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INTERNATIONAL LIQUIDITY

Philipp Hartmann

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INTERNATIONAL LIQUIDITY

Abstract

Global or international liquidity has moved to centre stage in recent international policy, research and market discussions. Contrary to the approach of major international organisations, which focus particularly on cross-border credit, this paper discusses five dimensions of international liquidity that are all of interest to central banks and should be subject to appropriate surveillance. It describes how they have evolved before, during and after the financial crisis. No general shortage of liquidity is found for the recent past and diverse developments can be explained, in part, by a small number of factors. The paper also raises salient policy issues related to these international liquidity developments. For example, financial regulation needs to be designed in a way that preserves incentives for market-making in major international assets. Data need to be made available for properly analysing to which extent global collateral re-use “lubricates” the financial system and to which extent it may act as a conduit for contagion. Ways need to be found how soaring corporate cash hoarding can be brought back into real investment. International spillovers of unconventional monetary policies suggest revisiting the current consensus on international monetary policy coordination. As the economic recovery in advanced economies strengthens consolidating public finances may be a more sustainable approach to re-increasing the availability of liquid and safe international assets than the further issuance of sovereign bonds by large countries that have already high levels of debt.

JEL Classification: F21, F32, F33, G15, G28, E42, E51, E52

Keywords: Financial market liquidity, funding liquidity, money supply, Unconventional Monetary Policy, international payments, Collateral, liquidity hoarding, international financial stability, global financial cycle, international safe assets

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International Liquidity

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Abstract: Global or international liquidity has moved to centre stage in recent international policy, research and market discussions. Contrary to the approach of major international organisations, which focus particularly on cross-border credit, this paper discusses five dimensions of international liquidity that are all of interest to central banks and should be subject to appropriate surveillance. It describes how they have evolved before, during and after the financial crisis. No general shortage of liquidity is found for the recent past and diverse developments can be explained, in part, by a small number of factors. The paper also raises salient policy issues related to these international liquidity developments. For example, financial regulation needs to be designed in a way that preserves incentives for market-making in major international assets. Data need to be made available for properly analysing to which extent global collateral re-use “lubricates” the financial system and to which extent it may act as a conduit for contagion. Ways need to be found how soaring corporate cash hoarding can be brought back into real investment. International spillovers of unconventional monetary policies suggest revisiting the current consensus on international monetary policy coordination. As the economic recovery in advanced economies strengthens consolidating public finances may be a more sustainable approach to re-increasing the availability of liquid and safe international assets than the further issuance of sovereign bonds by large countries that have already high levels of debt.

Key words: Financial market liquidity, funding liquidity, money supply, unconventional monetary policy, international payments, collateral, liquidity hoarding, international financial stability, global financial cycle, financial regulation, international safe assets

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Liquidity is an important concept in economics with high relevance for many policy issues, including for central banks. At a general level it refers to the ease with which goods and assets can be exchanged. It has proven to be a challenge, however, to develop a commonly agreed and used definition of it, partly because liquidity has a number of different facets.¹ It has microeconomic and macroeconomic, financial and monetary as well as important international dimensions. In this paper I want to look at international liquidity.

International liquidity problems were a recurrent subject in modern economic history. Frequently, these were discussed in terms of potential shortages or excesses of the main reserve asset(s) supporting an international monetary standard. For example, Cassel (1928) worried about the shortage of gold after the re-establishment of the gold standard in the inter-war period. Or Triffin (1960) warned that under the Bretton Woods system of fixed exchange rates the supply of US dollars that would be needed for financing imbalances of international payments could become larger than the stock of gold that the United States had available for redeeming dollars at the agreed parity. It was also discussed whether an international lender of last resort was needed for providing liquidity to support international banks or countries in crises (e.g. Kindleberger 1978 or Fischer 1999).

Recently, international liquidity issues have moved to centre stage again. Particularly, major international organisations developed surveillance frameworks for “global liquidity” (see CGFS 2011, IMF 2014b, BIS 2015 or the BIS Global Liquidity Indicators website <http://www.bis.org/statistics/gli.htm>). This surveillance activity pays special attention to cross-country (and aggregate international) bank credit. The policy objective seems to be international financial stability.² Some academic research substantiated this particular perspective (Bruno and Shin 2016 or Claessens et al. 2016). Other academic work has reconsidered the debate on the availability of sufficient reserve currency/assets in today’s floating exchange rate system (e.g. Farhi et al. 2011 or Eichengreen 2012) and discussed the roles that a lack of safe government bonds (Eichengreen 2016) or the emergence of new international currencies, such as the Chinese renminbi (Taylor 2013), may play in it. In fact, ensuring a sufficient amount of international liquidity may have to be backed up by fiscal capacity (Obstfeld 2011).

While I include credit flows as one important dimension and the availability of sufficient reserve assets as another in the discussion of this paper, I argue that an encompassing international surveillance framework for liquidity should take a broader perspective. I first distinguish six major dimensions of international liquidity. I chose those because each of them corresponds to an important dimension of liquidity and relates to major contemporaneous policy questions. Then I focus on five of them, review their evolution

¹ For example, the New Palgrave Dictionary of Economics (<http://www.dictionaryofeconomics.com/dictionary>, Durlauf and Blume 2008) has entries for liquidity constraints, thin markets, money or the liquidity trap but not one on liquidity more generally.

² For further discussions of global liquidity from a monetary policy or financial stability perspective, see ECB (2012) and ECB (2011), respectively.

before, during and after the recent financial crisis and briefly sketch some major policy issues they raise at present, including with respect to the roles of central banks. I end with some concluding remarks.

1. Dimensions of international liquidity

On the basis of the extant literature and recent practical policy debates I can see six dimensions of international liquidity, which are summarised in Table 1.

Table 1: Dimensions of international liquidity

1) International financial market liquidity	Ease of buying and selling key internationally traded assets
2) International funding liquidity	Ease with which financial intermediaries or non-financial corporations can receive funding from non-residents or in international currencies
3) Private monetary liquidity	Cross-country trends of holdings of liquid assets by financial intermediaries, non-financial corporations or households
4) Central bank liquidity	Cross-country trends in (aggregate) provision of money/liquidity by key central banks in international currencies
5) International payments liquidity	Availability of generally accepted means for settling international payments (or of safe assets that are easily convertible in such means)
6) International public liquidity support (not covered in this paper)	Funds provided by or available from central banks for short-term support to financial intermediaries in foreign currencies (could also be defined including short-term support of international organisations to countries for managing balance of payments or budget crises)

Source: Author.

The first I denote as International financial market liquidity. It refers to the ease with which assets that are of key importance for the international monetary and financial system, such as government bonds or blue chip stocks from major economies, can be traded. These assets play important roles in international investment portfolios, for example because of the size of their domestic markets, their high credit worthiness or the good legal and

governance frameworks they are subject to. A vast number of investors depend on the liquidity of the markets in which they are traded.

The second dimension I call international funding liquidity. It describes the ease with which financial intermediaries or non-financial corporations can receive funding from non-residents or in international currencies. This very much coincides with the global liquidity concept used by the Bank for International Settlements (BIS) or the International Monetary Fund (IMF), as referred to in the introduction. It can also be seen as the international dimension of what used to be called general financing conditions in the literature.

The third dimension in Table 1 can be described as private monetary liquidity. Here I mean the cross-country trends in buffers of liquid assets that financial intermediaries, non-financial corporations or households hold. For example, firms or households in several major countries could sometimes particularly “hoard” cash and therefore be relatively resilient to shocks or in other times be vulnerable to shocks when their liquidity holdings are low.

Fourth, central banks provide base money as part of their monetary policies and sometimes also emergency liquidity to restore financial stability in crisis situations. Surely, cross-country trends in the total creation of money by central banks, notably those issuing major international currencies, are a salient factor in international liquidity. Since an important part of the overall creation of money is endogenous, as driven by the demand of the private economic sectors, I do not call this public monetary liquidity but central bank liquidity.

The fifth, and last, dimension of international liquidity that I cover in this paper can be regarded as the contemporaneous version of the availability of reserve assets that came up regularly in economic history (see the exemplary references in the introduction). While in the various forms of fixed exchange rate systems of the past certain amounts of reserve assets at the aggregate or individual country level were necessary for the agreed parities to hold, the application to today’s mostly floating exchange rate system is less direct. Still, a certain availability of generally accepted means for settling international payments will make international trade and capital account transactions easier. These means include, inter alia, the availability of widely accepted international currencies and of assets that are safe and can be easily converted into such currencies. I call this international payments liquidity.

There is also a sixth dimension of international liquidity that I denote as international public liquidity support. This includes, for example, the swap agreements between central banks through which they provide liquidity in foreign currencies to financial intermediaries in their jurisdictions when private markets lead to shortages in those currencies. One could also include short-term assistance of international organisations, such as the IMF, to countries for which liquidity problems lead to balance of payments or budget crises in this category. In other words, this category may also be regarded as the liquidity aspects of what is now

often referred to as the global financial safety net³ and what the historical literature described as international lender of last resort (see the introduction). Unfortunately, there is not enough space in this paper to give justice to this topic in addition to the other five above.

For all these dimensions too much or too little liquidity may not be good for the global economy or single countries' economies. For most of them too much liquidity could lead, inter alia, to excessive financing (negative net present value investments being financed), financial stability risks or economic over-heating and inflation. Too little liquidity could lead to financing constraints or subdued economic activity and disinflationary pressures. Only private monetary liquidity is somewhat different in this regard, because too much of it may be associated with too little economic activity. Liquidity hoarding is more likely to be associated with low investment or low consumption.

