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Tracing the origins of the financial crisis

by
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More than half a decade has passed since the most significant economic crisis of our lifetimes and a plethora of different interpretations has been offered about its origins. This paper consolidates the stylised facts put forward so far into a concise and coherent meta-narrative. The paper connects the dots between the arguments developed in the literature on macroeconomics and those laid out in the literature on financial economics. It focuses, in particular, on the interaction of monetary policy, international capital flows and the decisive impact of the rise of the shadow banking industry.

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Introduction and motivation

The economic profession was taken by surprise as a seemingly negligible turmoil, in what was considered to be a rather remote segment of the US mortgage market, turned into a global financial and economic crisis from 2007 to 2008. The serious repercussions triggered by these events are still felt today. As a result, the crisis will likely effectuate the most substantial paradigm changes in economic policy-making as well as in economic theory. Since the outbreak of the crisis, the question about its origins has dominated the policy and academic debate; the result being a plethora of articles investigating the roots of this major event.

This paper takes stock of the major results and synthesises the main insights of the first years of discussion. Its particular value added is that it brings together the arguments developed in the literature on macroeconomics with those laid out in the literature on financial economics.[1]

We start with a brief discussion of supply-side factors in the creation of the US mortgage bubble. First, we will focus on the role of monetary policy and policy rates in stimulating banks' reliance on wholesale funding. After that, we will analyse how international capital flows and global imbalances contributed to the reduction in long-term interest rates and credit supply and focus on the insights gained from the difference between net and gross capital flows. Next, we will evaluate the arguments that point to the rise in inequality and its effects on consumer behaviour and mortgage demand. The second part of the paper continues with a discussion of financial sector factors. First, we will evaluate how the rise of institutional capital contributed to global capital flow imbalances. In the next step, we will analyse the role of the shadow banking sector as the crucial bypass for institutional capital into the mortgage market. Finally, we show how the combination of all these factors contributed to what could be called a classic 19th century-style bank run in a new disguise.

I. Macroeconomic factors

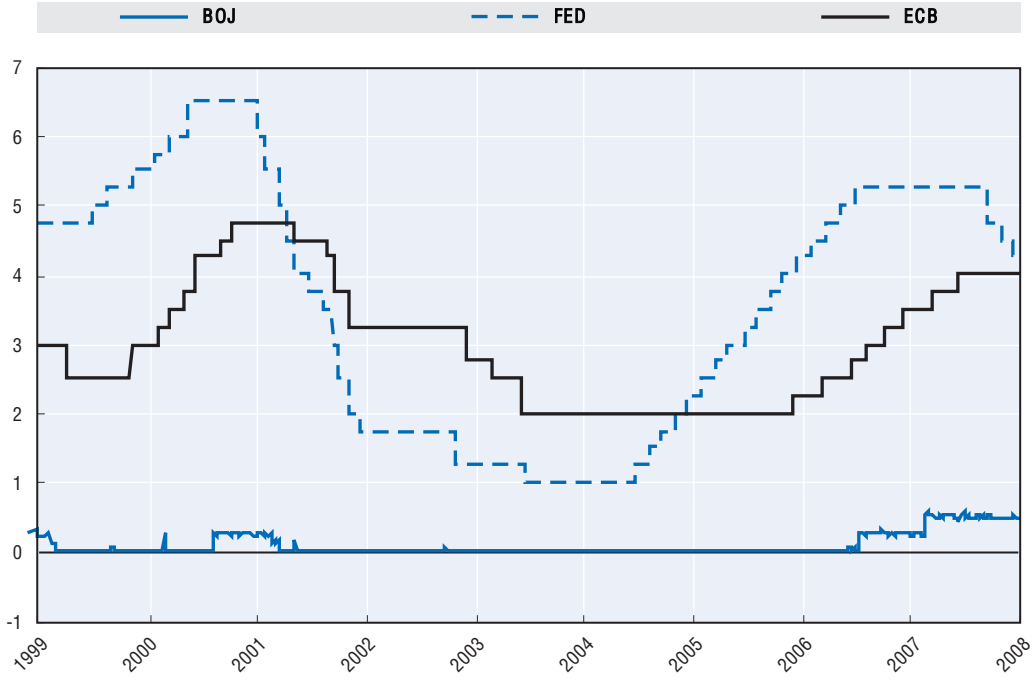
1. Policy rates and credit creation

The first important factor in the run-up to the crisis was the remarkable decline in short-term interest rates. Several factors contributed to this drop. First, starting from the early 1990s, central banks increasingly moved towards inflation targeting policies. This led to a situation in which Taylor rules – that model the interest rate as a function of the deviation from targeted inflation and the output gap – proved successful in empirically describing the behaviour of central banks. At the same time, the gradual opening of the Chinese economy and the fall of the Soviet Union constituted positive labour supply shocks to the world economy. In combination with the widespread decline in the bargaining strength of labour unions in the industrialised world, these developments exerted downward pressures on wages and thus on prices. On top of that, fundamental innovations in the IT industry boosted productivity in many sectors and further reduced the overall pressure on price growth.

