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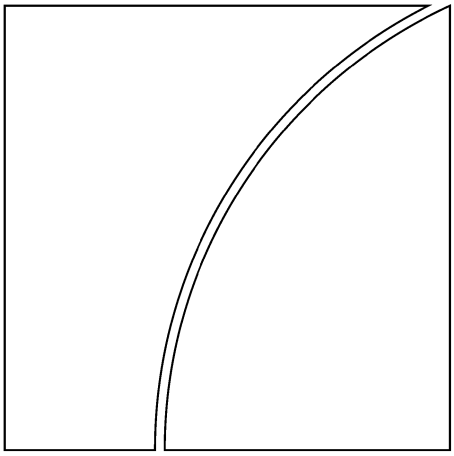

Global liquidity – concept, measurement and policy implications

Report submitted by an Ad-hoc Group established by the Committee on the Global Financial System

The Group was chaired by Jean-Pierre Landau, Bank of France

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Preface

In May 2011, following a request from BIS Governors, the Committee on the Global Financial System (CGFS) established an Ad-hoc Group to investigate the measurement, drivers and policy implications of global liquidity. Issues related to global liquidity had become a major focus of international policy, necessitating work both on indicators that can help track global liquidity developments and on the appropriate measures to address them.

The Group was chaired by Jean-Pierre Landau of the Bank of France. The report was finalised in early September 2011, and presented to central bank Governors at the Global Economy Meeting later that month, where it received endorsement for wider circulation. It has since been circulated to the G20 for their meetings in October and November 2011.

This report should provide relevant and timely input to international initiatives related to global liquidity and the international monetary system.

Mark Carney

Chairman, Committee on the Global Financial System
Governor, Bank of Canada

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Executive summary

Global liquidity has become a key focus of international policy debates over recent years. This reflects the view that global liquidity and its drivers are of major importance for international financial stability. The concept of global liquidity, however continues to be used in a variety of ways and this ambiguity can lead to unfounded and potentially destabilising policy initiatives.

In a world of high capital mobility, global liquidity cannot be approached as it used to be a few decades ago. It has both an official and a private component. The official component can be defined as "the funding that is unconditionally available to settle claims through monetary authorities." It can be accessed through various instruments, such as foreign exchange reserves and swap lines between central banks. Ultimately, only central banks can create official liquidity. IMF programmes and SDRs, in turn, are vehicles for mobilising official liquidity, but are not tools for liquidity creation. The other concept is private (or private sector) liquidity, which is created to a large degree through cross-border operations of banks and other financial institutions. These two concepts both capture one common element, namely the ease of financing.

Quantitatively, private liquidity dominates official liquidity. Most global liquidity today is privately created through cross border operations by both bank and non-bank financial institutions. From a financial stability perspective, understanding the determinants of private liquidity is of particular importance. Private global liquidity displays both an increasing trend and a strong cyclical component. The increasing trend is a result of deeper financial integration between countries and financial innovation (spurred, among other things, by regulatory changes). But private global liquidity is also highly cyclical because it is driven by divergences in growth rates, monetary policies and, above all, risk appetite.

Private liquidity can give rise to international spillovers as many financial institutions provide liquidity both domestically and in other countries. The creation and destruction of private liquidity is closely related to leveraging and deleveraging by private institutions. Hence, globally, private liquidity is linked to the dynamics of gross international capital flows, including cross-border banking or portfolio movements. This international component of liquidity can be a potential source of instability, because of its own dynamics or because it amplifies cyclical movements in domestic financial conditions and intensifies domestic imbalances.

There is some interaction between official and private liquidity. In normal times and particularly in boom periods, the supply of global liquidity will be largely determined by international banks (either directly or through financial markets). In times of stress, the supply of global liquidity will depend crucially on the private sector's access to official liquidity.

Global liquidity, and especially its private component, is best assessed on the basis of a combination of both price and quantity measures. Price indicators tend to provide information about the conditions at which liquidity is provided, while quantity measures capture how far such conditions translate into the build-up of potential risks.

Policy responses to global liquidity call for a consistent framework that considers all phases of global liquidity cycles, countering both surges and shortages. Such a framework should rest on three lines of defence.

The first line of defence is the prevention of excessive liquidity surges through strengthened regulatory frameworks. The current reform agenda clearly goes in the right direction. It will limit the probability and frequency of liquidity disruptions by increasing the resilience of global financial intermediation. It will also dampen the amplitude of global liquidity cycles by limiting the intrinsic procyclicality of our financial systems.

Domestic policies are a second line of defence. They include, inter alia, macroprudential measures and central bank liquidity provision. One issue is the extent to which individual countries will want to insure themselves against liquidity shocks by building sufficiently large stocks of foreign reserves. The accumulation of reserves, which has been on an increasing trend, entails some negative externalities as well as operational challenges. The report notes, however, the complexity of drivers behind

reserve accumulation, especially relating to the so-called precautionary motive. There are many factors at play: insuring against a run on domestic financial systems; providing foreign currency liquidity to domestic corporates and financial institutions; and influencing market sentiment and risk premia. These same factors may also explain why there is a reluctance to use reserves in times of stress (the so-called fear of losing reserves). This raises the question of whether and to what extent other sources of foreign currency liquidity could substitute for the accumulation of precautionary reserves, thus helping to limit some of the costs and externalities imposed by large foreign exchange reserves holdings.

Cooperative measures for the provision of liquidity in crisis situations provide the third line of defence. There is a well known tradeoff between ex ante clarity and the risk of moral hazard. Existing IMF precautionary facilities have worked well, but it is important to preserve the current level of conditionality. Swap arrangements between central banks have played a crucial role in the crisis, which has shown that truly global liquidity shocks necessitate direct interventions in amounts large enough to break downward liquidity spirals. Central banks' ability to elastically supply potentially very sizeable amounts of foreign currency liquidity at short notice can thus successfully assure credibility among financial market participants. This advantage has to be balanced, however, by the necessity of avoiding moral hazard, preserving monetary policy autonomy, and controlling financial risks for the liquidity-providing central bank.

Central banks have a key role to play in all these policy areas. The established cooperative Basel process ensures that central banks understand each others' reaction functions and economic outlooks. This provides the context within which they can set their own policies in a manner consistent with their domestic policy principles and financial and price stability objectives. Working through this process, central banks remain well placed to address future surges and shortages in global liquidity.

1. Introduction

Global liquidity has become a key focus of international policy debates over recent years. This reflects the view that global liquidity and its drivers are of major importance for international financial stability, both in the build-up phase for vulnerabilities and when any resulting financial imbalances unwind. This is for at least four reasons: (i) with increasing financial integration, global financial conditions have a growing impact on domestic economic conditions in each country, affecting international capital flows and the dynamics of credit, financial asset and property prices in all major economies; (ii) global liquidity can contribute to the build-up of financial system vulnerabilities in the form of large mismatches across currencies, maturities and countries; (iii) shortages of global liquidity can have important implications for economic growth, as experienced in 2008–09; and (iv) policy responses to these shortages, such as the accumulation of precautionary reserves, can affect capital flow patterns and financial markets more broadly.

Given these observations, and against the backdrop of ongoing work at the G20 on the International Monetary System and Global Liquidity Management, in May 2011 BIS Governors asked the Committee on the Global Financial System (CGFS) to investigate the measurement, drivers and policy implications of global liquidity. In response, the Committee decided to establish an Ad-hoc Group to analyse global liquidity, primarily from a financial stability perspective.

The Group's deliberations are summarised in this report. It argues that the policy implications of global liquidity are best approached in the context of two distinct liquidity concepts. One is private (or private sector) liquidity and is closely associated with liquidity surges and related build-ups of risk in expansionary policy environments. Hence, responses to private liquidity are tightly linked with micro- and macroprudential policies as well as the financial reform agenda, which will help reduce the vulnerabilities associated with global liquidity cycles. The second concept is official (or public sector) liquidity and relates to situations of liquidity shortage or disruptions in the private provision of liquidity. Policy considerations in this area are primarily related to discussions about precautionary foreign exchange reserve holdings, central bank swap lines and other tools for the international distribution of liquidity. Central banks have a key role to play in both policy areas.

The remainder of this report is organised as follows. To set the stage, Section 2 discusses key concepts of liquidity at both the domestic and international level, followed by a discussion of drivers and transmission channels. Section 3 proposes a possible conceptual framework for the assessment of global liquidity. Section 4 discusses policy responses to global liquidity. The final section concludes.

2. Global liquidity and its drivers

2.1 Key concepts

Even with increased attention to global liquidity in recent years, a precise definition is still missing. Liquidity is a multifaceted concept and, if anything, "*ease of financing*" (or perceptions thereof) appears to be the common element.[1] From a global perspective, an essential distinction to be introduced from the start is between *official* liquidity – which is created by the public sector – and *private* (or private sector) liquidity.

Official liquidity. For the purposes of this report, official (or public sector) liquidity is defined as the funding that is unconditionally available to settle claims through monetary authorities. Central banks create official liquidity in their domestic currency. They do so through their regular monetary operations and, in periods of stress, emergency liquidity support. Official liquidity can also be created as a consequence of other central bank actions, for instance changes in the terms under which standing facilities can be accessed.

Various instruments can provide access to official liquidity in foreign currency. The first and most traditional form is foreign exchange reserves, which can be mobilised to provide official liquidity at the discretion of the reserve-accumulating central bank. Second, official liquidity can be accessed through swap lines between central banks. A third possibility is dedicated facilities, such as IMF programmes or Special Drawing Rights (SDR). Ultimately, all these instruments provide access to official liquidity created by foreign central banks, though subject to different degrees of friction and conditionality. SDR, for example, can be used (ie sold against usable currencies) only in limited quantities,[2] with any increase in the global supply of liquidity entirely at the discretion of the reserve-providing central bank. Thus, SDR – and similar instruments – should best be seen as vehicles for mobilising official liquidity, but not as a tool for liquidity creation.

Private liquidity. In a world of capital mobility and internationally integrated financial markets, the concept of global liquidity has come to cover also private liquidity. Nowadays, a key determinant of the funding conditions for the broader international economy is the behaviour of the financial sector, and its willingness to provide cross-border and/or foreign currency financing. Financial institutions provide market liquidity to securities markets, for instance through market-making activity, or provide funding liquidity through, for example, interbank lending. The conditions under which these intermediaries can fund their balance sheets, in turn, depend on the willingness of other private sector participants to provide funding or market liquidity.[3] This interdependence underlines the *endogenous character* of private liquidity. At the macroeconomic level, private liquidity is thus closely related to monetary liquidity or funding conditions, as reflected in various monetary and credit aggregates or measures of the cost of funding.

From a financial stability perspective, two broad points can be made regarding private liquidity:

First, *private liquidity* can give rise to *international spillovers*. Many financial institutions provide liquidity both domestically and in other countries, with the latter involving relationships between residents in different jurisdictions and/or in different currencies. While the same forces may drive domestic and global private liquidity dynamics, they can have quite different implications for domestic

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1 For an exposition of these concepts, see BIS (2011).

2 SDR are potential claims on the freely usable currencies of IMF members. Holders of SDR can obtain these currencies in exchange for their SDR in two ways: first, through the arrangement of voluntary exchanges between members; and second, by the IMF designating members with strong external positions to purchase SDR from members with weak external positions.

3 *Market liquidity* is the ability to trade an asset or financial instrument at short notice with little impact on its price. *Funding liquidity*, in turn, describes the ability to raise cash either via the sale of an asset (sometimes called balance sheet liquidity) or by borrowing. The two concepts of liquidity are closely interlinked.

and international markets. These effects can go both ways: domestic liquidity can spill over to global markets; and, conversely, domestic liquidity conditions can be influenced by global developments.

Second, *private liquidity* is *cyclical* around an *increasing trend*. The creation and destruction of private liquidity is closely related to leveraging and deleveraging by private institutions. Depending on their ability or willingness to take risks and provide maturity or currency transformation services, financial institutions can both dampen or amplify monetary stimuli provided by central banks or provide stimuli of their own. Easier funding or credit conditions can be reflected in a liquidity surge with accelerated credit growth, compressed risk premia and run-ups in asset prices. Rising asset prices, in turn, can ease credit constraints and induce greater risk-taking, while financial integration and innovation will tend to enlarge the reach of financial sector activities, contributing to a rising trend of global liquidity over time. Equally, when the cycle reverses, financial sector deleveraging will endogenously reduce global liquidity provision.[4] This gives rise to a pronounced *state dependency* of private global liquidity. In the extreme, general uncertainty about the viability of banks and other financial institutions can lead to a drying-up of private funding, and the private, endogenous component of global liquidity disappears altogether.