What makes these liquidity dimensions international? I use three criteria. They need to refer to

- (i) the provision or receipt of funds or assets to or from abroad,
- (ii) to the provision or receipt of funds or assets in foreign or international currencies or
- (iii) to common developments among (several) major economies.

Whilst the six dimensions are distinct, they are by no means independent of each other. Quite important relationships and sometimes overlaps exist between them, which – in the interest of space – I will however not discuss further.⁴ Needless to say that any attempt to defining international liquidity and assessing it empirically is fraught with difficulty and there are certainly other valuable ways to describe the field.

2. International financial market liquidity

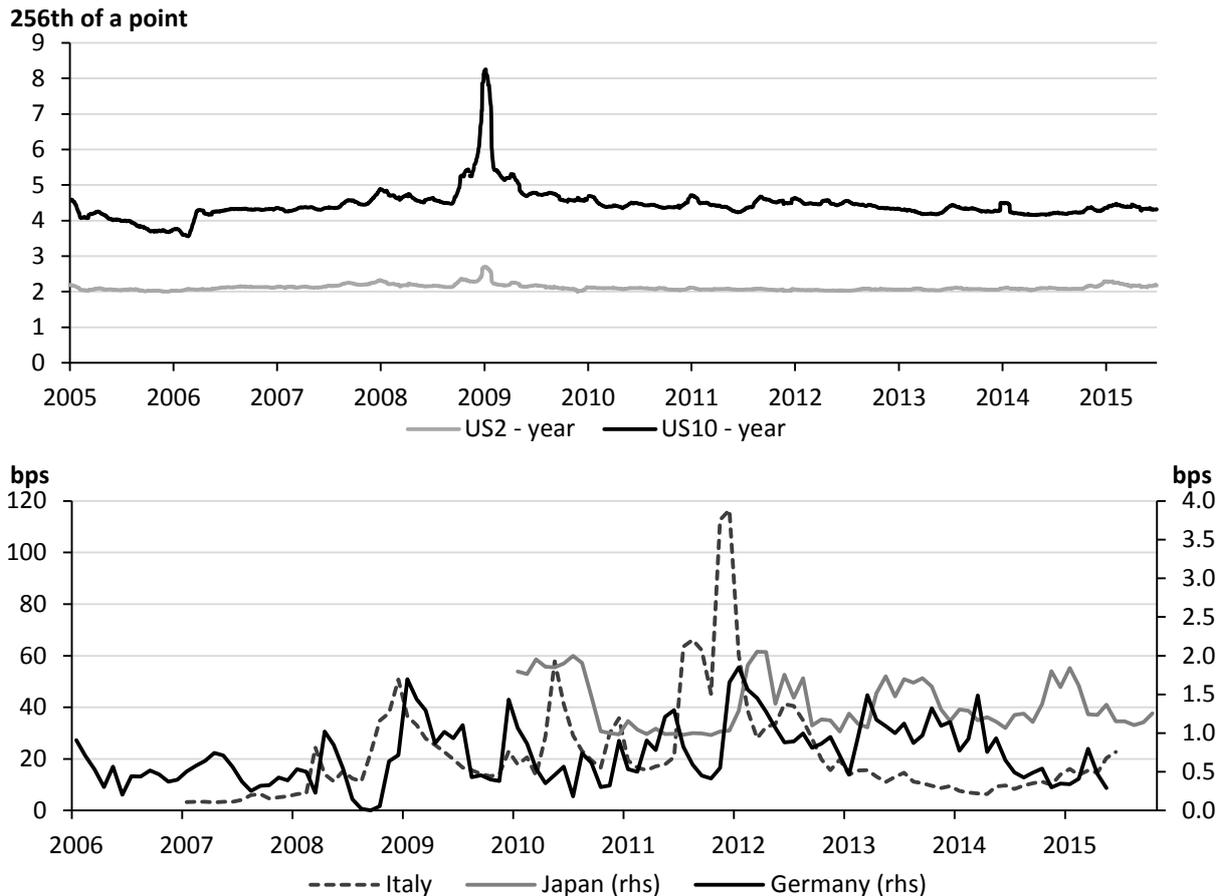
Financial market liquidity is typically measured with microstructure indicators such as trading volume, bid-ask spread or price impact of trades. At the international level the liquidity of major fixed-income and equity markets of the countries issuing the main international currencies and hosting the most important financial centres are of particular relevance.

³ For recent discussions of the global financial safety net, see for example ECB (2016), Enbee et al. (2016), IMF (2016) and Scheubel and Stracca (2016). Allen (2013) provides an extensive discussion of central bank swap lines.

⁴ For example, Korniyenko and Loukoianova (2015) analyse relationships between central bank liquidity, international funding liquidity and international payments liquidity. All the dimensions also mix demand and supply factors, albeit to varying degrees.

In what concerns fixed-income markets a recent cross-country study by the G-20 Committee on the Global Financial System finds that their liquidity had suffered significantly during the crisis but – using standard quantitative measures – has recovered recently to levels similar to before the crisis (CGFS 2016). Figure 1 provides an example of this for the transaction costs observed in benchmark government bond markets of Germany, Italy, Japan and the United States.

Figure 1: Bid-ask spreads of major benchmark government bonds



Notes: Bid-ask spreads are defined as the difference between ask and bid prices divided by the average of the two.

Sources: CGFS (2016) and Brokertec.

The average results for many such standard measures, however, are not consistent with widespread market commentary about liquidity deteriorations in fixed-income markets (e.g. Barclays 2015, ICMA 2016 or Hooper et al. 2016). In fact, they seem to mask some signs of fragility and “bifurcation” in liquidity. As regards the former, even the major benchmark bonds of AAA-rated sovereign issuers behind the two main international currencies have experienced occasional tangible market disruptions. For example, between 2014 and 2015

US treasuries exhibited an unusual “flash rally” event and German bunds a “sudden reversal”.⁵

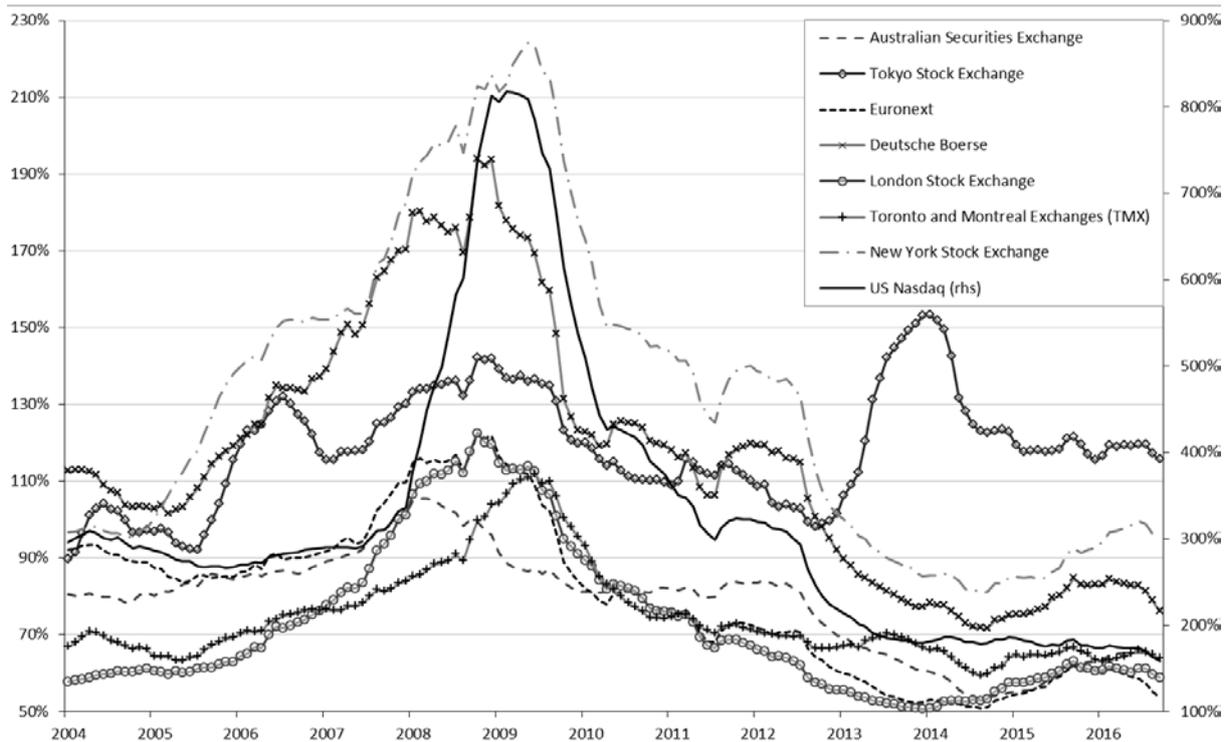
“Bifurcation” refers to the phenomenon that some market segments, in particular the ones that are traditionally less liquid, show signs of not sharing the normalisation of liquidity in the major segments. For example, Bao et al. (2016) estimate that for stressed US corporate bonds the price impact of trades have increased after the introduction of the Volcker rule. In line with market commentary, Adrian et al. (2016) find that trade sizes in US corporate bond markets remain low after the crisis. But they argue that this could also be explained by other factors than more difficult block trading (e.g. the increased role of high-frequency trading). Duffie (2016) presents evidence of reduced market making in the US general collateral repo market. Kurosaki et al. (2015) find that a host of less standard measures indicate a loss of liquidity in the Japanese government bond market and associated repo and futures markets since the fall of 2014.