As a result, there was a "great moderation" of price growth, and policy rates reached historically low levels (Figure 1). This secular decline in inflation also allowed central banks to aggressively slash interest rates even further once the asset bubble – that had been triggered by the boom in the IT sector – had busted. Growth – particularly in the United States – picked up quickly but unemployment remained high. Against the low inflation background, policy rates were thus left at very low levels and below the level implied by the Taylor rule.

Figure 1. **Policy rates**

In per cent



Source: Thomson Reuters.

Historically, situations in which policy rates are below the Taylor rule have been correlated with asset price increases in many economies (Ahrend et al., 2008), and it appears that deviations from the Taylor rule may also have added to the recent surge in US housing demand (Jarocinski and Smets, 2008). In particular, low policy rates drove down the cost of wholesale funding, and cheap wholesale funding has been an important factor in the increase in credit supply (Borio and Zhu, 2008; Shin, 2011).

While a clear-cut relation between expansionary monetary policies and financial leverage could not be verified (Merrouche and Nier, 2010; Dokko et al., 2011), the low policy rates likely contributed to the substantial increase in wholesale funding that was observed in the banking sector during this period. Still, as wholesale funding is far more information-sensitive – and as a result more instable during a crisis than e.g. retail deposits – the hike in wholesale funding has made the financial system more vulnerable as a whole. Interestingly, it was particularly European investors who raised a substantial part of their funding on wholesale markets (Shin, 2012; Bernanke et al., 2011) but also US investment banks relied on wholesale markets for up to a quarter of their funding.

2. Effect and direction of international capital flows

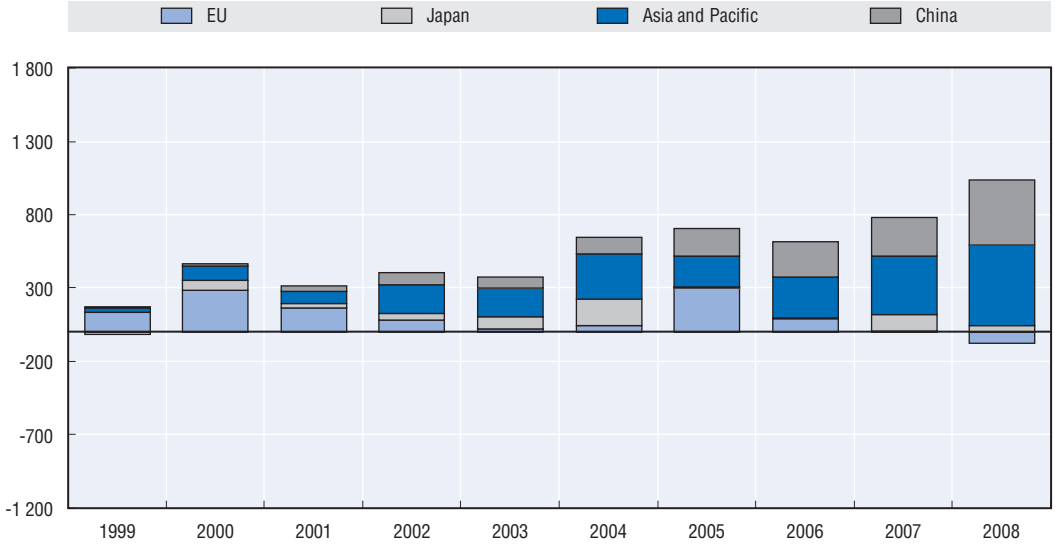
However, it is long-run interest rates that govern capital markets and ultimately co-determine investors' allocative decisions. Policy rates only have an impact in as far as they affect expectations about long-run interest rates. As it turns out, particularly international capital flows exerted significant downward pressure on long-run interest rates in the United States.

First, China's already-mentioned gradual opening was characterised by a combination of export-led growth and a managed exchange rate. Consequently, the Chinese economy accumulated substantial foreign reserves. In addition, economies across South-East Asia started to accumulate foreign reserves as well: the region had experienced a major current account crisis in the 1990s and had to implement economic adjustment programmes including IMF assistance programmes. Historically, it can be shown that IMF programmes trigger an accumulation of foreign reserves in the affected economies (Bird and Mandilaras, 2011). One possible reason for this is that foreign reserves are one of the few robust indicators that reduce the propensity and severity of financial crises (Frankel and Saravelos, 2010). This was also the case during the most recent global economic crisis (Feldkircher, 2014). Consequently, current accounts of Asian (and OPEC) economies were recycled back into Western financial markets (Blundell-Wignall and Atkinson, 2008).

As countries accumulate foreign reserves, the country that issues the preferred reserve currency experiences capital inflows. Given the preference for dollar reserves in Asia (see e.g. ECB, 2013) net capital inflows from Asia to the US grew rapidly. Figure 2 shows a sharp increase in net capital inflows to the US from Asia and the Pacific and China from the turn of the century. From a very early stage, this phenomenon has been labelled "savings glut" (Bernanke, 2005) and related to asset price inflation in the United States.