Hence, global private liquidity:

- cannot be approached or understood by considering domestic liquidity concepts only. The *international components* of liquidity (eg lending to *non-residents*, lending in *foreign currencies* to residents) will matter for market and macroeconomic outcomes in recipient countries. Consideration of global liquidity should therefore take account of both the origins and the transmission of domestic impulses;[5]
- is closely linked to the dynamics of gross international capital flows, cross-border banking or portfolio movements. It is these gross flows that help determine the balance sheet size of financial intermediaries and that can contribute to potential balance sheet mismatches and systemic risks; and
- can be a potential source of instability because of its own dynamics or because it amplifies cyclical movements in domestic financial conditions and intensifies domestic imbalances.

2.2 Drivers and transmission mechanisms

Global liquidity – seen from a financial stability perspective – is based in large part on international financial flows (eg cross-border credit provision and foreign currency lending), which are determined by choices made in both source and recipient economies and by the official as well as private sectors.

Global liquidity conditions are the result of interactions among three major categories of drivers: (i) macroeconomic factors, including economic growth, the stance of monetary policy, exchange rate regime choice, capital account policies and the way they affect global imbalances; (ii) other public sector policies, including financial regulation; and (iii) financial factors that guide the behaviour of financial market participants and intermediaries, such as financial innovation and risk appetite.

Both macroeconomic and financial factors change and interact in complex ways, blurring any distinction between driving factors (as the source of impulses) and their associated transmission or amplification mechanisms. This section provides a broad description of the main drivers and their interactions.

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[4] See eg Adrian and Shin (2009).

[5] It is, for instance, possible that measures of global liquidity are more closely correlated with a given economy's key macro variables than the corresponding domestic liquidity indicators.

2.2.1 Macroeconomic factors

Macroeconomic factors influence global liquidity through actual funding costs, return expectations, and market participants' perceptions of economic risks for individual markets, economies and the world economy as a whole. As a result, macroeconomic policies have a major influence on both the supply of and demand for global liquidity, even though, in practice, a broad host of private sector factors will be important as well.

Monetary policy and interest rate differentials. The stance of monetary policy determines domestic short-term interest rates and influences risk-free (nominal) yield curves through expectations about the future path of policy rates. Interbank market rates and those for other financial assets are set on the basis of these risk-free rates, with risk premia added to reflect market-specific liquidity and counterparty risks as well as risk appetite. The level of interest rates, in turn, affects the growth rate of private credit and overall funding and liquidity conditions throughout the economy. At the same time, it is important to note that monetary policies are themselves endogenous and move in response to macroeconomic factors (real growth and inflation) that can drive risk-taking and global credit. Also, longer-term interest rates, especially real ones, are driven by more than simply monetary policy, and can be affected by factors such as global savings and investment patterns.

Easy monetary conditions or low longer-term interest rates may also increase private liquidity by inducing *search for yield* behaviour in financial markets, for example through incentives for *carry trades* and similar cross-currency investment strategies. Hence, periods with low policy rates or elevated interest rate differentials across currency areas can be associated with over-optimistic risk perceptions and elevated risk tolerance, leading to a mispricing of assets and excessive easing of lending standards (see also Section 2.2.3 below).[6]

Exchange rate policies. One factor in the transmission of monetary stimuli across currency areas is exchange rate regimes. Allowing the exchange rate to adjust can help to mitigate the transmission of *policy spillovers* and reduce capital flows induced by currency misalignments or other macroeconomic factors. A country *pegging* its exchange rate, in turn, effectively adopts a foreign currency's monetary policy stance if capital movements are fully liberalised and will accumulate or reduce official reserve holdings as external adjustment pressures translate into exchange rate intervention (see Section 4.2 below). In addition, a commitment to maintain a peg may be perceived as an implicit guarantee and can create powerful incentives for unhedged foreign currency borrowing and lending. This can be a source of systemic risk if the currency peg is abandoned, unless appropriately addressed by prudential measures.

Yet, even *flexible* exchange rates do not fully insulate a country from the spillover effects of foreign macroeconomic conditions.[7] This is shown by the existence of strong international asset market linkages among advanced countries with floating currencies, as illustrated by the global crisis. As a result, for both flexible and fixed exchange rate regimes, surges in capital inflows can affect domestic credit and asset prices. They may also help to trigger or exacerbate financial boom-bust cycles. In this context, the strength and propagation of the effects of cross-border flows on credit and liquidity creation in recipient countries will depend on the degree of exchange rate flexibility as well as on factors such as the financial structure of the recipient economy.

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[6] This has been termed the *risk-taking channel* of the monetary policy transmission process. See Altunbas et al (2010).

[7] Empirical evidence establishes strong links between global monetary policy spillovers and official reserve accumulation as well as portfolio flows. Specifically, rising exchange rate flexibility in receiving economies seems to be associated with smaller monetary policy spillovers into domestic asset returns, though without insulating recipient countries altogether. At the same time, causal relationships may go in both directions, suggesting that global as well as domestic policy influences are determinants of asset returns. See eg IMF (2010).

2.2.2 Other public sector policies

Central bank liquidity policies. The characteristics of central bank liquidity facilities (including collateral policies) can have important effects on the availability and allocation of liquidity. During the recent financial crisis, the introduction of extraordinary (temporary) liquidity facilities helped to support the functioning of funding markets under conditions of illiquid global capital markets and elevated financial stress. The expansion of central bank collateral frameworks countered deteriorating private liquidity conditions as many assets were no longer accepted as collateral in private transactions. Given the significant reliance of financial institutions on market sources of funding, these policies had more general effects on liquidity and financial conditions throughout the financial system.

Financial regulation. Banks and other intermediaries will deploy available funds globally according to portfolio allocation decisions that seek out the most profitable use of such funds. The *ability* to extend liquidity cross-border thus depends on the availability of markets, instruments and infrastructures (including cross-border payment and settlement systems) for cross-border financing and the way that financial intermediaries organise their international business.[8] These factors, in turn, importantly reflect incentives created by prudential regulation, which will constrain the choices made by financial intermediaries and their counterparties (including any constraints on foreign exchange borrowing or lending applying in recipient countries).

Differences in regulation and supervision across market participants and jurisdictions can play a key role. While banks tend to face rather stringent capital and liquidity requirements, non-bank financial intermediaries may not. This, together with different business models, implies that non-bank entities may affect global liquidity conditions in ways that are largely beyond the scope of regulatory policies. However, coordinated efforts to reduce the scope for regulatory arbitrage could help mitigate these risks.

2.2.3 Financial factors

Financial integration. Financial integration promotes greater cross-border financing flows and facilitates access to new financial products across jurisdictions. The degree of financial integration therefore has a bearing on global liquidity by affecting any spillovers of domestic liquidity into other economies.

Apart from global banks, other highly active participants, such as global investment funds, have taken on a more active role in international markets. These developments have increased the number and diversity of market participants, and hence added to market liquidity. At the same time, and consistent with the endogeneity of liquidity, there has been a positive feedback effect as the increase in market liquidity itself attracted new participants.

Financial innovation. Financial innovation often leads to the development of instruments that create new means of payment or enhance market or funding liquidity. A first example for the liquidity-enhancing effect of financial innovation is securitisation, which involves the transformation of illiquid assets into more liquid ones via the pooling and transfer of assets to bankruptcy-remote special purpose vehicles, which may then issue tranched claims against the assets. The large cross-border investments of international banks in securitised products illustrate how this innovation may have contributed to global liquidity. Another example is more widespread use of collateralised funding. It has been argued that repo contracts, which served as a major pre-crisis source of short-term financing for many financial institutions, represented an important form of money creation, since the collateral received in repo transactions could be re-hypothecated. Again, to the extent that such markets are international, there will be effects on global liquidity. Third, derivatives affect market liquidity. On the one hand, derivatives that are sufficiently standardised facilitate position-taking and hedging due to their low cost and high flexibility – in both the domestic and international contexts. On

[8] See CGFS (2010d).

the other hand, derivatives may also be a potential source of illiquidity in funding, since positions in these instruments entail requirements for margin and daily cash settlement or may expose investors to hidden maturity mismatches.[9]

Risk appetite. The *willingness* of market participants to provide liquidity depends on risk preferences and assessments. The cyclical behaviour of risk appetite is a well known empirical regularity. Thus, sudden shifts in risk appetite or liquidity preference[10] and the associated changes in leverage can amplify global liquidity cycles by intensifying both liquidity surges and shortages.[11] An example of such developments is the expansion of international banking, which is closely correlated with fluctuations in attitudes towards risk.[12]

The cyclical behaviour of risk appetite is reflected, for example, in carry trades and their role as an important driver of the international transmission of liquidity. As noted earlier, carry trades depend not only on monetary policies and interest rate differentials, but also, crucially, on the propensity to take on risk. As such, they have the potential of being unwound in a disruptive fashion in response to shocks, such as unexpected changes in monetary conditions or in investors' perceptions thereof, and can become an important amplifying factor in sharp reversals of liquidity conditions.

More generally, periods of rising risk appetite tend to be associated with swelling balance sheets, rising leverage and an increasing reliance on short-term, wholesale funding, particularly in the banking sector.[13] S*hocks* can then cause critical funding to be suddenly withdrawn, and concerns about liquidity rapidly become concerns about solvency. As market participants struggle to reduce leverage in an environment of collapsing risk appetite, heightened counterparty risk and vanishing market liquidity, they can become reluctant, even unwilling, to transact with one another. As a result, situations of a drying-up in market and funding liquidity tend to correlate with surges in financial market volatility.[14]

Overall, in good times, banks and other investors will add to market liquidity. In bad times, however, their impact on market liquidity will depend on the nature of their liabilities and their investment objectives. Their behaviour can thus serve as an important acceleration mechanism for negative liquidity shocks, particularly when their balance sheets are highly leveraged or subject to maturity or currency mismatches.

2.2.4 Interactions and dynamics

Taking into account the drivers and transmission mechanisms described above, the dynamics of global liquidity are perhaps most easily summarised by way of reference to two broad types of interactions: between risk and liquidity; and between private and official liquidity. These, in turn, affect shock transmission across economies and financial systems.

Risk and liquidity. Liquidity, no matter how defined, is widely understood to follow a cyclical pattern, reflecting the *self-reinforcing interaction* between risk appetite and liquidity. At a broad level, risk appetite is influenced by liquidity conditions, while liquidity depends on the ability and propensity of

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[9] See Section 3.3 below and McGuire and von Peter (2009) for an example in the context of cross-currency funding activities by European banks.

[10] "Liquidity illusion" is a related concept; see Nesvetailova (2008). It describes the perception that the liquidity of an asset or market is more robust than it is in reality. In this case, liquidity will be underpriced as market participants implicitly assume that the asset or market will remain liquid indefinitely. Alternatively, financial institutions may be aware of the liquidity risk they are taking on, but may assume that they will have access to central bank liquidity if that risk materialises. See Farhi and Tirole, (2011).

[11] On the concept of risk appetite and its relationship with risk aversion, see Gai and Vause (2004).

[12] See CGFS (2010e).

[13] See Bruno and Shin (2011) for a model of international banking and capital flows that captures these effects.

[14] See Eichner et al (2011).

investors to take risks. The relationship between risk (or risk appetite) and liquidity, therefore, is *bi-directional*.

On the one hand, liquidity can be argued to have a strong impact on risk-taking. Specifically, investors' risk appetite may depend not only on uncertainty over the macroeconomic environment and investor risk aversion,[15] but also on perceived liquidity constraints. Greater liquidity can hence reduce the perceived level of uncertainty (eg about potential future liquidity constraints), encouraging investors towards higher leverage and greater risk-taking. Higher asset and collateral values, in turn, will tend to make even more liquidity available.