Equity markets seem to have received a bit less attention in the recent international financial market liquidity debate compared to fixed-income markets. Aggregate turnovers in the major stock exchanges tend to be around or above their pre-crisis levels.⁶ But turnover velocity, the ratio of total trading volume and total market capitalisation, tends to be around or below pre-crisis levels (except for the Tokyo Stock Exchange). This aggregate measure of equity market liquidity is shown in Figure 2. A more granular discussion of liquidity developments across more market segments, combining practical experience and research, is provided by PricewaterhouseCoopers (2015). It finds mixed evidence for recent developments in equity market liquidity.

One point of concern is whether the growth of high-frequency or algorithmic trading over the last decade is positive or negative for equity market quality. In what concerns the specific question that is of most interest in the context of this article, my reading of the available empirical literature is that technical progress and electronic trading led on average to a measurable improvements of liquidity and trading costs in equity markets (e.g. Hendershott et al. 2011, Boehmer et al. 2013 or Menkveld 2016). This notwithstanding, aggressive forms of high-frequency trading (e.g. that exploit speed differences between operators) can give rise to manipulative trading strategies (such as order anticipation or momentum ignition) that can impair market integrity (SEC 2014, Miller and Shorter 2016) or deteriorate liquidity through “toxic” arbitrage opportunities (Foucault et al. 2016) or “back-running” large informed orders (Kervel and Menkveld 2016). Moreover, in stressed market conditions automated order execution can interact with algorithmic trading in a way that leads to extreme price movements and the quick erosion of liquidity (CFTC and SEC 2010).

⁵ Adrian et al. (2016) discuss two more recent market disruptions in US fixed-income markets.

⁶ The figures are available from the author upon request.

Figure 2: Turnover velocity in major stock markets

Notes: Turnover velocity is defined as aggregate electronic order book trading volume of domestic shares divided by their aggregate market capitalisation times 100. It is annualised and displayed as 12-month moving average in the figure.

Sources: World Federation of Exchanges and ECB calculations.

Another point of concern is the impact that the emergence of new trading venues is having on equity markets. The main issue is whether the competition and diversity benefits of this new “fragmentation” exceed potential costs in terms of reduced liquidity or price discovery problems. The literature, as surveyed by SEC (2013), seems to suggest that the emergence of “lit” venues⁷ have been beneficial, without any measurable losses of liquidity, as long as the overall fragmentation does not exceed certain thresholds. For “dark” venues,⁸ however, some negative effects on market quality have been found, including for measures of market liquidity, e.g. when they are not limited to block trading or exceed relatively low shares of total trading.

All in all, three main groups of factors tend to drive recent liquidity developments in major bond and equity markets. First, post-crisis (private) de-risking and (public) re-regulation reduce banks’ proprietary trading and market-making activities. For example, the enhanced risk sensitivity of major dealers seems to make them more reluctant to accept sizeable inventories so that it becomes more difficult to conduct large trades. Second, while technical progress and market transparency initiatives tend to lower trading costs in the long term (as discussed above), some forms of high-frequency trading and some “dark”

⁷ These are trading systems that display quotations in the consolidated quote streams.

⁸ These are trading systems that are not “lit”, as defined in the previous footnote.

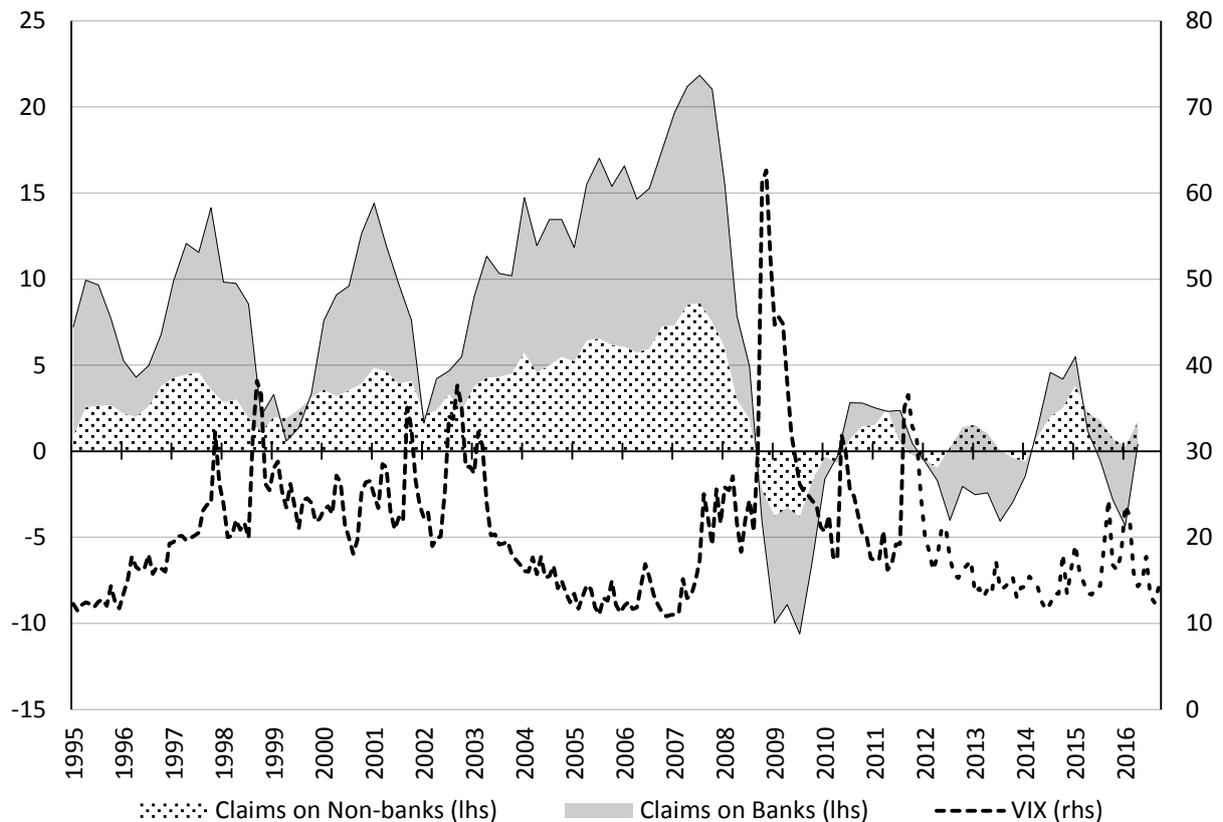
trading venues may also contribute to diverse liquidity outcomes. Third, novel unconventional monetary policies tend to have supportive short-term effects on many financial markets, but they can also add elements of fragility. First, asset valuations and liquidity may depend much more on market expectations about central bank behaviour, notably when expectations about turning points emerge (think, for example, of the US Federal Reserve's taper tantrum of 2013). Second, large amounts of assets are held on central banks' balance sheets and are not available as collateral or for trading (e.g. CGFS 2017 or Singh 2017).

Three policy directions seem to emerge from this discussion. First, while ensuring the safety of systemic banks remains an important objective of post-crisis regulatory reforms, it is of great importance that the regulatory environment preserves incentives for resilient market making. Second, whilst technical progress and electronic trading are overall beneficial for financial market liquidity, there need to be limits to some aggressive forms of high-frequency trading and "dark" trading venues should be reserved primarily to block trading. Third, central banks need to be particularly careful in communicating about their rather complex unconventional monetary policies and are well advised to adopt securities lending programs (as many actually do) through which they give some of the assets otherwise encumbered on their balance sheets back to the markets. (I shall come back to the issue of unconventional monetary policies in Section 5.)

3. International funding liquidity

International funding liquidity can be measured via quantities or prices. Quantities are typically captured with the amounts of funding that financial or non-financial corporations receive from abroad or in international currencies. The costs of borrowing are captured with the associated interest rates on loans or corporate bonds and the costs of equity financing via the associated returns.

Let us look at international bank lending first, which is shown in Figure 3, distinguishing the parts that go to other banks (grey area) from the parts that go to non-banks (dotted area). Three observations stand out from the figure. First, there is a pronounced cycle (which seems to behave counter-cyclically to general financial market uncertainty, as captured by the Chicago Board Options Exchange VIX indicator also displayed in the figure). Total cross-border bank credit fluctuates between +20 per cent and -10 per cent per annum. Second, interbank lending is more volatile than retail lending. Third, since the financial crisis the average growth rate and the volatility of this cross-border credit cycle have declined materially.

Figure 3: International bank lending

Notes: Bank claims include all BIS reporting banks' cross-border credit plus local credit in foreign currency. The data is quarterly but the two measures are expressed in year-on-year growth rates. Interbank and retail lending are stacked upon each other, so that the blue and pink regions show their relative growth contributions. The VIX is in per cent.

Sources: BIS (global liquidity indicators) and Chicago Board Options Exchange.

The volatile capital flows that are visible in Figure 3 provide a rationale for their surveillance and perhaps also for elements of the global financial safety net that can contain the potentially disruptive implications of violent credit flows in and out of countries and thereby help preserve international financial stability. Going beyond the bank credit in Figure 3, the Committee on the Global Financial System (2011) and the Bank for International Settlements (2015) developed a framework for assessing international funding liquidity (denoted there as "global liquidity") with the help of a multiplicity of indicators. The International Monetary Fund (2014) developed a surveillance dashboard of drivers, transmission channels and outcomes. Policy options for containing disruptive cross-border flows or limiting their effects include capital controls and prudential supervision and regulations (e.g. IMF 2012c, 2013 and 2015). In particular, the exposure of emerging market economies to an international financial cycle of capital inflows and outflows (e.g. Rajan 2014 or Rey 2013) may make high-quality domestic financial supervision and a pragmatic approach to some capital controls necessary for those countries. Sound domestic monetary and fiscal policies, while important, will probably not be enough (see also Section 5).