Figure 2. **Net capital flows to the United States**

USD billions



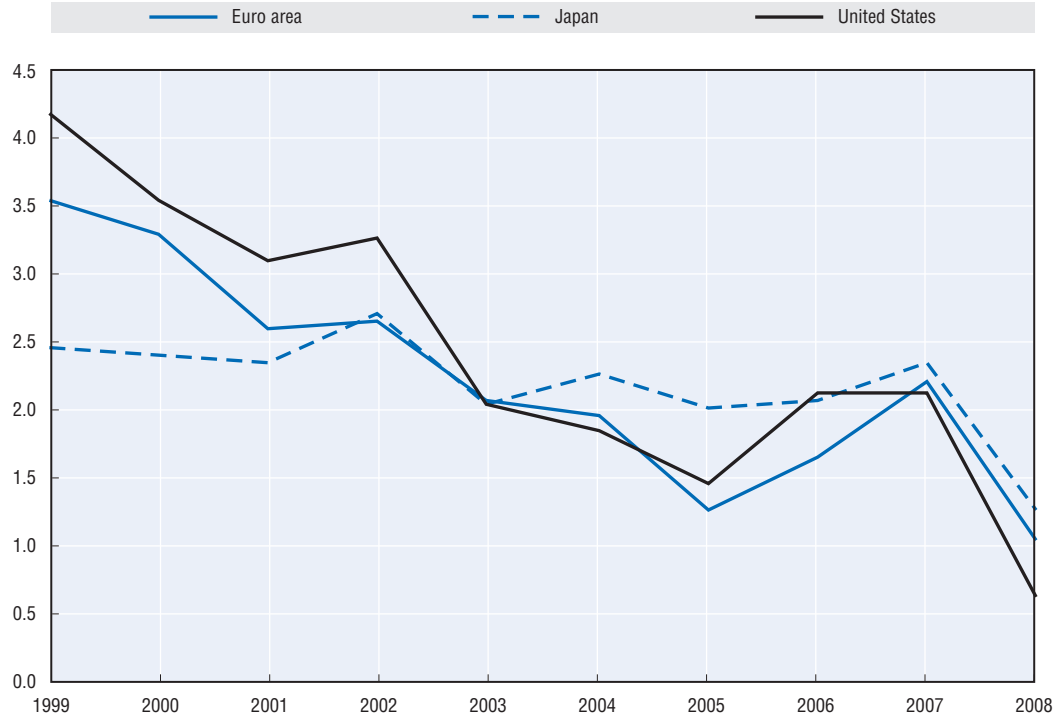
Source: US Bureau of Economic Analysis.

However, as subsequent analysis proved, most of the foreign investment in the market for securitised bonds[2] – the key market for the allocation of funds to the US mortgage

market (see below) – did not originate in Asia (Bernanke et al., 2011; Shin 2012). This means that the relation between the housing bubble in the United States and net inflows from Asia is not a direct one; capital inflows from Asia exerted an indirect influence on the US mortgage market. As the bulk of capital inflows from Asia to the US was invested in treasuries, long-term interest rates were squeezed (Figure 3). The resulting lower yields on treasuries had a crowding-out effect as other investors invested in the market for securitised bonds in the hunt for higher yields (Bertaud et al., 2012).

Figure 3. **Long-term interest rates**

In per cent



Source: OECD Economic Outlook Database, http://dx.doi.org/10.1787/data-00688-en.

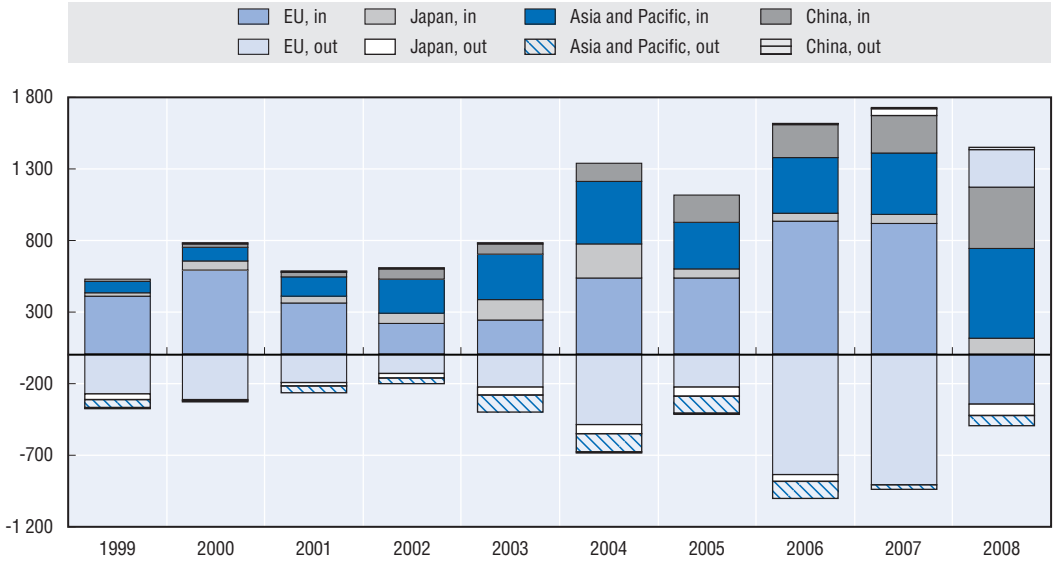
Still, interest rates on securitised bonds dropped even more sharply than interest rates on treasuries, suggesting a genuine shift in investor preference. This is where Europe enters the picture. Of course, US investors started to increase their exposure towards securitised bonds, too, but it was above all European investors who shifted their funds to these markets (Bernanke et al., 2011; Shin 2012). As a matter of fact, on the eve of the crisis, the US had issued roughly 80% of all outstanding securitised bonds worldwide while European investors were holding roughly 60% of these securities (Gourinchas et al., 2011). But why did this major development go unnoticed before the crisis?