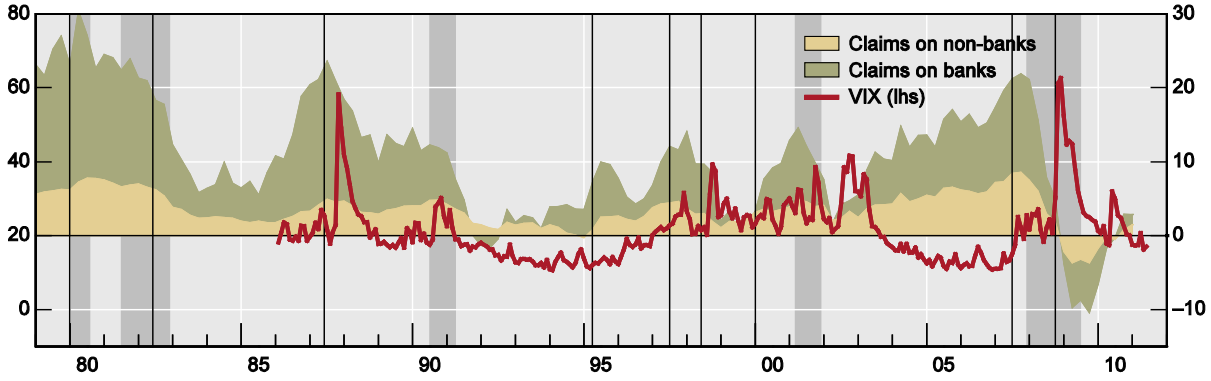
On the other hand, the causality can also run from risk appetite to liquidity. That is, when risk appetite increases, the availability of liquidity is usually enhanced. This circularity is perhaps most visible in the interaction between funding and market liquidity during periods of liquidity shortages. As illustrated during the financial crisis, when risk appetite declines and perceived counterparty risk rises, the deterioration in funding liquidity may force market participants to sell assets. Such fire sales may lead to a generalised decline in asset prices, and raise investors' funding liquidity risk through, for example, margin calls. The resulting interaction between funding liquidity and market liquidity can be self-reinforcing in turbulent times, and the deterioration in private liquidity can have significant adverse effects on the broader financial and economic systems. If market liquidity is abundant, however, such a vicious circle is unlikely to arise.

The interaction between liquidity and risk can also occur through the active management, by financial intermediaries, of their balance sheets. In particular, reductions in measured risk will influence the amount of leverage.[16] On the assets side, this means that search for potential exposure vis-à-vis financial and non-financial institutions will increase liquidity in the financial system. On the liabilities side, financial institutions may take on more short-term debt and increase maturity transformation.

Graph 1

Contributions to growth in total international claims[1] and VIX index readings

Year-on-year change; in per cent[2]



The vertical lines mark: 1979 second oil shock; 1982 Mexican default; 1987 stock market correction; 1994 Mexican peso devaluation; 1997 Asian financial crisis; 1998 Russian default and LTCM; 2000 Nasdaq peak; 2007 global financial crisis; 2008 collapse of Lehman Brothers. The shaded areas mark US recessions (NBER definition).

[1] The stacked areas indicate the contributions to the total year-on-year rate of growth in international claims, which include BIS reporting banks' cross-border in all currencies claims and locally-extended foreign currency claims on residents of reporting countries. "Claims on banks" include cross-border claims on own offices. [2] Contributions to growth are calculated as the sum of the exchange-rate adjusted changes in claims on sector i in periods t to t-3 divided by the stock of claims on all sectors at period *t-3*.

Sources: NBER; Bloomberg; BIS locational banking statistics by residence.

[15] See Gai and Vause (2004).

[16] See Adrian and Shin (2008).

The close relationship between risk and liquidity is illustrated in Graph 1, which shows indicators of cross-border credit extension across BIS reporting countries (as a quantity measure of private liquidity)[17] together with the VIX index as a simple measure of risk appetite. Observed patterns will be broadly similar for other risk appetite proxies[18] and for indicators known or expected to correlate with risk-taking in the private sector, such as measures of the global monetary policy stance.

Two broad patterns emerge. First, as expected, the growth in international bank credit exhibits boom-bust cycles that correspond closely to episodes of financial exuberance and distress. In particular, in the periods prior to financial crises, the interbank component tends to grow much faster than total international credit (ie cross-border credit granted to both banks and non-banks), while international interbank lending fell sharply following the onset of the recent crisis, contributing to the drop in overall private liquidity.

Second, periods of particularly strong growth in cross-border credit often coincide with episodes of elevated risk appetite and compressed risk premia, while periods of contracting cross-border credit seem to coincide with episodic downward shifts in risk appetite – consistent with the interaction of liquidity and risk discussed before. As a result, over the period 2003–07 (though less so for the period prior to 2003), sizeable growth rates in cross-border interbank credit and low or declining risk appetite measures were pointing to a build-up of global liquidity and associated financial vulnerabilities. While both measures have recently bounced back from their crisis values, current levels do not necessarily appear elevated from a historical perspective – at least not when focusing on broad cross-country aggregates.

Official and private liquidity. Official and private liquidity *should be considered together*, as they may closely interact, both in times of crisis and in more normal times. In times of crisis, private liquidity tends to evaporate and global liquidity collapses into its public component. In those circumstances, global liquidity will crucially depend on individual banks' access to official sector funding. This is particularly relevant when these funding needs are in a foreign currency, constraining the ability of the domestic central bank to address liquidity shortages.[19] An important policy issue, therefore, is how the interaction between private and public global liquidity should be managed in order to prevent and mitigate financial instability.

Official and private global liquidity may also interact in other, more normal, circumstances. As mentioned above, private sector perceptions of the availability of official liquidity may affect risk-taking. In the extreme, an expectation that central banks will support liquidity in times of stress may lead to moral hazard. This has important implications for the design of mechanisms for dealing with global liquidity shortages. Other linkages between private and official liquidity may result from the use of private financial instruments when providing or managing official liquidity. For instance, collateral policies of central banks may influence the terms and conditions of secured funding in private markets.

Finally, a number of studies point to a positive interaction between official and private global liquidity through the reinvestment of foreign exchange reserves.[20] According to these analyses, easy monetary and financial conditions in major funding currencies can trigger cross-border capital flows and subsequent foreign exchange reserve accumulation in recipient countries. In turn, the reinvestment of these reserves in issuing countries' liquid assets further contributes to easing financial conditions, causing additional capital outflows and reserve accumulation. That *feedback loop* acts as an amplification mechanism on the original monetary impulse and its impact on global liquidity.

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[17] See Section 3 below for details of the choice and construction of this indicator.

[18] This includes the model-based indicators described, for example, in Gai and Vause (2006).

[19] See Landau (2011).

[20] See eg Kobayashi and Yoshino (2011).

The existence of such a feedback loop, however, depends on two conditions. First, differences in monetary policies (or expected rates of return) need to trigger capital flows into receiving economies, which must in turn translate into reserve accumulation. This, of course, depends on the exchange rate regime. Private capital inflows into countries with pegged exchange rates or that otherwise intervene in the foreign exchange market lead to an accumulation of official reserves that need to be reinvested. Second, the reinvestment of foreign exchange reserves must have a material impact on interest rates in reserve currencies; for example, because of the different investment preferences of reserve managers and private sector investors. Views on the significance of such effects differ. One view is that this additional demand, if large enough, can contribute to lowering long-term interest rates (eg through a reduced term premium).[21] Another view is that such demand cannot significantly affect the equilibrium level of long-term yields.[22] Overall, while no consensus exists, the available evidence suggests that an amplifying impact on global liquidity from the reinvestment of foreign exchange reserves cannot be excluded.

Differences in financial system dynamics. Financial institutions – both banking and non-banking – play a key role in the transmission of international liquidity. Globally active banks, in particular, tend to fund themselves in a limited number of major currencies and use their balance sheets to intermediate and distribute global liquidity across markets and jurisdictions. International flows of credit (both cross-border and in foreign currencies) can thus play an important part in the transmission of liquidity impulses.

The nature of this transmission is likely to depend on a variety of factors, suggesting that different financial systems may react differently to the same monetary or financial impulse – giving the impression of different "multipliers" being at work in different countries and at different points in time. One factor is individual economies' cyclical positions as well as structural features, such as the state of financial development and the degree of integration into the global financial system.

Another factor is the "balance sheet capacity" of international banks and other intermediaries, and hence their ability to expand leverage and conduct maturity transformation. This balance sheet capacity, in turn, is a function of both structural and cyclical factors. Structural factors relate to the degree of financial development and the regulatory environment. Cyclical factors include the health of the financial sector (eg the strength of bank capital) and country-specific variation in risk appetite, which is affected by the degree of economic uncertainty. This implies that, for the same global financial environment, the dynamics of global liquidity components can differ across jurisdictions. Countries that are in a process of deleveraging will not be very responsive to increases in global liquidity, whereas countries that are in a process of re-leveraging may react strongly.

This observed heterogeneity in the response to global financing conditions has several important consequences. First, assessing the implications of a given level of global liquidity for financial stability becomes more complex, because the implications are contingent on the state of the financial system in the various economies. Second, variation in the state of the financial system may explain why a surge in global liquidity triggers asset price pressure in certain countries while credit remains depressed in others. Third, in order to safeguard financial stability, countries need differentiated policy responses to global liquidity developments. The use of tailored macroprudential policies could be appropriate in this context.

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[21] A prominent study estimates that foreign purchases lowered US Treasury yields by some 90 basis points in 2005: see Warnock and Warnock (2009). ECB (2006) summarises similar results from other studies.

[22] This would be the case, for instance, if long-term yields were driven only by the expected path of short-term interest rates, which would not be affected by the investment of reserve proceeds. Various studies have rejected this hypothesis (the "expectations hypothesis"), as summarised, for example, in Campbell et al (1997).

3. Towards a framework for the assessment of global liquidity

This section presents a conceptual framework for the assessment of global liquidity conditions from a financial stability perspective. It primarily aims to accommodate discussions of private liquidity, with particular emphasis on the international components of global credit as the main feature of the global liquidity concept.

3.1 The measurement of global liquidity: basic considerations

As a result of the elusive nature of the concept, it is unlikely that a single measure can capture all relevant aspects of global liquidity. In assessing global liquidity, it is therefore important to rely on a variety of measures, where the selection of any particular combination depends on the specific analytical question at hand. Key issues include:[23]

Monetary versus financial stability considerations. Indicator selection depends in part on the chosen focus of the analysis. For example, in analyses focused on traditional policy concerns about the risk of *monetary policy spillovers* and their effects on aggregate demand, it is common to use some aggregation of indicators of monetary conditions (or *monetary liquidity*) for individual currency areas. As discussed in more detail below, these could be price-based (eg real short-term interest rates, perhaps compared with natural or equilibrium measures of these rates) or quantity-based (eg the monetary base or a more broadly defined monetary or credit aggregate, where the exact choice depends on whether the focus is on public or private liquidity).

For analyses driven by concerns over *financial stability*, eg asset price inflation and the associated build-up of vulnerabilities, some combination of measures of vulnerabilities at the international or global level (including indicators that capture risk-taking or market and funding liquidity as well as some financial aggregate) is likely to be more appropriate. Specifically, there are several justifications for using (global) credit, rather than monetary, aggregates: private sector credit better captures the idea of "ease of financing" that underpins global liquidity, and has been shown to have better properties as an early warning indicator, especially when combined with measures such as asset prices.[24] In addition, credit aggregates take better account of the liquidity creation of the financial system, which to a large extent derives from the leverage that market participants aim for. They also allow for broad and consistent international coverage. Critically, (gross) cross-border positions (especially those in interbank markets), which tend to be ignored from a monetary policy point of view, will be important when the focus is on how global liquidity conditions may be transmitted internationally and affect domestic financial stability.[25] This places a premium on measures that are able to capture such interlinkages.

Prices versus quantities. One possible approach is to measure the *price* at which financing is available, covering both interest rate and non-interest rate terms. The former would tend to include major policy rates and those from interbank money as well as other wholesale funding markets and also from longer-term capital markets, ie measures of *funding liquidity*. The latter could include indicators for the tightness of collateral provisions[26] or measures of *market liquidity*, such as bid-ask

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[23] A set of additional, more specific issues is discussed in Box 1.