Let me turn from the widely debated “global liquidity” to an aspect of international funding liquidity that has received much less attention to date. This is the international availability and onward use of collateral assets. Many investors (such as hedge funds, insurance companies, pension funds or sovereign wealth funds) have assets in their portfolios which they will not wish to sell for some time. But they may have an interest in earning a further margin on them by lending them out for a while. Conversely, other financial operators that have short-term liquidity needs may desire to borrow such assets for using them as collateral in secured re-financing transactions. There is a global market for reallocating these collateral assets among lenders and borrowers, which primarily 10 to 15 major banks operate.⁹

Figure 4, whose right-hand side displays the numbers from Singh (2016a, Table 1), describes the activity in this market before and after the financial crisis, including both public and private assets. It shows estimates of the total volume of secured transactions (solid and dashed lines), the collateral pledged for onward use at the above major dealers (solid line with triangles) and the ratio between the two, which defines the collateral re-use rate (solid line with squares). Numbers for the last two categories are not available before 2007.¹⁰

Whereas the available collateral appears relatively stable, secured transactions declined dramatically after 2007 and never recovered (Singh 2016a). This implies the sharp reduction in the estimated rate at which collateral is re-used. One interpretation of this decline in the international “collateral velocity” or “collateral multiplier” (Singh 2011) is that the “lubrication” of international financial markets, e.g. the ease with which secured funding can be raised, has suffered after the financial crisis. For example, the Basel III re-regulation of banks includes the requirement to hold a minimum amount of high-quality liquid assets (Basel Committee 2013) and a limit to leverage (Basel Committee 2014a). Both limit balance-sheet space and increase the effective costs of onward use of collateral (Singh 2017).¹¹

Another interpretation is that collateral re-use and therefore the markets for secured transactions had grown out of proportion, which was corrected by the crisis and subsequent de-risking and re-regulation. Notice that the rough estimate of their size displayed in the dashed line shows a sharp upward trend between 2002 and 2006. Some observers have argued that excessive chains of collateral re-use helped build up leverage and interconnectedness and therefore turned into conduits of financial contagion during the

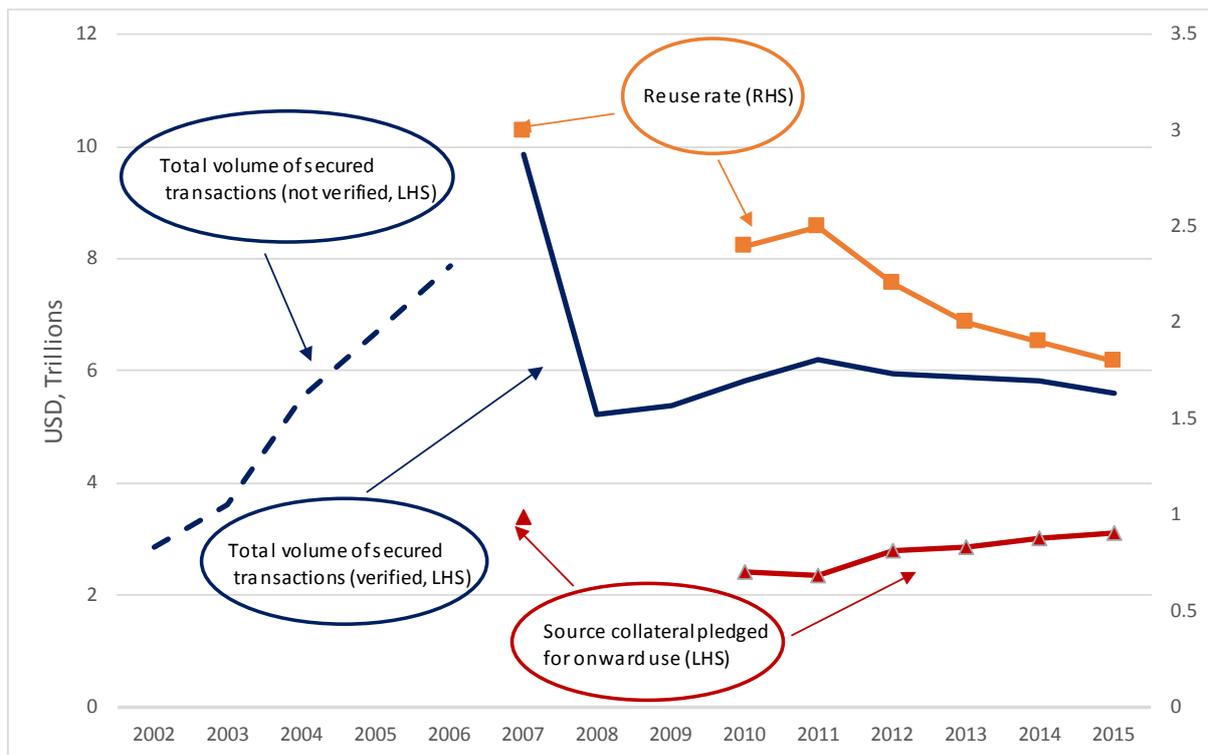
⁹ See Singh (2016b) for a detailed description of this market.

¹⁰ I am grateful to Manmohan Singh for authorising the reproduction of the figures since 2007 and for making the yet unpublished figures for the estimated volume of secured transactions before 2007 (dashed line) available. Note, however, that the latter figures (marked as “not verified”) could not be cleaned for potential reporting errors and may therefore constitute rough estimates.

¹¹ Duffie (2016) argues that the supplementary leverage ratio in the US led to a reduction in trading of repurchase agreements. As many repos are backed by high-quality treasury securities and therefore constitute low-risk low-return business (at the individual level), he reasons, they are not attractive for dealers to intermediate when these are subject to a constraining regulatory ratio that is not weighted for risks.

crisis (e.g. Gorton and Metrick 2012 or FSB 2016). Once market stress hits, the multiple uses of the same collateral assets mean that some collateral providers cannot promptly access their securities when they need them, borrowers cannot roll over their liabilities when they have to do so and the supposed coverage of exposures in the system turns out to be partial leading to unexpected losses.

Figure 4: Collateral available at and its re-use via major international dealers



Notes: The re-use rate is the ratio between the total volume of secured transactions and the collateral pledged at major dealers for potential onward use.

Sources: Singh (2016, Table 1) for data as of 2007 and unpublished pre-2007 data courtesy Manmohan Singh. The total volume of secured transactions is derived from annual reports of the most important international banks intermediating collateral (Bear Stearns, Lehman Brothers (both only 2007), Citigroup, Goldman Sachs, JP Morgan, Merrill Lynch/Bank of America, Morgan Stanley, Barclays, BNP Paribas, Credit Suisse, Deutsche Bank, HSBC, Royal Bank of Scotland, Société Générale, UBS and Nomura). The collateral pledged at these major dealers for onward use is calculated from proprietary data of hedge funds in major international financial centers and from data of the Risk Management Association (covering collateral pledged by pension funds, insurance companies, sovereign wealth funds etc.). Pre-2007 data are not cleaned from potential reporting errors.

There seems to be a trade-off here. Some re-use of collateral is required for supporting international funding liquidity. Too much re-use of collateral, however, may contribute to illusory liquidity and become a risk to financial stability. Baranova et al. (2016) estimate the supply chain of high-quality public bond collateral for 2014 data at around four, which means that a high-quality government bond available for re-use is on average re-used about

four times.¹² They argue that this might constitute a “required intermediation activity” and discuss how financial stress can lead to imbalances between collateral demand and supply and adversely affect dealers’ intermediation capacity.

The few available studies on the international re-use of collateral typically rely on incomplete data (that require simplifying assumptions), many of which are not publicly available. In order to gain a better understanding of the optimal level of international collateral re-use as a contributor to international liquidity and draw more firm policy conclusions, it is of great importance that better data become more readily available to research, policy and market communities. The Financial Stability Board (FSB 2016) recently engaged in an initiative for generating such data. It deserves strong support and should ultimately lead to the dissemination of sufficiently representative and granular data in the appropriate format so that the needed research on the value and risks of collateral re-use can be conducted.

4. Private monetary liquidity

In the framework that I presented in Section 1 private monetary liquidity is captured by the holdings of liquid assets by households, non-financial corporations and financial intermediaries. Liquidity holdings can be measured in a narrow or broader sense. Narrow measures incorporate cash holdings and current account balances, relative to total assets, equity or GDP. Broader measures add to them also other assets that can be easily converted into current account balances or cash.

Since some time the literature has pointed towards a secular increase of liquidity holdings by non-financial corporations in major economies (Bates et al. 2009, IMF 2011a and 2014a, Iskandar-Datta and Jia 2012 or Horioka and Terada-Hagiwara 2013). This is corroborated by Figure 5, which shows a narrow measure of corporate liquidity holdings in the G-5 economies. The common upward trend is clearly visible in all five countries, although this data starts only in 1999.