In fact, most analysts and decision-makers did notice global (gross) capital flow imbalances but focused on current account (im)balances. Figure 2 above reflects this view of the world. Net capital flows from Europe to the US were moderate before the crisis, but netting is decisive in this instance. As already indicated, European investors were borrowing on wholesale markets in the United States. However, wholesale borrowing by European investors is registered as capital outflows from the US perspective. Thus, somewhat peculiar,

the rise in US wholesale funding by European investors disguised, through aggregating and netting, the hike in European investment in securitised bonds (McGuire and von Peter, 2009; Bernanke et al., 2011). This is reflected in gross capital flows (Figure 4). As a result, the build-up of major imbalances went largely unnoticed because of the relatively balanced current account.

Figure 4. **Gross capital flows to and from the United States**

In billions of US dollar



Source: US Bureau of Economic Analysis.

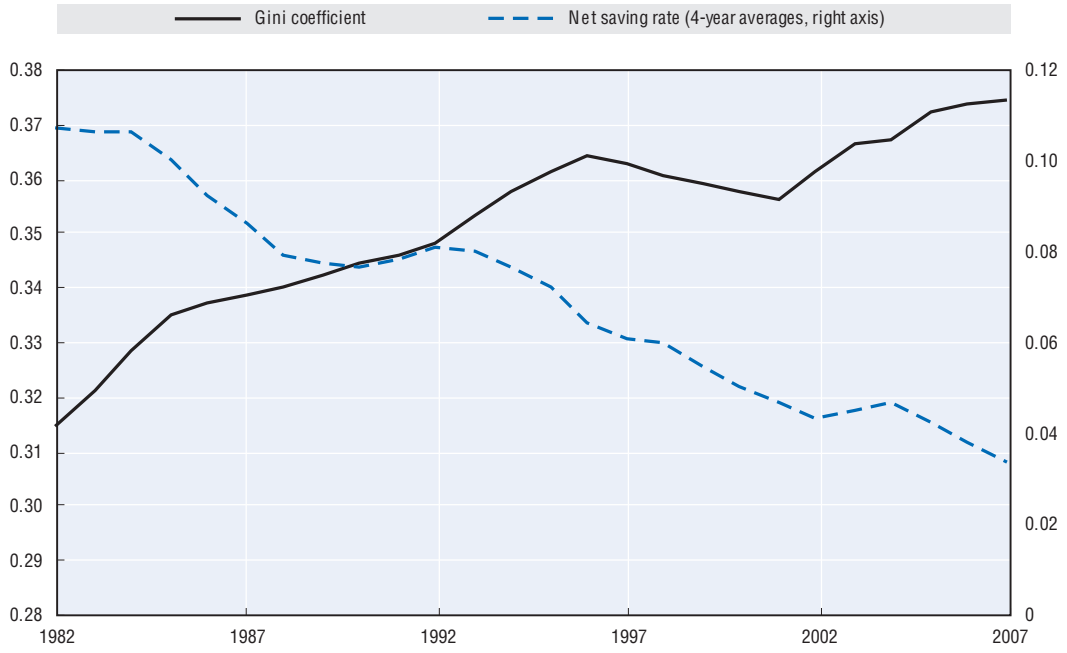
3. Growing demand for mortgages

The downward pressure on interest rates and the desire to achieve higher yields whetted investors' appetite for risky assets. At the same time, structural factors on the demand side appear to have fuelled the demand for mortgages, thereby forming the basis for the production of these risky assets on a large scale. In this regard, the co-movement of inequality and debt in the United States – as depicted in Figure 5 – is particularly remarkable. This co-movement suggests that inequality might have been a driver of credit demand in the United States. However, different explanations exist for this coexistence.

The first explanation relates to Milton Friedman's famous hypothesis that households smooth consumption over their lifetimes. In principle, this hypothesis can explain the patterns shown in Figure 5 provided that income has become more volatile over the lifetime of an average US household. For instance, more people might take out loans to finance their studies and pay down their debt once they finished their studies. We would see an increase in low-income groups (students) who would be in a transitory state in their employment history, though, as they would join the ranks of higher-income groups at a later stage of their professional life (better paid academics). Inequality would increase in this situation. The associated hike in debt would not be problematic, though, as the indebted group would likely be able to redeem its debt.