[24] In particular, there is a growing literature suggesting that joint cumulative increases in private sector credit and asset prices beyond historical norms tend to herald subsequent financial distress. See eg Alessi and Detken (2009), Borio and Drehmann (2009) and Bussière and Fratzscher (2006).

[25] See Bruno and Shin (2011).

[26] Although not strictly based on prices, this could also include quantitative survey measures, such as those tracking changes in credit conditions in wholesale markets (ie securities financing and OTC derivatives), as proposed in CGFS (2010a).

Box 1

This box discusses a number of technical issues that will complicate assessments of global liquidity, given the conceptual definitions adopted for this report.

Ex post versus ex ante availability of official liquidity. In principle, monitoring central bank liquidity in major funding currencies and foreign exchange reserves allows an assessment of the funds available to settle international claims in case of a severe shock (ie official liquidity).[1] However, given the ability of central banks to inject liquidity at the time of a crisis and to enter swap arrangements with other central banks, the amount of central bank liquidity in place prior to a crisis is not necessarily indicative of the amount that would be available in case of a severe shock. Also, in terms of cross-border credit, there is no guarantee that domestic central bank liquidity will find its way to foreign firms via interbank lending, which suggests that the amount of central bank liquidity in place before a crisis is also not directly indicative of how much funds could be available to internationally active institutions.

Issues of aggregation. A non-trivial problem is constructing measures of global liquidity based on domestic indicators. Aggregation requires the availability of consistent data across a possibly large group of jurisdictions. In addition, choices have to be made on how to combine national data into a global measure. For example, should global quantity measures be based on simple sums or weighted averages, and how would the appropriate weights be selected?[2] Cross-currency aggregation is particularly problematic, as the effect of exchange rate movements on the relative size of the aggregates' individual components needs to be taken into account. Alternatively, indicators derived from important international markets can be used as global benchmarks, which is often done by applying standard statistical methodologies, such as principal components analysis, to a number of measures deemed to be driven by similar phenomena.[3] However, given that these measures are based on specific markets or instruments, it remains unclear whether they are truly global in coverage.

Lack of equilibrium concepts. Another obstacle in the assessment of global liquidity, even after the appropriate measures have been chosen, is the absence of a commonly agreed operational benchmark (or "equilibrium" concept) against which actual developments can be judged. Overall, this suggests the need for an empirical approach that relies on observed regularities in the selected indicators for clues on whether or not global liquidity conditions are "easy" or not. For example, the literature on financial crises suggests that risk premia tend to be unusually compressed as crisis risks build up. To judge global liquidity from a financial stability perspective, one would therefore have to look for patterns that, say, combine high growth rates in credit aggregates (as a flow measure of global liquidity), possibly relative to nominal GDP growth, with tight credit spreads, loose credit standards and similar indicators of risk-taking. Finally, as global indicators may mask developments in individual countries, global aggregates would have to be complemented with an analysis of national measures in coming to a more refined assessment. Even then, however, assessments of global liquidity are bound to be subject to inherent uncertainties that will inhibit clear-cut judgments on equilibria or disequilibria.

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[1] As indicated in Section 2.1 above, monitoring official liquidity raises the question of how appropriate global measures would be designed and whether SDR and IMF facilities would be treated as sources or as instruments for the distribution of liquidity.

[2] A standard aggregation procedure used to generate global measures of bank credit relies on GDP-weighted averages, as in Alessi and Detken (2009).

[3] See eg IMF (2011), which suggests a measure of global liquidity risk based on data on arbitrage violations.

spreads or proxies for the price impact of trades. Also included would be more indirect measures of the willingness to supply funding, such as various indicators of risk perception and tolerance (eg risk spreads and implied volatilities).

Another, complementary approach is to focus on *quantities*. Quantities may single out balance sheet components deemed especially liquid or short-term safe assets (eg high-quality government securities). They may also refer to the relationship between the liquidity of assets and liabilities on balance sheets, such as measures of maturity transformation or leverage (perhaps based on liquidity

coverage ratio (LCR)-type data for banks).[27] In addition, they may reflect the *outcome* of financing conditions, such as the rate of credit growth, both in aggregate terms or for particular borrower types, for example those seen as likely to be credit-constrained (eg lower-income households or lower-rated businesses).

3.2 Key features of the framework

Reflecting the discussion of concepts and drivers above, the proposed approach for the assessment of global liquidity is based on the following considerations:

- Global liquidity, and especially its private component, is best assessed on the basis of a *combination* of both price and quantity measures. Price indicators provide information about the conditions at which liquidity is provided, while quantity measures capture how far such conditions translate into the build-up of risks. Moreover, in principle, empirical regularities in both quantity and price measures can be used to infer situations that may raise possible financial stability concerns.
- A number of key *global* credit aggregates serve as the starting point.[28] Specifically, broad global aggregates, ideally comprising bank- and non-bank credit, provide an indication of *liquidity creation* by the private sector and can help track global liquidity cycles.[29] In addition, when expressed relative to GDP, they can serve as broad measures of leverage at a macroeconomic level. Significantly positive deviations of such ratios from their long-term trend over an extended period (*credit-to-GDP gaps*) can hence signal potential situations of excess liquidity.
- Particular emphasis is placed on the *international components* of global credit. Direct cross-border credit, in particular, tends to be highly procyclical, providing insight on how global liquidity affects the international transmission of cyclical fluctuations and the emergence of financial imbalances. The separation of domestic and international credit to non-banks, in turn, facilitates the analysis of liquidity conditions (and related vulnerabilities) from the "currency denomination", "credit originator" and "recipient economy" perspectives.

On this basis, the framework relies on a set of key credit aggregates and complementary price- and quantity-based indicators of monetary, funding and market liquidity in order to assess the sources and uses of global liquidity. It is important to keep in mind, however, that what is proposed here is only one of many possible approaches, especially when a perspective other than financial stability is adopted. In addition, there are a number of open issues, for example in the context of the absence of a suitable equilibrium concept for the assessment of global liquidity (see Box 1).

3.3 Applying the framework

The proposed framework relies heavily on the BIS international banking and securities statistics. These data allow the construction of consistent credit aggregates and maturity mismatch measures that include cross-border bank lending and – to some extent – securities issuance.[30] This helps to

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[27] An example would be measures of so-called cross-currency funding gaps, as described in McGuire and von Peter (2009) and CGFS (2010b).

[28] The focus on credit rather than monetary aggregates differentiates the framework proposed here from much of the existing empirical literature, which tends to focus narrowly on monetary policy spillovers and, hence, on monetary aggregates and international reserves as measures of global liquidity. See eg Darius and Radde (2010) and Baks and Kramer (1999), who find a positive relationship between global (excess) money growth and equity returns.

[29] Preliminary empirical work based on Anguren (2011) suggests that credit aggregates may have superior indicator properties in the detection of expansionary phases of global liquidity when compared with various monetary aggregates.

[30] For details, see BIS (2011) and Borio et al (2011).

accommodate the fact that, in normal times, and particularly in boom periods, international banks will tend to endogenously determine the supply of global liquidity (either directly or through financial markets). This is in contrast to times of stress, when global liquidity will depend crucially on banks' access to official liquidity (ie central bank funding, including via international reserves or central bank swap lines).

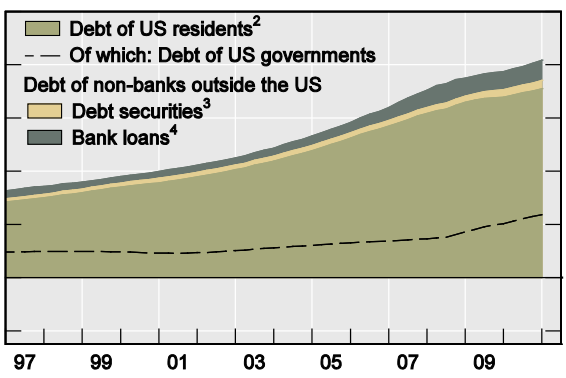
Three possible quantity-based approaches for measuring global credit are presented here. While related, each highlights a somewhat different way in which global credit could be usefully measured. The first approach considers global credit provided in a particular currency, and focuses on credit (securities issues and bank loans) to non-financials located *outside* the currency-issuing country. A second approach estimates the maturity mismatch of assets and liabilities in a given currency on banks' global balance sheets. The case of US dollar assets held by European banks is used as an illustration. The third approach takes the perspective of non-bank borrowers in a particular country or region, and focuses on the various international components of credit provided to these borrowers.

All three approaches necessarily face limitations. One is *data constraints*, which limit these measures in terms of their global coverage, institutional coverage (eg bank versus non-bank financial entities), or in the conceptual ways in which international or total credit might be measured. Results can thus be misleading if, for example, cross-border financing through non-bank intermediaries is significant, or becomes more important due to financial innovation. *Measurement issues* are another limitation, as discussed above. For instance, aggregation of credit across currencies is challenging. But even for a given currency, *hedging activity* can change the interpretation of observed developments unless appropriately accounted for in the data.[31]

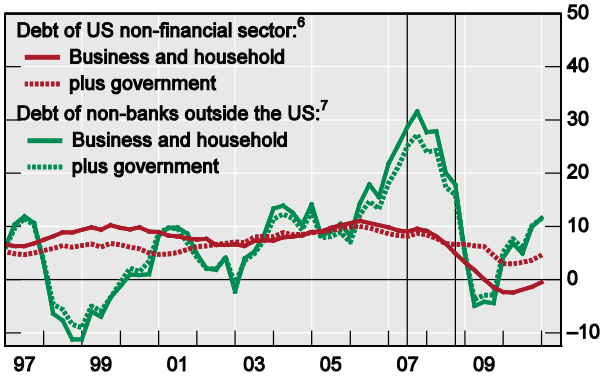
Graph 2

Domestic and international US dollar credit

Credit to the non-financial sector[1]



Growth in credit to the non-financial sector[5]



[1] In trillions of US dollars. [2] Non-financial sector debt of residents of the United States, which consists of debt securities, mortgages, bank loans, commercial paper, consumer credit, government loans, and other loans and advances; it excludes trade debt, loans for the purpose of carrying securities, and funds raised from equity sources. [3] Outstanding US dollar debt securities issued by non financial resident outside the United States. [4] Cross-border and local US dollar loans to non-banks resident outside the United States. For China, local US dollar loans to non-banks is based on national data on total local lending in foreign currency and assumes that 80% are denominated in US dollar. For other non-BIS reporting countries, the local US dollar loans to non-banks are proxied by all BIS reporting banks' cross-border US dollar loans to banks in the country. [5] Year on year growth, in per cent. The vertical lines represent end-Q2 2007 and end-Q3 2008. [6] The solid line is total credit to the non-financial *private* sector in the United States. The dotted line includes credit to the US government. [7] The solid line is estimated total credit to the non-financial *private* sector outside the United States. The dotted line includes US dollar international debt securities issued by the non-US public sector.

Sources: People's Bank of China; Board of Governors of the Federal Reserve System; BIS international debt statistics and locational banking statistics by residence.

[31] Specifically, the ultimate cost of hedged borrowings is more reflective of the stance of monetary policy in the borrower's country than the stance of monetary policy in the lender's country. In addition, as long as derivatives markets remain sufficiently liquid, hedged borrowings are likely to be more easily serviced than unhedged borrowings, as they are not subject to exchange rate risk and as they are ultimately a liability in the same currency as that provided by the domestic central bank. This underscores the potential value of increasing the coverage and granularity of available derivatives data.

The currency denomination perspective. BIS data, in combination with national sources, facilitate the calculation of currency-specific global credit aggregates, defined as credit in a particular currency extended to the non-financial sector worldwide. Importantly, credit to non-bank borrowers *outside* the currency-issuing country can be isolated. Much of this international credit is denominated in US dollars, euros, yen, sterling and Swiss francs.[32] Graph 2 (left-hand panel) illustrates the case of the US dollar by comparing the outstanding debt of the US business, household and government sectors (from the flow of funds statistics) with the US dollar debt of non-banks outside the United States. In particular, this includes international bonds issued by, and bank loans to, these non-banks.