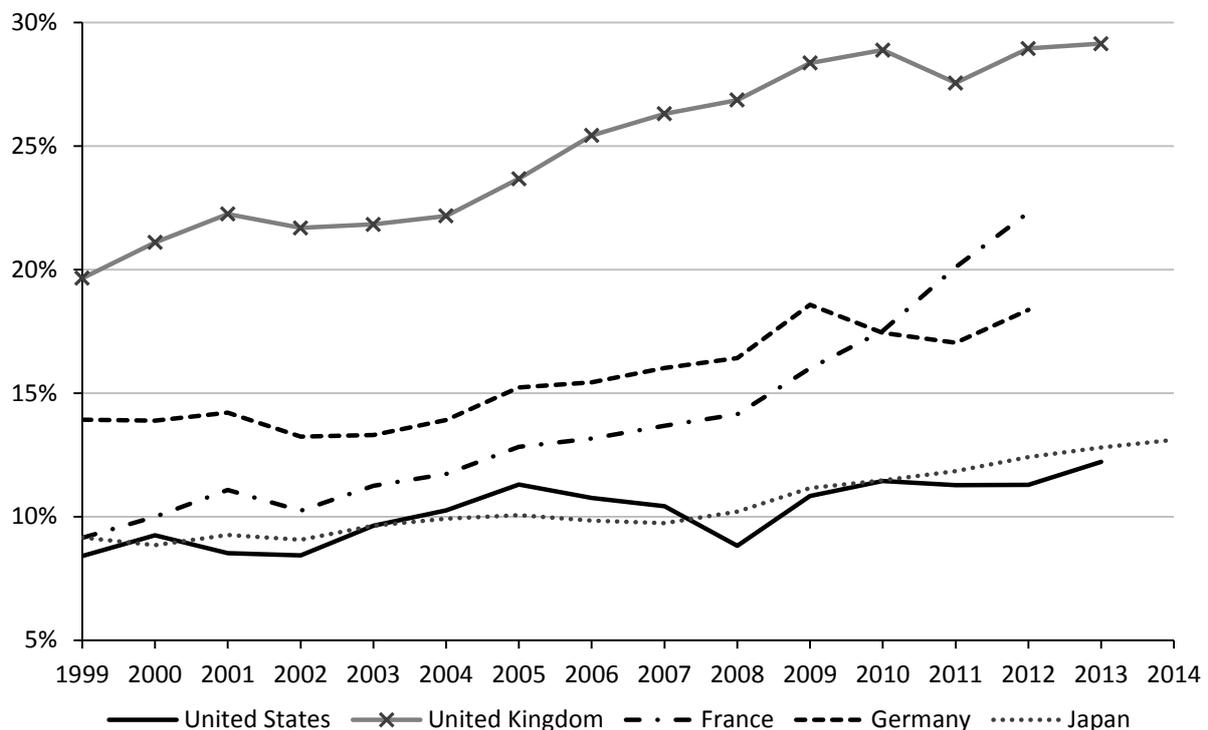
The phenomenon is to some extent paradoxical, because one would expect that with technical progress and financial development the need to hold cash for corporations would decrease rather than increase.¹³ An active corporate finance literature has discussed the factors that can explain (high) corporate liquidity holdings. They include, for example,

¹² This number is higher than the ones in Figure 4, because Singh’s collateral data are broader including also below AAA and private assets such as equities.

¹³ In other words, it gives the impression that recent levels of corporate liquidity holdings are excessive, i.e. significantly higher than what would be needed if firms and markets were efficient and companies would only hold the liquidity they need for covering current expenses (paying for investments, wages, taxes or dividends).

agency problems or weak corporate governance frameworks that allow managers to retain “free cash flows” for personal motives rather than investing them or paying dividends, cash flow or general business uncertainty that strengthens precautionary motives, the needs of firms that operate in sectors that require particular flexibility in investment or hiring patterns (e.g. firms that are in the “technology race” or rely on mobile human capital for making intangible investments), scarcity of investment and growth opportunities (including the value of waiting for better times), external financing constraints and underdeveloped or malfunctioning financial systems as well as national tax regimes and international tax loopholes that provide incentives for holding funds abroad rather than for repatriating profits. While the secular increase in corporate liquidity holdings since at least the 1990s is fairly common, the reasons for it can be quite different across countries (e.g. Iskandar-Datta and Jia 2012) and also over time (e.g. Naoki 2012). Therefore depending on the country considered, most of the above factors seem to have played some role in this trend. In the crisis and post-crisis environment a number of features related to the above factors keep incentives for elevated corporate liquidity holdings high. These include, inter alia, economic uncertainties about the recovery, a host of political uncertainties and low opportunity costs of holding liquidity (e.g. related to low interest rates).

Figure 5: Liquidity holdings of non-financial corporations in major economies



Notes: Liquidity holdings comprise currency and deposits and are expressed in per cent of GDP.

Sources: Currency and deposits: OECD Financial Accounts. Data for France and Germany only available until 2012 and for the US and the UK until 2013. GDP: Bureau of Economic Analysis for the US; Office for National Statistics for the UK; Institut national de la statistique et des études économiques for France; Statistisches Bundesamt for Germany; and Cabinet Office of Japan.

Interestingly, also households' liquidity holdings have been rising in countries like the US, Japan or the euro area (since at least the late 1990s).¹⁴ This phenomenon seems to be much less discussed in the literature than the corporate liquidity trend. For reasons of space I do not address it further in this paper, although it is an interesting area for future research.

In what concerns financial intermediaries the financial crisis has shown that not only capital but also liquidity buffers of banks have been too low and liquidity risk management too weak. In fact, there seems to have been a decline of liquidity holdings by banks over several decades (e.g. Banerjee and Mio 2014 or Bonner and Hilbers 2015) and in the run-up to the crisis an over-reliance on unstable sources of short-term financing (e.g. Huang and Ratnovsky 2011 or Hahm et al. 2013). This reversed in the financial crisis, when banks hoarded liquidity (e.g. Berrospide 2013 and Acharya et al. 2011) and short-term funding markets dried up (e.g. Cassola et al. 2008, Gorton and Metrick 2012 or Heider et al. 2015). Following this experience, the new global liquidity standard of Basel III introduces a liquidity coverage ratio and a net stable funding ratio (Basel Committee 2010, 2013 and 2014b) in order to make banks adopt a more cautious approach to managing liquidity already in good times, so as to be more resilient to liquidity shocks when financial stress hits. The gradual phasing in of these regulatory instruments is also contributing to a re-increase of banks' liquidity holdings. (Their financial stability advantages are the flip-side of part of the balance-sheet constraints for collateral re-use I mentioned in Section 3.) It is interesting to see that in terms of liquidity holdings banks and non-financial corporations had been on, more or less, opposite trajectories, but the crisis and subsequent re-regulation made banks again more similar to non-financial corporations.

What are the policy implications of the corporate liquidity "hoarding" phenomenon referred to before? First, to the extent that it reflects economic uncertainties and limited growth prospects, appropriate demand and supply-side policies that firm up the current recovery and lay the ground for an increase in potential growth are called for. Second, and related to the first point, the scarcity of investment opportunities could be alleviated through policies that foster innovation. Third, as the recovery strengthens and monetary policies normalise, the opportunity costs of holding cash should rise. Fourth, in countries where financing constraints play a role increasing transparency through accounting reforms, restructuring of the banking system or the development of capital markets and other non-bank financing sources (e.g. Sher 2014) could be considered. Fifth, in the countries where there is evidence of agency problems in corporate control corporate governance reforms (such as enhancing the presence and independence of outside directors, limiting dual roles of Chief Executive Officers (acting also as chairman of the supervisory board), introducing a corporate governance code (including fiduciary responsibilities for institutional investors) and strengthening firm audit and monitoring functions) could help (see e.g. Aoyagi and Canelli 2014 or Sher 2014). Sixth, the international harmonisation of tax systems would be

¹⁴ Some indicators are available from the author on request.

desirable. Since this does not seem to be very realistic, it would be important to further pursue international agreements that limit the exploitation of gaps and mismatches in tax rules allowing the artificial shifting of profits to low or no-tax locations, such as the Organisation of Economic Cooperation Development's Base Erosion and Profit Shifting (BEPS) initiative (see <http://www.oecd.org/tax/beps/>). From this list it becomes clear that high corporate liquidity holdings may be a symptom (or side effect) of other problems in major economies. So, most policy measures that could be considered are not intended to reduce corporate liquidity holdings as such but to address the deeper underlying problems.