The major problem with this explanation is that most recent studies indicate that it was the permanent rather than the transitory component of income that lead to the hike in inequality in the United States (Primiceri and Rens, 2009; Kopczuk et al., 2010; Debacker

Figure 5. **Inequality and debt**
In per cent



Source: OECD Economic Outlook Database, http://dx.doi.org/10.1787/data-00688-en and *OECD Income Distribution Database, http://dx.doi.org/10.1787/data-00654-en.*

et al., 2013). Put differently, once people enter a low- or high-income trajectory, they are likely to remain stuck on it. Consequently, it appears as if the permanent income hypothesis fails to explain the pre-crisis situation in the United States. The increase in indebtedness of low and middle-low income households (Wisman, 2013) might indicate that people simply used loans to finance unsustainable levels of consumption or housing.

This leads to an alternative, increasingly popular explanation for the above observed pattern: people's well-being depends on relative consumption in addition to absolute levels of consumption (Luttmer, 2005). As a result, it has been argued that people exhibit patterns of "conspicuous consumption", that is, they imitate their wealthier peers. In such a situation, expenditure cascades are initiated by increasing consumption at the top end of the distribution inducing low-income households to consume beyond their means. Indeed, regions with higher levels of inequality show higher debt amongst households and higher non-performing loan rates (Frank et al., 2014), and inequality has been more generally related to hikes in household debt (Bertrand and Morse, 2013; Kumhof et al., 2013).[3]

II. Financial market factors

1. *The market for securitised bonds*

Let us now turn to the role of the financial structure in contributing to the crisis. The most important factor here is that over the past decades, the opportunities to increase leverage increased significantly in the financial sectors of many industrialised economies. One reason was the excess liquidity caused by the factors discussed above, like low policy rates and reserve accumulation (Blundell-Wignall et al., 2009). On top of this, the system's capacity to create credit increased substantially, which ultimately led to excess elasticity of the financial system (Borio et al., 2010). Putting it simply, a financial system's credit-creating

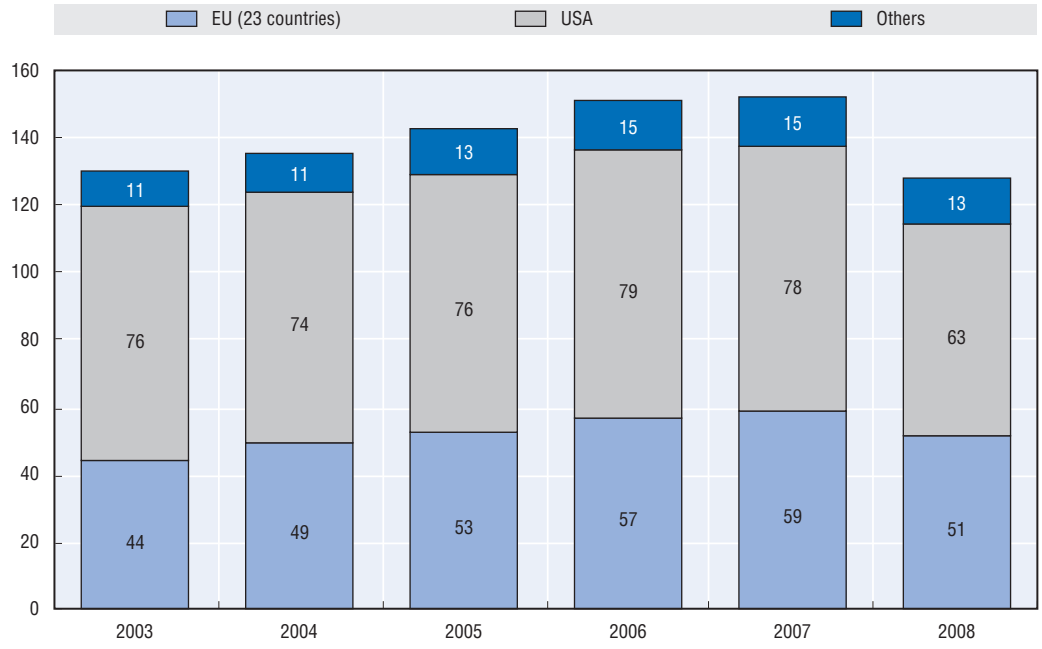
capacity is limited by the interplay between regulatory capital and leverage ratios and the credit-creating institution's equity. Obviously, an increase in the banking sector's equity increases its capacity to create credit. When banks sell credit-based assets, however, even for a given level of equity, they can reengage a given amount of capital in the credit-creating process over and over again even before any of the created debt has been redeemed. This is the case, for instance, when banks bundle loans into tradable securities such as securitised bonds and sell them. Indeed, before the crisis, banks increasingly relied on trading income (as generated by the brokerage of securitised bonds) and less on interest income (generated by the interest rate differential between loans and deposits; Allen and Santomero, 2001; Keeley and Love, 2010). This development made it possible to accommodate the rising desire for credit creation in the United States without a comparable hike in the banking sector's overall equity.