The international component of global credit can be quite sizeable. For the US dollar, in mid-2010, dollar credit to non-US residents reached 13% of dollar credit to the non-financial sector worldwide, from 10% in mid-2000. If dollar credit to governments (Graph 2, left-hand panel, dashed line) is excluded, the international component is even higher, at 17% (up from 11% in 2000).

Another observation is that US dollar credit to the rest of the world has at times grown faster than credit to US residents. Dollar credit to households and non-financial businesses in the United States grew at roughly 9% year on year between 2000 and 2007, to reach $23 trillion on the eve of the crisis, or 167% of GDP. Over the same period, dollar credit to non-financial private sector borrowers outside the United States grew more quickly, peaking at no less than 30% year on year by mid-2007 (Graph 2, right-hand panel). At $3.7 trillion in mid-2007, this amounted to 9% of the GDP of the rest of the world.

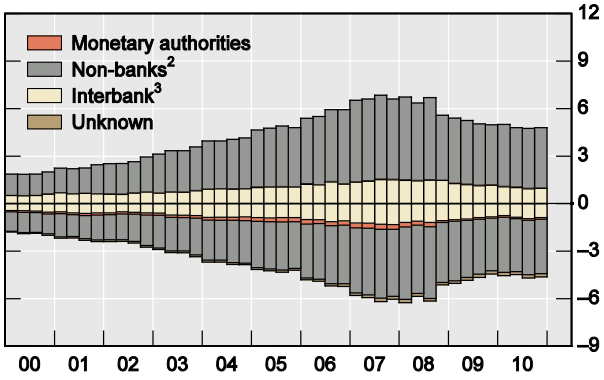
The credit originator perspective. Global credit aggregates can be analysed further from two angles of particular relevance from a financial stability point of view. One is the perspective of the funding provider. Here, it is important to distinguish the perspective of the economy that issues the currency (see above) from that of the intermediaries that ultimately extend credit, possibly in foreign currency. While the authorities in the former provide official liquidity in the respective currency, the decisions of international banks (and other intermediaries) determine the financial risks associated with the extension of credit.

Graph 3

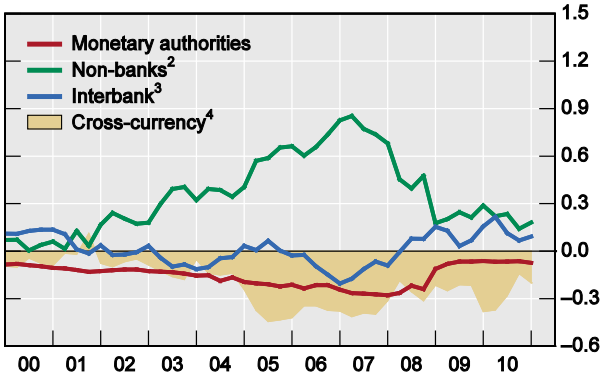
On-balance sheet USD positions at long-USD European banks[1]

In trillions of US dollars

Gross, by counterparty sector



Net, by counterparty sector



[1] Estimates are constructed by aggregating the worldwide on-balance sheet cross-border and local positions reported by internationally active banks headquartered in Germany, the Netherlands, Switzerland and the United Kingdom. [2] International positions vis-à-vis non-banks plus local positions vis-à-vis US residents (all sectors) booked by banks' offices in the United States. No sectoral breakdown is available for these positions. [3] Estimated net interbank lending to other (unaffiliated) banks. [4] Implied cross-currency funding (ie FX swaps), which equates US dollar assets and liabilities.

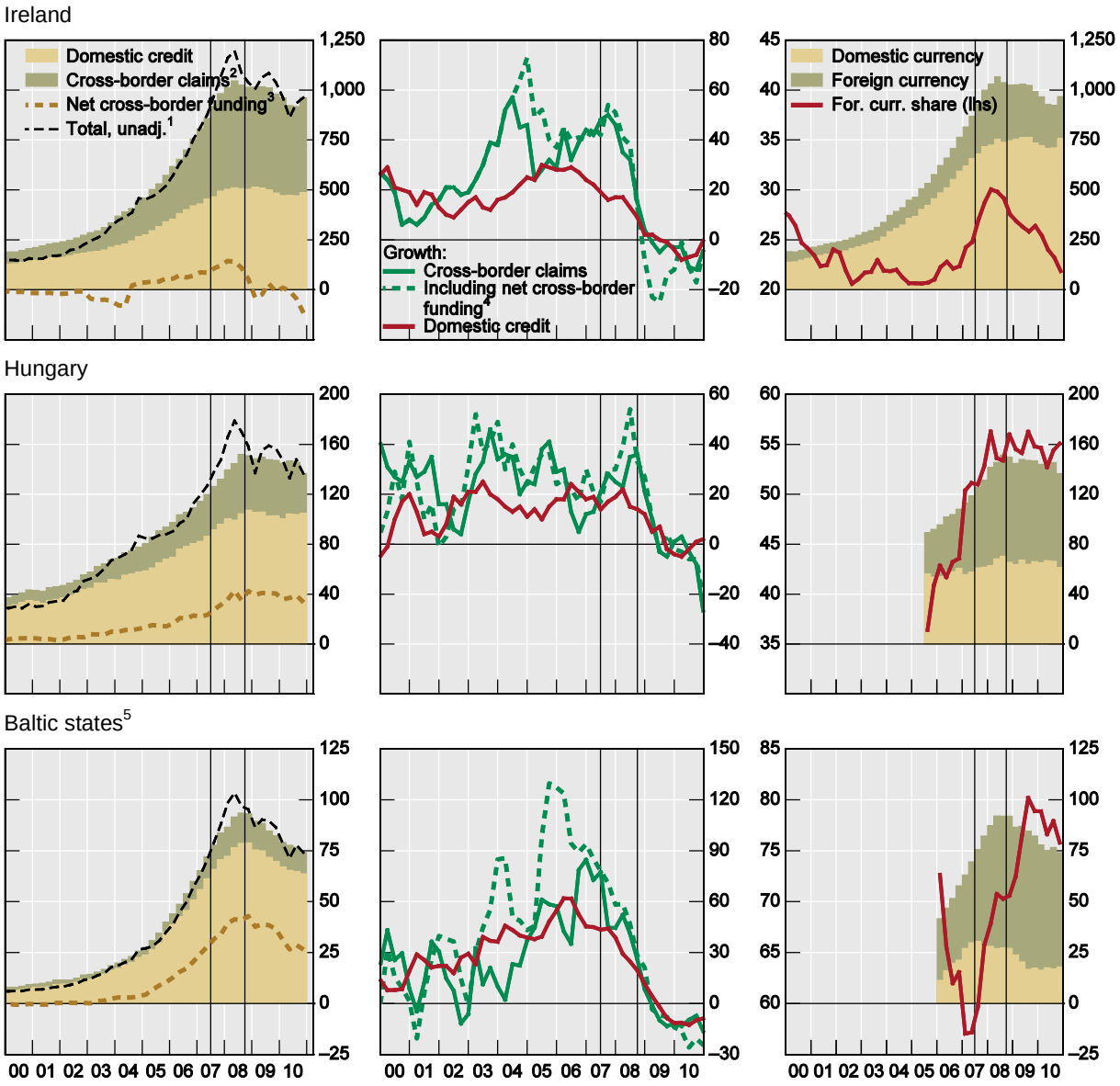
Sources: Bloomberg; JPMorgan Chase; BIS consolidated banking statistics (immediate borrower basis); BIS locational statistics by nationality.

[32] See BIS (2011) for a discussion.

Graph 4

Bank credit to non-banks in selected European countries

At constant end-2010 exchange rates[1]



[1] The stacked bars indicate total credit expressed in US dollars at constant end-2010 exchange rates, and thus exclude valuation effects. The dotted black line shows unadjusted total credit converted into US dollars at contemporaneous exchange rates. [2] BIS reporting banks' cross-border claims on non-banks. Claims include loans and securities, most of which is debt. [3] Net cross-border borrowing (liabilities minus claims) from all sectors by banks located in the country. For non-BIS reporting countries (Hungary, Croatia and the Baltic States), BIS reporting banks' net cross-border claims on banks in the country. [4] Growth after first including net cross-border borrowing (if positive) by banks in the country (dashed brown line), under the assumption that this cross-border credit is ultimately passed on to non-banks in the country. [5] Estonia, Latvia and Lithuania.

Sources: IMF *International Financial Statistics*; BIS Locational banking statistics; BIS Consolidated banking statistics.

One implication of these activities is the possibility of maturity mismatches on international banks' balance sheets. Graph 3 illustrates these mismatches for the consolidated US dollar books of a sample of European banks. Information on the counterparty type (monetary authority, non-bank, interbank) is used to proxy for the (unavailable) remaining maturity of positions, where interbank

positions and net foreign exchange swap ("cross-currency") positions are assumed to have a shorter average maturity than positions vis-à-vis non-banks.[33] The graph shows (right-hand panel) that, ahead of the crisis, many large international banks had built up sizeable US dollar asset positions and funded them borrowing short-term in the same currency or swapping into dollars out of their domestic currency. As such, it is highly suggestive of excess global liquidity supporting growing exposures to funding risk prior to the crisis, as the longer-term investments in non-banks became increasingly dependent on short-term foreign currency funding. In the end, banks' dollar liquidity needs were met through the establishment of central bank swap lines.

The recipient economy perspective. The other important perspective is that of the recipient economy, taking into account the international components of global credit aggregates across a wider set of currencies. For this analysis, the focus is again on credit provided by banks, given the lack of sufficient creditor-side data outside the banking sector – information on credit provided by non-banks, through their holdings of debt securities, for example, is not collected in a systematic way.[34]

Graph 4 shows estimates of total bank credit to non-banks for a number of individual country examples, differentiating domestic credit and three international components: (i) *direct cross-border credit* to non-banks (left-hand panels); (ii) domestic credit creation funded by *cross-border sources of funds* (dashed brown lines); and (iii) *credit in foreign currencies*, either domestic or cross-border (right-hand panels). It suggests that, during booms, the international components supporting credit expansion often grow faster than the credit granted by banks located in the country (centre panels).[35] Thus, international credit can amplify credit booms in recipient economies, and monitoring of measures of the international components of credit can help domestic authorities assess the degree (and sources) of risks.

The recent experience of Ireland is a case in point. Direct cross-border credit to non-banks (including vehicles such as SIVs) in the country (dark shaded area, top left-hand panel) grew at roughly 40% year on year in the three years prior to the crisis, 10 points above the rate for domestic bank credit (top centre panel). Moreover, banks in Ireland drew also on cross-border sources of funds from both banks and non-banks (top left-hand panel, dashed brown line) – positions that include both interbank market borrowing and funding received from money market funds and other wholesale sources. Combined, these two cross-border components accounted for more than half of total bank credit to non-banks in 2008.

In some countries, this cross-border financing channel was even more important. In the run-up to the most recent crisis episode, much of the cross-border financing of domestic credit in emerging European countries was inter-office funding of foreign subsidiaries in these countries, and these funds were used to finance *foreign currency* lending to residents (Graph 4, right-hand panels). In the Baltic states, for example, credit extended by foreign subsidiaries located in these countries accounted for the bulk of total bank credit to non-banks. Moreover, most of this credit was denominated in foreign currencies. Foreign currency credit, if unhedged, subjects residents to the risk of a sudden depreciation of the domestic currency.

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[33] For details, see McGuire and von Peter (2009) and Fender and McGuire (2010).