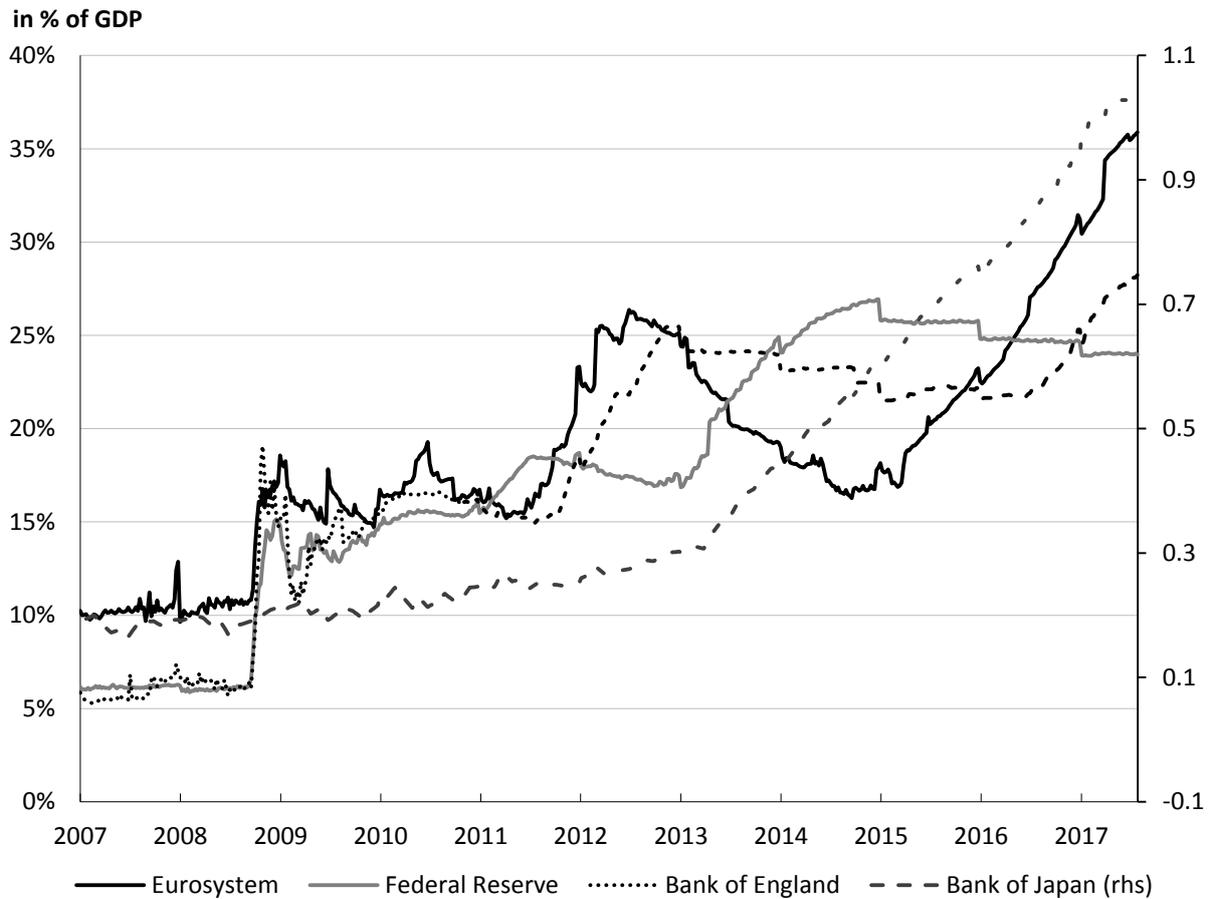
5. Central bank liquidity

The monetary liquidity created by central banks has traditionally been measured with various monetary aggregates, ranging from base money to M3. But in times where money aggregates are not targeted narrow aggregates underestimate the total liquidity creation of central banks and broad aggregates are driven by many factors that cannot be influenced by central banks. Moreover, when one wants to make the stocks comparable across central banks and divide by GDP, then one may see differences in the velocity of money rather than differences in total liquidity creation. Hence, monetary aggregates may not be the best measures for capturing central banks' liquidity creation.

This is why in Figure 6 I look at a measure that expresses the total balance-sheet size of four major central banks in per cent of their domestic GDP. This measure is also meant to capture the total stimulus that the central banks try to provide to their respective economies in times when interest rates are at or close to their lower bounds and unconventional monetary policies, such as asset purchase programs, are very large.¹⁵ Due to the severity of the financial crisis (and of the subsequent European debt crisis) as well as the depth and length of the associated recessions, central bank liquidity reached unprecedented peace-time levels (e.g. Ferguson et al. 2014).

The relative extent of these expansions depended on the relative length and severity of recessions in different constituencies, on their economic and financial structures, on the degree with which other policy branches (notably fiscal and structural policies) were also able to support the recoveries and potential growth as well as on the different central bank objectives and tools. In the US the peak level mildly exceeded 25 per cent of GDP. The euro area and the United Kingdom recently broke 35 and 28 per cent, respectively (all left-hand scale in Figure 6). In Japan the central bank's balance sheet even exceeded 100 per cent of GDP lately (right-hand scale in Figure 6).

¹⁵ It does not capture, however, central banks' forward guidance communication.

Figure 6: Balance-sheet sizes of major central banks

Notes: Balance-sheet size is measured as total assets in per cent of domestic GDP.

Sources: Bank of England, Bank of Japan, ECB, Federal Reserve Board and ECB calculations.

Whether the monetary policies behind them were – from a cost-benefit perspective taking into account both the achievement of central bank objectives and unintended side effects – overall just right, too drastic or too timid remains the subject of fierce debates. Supporters point to

- large and protracted deviations from statutory central bank objectives and evidence that target variables move in the right direction in response to the policies,
- risks of deflation and stagnation comparable to the Great Depression in the 1930s and
- the absence of (sufficiently strong) other policies moving central bank target variables in the right direction and avoiding very bad economic outcomes.

In other words, central banks just did what was needed to fulfil their objectives in very difficult times and to avoid economic disaster.¹⁶

Critiques argue that unconventional monetary policies (also in combination with low (and sometimes even negative) policy rates)

- stretch or even violate central bank mandates,
- are little effective, contradictory and coincidental movements of target variables towards central bank objectives are largely driven by other factors (such as commodity price or exchange rate fluctuations),
- imply sizeable adverse economic side effects, such as distortions in financial markets (e.g. with respect to asset valuations, market fragilities or trading strategies; see also Section 2), financial stability risks (see also Section 3), moral hazard on the side of governments, economic uncertainty or contributions to inequality,
- make the fulfilment of other policy authorities' mandates more difficult (e.g. prudential policies with respect to various financial intermediaries at home or macroeconomic management in emerging economies) and
- cause major exit challenges (including the risk of central bank losses, which may in turn unduly delay the normalisation).

In their eyes the costs of such policies exceed their benefits (or they tend to do so when being multiplied over time (QE1, QE2 etc.) or when their durations exceed certain times).¹⁷

It is outside the scope of this paper to reach a conclusion about which camp is right. The judgement may also differ across constituencies.¹⁸ Assuming that unconventional monetary policies create domestic stimuli in the countries that undertake them, the issue is how this adds up internationally. Bernanke (2013) argues that the additional aggregate demand amounts to a positive-sum game among the countries involved. Since all the major industrial countries engage in similar monetary expansions, exchange rates should not change persistently (which makes the current episode different from the early 1930s tariff war and beggar-thy-neighbour competitive devaluations). Moreover, a few recent studies (e.g. Ammer et al. 2016 or Georgiadis 2016) point out that the contractionary effects on foreign countries via exchange rate depreciations and exports may be over-compensated by expansionary effects via expenditures and imports of the source countries. So, even if

¹⁶ For central bank policy makers providing the rationale for their unconventional monetary policies and defending their effectiveness see, for example, Bernanke (2012), Draghi (2015) or Kuroda (2015). For research papers supporting their effectiveness see, for example, Kapetanios et al. (2012), Gambacorta et al. (2014), Engen et al. (2015), Andrade et al. (2016) or Ciccarelli and Osbat (2017).

¹⁷ See, for example, White (2012), who also discusses many of the above arguments. Other critical voices include Meltzer (2012), Goodhart and Wood (2016) or Taylor (2017). Goodhart, as cited by The Economist (2016), points out that trying to make negative rates effective via bank lending (which would require passing them on to deposit rates) would amount to political suicide.

¹⁸ Blinder et al. (2017) interpret the results of a survey showing mixed results for central bank governors' views about whether quantitative easing monetary policies would remain in central banks' regular toolkit in the future as indicative for much still being unknown about their costs and benefits.

unconventional policy drives the exchange rate down still a positive-sum game may emerge among countries with similar positions in the business cycle. I am not aware of any study, however, that tries to assess analytically both the adequacy of the aggregate demand effects at the international level and the costs of potential unintended side effects. As a sub-issue of such an analysis, we do not know at this juncture whether the effects of unconventional monetary policies on aggregate central bank liquidity creation in the major international currencies are optimal, or at least net welfare positive.

I see, nevertheless, a few selected conclusions from this experience, which may have implications for future monetary policies. First, central banks and academia do not yet possess proper frameworks for assessing the relative benefits and costs of monetary policies as extreme as the ones that we experienced during the last decade. On the one hand, analytical models that can compare in a consistent way the welfare benefits and welfare costs of the closer fulfilment of statutory central bank objectives with the unintended side effects mentioned above largely are still to be developed. On the other hand, and perhaps even more challenging, if some of the most important side effects severely affect non-central bank policy branches (e.g. bank, securities market, insurance or pension supervision¹⁹ or fiscal policy and prudence), then the standard economic answer would be coordination, through a higher authority or through negotiation between central banks and the affected authorities. Both solutions, however, are inconsistent with the strong independence that has so far been regarded as a corner stone of modern central banking.²⁰ In other words, a re-definition of central bank independence may have to be considered if extreme unconventional monetary policies have also to be conducted in the future.²¹

Second, it has been argued that international spillovers of unconventional monetary policies can be large (e.g. Neely 2015, Chen et al. 2014 or Chen et al. 2016).²² In particular, via capital inflows and outflows they can significantly disturb the domestic macroeconomic management of some emerging market economies that have different cyclical positions

¹⁹ See e.g. Aldrick (2012) citing Goodhart or EIOPA (2014) on pensions. Based on a very careful analysis, Chodorow-Reich (2014) argues that the Fed's unconventional monetary policies tended to have beneficial or neutral effects on asset prices of US bank holding companies and life insurers. Moreover, reach-for-yield behaviour of US pension and money market funds that can be identified after such policies dissipated after a few years. A close look at the results, however, reveals a large diversity of findings across policy announcements and intermediaries and a frequent absence of statistical significance for CDS premium and bond yield measures. In addition, the narrow event windows that had to be used for banks and life insurers may be vulnerable to short-termism of investors. Finally, the US policy mix considered does not include negative policy rates, as the case in the euro area, Japan, Sweden or Switzerland, and the US also recovered more quickly from the crisis than other economies.