Let us examine this in detail. In many ways, the trade in securitised bonds resembles transactions on a traditional goods market. However, the forward-looking character of these assets creates a fundamental difference to traditional goods on spot markets. Essentially, the current value of credit-backed assets crucially depends on the trustworthiness of the debtors' promise to repay the loan or, put differently, on a debtor's perceived creditworthiness. The validity of a debtor's promise to repay, though, can only be evaluated over a very long horizon, and the perceived creditworthiness can thus vary over time and may include panic-induced radical shifts. This is particularly problematic when long-run assets are financed with short-run liabilities, as commonly occurs in credit transactions. Traditional banking is focused on transforming short-term liabilities into long-term assets, a process referred to as term transformation. It is this term transformation that is the root cause of bank runs. In a typical (e.g. 19th century) bank run, the erosion of trust in a bank's financial soundness (justified or not) prompts depositors to withdraw their deposits in a panic. The affected bank is forced into fire sales of its assets even if it has to do so at a very disadvantageous price. As a result, bank runs can be self-fulfilling prophecies. The introduction of deposit insurance and a borrower of last resort specifically designed to service banking institutions (i.e. the central bank) has helped to make bank runs very unlikely (even with deposit insurance, irrational panic can cause bank runs). However, the more banks bundled and sold securitised bonds, the more they outsourced the term-transformation function. The popularisation of term transformation – involving a large set of non-bank actors – was *the* decisive factor that made this crisis so devastating.

Of course, banks were only able to create a large market for securitised bonds because they had a large and growing base of investors who were eager to invest in these assets. To a large extent, investors' growing taste for securitised bonds can be related to the rise of institutional investors (Figure 6), which, in turn, can be traced to the following factors: first, there was an increasing shift towards capital-based (funded) pension schemes (OECD, 1998), and growing institutionalised savings in OECD economies were increasingly directed towards cross-border portfolio investments (CGFS, 2007). Second, the increase in cash pools of corporates and high-net-worth individuals (Poszar, 2011) added to the rising demand for institutional investments, as did the increase in financial wealth more generally. We know that at least for the euro area, wealthier households are more likely to hold savings in the form of riskier assets such as mutual funds, bonds or shares (Arrondel et al., 2013), and this observation is likely to hold true more generally. For corporations, a structural increase in their liquidity preference was already present before the crisis

Figure 6. **Total assets of institutional investors**

In per cent of GDP



Source: OECD Institutional Investors Database, http://dx.doi.org/10.1787/data-00498-en.

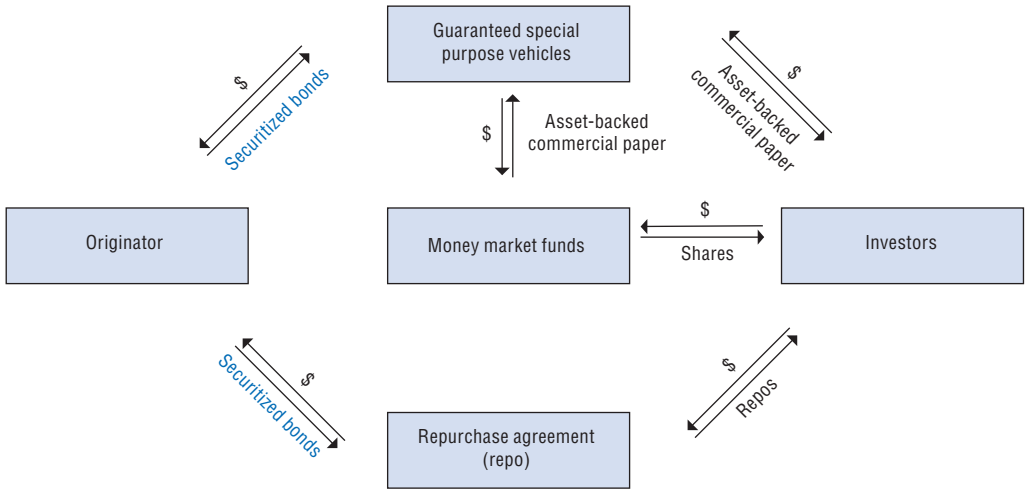
(André et al., 2007), boosting institutional cash holdings (Pinkowitz et al., 2012). As a result, the cash reserves managed by institutional investors rose considerably and they increasingly invested in the market for securitised bonds. From 1998 onwards, the securitised bond holdings of US-based mutual funds and insurance companies alone increased fourfold and amounted to almost USD 2 trillion in 2007 (Manconi et al., 2012).

2. Bypassing institutional investors and mortgage markets

Crucially though, many institutional investors have to comply with investment policies that often prevent them from taking direct exposure to mortgages and similar assets. Consequently, the indirect channel was an important avenue through which the funds of institutional investors where channelled into the market for securitised bonds (and thus ultimately into the US housing market). This indirect avenue was provided by the rapidly growing shadow banking sector.