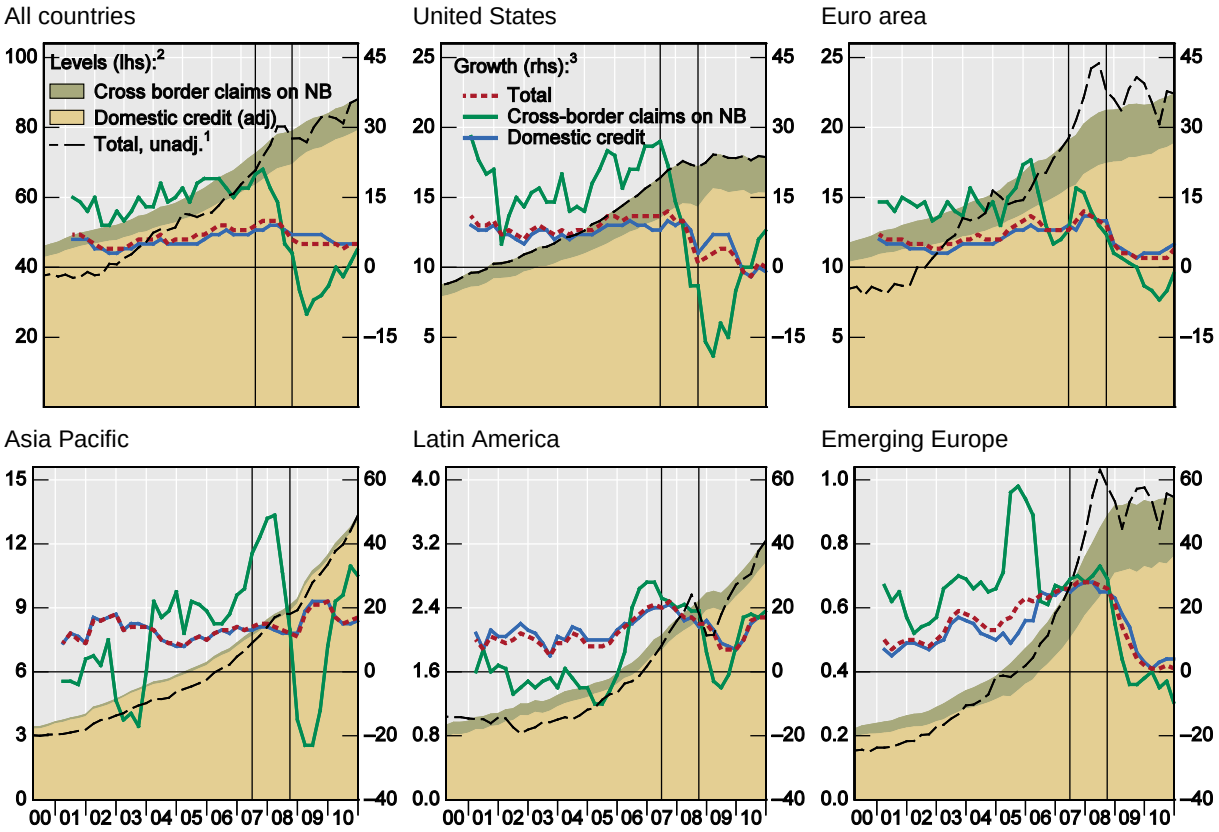
[34] This contrasts with the availability of much more granular data for the banking sector, which will be further enhanced in the context of ongoing statistical efforts at the international level.

[35] This could be because international banks may have less information on the quality of borrowers than local lenders. Therefore, they may have been overoptimistic about borrower strength in foreign markets in the upswing, resulting in a sudden change of assessment in the downswing. Another possibility is that international banks may regard certain foreign markets as a non-core business, affecting their willingness to expand or contract these activities in a procyclical fashion. It is also possible that international banks faced bigger negative shocks at home and that these banks relied more on wholesale funding than domestic banks.

Graph 5

Global credit aggregates, by borrower region

At constant end-2010 exchange rates[1]



The vertical lines represent end-Q2 2007 and end-Q3 2008.

[1] The shaded areas indicate total credit expressed in US dollars at constant end-2010 exchange rates, and thus exclude exchange rate valuation effects. The dotted black line shows unadjusted total credit converted into US dollars at contemporaneous exchange rates. The adjustment of the shaded areas is done using various pieces of the BIS banking statistics to get a breakdown by currency for both cross-border credit and domestic credit. [2] In trillions of US dollars. [3] In per cent.

Sources: IMF, *International Financial Statistics*; BIS locational banking statistics by residence; BIS calculations.

Aggregation across countries, finally, yields consistent aggregates of domestic and cross-border bank credit, both across regions and globally – broad measures of global liquidity from the recipient's perspective (Graph 5). According to these data, worldwide, bank credit continued to expand throughout the recent crisis. While cross-border credit and, hence, internationally intermediated liquidity did contract (green line), the overall growth rate of bank credit remained positive. Across regions, however, there were significant differences. Total bank credit to non-banks in the United States and the euro area has levelled off since the start of the crisis, whereas bank credit to borrowers in Asia-Pacific is currently growing at rates comparable to those seen before 2007.

Complementary indicators. In analysing global liquidity, it will be necessary to complement the chosen key quantity measures with a range of additional indicators that capture the relevant aspects of monetary, funding and market liquidity. Table 1 provides a number of examples, drawing on a range of measures capturing monetary and financing conditions, risk appetite and incentives for position-taking across various markets. In practice, some of these measures will tend to be *composite* indicators where the selection of individual measures depends on the specific analytical question and on whether global or country-specific factors are seen as important. If the focus is on global measures, each individual indicator will have to be calculated in ways that capture as wide a portion of the global economy as possible, which would include both major advanced and emerging market economies.

Table 1

Selected complementary indicators

	Quantities	Prices
Monetary liquidity	Base money and broader monetary aggregates Foreign exchange reserves	Policy and money market interest rates Monetary conditions indices
Funding liquidity	Bank liquidity ratios Maturity mismatch measures CP market volumes	Libor-OIS spreads FX swap basis Bond-CDS basis Qualitative surveys of funding conditions
Market liquidity	Transaction volumes	Bid-ask spreads on selected global assets Qualitative fund manager surveys
Risk-taking and valuation	Bank leverage ratios	VIX index and other risk appetite measures Sharpe and carry-to-risk ratios Financial asset prices and spreads Property prices Price/earnings ratios

Many of these complementary measures, such as policy rates, monetary aggregates and foreign exchange reserves, are closely related to drivers and transmission mechanisms of liquidity (see separate section above) and hence allow for an analysis of their importance in explaining the evolution of global liquidity.[36] Carry-to-risk ratios and similar measures help in assessing the incentives of short-term investors in cross-currency fixed income markets, and also serve as indicators of international interest rate differentials and cross-border activity in general. In this context, price-based measures, such as Libor-OIS or the FX swap basis, have the advantage of being readily available at high frequencies and thus lend themselves to the identification of crisis periods – though not in a forward-looking sense, as possibly large and variable risk premia may make interpretation at any given point in time difficult. Both price and quantity measures, in turn, can be combined to investigate the liquidity cycle and related build-ups of risk. (See Graph 1 above for an illustration.)

[36] In doing so, the level of policy rates, for example, could be assessed by way of Taylor rules or similar tools, while other measures might be benchmarked against longer-term historical averages.

4. Policy responses to global liquidity

Global liquidity has a pronounced cyclical nature, while being subject to occasional adverse shocks. This, in turn, implies a *twofold objective* for policymaking from a financial stability perspective based on the two liquidity concepts adopted in this report:

- first, mitigate global *private liquidity* surges and cycles and their associated credit and asset price surges; and
- second, address sudden shortages of global liquidity and associated disruptions in financial systems and economic growth – this may involve the provision of *official liquidity*.

This calls for a *flexible policy approach* comprising *three lines of defence* that assign instruments as appropriate, as set out below.

The *first line of defence* is the prevention of excessive liquidity surges through strengthened regulatory frameworks. The current reform agenda clearly goes in the right direction. By enhancing the resilience and dampening the procyclicality of the financial system, both the frequency and severity of negative liquidity shocks as well as the amplitude of global liquidity cycles are likely to be reduced. The overall effect remains difficult to assess with any certainty, however, and will depend in part on how the reforms are implemented and to what extent displacement effects (such as increased liquidity provision through the shadow banking sector) can be avoided.

Domestic policies are a *second line of defence*. They include, inter alia, macroprudential measures and central bank liquidity provision. One issue is the extent to which individual countries will want to insure themselves against liquidity shocks by building sufficiently large stocks of foreign reserves. This decision will depend in part on the degree to which other mechanisms are perceived as providing unconditional access to official foreign currency liquidity in a way that is comparable to precautionary reserve holdings. While it is not clear whether any particular instrument could serve as a substitute under all conditions, a combination of the mechanisms discussed below may well reduce the incentives for precautionary reserve accumulation over time.

Cooperative measures for the provision of liquidity in crisis situations provide the *third line of defence*, in cases when global liquidity shortages have actually materialised. The recent crisis experience has shown that central banks' ability to elastically supply potentially very sizeable amounts of foreign currency liquidity at short notice can successfully assure credibility among financial market participants. Direct liquidity provision by foreign central banks can have strong and lasting effects on market confidence. This advantage has to be balanced, however, by the necessity of avoiding moral hazard, preserving monetary policy autonomy, and controlling financial risks for the liquidity-providing central bank. Conditional liquidity support remains the responsibility of the IMF, including its new and enhanced precautionary facilities. Regional arrangements, in turn, can provide an additional source of official funding assistance, in case of asymmetric shocks inside that region.

4.1 Mitigating global liquidity cycles through a stronger regulatory framework

The importance of private liquidity creation suggests that measures affecting the risk-taking and resilience of the financial sector can play a key role in mitigating global liquidity cycles. Improvements in regulatory frameworks can be expected to limit the destabilising effects of global liquidity in two complementary ways:

- *greater resilience of financial institutions* will reduce the probability and frequency of sudden global liquidity shocks; and
- *reduced procyclicality of the financial system* will help to stabilise global liquidity flows, thus mitigating the magnitude of liquidity shocks.

A first set of measures, including in particular banking regulation and supervision, targets individual financial institutions. The Basel Committee's reforms to strengthen global capital and liquidity regulations (Basel III) are among the most important of the current financial reform efforts. A second

group of policies takes a system-wide or macroprudential perspective, aiming at risk-taking incentives and enhanced resilience in the financial system as a whole. Banking regulations typically aim at strengthening the resilience of individual institutions, while macroprudential policies are often associated with measures to reduce procyclicality. In practice, however, this distinction is not clear-cut, and the regulatory reform framework includes elements of regulation that should reduce procyclicality, while a number of macroprudential measures should also strengthen the resilience of the financial system.

4.1.1 Enhancing resilience and reducing the likelihood of liquidity shocks

Capital-related measures are the core of the Basel III reforms and include higher capital ratios (and a tighter definition of capital), countercyclical capital buffers and additional capital to further enhance the loss absorbency capacity for institutions that are deemed systemically important from a global perspective. These measures can be expected to strengthen resilience in the following way: more stringent capital requirements will help to ensure that financial firms are better prepared to withstand financial shocks. Specifically, higher capital levels can be expected to mitigate counterparty risk concerns and help to ensure bank access to funding markets in stressed market environments. This should reduce the risk of private liquidity drying up and the need to rely on public sources of funding.

Liquidity-related measures. Liquidity regulation, as introduced as part of Basel III, aims to constrain the ability of the banking system to provide maturity transformation services, which will tend to reduce the amplitude of boom-bust cycles in global liquidity provision. Both the newly established liquidity coverage ratio (LCR) and the net stable funding ratio (NSFR) are important in this context.

The LCR requires banks to have sufficient high-quality assets to fund projected cash outflows over a 30-day period, with different "run-off" rates assumed for different liabilities. It is aimed at the ability of banks to withstand periods of funding stress and will tend to reduce the likelihood of a collapse in private liquidity as well as the need for injections of official liquidity should such a collapse nonetheless occur. The NSFR, in turn, is specifically designed to prevent excessive maturity transformation by requiring a minimum amount of "stable" funding sources, taking into account the liquidity profile of the assets and off-balance sheet commitments, over a one-year horizon. As such, the requirement should help limit over-reliance on short-term wholesale funding associated with the upswing in private liquidity, thus dampening liquidity cycles.

The overall effect of these new rules on global liquidity cycles, however, will importantly depend on how the rules will be implemented. For example, the extent to which buffers would dampen the effects of adverse liquidity shocks would depend on the ability to run down liquid assets. A related issue concerns the ability of international banks to pool and transfer liquidity internationally in the event of a shock. National liquidity regulation can potentially create pools of liquidity that international banks cannot use to cover liquidity shortfalls in other jurisdictions.[37] An important feature of the Basel Process is the effort to coordinate supervisory initiatives at the international level and maintain a level playing field.