²⁰ The Deutsche Bundesbank, founded in 1957, is widely seen as the first role model of an independent central bank. For a recent discussion of the literature and merits of central bank independence, see e.g. Fischer (2015).

²¹ This conclusion would not apply if research showed that the dominance of monetary policy over all other policy branches was superior to other scenarios in terms of economic welfare.

²² They seem to be particularly pronounced for US asset purchase programs, whereas euro area unconventional monetary policies seem to have much weaker international effects (e.g. Chen et al. 2017).

from the source countries and create financial stability risks for them (e.g. Rajan 2014).²³ At this point, it does not appear likely that emerging economies could sufficiently ring-fence their economies from spillovers originating from extreme monetary policies of a country at the centre of the international monetary system by improving their domestic economic policies. For example, even if emerging economies could afford freely floating exchange rates, this would not allow a fully independent monetary policy (Rey 2013) and the traditional domestic counter-cyclical approach to it could well amplify the problematic capital inflows and outflows. This, in turn, would make it harder to design effective macroprudential measures or capital controls leaning against them (see also Section 3).

There are also concerns that sizeable exchange rate effects of unconventional monetary policies could give rise to so-called “currency wars” (a term coined by Brazil’s finance minister Guido Mantega in 2010). Stimulating the domestic economy via policies that depreciate the exchange rate cannot work for all countries at the same time, as some countries’ depreciations are other countries’ appreciations. The extant literature is not yet clear about how important the exchange rate is as a transmission channel for unconventional monetary policy and whether it is more or less important than for the transmission of conventional monetary policy.²⁴ But since the extent of such policies have been rather extreme for major economies (see Figure 6), but not identical, and their timing different, exchange rate implications cannot be ignored (even if estimated elasticities were comparable to conventional monetary policy).

All in all, these observations suggest that the previous consensus that monetary policy should focus at the statutory domestic objectives²⁵ and that the gains from international monetary policy coordination are small, at best, may have to be revisited in a world where sizeable unconventional policies are not a rare exception (at least with respect to the effects on emerging economies and perhaps on other advanced economies that have different cyclical positions from the source countries).²⁶

²³ Fratzscher et al. (2013) find that US quantitative easing policies increased the pro-cyclicality of portfolio investment flows to emerging economies. Moreover, for an emerging economy such as Mexico, which has significant foreign bank presence, the internal risk effects of foreign quantitative easing programs may be larger than positive real economy effects (Morais et al. 2015). All this is consistent with monetary policy spillovers being positive, i.e. expansionary US policies having a stimulating effect on the economies of other countries and vice versa. See also the discussion on the international financial cycle and its link to US monetary policy in Section 3.

²⁴ For recent estimates of the exchange rate channel in the transmission of conventional and unconventional monetary policies in the euro area, see for example Ciccarelli and Osbat (2017).

²⁵ Kenen et al. (2004) date the so-called OHIO doctrine, which stipulates that it is best if every country’s economic policies keep its own house in order, back to the Reagan-Thatcher era of the 1980s.

²⁶ Borio (2014) makes a similar point in that central banks were reminded by the crisis period that they need to take their global interactions more into account. Taylor (2012), however, argues that the main reason for sizeable international repercussions of unconventional monetary policies was the deviations they implied from the usual central bank rules. A return of major central banks to some monetary policy rules could bring the world economy close to a cooperative equilibrium, in his view.

6. International payments liquidity

In today's floating exchange rate environment it is less straightforward how to measure the "reserves" that are available for settling international payments than it was the case in fixed-rate regimes such as the Bretton Woods system. In Figure 7 I follow Eichengreen (2016, Chart 8), who aggregates world gold holdings, base money created by OECD central banks and highly rated debt securities of OECD countries and supranational institutions as a measure of "international liquidity".²⁷ The idea is that these liquid and safe assets can either be used directly in settling current or capital account transactions or can be easily converted into the currencies needed for this purpose. For example, if their availability was too low then the concern is that trade in goods or assets could be hampered. I added to the figure a measure of world trade growth (black dashed line), keeping in mind that it is highly endogenous, much like the total stock of liquid and safe assets. While a relationship between the two variables is hard to see for yearly fluctuations, their hump-shaped development over the whole 35 years covered in the figure is consistent with a mildly positive long-term correlation.

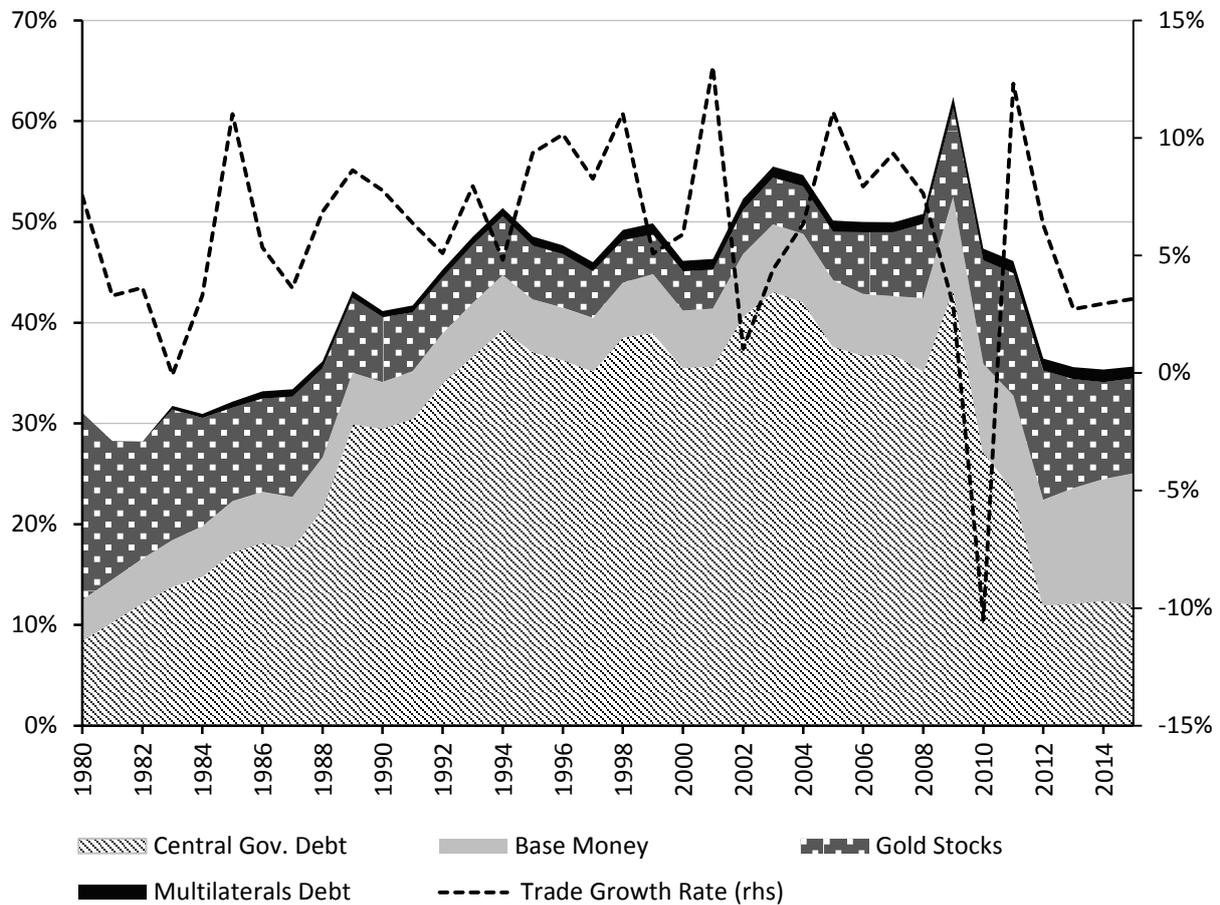
More specifically, after a long period of an increasing stock of liquid and safe assets, in line with quite steady trade growth, Figure 7 shows a marked decline between 2009 and 2012. This happened when the financial crisis proceeded and, in Europe, turned into a sovereign debt crisis, i.e. precisely when the demand for safe assets was extremely high as investors were flying to safety. Moreover, ongoing regulatory reforms, such as the Basel global liquidity standard (Basel Committee 2010, 2013 and 2014b) and the transfer of over-the-counter derivatives onto central clearing counterparties (Financial Stability Board 2010), are further adding to the demand for high-quality liquid assets. As can be seen from the diminishing area with diagonal lines, the main source of the reduction in "supply" comes from the reduction of highly rated OECD country sovereign debt. The subsequent base money creation of OECD central banks (although being very large by historical standards in terms of domestic GDP; see Section 5 above) could only partially compensate for it relative to world GDP (expanding the grey area in Figure 7). As observed already by Caballero (2010), Credit Suisse (2011, Exhibit 174) and Garcia (2011), most of this was due to downgrades of government debt during the European sovereign debt crisis, which further reinforced the reduction of private "safe assets" from the preceding financial crisis.