Shadow banking refers to activities that involve a term transformation while not being covered by conventional deposit insurance or issued by an institution with access to the lender of last resort. There are three distinct channels through which investors had indirect holdings of securitised bonds (Figure 7). The first channel is (some) money market funds. These funds – also institutional investors in their own right – started to grow rapidly from the end of the 1990s, holding some USD 1.7 trillion of total assets in 2006 (Kacperczyk and Schnabl, 2013). While many of these funds invest in treasuries, a large majority invests in a broader set of assets that have to be classified as being safe (McCabe, 2010), including in particular commercial market paper and agency debt (Brennan et al., 2009) and thus exhibiting a strong link to the mortgage market. To finance their investments, money market funds sell shares to investors and guarantee to take these shares back at least at face value. The underlying assets serve as collateral.

Figure 7. **The rise of shadow banking: Instruments**



The second channel via which institutional investors were indirectly investing in securitised bonds – and also one of the investment avenues used by money market funds – was the market for asset-backed commercial paper (outstanding asset-backed commercial paper totalled roughly USD 2 trillion in 2006).

To create commercial market paper, an originator – typically a bank – transfers securitised bonds into a special purpose vehicle. The "special purpose" of this vehicle is to hold the assets and issue commercial paper backed by them. Usually, the asset-backed commercial paper created is also covered by different types of guarantees issued by the respective originators. Since most of the guarantees were technically not binding in the case of default, though, originators usually did not have to unveil this exposure on their balance sheets. However, a default was in most cases ruled out in practice by defining it through some slow-moving variable. This close relationship has been underlined by the interdependence of stock prices and the exposure of related special purpose vehicles (Acharya et al., 2013), which clearly demonstrates that the market acknowledged the close relationship. Indeed most sponsors actually stepped in for their vehicles.

The third, more direct and most important channel via which institutional investors were indirectly exposed to securitised bonds was the market for repos (Gorton and Metrick, 2012). Unfortunately this market is extremely opaque and precise data are not available. Yet, we know that for the euro area, the repo market doubled in size from 2002 to 2008 and accounted for 65% of euro area GDP at the onset of the crisis. An incomplete account of the US estimates the market capitalisation of repos at 70% of US GDP (Höhrdahl and King, 2008). In a repo transaction, a market participant (e.g. a bank) sells a certain asset and agrees to repurchase it for a slightly higher price at a later date. The difference between purchase and repurchase price – called the haircut – mimics the interest rate, and the asset can be used as collateral in case the bank fails. A significant share of repos before the crisis was based on securitised bonds (Gorton and Metrick, 2012).

Many of the assets underlying these transactions were regarded as safe, which shifts our attention to the role played by credit ratings. Credit rating agencies had been primarily concerned with the rating of single-name corporate finance. However, in the run-up to the crisis, they increasingly rated securitised bonds, too, and they applied a similar rating

methodology and the same ordinal scale as for corporate bonds (i.e. AAA, etc.), thus effectively pouring new wine in old bottles. In fact, in addition to the probability of default of the individual underlying loans, the creation of most securitised bonds involved assumptions about the joint probability of default – which, of course, has a higher potential for mistakes. Together with a couple of other factors, this changed the ratings' information value (Coval et al., 2009; Fender et al., 2008; Fender and Mitchell, 2005). Given that ratings are often at the heart of institutional investors' investment policies (that restrict e.g. investments into investment-grade assets), changes in the ratings' information value lead to an almost automatic change in investor behaviour, in this case inducing them to take higher risks.

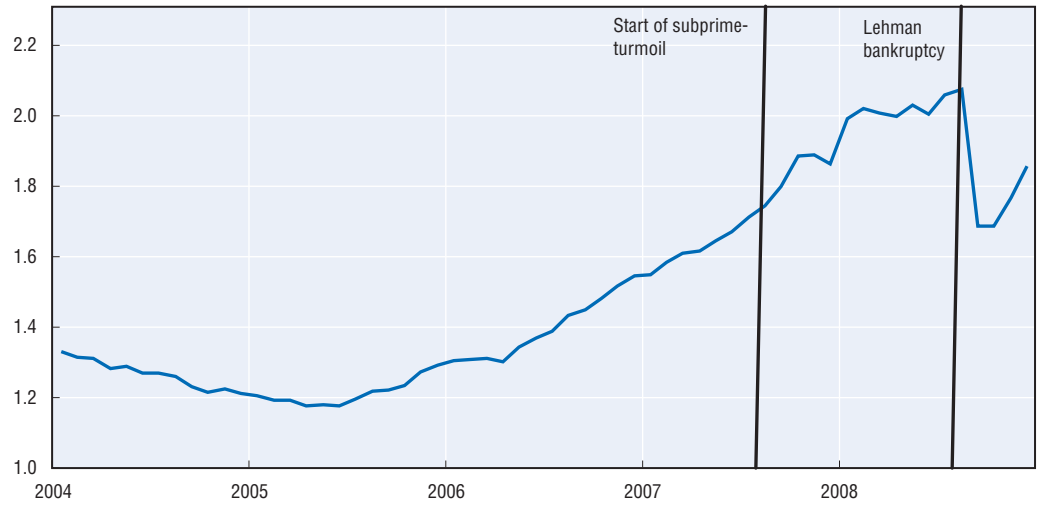
3. A classic bank-run, reloaded

To sum up, the direct and indirect exposure of institutional investors to securitised bonds increased substantially before the crisis. This includes a growing exposure of European investors. The huge indirect channel was based on instruments that involved term transformation (money market funds, commercial market paper, and repos). However, this term transformation was not covered by the backstop of deposit insurance and a lender of last resort, both of which had turned out to be so vital in the past. The function of these traditional backstops was mimicked by securitised bonds that – in one form or another – served as collateral. Securitised bonds thus became a substitute for deposit insurance. As it turned out, this substitute was far from perfect.

