other (non-bank) financial corporations sector, and develop from-whom-to-whom matrices for both transactions and stocks to support balance sheet

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analysis. The IAG, in collaboration with the Inter-Secretariat Working Group on National Accounts (ISWGNA), to encourage and monitor the progress by G-20 economies.

9. *Household Distributional Information*: The IAG, in close collaboration with the G-20 economies, to encourage the production and dissemination of distributional information on income, consumption, saving, and wealth, for the household sector. The OECD to coordinate the work in close co-operation with Eurostat and ECB.
10. *International Investment Position (IIP)*: The G-20 economies to provide quarterly IIP data to the IMF, consistent with the Balance of Payments and International Investment Position Manual, sixth edition (BPM6), and including the enhancements such as the currency composition and separate identification of other (non-bank) financial corporations, introduced in that Manual. IMF to monitor reporting and the consistency of IIP data, and consider separate identification of nonfinancial corporations, in collaboration with IMF Committee on Balance of Payments Statistics (BOPCOM).
11. *International Banking Statistics (IBS)*: G-20 economies to provide enhanced BIS international banking statistics. BIS to work with all reporting countries to close gaps in the reporting of IBS, to review options for improving the consistency between the consolidated IBS and supervisory data, and to support efforts to make data more widely available.
12. *Coordinated Portfolio Investment Survey (CPIS)*: G-20 economies to provide, on a semi-annual frequency, data for the IMF CPIS, including the sector of holder table and, preferably, also the sector of non-resident issuer table. IMF to monitor the regular reporting and consistency of data, to continue to improve the coverage of significant financial centres, and to investigate the possibility of quarterly reporting.
13. *Coordinated Direct Investment Survey (CDIS)*: G-20 economies to participate in and improve their reporting of the IMF CDIS, both inward and outward direct investment. IMF to monitor the progress.
14. *Cross-Border Exposures of Nonbank Corporations*: The IAG to improve the consistency and dissemination of data on non-bank corporations' cross-border exposures, including those through foreign affiliates and intra-group funding, to better analyse the risks and vulnerabilities arising from such exposures, including foreign currency mismatches. The work will draw on existing data collections by the BIS and IMF, and on the development of the OECD framework for foreign direct investment. The G-20 economies to support the work of the IAG.
15. *Government Finance Statistics*: The G-20 economies to disseminate quarterly general government data consistent with the Government Finance

Statistics Manual 2014 (GFSM 2014). Adoption of accrual accounting by the G-20 economies is encouraged. The IMF to monitor the regular reporting and dissemination of timely, comparable, and high-quality government finance data.

16. *Public Sector Debt Statistics*: The G-20 economies to provide comprehensive general government debt data with broad instrument coverage to the World Bank/IMF/OECD Public Sector Debt Statistics Database. The World Bank to coordinate the work.
17. *Residential Property Prices*: The G-20 economies to publish residential property price indices consistent with the Handbook on Residential Property Price Indices (RPPI) and supply these data to the relevant international organizations, including the BIS, Eurostat, and OECD. The IAG in collaboration with the Inter-Secretariat Working Group on Price Statistics (IWGPS) to work on a set of common headline residential property price indices; encouraging the production of long time series; developing a list of other housing-related indicators; and disseminating the headline residential property price data via the PGI website.
18. *Commercial Property Prices*: The IAG in collaboration with the Inter-Secretariat Working Group on Price Statistics to enhance the methodological guidance on the compilation of Commercial Property Price Indices (CPPI) and encourage dissemination of data on commercial property prices via the BIS website.
19. *International Data Co-operation and Communication*: The IAG to foster improved international data co-operation among international organizations and support timely standardized transmission of data through internationally agreed formats (e.g., SDMX), to reduce the burden on reporting economies, and promote outreach to users. The IAG to continue to work with G-20 economies to present timely, consistent national data on the PGI website and on the websites of participating international organizations.
20. *Promotion of Data Sharing by G-20 Economies*: The IAG and G-20 economies to promote and encourage the exchange of data and metadata among and within G-20 economies, and with international agencies, to improve the quality (e.g. consistency) of data, and availability for policy use. The G-20 economies are also encouraged to increase the sharing and accessibility of granular data, if needed by revisiting existing confidentiality constraints.

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Notes

1. Note by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".
2. Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.
3. See Debelle (2004) for a general discussion of the impact of housing equity in advanced economies.
4. That finance has become easier to access for a wider range of borrowers is not disputed and has indeed been a key factor explaining the growing importance of finance in recent decades ("financial deepening") in the global economy. Whether finance has become cheaper has been questioned by those that have highlighted the fact that financial intermediation margins have remained high. Wolf (2016) reports that the unit cost of US financial intermediation seems to have been unchanged over the last century, a sign of steady rent-extraction by banks. However, the fact that a wider range of (lower quality) borrowers has gained access to finance may be compatible with this findings. Moreover, the risk free interest rate has steadily declined in the past decades (Turner, 2013), suggesting that total finance costs for borrowers has come down too.
5. This remains a debated issue; see BIS (2017c) for a review of the various arguments.
6. See footnotes 1 and 2.
7. One issue relates to the recording of government liabilities related to the creation of so-called "financial defeasance structures" to manage the "non-performing" assets of distressed institutions, especially as regards the perimeter of the government sector and the treatment of contingent liabilities (see in particular Ynesta et al. [2013]).
8. See BCBS's Basel III overview table on *www.bis.org/bcbs/basel3/b3summarytable.pdf*.
9. A central counterparty (CCP) is a "financial institution that provides clearing and settlement services for trades in foreign exchange, securities, options and derivative contracts." These institutions are an increasingly important part of the financial system, particularly following post-crisis reforms to mandate central clearing of standardised over-the-counter derivatives contracts through CCPs (see BCBS et al, 2017).
10. Cf. the recommendation to "*Remove obstacles to the greater use of public sector administrative data for statistical purposes*" in the recently conducted independent review of UK economic statistics (Bean, 2015).

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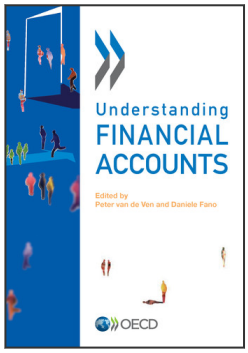

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