Measures targeting shadow banks. Any dampening effects of banking regulation on the amplitude of liquidity cycles will be reduced to the extent that risks to the resilience of the financial system originate from outside the banking sector. Particularly in boom periods, intermediation tends to shift into the unregulated or less regulated parts of the financial system (ie the *shadow banking* sector), as non-regulated institutions will tend to fill the void left by regulated entities and those subject to tight supervision. Similarly, regulation-induced financial innovations may emerge, circumventing new and existing rules and therefore diminishing the ability of the new regulations to moderate liquidity cycles.

Overall, this would seem to necessitate more thorough monitoring and supervision of key non-bank financial institutions (as well as related markets and financial innovations) to facilitate the earlier

[37] For a discussion of these effects, see CGFS (2010d).

detection and correction of build-ups of liquidity risk in the wider financial system – for example, by placing parts of the shadow banking system under supervisory oversight, as currently under consideration by a dedicated FSB workstream. It also supports measures already taken to improve the resilience of major providers of short-term financing to banks and other financial institutions, such as tighter regulation of money market mutual funds.

4.1.2 Reducing the cyclicality of global liquidity flows

Capital-related measures. Among the various parts of the Basel III reform package, the countercyclical buffer – up to 2½% of risk-weighted assets and comprising common equity – is the one most specifically targeted at dampening liquidity cycles. It will tend to mitigate the expansion in bank balance sheets and the build-up of leverage during boom periods. It will be imposed when national authorities determine that credit growth is contributing to an unacceptable increase in systemic risk. The resulting increase in capital requirements will tend to raise lending costs for both domestic and foreign financial institutions with exposures to the domestic economy (owing to jurisdictional reciprocity). While most of the impact of the buffer on credit growth will typically come through domestic institutions, the increase in capital requirements would also tend to reduce the supply of direct and indirect cross-border lending, thus moderating the international component of private liquidity.[38] Overall, cyclical increases in the demand for interbank and other forms of wholesale funding should also be moderated.

Other measures of the Basel III framework can also help to dampen procyclicality, even when not specifically designed for this purpose. This includes the capital conservation buffer, which – because drawdowns will incur costs in the form of restrictions on capital distributions to shareholders – will tend to incentivise bank managers to avoid such drawdowns in the first place. The same applies to the minimum leverage ratio, which should help limit the build-up of imbalances in the expansion phase of the global liquidity cycle by limiting the effects of over-optimistic point-in-time risk measures for bank balance sheets.[39]

Macroprudential policy. There is now widespread agreement that prudential policies – even under the revised Basel framework now being phased in, and taking into account any additional measures to address shadow banking – will have to be complemented by measures that provide a more distinct macroprudential orientation directed at limiting systemic or system-wide financial risk. The Basel III framework as such goes some way in this direction by providing a macroprudential overlay targeting both the cross-sectional (eg higher capital requirements for trading and derivatives exposures, surcharge for systemically important institutions) as well as the time-series dimension (eg the countercyclical capital buffer) of systemic risk.[40] Other measures, such as revised accounting rules (ie expected loss provisioning) are aimed at further reducing procyclical balance sheet growth.[41]

Macroprudential policy frameworks have been established in a number of countries and further policy tools are under active development, targeting country-specific vulnerabilities such as procyclical lending behaviour in property markets (eg LTV ratio limits) or the impact of capital flow volatility on

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[38] Other parts of the Basel III framework will have similar effects. For example, new trading book capital rules subject the assets held in banks' trading books to stressed value-at-risk capital requirements, and securitisation exposures will be subject to capital charges more consistent with those in the banking book. As inadequate capital charges in these areas exacerbated the recent upswing in private liquidity, these new rules will have a moderating impact during future cycles.

[39] See BIS-FSB-IMF 2011.

[40] Macroprudential policy is typically thought of as having two dimensions: first, how risk is distributed in the financial system at a given point in time (the cross-sectional dimension); and second, how this risk evolves over time (the time-series dimension).

[41] See eg CGFS (2010c) and BIS-FSB-IMF (2011).

domestic financial systems (eg levies on short-term foreign currency borrowing).[42] Taken together, these macroprudential policy measures are likely to help further reduce the risks of asset price surges and the procyclicality of banking system behaviour, hence dampening liquidity cycles and the transmission of negative shocks across institutions.

4.2 Addressing liquidity shortages with instruments for providing official liquidity

Although the financial reform agenda will help reduce the probability and potential impact of adverse liquidity shocks to the financial system, disruptions in the supply of private liquidity cannot be ruled out. This underpins the need for adequate means to provide and distribute official liquidity in a domestic and international context, should a sudden withdrawal of private liquidity threaten financial stability. The following considerations will be important in this context:

Idiosyncratic versus global shocks. Liquidity is inherently fragile. Concerns about the solvency of a country or an individual financial institution can lead to runs or sudden stops, which can give rise to self-fulfilling crisis developments with multiple equilibria and the danger of a vicious liquidity cycle emerging. One key conceptual distinction, therefore, is between idiosyncratic, or relatively small-scale or regional, liquidity shocks hitting a limited number of countries, and global shocks, as experienced during the recent crisis. As a result, the appropriate policy responses will have to be calibrated according to the possible size and nature of the liquidity shock, distinguishing tools for the distribution of liquidity from those that create (official) liquidity.

Domestic versus foreign currency shocks. For domestic currency liquidity shocks, deposit insurance and the central bank acting as a lender of last resort can avoid bad equilibria. Central bank provision of domestic currency official liquidity – in potentially unlimited quantity – can take three main forms. First, operations designed to implement the central banks' desired monetary policy stance (*monetary policy operations*). Second, operations designed to aid the functioning of markets (*market-maker of last resort operations*). Third, operations designed to provide a liquidity backstop to individual banks (*liquidity backstops*). These mechanisms act to redistribute central bank reserves, or to increase the overall amount of central bank reserves. In practice, some operations may serve more than just one of these functions.

Shocks to global liquidity typically involve large foreign exchange liquidity shortfalls. The ability of domestic authorities to address such shortages is constrained by their access to foreign currency liquidity. Several mechanisms, discussed in more detail below, can be devised to deal with the risk of foreign currency shortages: (i) self-insurance through precautionary holdings and drawdowns of foreign reserves; (ii) mechanisms that distribute foreign currency liquidity, such as recourse to IMF funding or regional support arrangements; and (iii) direct arrangements among central banks.

Moral hazard. The provision of official liquidity in times of stress at the international level is subject to very much the same trade-off between *ex ante clarity* and *moral hazard* both for governments and for the financial sector. Specifically, a perception that prearranged international liquidity support ensures unconditional availability of funds in times of crisis could cause an unwelcome delay in needed domestic adjustments and in reducing existing imbalances. It could also fuel risk-taking, and tempt banks and other financial institutions to run larger currency and maturity mismatches. In addition, ex ante arrangements to expand official liquidity provision may not prove tailored enough to address the specific nature of future liquidity shortages. They would also interfere with the balance sheets and mandates of the liquidity-providing central banks, constraining their ability to maintain effective control over domestic monetary conditions and exposing them to financial risks. While this argues strongly for *constructive ambiguity* in any response to liquidity shortages, some have suggested that policies that

[42] One issue in this context is that cross-border credit flows, which have been shown to be particularly cyclical in Section 3 above, may fall outside the policy perimeter of the domestic authorities. This highlights the importance of reciprocity arrangements across countries in their macroprudential policies.

overemphasise the ambiguity concept may run the risk of creating economic inefficiencies.[43] As a result, policymakers may want to find a balance between the need to prepare the technical aspects of liquidity support ex ante and the risk of feeding undue expectations about the availability and terms of such support in crisis situations.

4.2.1 Precautionary foreign exchange reserve holdings

The amount of foreign currency assets held by central banks has risen sharply in recent years, with the consequence that these assets are assuming a much more important role in central bank balance sheets and in monetary policy operations. The continuing pace of reserve accumulation is difficult to rationalise, although there is no consensus on what constitutes an adequate level of reserves. While part is due to exchange rate regime choice and the macroeconomic policy stance, certain jurisdictions have also expressed the desire to accumulate reserves for precautionary purposes (self-insurance).

Reserve holdings impose externalities on other countries, while possibly being costly also for the accumulating country itself. As mentioned above, the reinvestment of reserves may distort asset prices in the reserve-issuing countries, and the management of these reserves can present operational challenges for reserve-accumulating central banks (eg by subjecting them to exchange rate and valuation risks). Similarly, reserve purchases can result in reduced interest income (ie negative carry) for the accumulating central bank and may expose it to capital losses should the domestic currency eventually strengthen.

Precautionary reserve accumulation can provide the following significant and tangible benefits: (i) reserve purchases allow a country to insure itself against a destabilising run on its domestic currency and, more generally, can serve as a public demonstration of a commitment to financial stability; (ii) reserve holdings give an ability to provide foreign currency liquidity to domestic corporate and financial institutions, particularly in times of economic stress; and (iii) reserves may influence market sentiment and reduce risk premia: high levels help reassure foreign creditors and investors because they can be drawn down without depending on other countries or international agencies, thus allowing governments and the private sector to access funding markets at lower spreads or on easier terms.

However, while providing broad confidence-enhancing benefits, there are also factors that may complicate the use of foreign exchange reserves in times of crisis. For example, reserve holders may be judged by investors and credit rating agencies according to their level of reserves relative to others. As a result, countries may feel the need to accumulate ever higher levels of reserves, while being reluctant to use their reserves if this were perceived by financial markets as a negative signal of their financial soundness or of banking sector health. The fear of losing reserves can thus impede their usage and limit their efficiency so that alternative liquidity buffers may be desired and needed. Similarly, reserves may not be deployed all that quickly in the event of a global liquidity shock, and drawdowns of such reserves by multiple countries at the same time may depress prices of foreign reserve assets.

In the course of 2008, some emerging market economies did make use of their reserves to help firms having difficulties accessing funding. However, their use was relatively modest, and even countries with sizeable reserve holdings felt it necessary to seek other support mechanisms, such as IMF lending and swap lines with reserve-issuing central banks. This raises the question of whether and to what extent such other sources of foreign currency liquidity could substitute for the accumulation of precautionary reserves, thus helping to limit some of the costs and externalities imposed by large foreign exchange reserve holdings.

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[43] See eg Vinogradov (2010), who finds that ambiguous regulation on insolvency resolution can produce underinvestment, since both bankers and depositors overestimate their possible losses. These concerns, however, may not apply in the context of measures for the provision of liquidity in times of a global liquidity crisis.

4.2.2 Arrangements for distributing foreign currency liquidity

Regional financial arrangements (RFAs). RFAs provide for mutual assistance among countries (eg via regional pools of foreign exchange reserves) through the provision of foreign currency official liquidity in times of crisis. Existing RFAs are heterogeneous, covering countries in regions such as East Asia, Latin America, North America and the Middle East. With few but major exceptions, these RFAs played little role during the recent crisis, and even the size of the larger arrangements remains small relative to the possible liquidity needs that members may be facing.

Despite their relatively small size, RFAs offer a number of advantages, such as regional expertise and ex ante clarity that can provide confidence-enhancing effects and help address idiosyncratic or regional liquidity shocks. Their ability to deal with international or global liquidity shocks, however, may be limited. For example, owing to regional risk pooling, they may be less able to cope with shocks hitting the region as a whole, unless countries are affected in a sufficiently asymmetric fashion.

Recourse to IMF facilities. The IMF provides support to solvent but illiquid economies through conditional lending, based on existing or committed supplies of official liquidity. The existing policy toolkit has recently been extended, including through the creation and enhancement of facilities that provide for support on an *ex ante* basis for *qualifying countries* with strong and relatively strong macroeconomic fundamentals: these are, respectively, the Flexible Credit Line (FCL) and the Precautionary Credit Line (PCL).

The FCL is designed to provide IMF members that have strong economic fundamentals and a track record of good policies with a credit line that may be drawn on to deal with external financing needs brought on by events beyond the country's control. Unlike traditional IMF facilities, it is aimed at crisis prevention rather than crisis resolution, and the IMF is considering unilateral offers of FCLs to "systemically important" members and "crisis bystanders" to further reduce stigma. In the recent crisis, the FCL appears to have had a positive impact on sentiment towards some of the recipient countries. Mexico, for example, seems to have benefited from broad confidence-enhancing effects (in terms of continued access to offshore markets), even as the committed facilities were not used.