At the peak of the crisis, it became clear that securitised bonds did not provide the desired protection against tail risks. Put differently, what had been considered a functional equivalent of deposit insurance turned out to be dysfunctional, and once confidence in the market for securitised bonds eroded, the entire market was shattered by capital flight. However, instead of a direct run on commercial banks, what ensued was a run on repos (Gorton and Metrick, 2012), a run on money market funds (McCabe 2010; Figure 8), in direct relation to that a run on commercial paper (Kacperczyk and Schnabl, 2010; Figure 9) and as a result, the threat of a run on wholesale markets at large. Once the crisis had reached this point, banks – particularly those relying on larger amounts of wholesale funding – found

Figure 8. **Net assets of US prime money market funds**

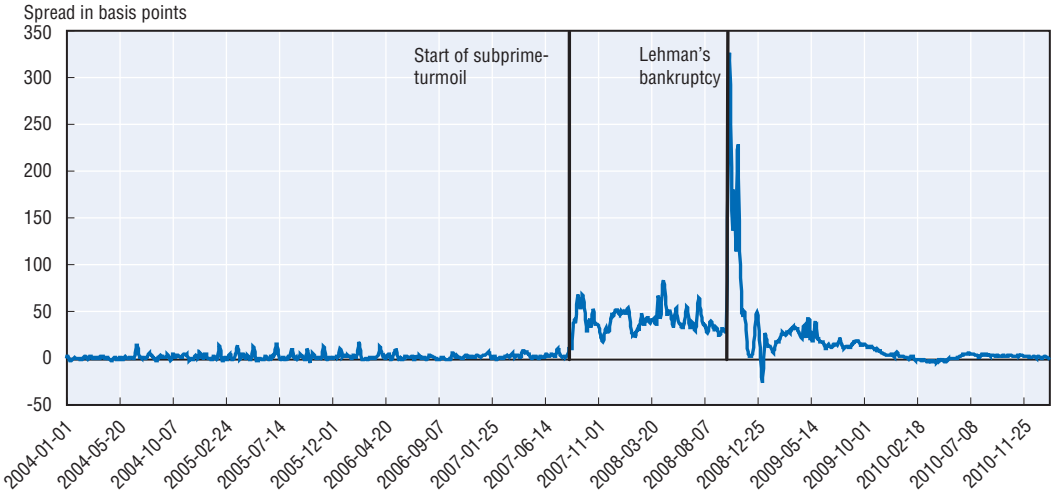
USD billions



Source: Thomson Reuters.

Figure 9. **Overnight commercial paper spreads**

Net of Fed Funds rate



Source: Board of Governors of the Federal Reserve System.

themselves at the brink of disaster as they found it increasingly difficult to roll over their short-term debt positions. This was particularly problematic from a European perspective. While deposits with US banks received a boost due to the run on money market funds, this was not the case for European banks – which had actually relied the most on the wholesale market (Baba et al., 2009). This way, the crisis quickly spread to Europe.

III. Conclusions

This paper has discussed some major findings about the origins of the crisis and attempted to connect the dots between various developments: before the crisis, a unique combination of fundamental innovations and geopolitical developments had led to a decline in inflation and thus policy rates. At the same time, export-focused policies in Asia shifted substantial amounts of capital into the market for US treasuries, thereby pushing down long-term interest rates in the United States as well. These factors made loans cheap. On the demand side, people apparently tried to offset a loss in relative income, which led to significant growth in mortgages.

At the same time, the rise of institutional investors created a ready base of potential buyers of securitised bonds. As securitised bonds were regarded as a substitute of insured deposits (a view that turned out to be wrong), institutional investors' mortgage market-related holdings surged before the crisis.

As soon as trust in the underlying assets started to erode, the fragile structure imploded. As a matter of fact, the creation of deposit equivalents outside the realm of deposit insurance and the lack of a lender of last resort led to a new version of a classic 19th century bank run. The effects of these ruptures are still felt today.

Notes

1. See the underlying paper (Ramskogler, 2014) for more details.
2. Following Manconi et al. (2012) the term securitised bonds (SB) is used as umbrella term for the often used terms asset-backed securities (ABS), mortgage backed securities (MBS) and

collateralised debt obligations (CDO). Thus, it is also intended to include the notorious subcategory of residential mortgage backed securities (RMBS) as well as the more specific asset-backed commercial paper (ABCP). While – in principle – this can include assets other than commercial or residential mortgages, the vast majority of the associated securities were based on such assets before the crisis and we will thus exclusively focus on this aspect of that market.

3. Though it should not go unmentioned that also this explanation has been challenged recently (Coibion et al., 2014).

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