Since the resulting demand-supply mismatch may be weighing on global growth, the issue emerges what could be done about it. The market mechanism may not be doing its regular job, because many interest rates are at or close to their lower bounds. On the one hand, it could be tried to reduce the demand for safe assets, which may be excessively high in the present context. This could be achieved through strengthening growth policies, resolving

²⁷ I would like to thank Barry Eichengreen for his permission to reproduce his chart.

remaining financial sector fragilities and reducing potential policy uncertainties. Many of the relevant policy options, however, may take time to gain traction.²⁸

Figure 7: Liquid and safe assets for settling international payments



Notes: Liquid and safe assets for settling international payments are measured as the aggregate stock of central government debt, multilateral debt, base money and gold in per cent of world GDP. Central government debt are AAA and AA-rated sovereign debt securities of OECD countries, multilateral debt are debt securities of supranational organisations, base money is high-powered money created by central banks of OECD countries and gold stocks are global gold holdings by governments, central banks, the International Monetary Fund and the private sector.

Sources: Eichengreen (2016, Chart 8) for liquid and safe assets for settling international payments in per cent of world GDP, OECD for trade growth and ECB calculations.

On the other hand, the supply of safe assets could be (re-)increased. One avenue in this direction would be that high-quality sovereign borrowers issue further public debt. Large sovereigns that could make some difference in this regard are, for example, the US or Germany, but they alone may not have the incentives or capacity to do so in sufficient amounts. Another avenue for expanding the spectrum of safe public assets would be to pool

²⁸ Caballero and Farhi (2013) suggest that the government could also tax the wealth of the agents with the highest demand for safe assets and finance a fiscal expansion from the proceeds (potentially including redistributing the money to agents with a low demand for safe assets). In theory, this could be a faster approach.

debt among euro area countries; be it via euro bonds (Farhi et al. 2011), where different sovereigns stand in for each other, or via European Safe Bonds (ESBies; see Brunnermeier et al. 2011), which are the senior tranche of a securitisation of different sovereign bonds. In both ways European countries could create a significantly larger pool of liquid and relatively safe public debt.²⁹ So far, however, it has proven to be difficult to move in these directions, in particular for the different interests of fiscally strong and fiscally weaker European countries. A third avenue for increasing the global supply would be to have emerging economies, notably large ones such as China, undertake the necessary fiscal, regulatory and legal reforms for developing their financial systems, opening up their capital accounts and becoming issuers of internationally liquid and safe public debt (e.g. Farhi et al. 2011). Despite the willingness of Chinese authorities to gradually develop the internationalisation of the renminbi, however, the prospect of a sizeable amount of internationally liquid and safe renminbi debt seems to be rather far off.

Both variants imply moving towards a multipolar international monetary and financial system, with less reliance on the dollar and US public debt (e.g. Eichengreen 2009, 2011 and 2016 or Dailami and Masson 2011). Be it for overcoming Triffin-type problems that the dominant economy at the centre of the system does not have the incentives to issue sufficient assets (Farhi et al. 2011) or for lower growth in the centre relative to other countries and international investors' interest in diversifying their portfolios (Portes 2013).³⁰ In such a multipolar system the dollar, the euro and the renminbi or US, European and Chinese public debt would share the responsibility for providing enough international liquid and safe assets.

Increasing the issuance of the best sovereign borrowers, however, raises immediately the question how it can be ensured that these bonds remain of high quality. In the aftermath of the crisis public debt has reached very high levels in major economies.³¹ For example, gross general government debt in advanced economies has increased from 74% of GDP in 2006 to 108% in 2016 (IMF 2011b and 2017). By 2016 large high-debt countries include particularly Japan (239%) and Italy (133%), but also the US reached 107% of GDP. In other words, major advanced economies face a public debt overhang, which needs to be resolved over time

²⁹ If managed well, this could also break the adverse sovereign-bank nexus and help stabilise European Economic and Monetary Union. In a recent note, however, Standard and Poor's (2017) warned that – based on its standard methodology – it would probably rate ESBies in the lower half of the investment grade spectrum rather than AAA. The reasons for this are the limited diversification of a portfolio of euro area sovereign bonds and the high correlation of euro area sovereign default risk. Moreover, S&P expects that ESBies would reduce the overall supply of AAA assets, as some of the current AAA sovereign bonds would be repackaged into lower rated ESBies.

³⁰ Hartmann (1998) argues that the medium of exchange and store of value functions of money imply centrifugal and centripetal forces, respectively, that can lead to multiple international currencies of varying importance.

³¹ For example, governments had to dedicate significant fiscal resources to stabilising their banking systems and assume very expansionary fiscal stances to cushion the crisis recessions. As Turner (2016) describes it, private sector debt overhangs were transferred to public sectors but not removed.

(IMF 2012b). Even though precise thresholds about critical public debt levels are hard to pin down, the historical experience is that excessive debt-accumulations precede sovereign defaults and make countries vulnerable to confidence and financial crises (Reinhart and Rogoff 2009 or IMF 2012b). Therefore, the room for increasing the amount of public debt is limited for many advanced economies at present.

Hence, a more sustainable – even though probably slower – avenue for re-increasing the amount of liquid and safe assets in the international monetary system may be to consolidate public finances in the countries that lost their high creditworthiness in the crisis (see e.g. IMF 2012a). In fact, as the economic recovery is strengthening in advanced economies, this may not be pro-cyclical any longer, even though some central banks have already started to exit from their ultra-expansionary monetary policies. As pointed out by Caballero and Farhi (2013), healthy public finances and therefore fiscal capacity are central to the ability of escaping a “safety trap”.³² Only when their public finances are solid and public debt levels limited, fiscal authorities of major countries are able to issue further public debt in response to shocks that make safe asset demand exceed safe asset supply. In other words, as the world moves towards a multipolar monetary system it is key that the main providers of liquid and safe assets (say, the US today and the major member countries of the euro area as well as China in the future) have sound public finances to start with.

7. Concluding remarks

In this paper I have divided the concept of international liquidity in six dimensions that have a significant cross-border component, that relate to foreign or major international currencies or that relate to joint trends in major countries. This includes but goes way beyond the “global liquidity” dimension (which I denote as international funding liquidity) recently emphasised by the Bank for International Settlements and the International Monetary Fund, which focus particularly on international financial stability issues. I argue that global economic and financial surveillance should take a broad approach and cover all the six dimensions.

I find that international financial market liquidity has broadly normalised after the financial crisis, but it seems to have become more fragile and some traditionally less liquid market segments seem to have lost some liquidity. International funding liquidity is strongly cyclical, but the growth rate and volatility of cross-border credit has declined after the financial crisis. Private monetary liquidity, in particular liquidity holdings of firms and households, has followed a similar upward trend in major countries since about two decades or more.

³² These authors start from a shock to the demand for safe assets, but the same reasoning applies to a safety trap associated with a drop in safe asset supply, such as sovereign downgrades.

Central bank liquidity has reached unprecedented peace-time levels during the crises. In contrast, international payments liquidity has declined materially during the crisis, mainly because of downgrades of European sovereigns that diminished the available amount of safe assets. (For reasons of space I do not particularly discuss the sixth international liquidity dimension, the one that captures public liquidity support.) Many of these liquidity dimensions cannot be added up, but – respecting their similarities and differences – I do not find a general shortage of international liquidity across the dimensions discussed in this paper. In some areas there are high levels of liquidity, in other areas there is diminished liquidity and yet in other areas further research is needed.

Several of these liquidity developments have similar origins. For example, the crisis recessions, slow recoveries and (in the eyes of some) limited growth prospects for the future contributed to major liquidity provisions by central banks, corporate cash hoarding and a reduction in cross-border credit cycles. The fiscal costs of financial instabilities and the significant deficit spending programs for cushioning the crisis recession significantly increased public debt (often already from relatively high levels) and reduced the creditworthiness of many sovereigns, which in turn reduced the availability of liquid and safe assets and therefore international payments and international funding liquidity. Post-crisis de-risking and financial re-regulation contributed to reduced market making in some markets and the reduction in the cross-border credit cycle. Very large asset purchase programs of central banks – albeit stabilising in the short term – may over time also contribute to some liquidity fragilities in financial markets and to some encumbrance of liquid and safe assets thereby reducing international payments liquidity.

The observations made in analysing these developments raise a number of policy considerations that have a bearing on the underlying forces influencing international liquidity. For example, financial regulation needs to be designed in a way that preserves incentives for market-making in major international assets. It may also have to discourage aggressive forms of high-frequency trading and limit “dark” trading venues to block trading. Moreover, emerging economies need to possess sound prudential frameworks and may have to adopt a pragmatic approach towards capital controls in order to cushion the effects of the international credit cycle on their economies. Also, data need to be made available for properly analysing to which extent global collateral re-use is needed for lubricating the financial system and to which extent it risks acting as a conduit for contagion. Furthermore, ways need to be found how soaring corporate cash hoarding can be brought back into real investment. In addition to growth policies this may also include corporate governance reforms or international tax agreements. International spillovers of unconventional monetary policies, in particular towards emerging economies, suggest revisiting the current consensus on international monetary policy coordination. It is also advisable that central banks running large asset purchase programs use securities lending facilities (as many actually do) to avoid that they contribute to the encumbrance of (liquid and safe) assets. They need also to be careful about communication on these and other unconventional

monetary policies, notably close to turning points. Finally, as the economic recovery in advanced economies strengthens, consolidating public finances may be a more sustainable approach to re-increasing the availability of liquid and safe assets for ensuring international payments liquidity than the further issuance of sovereign bonds by large countries that already reached high debt levels. Needless to remark, that many of these policy considerations are important way beyond the optimal level of international liquidity.

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