At the same time, there are two features that limit the effectiveness of prearranged facilities in the context of large-scale, global liquidity shocks. First, they have to strike a difficult balance between being too easy to obtain, thus causing moral hazard, and being too hard to access, defeating their purpose. The FCL was made available to countries with strong macroeconomic fundamentals and sound policy settings to rationalise both the lack of ex post conditionality and uniform lending rates. Second, the scale of available financing is naturally limited by the Fund's overall resources, existing governance arrangements and the desire of its members to limit moral hazard. Programme scale is thus hard or impossible to increase, especially under crisis conditions. Limited effectiveness in the context of global shocks is also in line with the observation that, during the last crisis, the amount drawn under central bank swap lines was much larger than the total amount made available under the FCL.[44]

Overall, IMF conditionality has been instrumental in containing moral hazard, and countries that qualified for support in the context of the recent crisis, such as Mexico, appear to have benefited from broad confidence-enhancing effects, even as the committed facilities were not actually drawn down. Offering access, rather than granting it on request, may help to further reduce stigma. At the same time, ex ante arrangements may run the risk of increasing moral hazard and are structurally inflexible, as future crisis needs may not be well addressed by instruments calibrated on the basis of past crisis responses. The same applies to programme size, which is likely to be insufficient in the event of a large-scale, global liquidity shock.

[44] Mexico had an FCL larger than the amount it ultimately drew via its Federal Reserve swap line, but chose not to use the FCL.

Special Drawing Rights (SDR). SDR are a mechanism for *mobilising* official liquidity in major reserve currencies, but not a tool for liquidity creation. Countries can choose to *exchange SDR* for one of the "usable" currencies that make up the SDR basket (US dollar, euro, yen and sterling) when faced with liquidity problems. They can maintain this "SDR drawdown" for an indefinite period of time, but are required to pay the SDR interest rate on this borrowing. In August–September 2009, the global stock of SDR was increased from SDR 21 billion to 204 billion, providing IMF members with an off-market mechanism for boosting their foreign exchange reserves. However, only about 2% of the SDR allocated in 2009 were actually converted into hard currencies during the crisis.

The limited drawdown of SDR during the crisis is consistent with a number of constraints that will also limit the degree to which future allocations of SDR can effectively support global liquidity. First, SDR are not a tool for liquidity creation. Ultimately, only the four central banks issuing the "usable" currencies can provide the large-scale liquidity needed to promote market confidence in a crisis. Sales of SDR allocations do not increase the global supply of constituent currencies, unless the SDR seller obtains the constituent currency from the issuing central bank and the issuer chooses not to sterilise the provision. (Sales of SDR to other central banks would merely transfer global liquidity, albeit between constrained and unconstrained countries.) Second, SDR are allocated to all IMF members, whether they have a need for liquidity or not, and the amount available to individual members that may require liquidity is limited. Third, the system depends on the continued willingness of designated members to purchase SDR (and, in some instances, run down their own reserves). Increasing the number of designated members and/or constituent currencies could help redress these problems, but would not solve the fundamental limitations of SDR in addressing global liquidity shocks (see below).

4.2.3 Arrangements among central banks.

During the recent crisis, foreign exchange swap arrangements between central banks were successfully used to address a large-scale shortage of liquidity in foreign currencies, notably following the process of deleveraging that resulted from the Lehman Brothers bankruptcy. The swap lines were applied flexibly, with country coverage and the amounts of liquidity being adjusted on a timely basis depending on the prevailing market conditions.[45] Importantly, they were regarded as a credible policy option by markets, generating strong confidence-building effects that were instrumental in ending the negative cycle of endogenous liquidity destruction that had developed.[46] They also relieved stigma concerns through their recognition as "tokens of trust" in central banks from countries with relatively strong economies that were facing temporary liquidity difficulties. Finally, they were designed to control the risk that official liquidity interventions would distort private sector behaviour and market functioning. Pricing was at a penalty rate which exceeded the cost of funds that would prevail under normal market conditions, providing for a natural exit mechanism by incentivising market participants to return to private sources of funding as market circumstances improved.

Given their success during the most recent crisis, one question that has been raised is whether central bank swap lines should become a more permanent feature of the international monetary system (ie some form of *pre-commitment*). In practice, however, even standing swap lines would be conditional, requiring the consent of both parties before draws could be made, making it difficult, and perhaps even impossible, to formally pre-commit to the precise circumstances under which standard swap lines could be drawn upon. Moreover, unconditional swap lines would force central banks to act as liquidity providers in favour of other countries, exposing these central banks to both financial and policy risks. In addition, as constructive ambiguity is a characteristic feature of the lender of last resort function of central banks at the domestic level, there is no reason to believe that a different approach

[45] Goldberg, Kennedy and Miu (2011) describe how the scope and size of the swap lines evolved in response to changing market conditions.

[46] See CGFS (2010b).

would be warranted in an international context. As a result, swap line arrangements can only be based on a "*no technical obstacles*" approach that would see central banks informally work out in advance any contractual specifics that could materially slow future policy responses.[47] In practice, central banks were able to work cooperatively to establish swap lines expeditiously during the crisis and encountered few technical obstacles. This recent experience is also likely to make the establishment of future swap lines even smoother.

Another question concerns the possibility of supplementing swap lines with other tools for the international distribution of liquidity. One of these is *repo transactions*, where one central bank provides collateralised liquidity in its own currency to another central bank to avoid fire sales of collateral assets in times of distressed market environments. In their simplest form, such repo transactions could involve the liquidity supplier's government securities held in the recipient central bank's foreign exchange reserves. Repurchase agreements involving other assets denominated in the currency of the liquidity supplier or high-quality assets denominated in the currency of the recipient country, subject to appropriate haircuts, could also be considered. While this would help central banks to mobilise the official liquidity embodied in their foreign exchange reserves, the downside is that such operations would tend to crowd out private repo markets and would not reduce the incentive for accumulating foreign reserves.

Another possibility is *cross-border collateral arrangements (CBCAs)*, under which central banks agree to provide liquidity to foreign financial institutions in their jurisdictions, against collateral assets held by foreign central banks participating in the arrangements. These can be effective tools for moderating cross-border capital flow volatility between countries by lessening financial institutions' funding mismatches across currencies and jurisdictions. However, such arrangements would expose the domestic central bank to credit and legal risks that are more appropriately placed with the foreign central bank, which, as the key liquidity provider (and in many cases regulator) of the recipient country's financial sector, is better placed to determine its creditworthiness and liquidity needs.

Both types of arrangement have been put in place on a bilateral basis among individual central banks. However, their viability can be subject to technical and legal constraints that would seem to limit applicability and standardisation across a larger number of central banks. In addition, given comparative advantages in terms of information access and processing, reserve-providing central banks will tend to favour solutions that assign primary responsibility for the distribution of liquidity to liquidity-receiving central banks, thus reducing the attractiveness of CBCAs relative to other measures.

[47] Central banks receiving foreign currency, in turn, may wish to consider adjusting their collateral policies in order to make their lending more effective. Specifically, they could consider whether expanding the range of assets eligible for central bank loans to include instruments denominated in the foreign currency might usefully broaden the base for central bank lending in that currency, without compromising risk management.

5. Conclusion

Concerns over global liquidity have increased over recent years. At the same time, conceptual ambiguities run the risk of leading to unfounded and potentially destabilising policy initiatives.

What is needed is a consistent policy framework for addressing global liquidity. The financial reform agenda and evolving macroprudential policy frameworks clearly work in the direction of reducing vulnerabilities associated with global liquidity cycles, through both enhanced financial sector resilience and reduced procyclicality. This provides the first line of defence, even though additional policy action will be needed at both the domestic and international levels to better deal with both surges and disturbances of global liquidity provision. This implies a key role for central banks as macroprudential and monetary policymakers and through their involvement in financial regulation and supervision. Specifically, while country-specific or regional shocks may be addressed through self-insurance and existing arrangements for the international distribution of liquidity, such as IMF programmes and similar facilities, global liquidity shocks will require interventions by institutions with the ability to supply official liquidity in an elastic manner and in potentially very sizeable amounts to break downward liquidity spirals. Only central banks have this ability.

Central banks, working cooperatively through the Basel Process, thus remain well placed to address future surges and shortages in global liquidity. The established cooperative process ensures that central banks understand each other's reaction functions and economic outlooks, and develop and discuss their own views on how the monetary stance in individual economies can have spillover effects across jurisdictions. This provides the context within which they can set their own policy in a manner consistent with their financial and price stability objectives. It also provides a proven and effective forum for cooperation between central banks in times of crisis and in their role as lenders of last resort.

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Appendix 1:
Mandate of the CGFS Ad-hoc Group on Global Liquidity

Background and objective

Progress on reforming the International Monetary System is a priority for the G20 in 2011, including improvement in the management of global liquidity. In this context, Governors have asked the CGFS to investigate the measurement, drivers and policy implications of global liquidity. The Committee's work will inform discussions among Governors of policy implications with a view to providing input into the G20 deliberations.

Mandate

The Ad-hoc Group on Global Liquidity will analyse global liquidity primarily from a financial stability perspective. Specifically, the group will (i) articulate how the concept of global liquidity can be defined and identify measures/indicators that can be used to monitor global liquidity, (ii) identify key drivers of global liquidity and (iii) discuss the policy implications of the analysis. The Group would proceed in two stages as follows:

Stage 1: Concept, assessment and drivers

- Discuss alternative definitions of global liquidity and how they are related, taking a financial stability perspective:
  - Propose appropriate measures/indicators for these various liquidity concepts.
  - Consider ways for assessing global liquidity on the basis of these measures.
- Identify and discuss key drivers of global liquidity (eg monetary policy stance, financial regulation, financial innovation (including derivatives), risk appetite over the cycle):
  - Discussion of "equilibrium"/"excess" liquidity concepts.
  - The evolution of global liquidity over time.

Stage 2: Policy implications of global liquidity

On the basis of Stage 1 conclusions:

- Consider potential mechanisms for dealing with global liquidity surges and shortages (eg reserve holdings, central bank swap lines, financial safety nets, SDRs and IMF lending capacity).
- Identify implications of the financial reform agenda for global liquidity (eg macro and micro regulation, macroprudential policy, evolution of shadow banking).

Process

The Group will be chaired by Jean-Pierre Landau (Banque de France). Governors would receive an interim report on stage 1 results in late June, which would also form the basis for an interim input into the G20 discussion in July. A final draft report would be prepared for the CGFS meeting in September 2011. The Group's work would also form the basis for a discussion at the September Governors' meetings. Based on these discussions, Governors could decide to submit the report (with amendments if necessary) to the G20 in mid-October.

Appendix 2:
Members of the CGFS Ad-hoc Group on Global Liquidity

Bank of France	Jean-Pierre Landau (Chair)
Reserve Bank of Australia	Chris Ryan
National Bank of Belgium	Janet Mitchell
Central Bank of Brazil	Katherine Hennings Eugenio Pacceli Ribeiro (alternate)
Bank of Canada	Allan Crawford
People's Bank of China	Jin Zhongxia
European Central Bank	José Manuel González-Páramo Marcel Fratzscher (alternate)
Bank of France	Matthieu Bussière
Deutsche Bundesbank	Edgar Brandt
Reserve Bank of India	Gurumoorthy Mahalingam Jagan Mohan (alternate)
Bank of Italy	Eugenio Gaiotti
Bank of Japan	Hidehiko Sogano Shun Kobayashi (alternate)
Bank of Korea	Hansoo Kim Dongsoo Hong (alternate)
Central Bank of Luxembourg	Francisco Nadal De Simone
Central Bank of Mexico	Jaime Cortina
Netherlands Bank	Maarten Gelderman Iskander Schrijvers (alternate)
Bank of Spain	Adrian Van Rixtel
Swiss National Bank	Samuel Reynard
Bank of England	Paul Fisher Martin Brooke (alternate)
Board of Governors of the Federal Reserve System	David Bowman
Federal Reserve Bank of New York	Spence Hilton
Bank for International Settlements	Dietrich Domanski Ingo Fender Patrick McGuire