1. The Global Financial Crisis

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1.1 INTRODUCTION

The Global Financial Crisis (GFC) of 2007–09 was the most severe crisis induced by a financial shock since the Great Depression. Although the more recent crisis caused by the COVID-19 pandemic has had even greater economic consequences, the GFC remains paradigmatic of the effects which systemic financial crises may provoke. In the United States (US), millions of families lost their homes and their wealth as a consequence of the GFC. Around the world, financial markets suffered huge losses, the credit market crashes, and the world economy experienced the worst recession in the post-war period. The magnitude of the losses was so high that economists define this episode as the “Great Financial Crisis”. For these reasons, we decided to devote the first chapter of the book to it. More precisely, Section 1.2 describes the chronology of the crisis in its peculiar features. Section 1.3 explains the macro causes of the crisis, while Section 1.4 focuses on the micro ones.^{1, 2}

1.2 CHRONOLOGY OF THE CRISIS

The roots of the GFC are to be found in the US financial deregulation waves, whose harmful effects have been exacerbated by the improvident monetary policy undertaken by the FED after the collapse of the “new economy”. In fact, between January 2001 and June 2003, decreasing policy rates, which dropped from 6 to 1 per cent, encouraged US households – who expected the real estate appreciation to continue – to increase their borrowings to buy real estate properties. As a result, real estate prices skyrocketed triggering two feedback processes, which have amplified the effects of monetary policy and fed the speculative bubble. The first process involved the real estate market: as a result of rising property prices, more credit was granted to households, which reinforced the real estate appreciation. The second process, which was closely related to

the spreading out of securitisation, took place in financial markets: rising real estate prices increased the value of the securities backed by mortgage loans, making the balance sheet of intermediaries stronger; thus banks could raise more funds to buy those securities, which reinforced their appreciation and guaranteed abundant liquidity to the primary mortgage market.

The growing real estate value and the increased ratio between issuance of mortgage-backed securities (MBS) and origination of mortgage loans led to a significant lowering of the credit standards. At the same time, financial authorities did not recognise the negative effects of excessive borrowing. Hence, a growing share of new loans was granted to individuals with very low repayment capacity, the so-called subprime clients. The solvency of this new category of borrowers depended almost exclusively on the continuous increase in the value of the collateral (i.e., the house) getting more credit to roll-over the debt at maturity.

However, between June 2004 and June 2006, the US policy rate increased from 1 to 5.25 per cent, jeopardising the sustainability of mortgage debts. Thus, the insolvencies started to increase, especially for subprime mortgages. Consequently, the demand for houses slowed down curbing the house price appreciation. Moreover, in 2006, reset options started to align the low initial mortgage rates to market rates, so increasing even further the servicing cost of mortgages. At the same time, the decreasing value of the houses made it very difficult to get a re-financing loan to remain solvent. In spring 2007, the insolvency rate on the *subprime* mortgages exceeded 16 per cent, thus speeding up the property price drop.

Defaults in the subprime segment soon affected financial markets because many insolvent loans, or loans at risk of insolvency, provided the cash flow of structured bonds (i.e., asset-backed securities – ABS – and collateralised debt obligations – CDOs) in the hands of a multitude of international investors. In addition, between June and July, as a result of many downgrades announced by the major rating agencies, markets lost confidence in the ability of ratings to estimate structured bonds' default probability. Financial markets worldwide panicked, as it became suddenly clear that no sufficient information was available to evaluate those securities in the changed environment.

The international financial crisis, that blew out in August 2007, went through five stages (BIS, 2009): (i) from the beginning to the Bear Stearns' rescue (August 2007–mid-March 2008); (ii) from the Bear Stearns' rescue to the bankruptcy of Lehman Brothers (mid-March 2008–mid-September 2008); (iii) from the bankruptcy of Lehman Brothers to the collapse of the international financial markets (mid-September 2008–end-October 2008); (iv) from the collapse of the financial markets to the world recession

(end-October 2008–mid-March 2009); (v) from the world recession to the first signs of recovery (mid-March 2009–onwards).

1.2.1 Phase 1

On 9 August 2007, the subprime crisis became global: three European investment funds were frozen because it was impossible to determine the value of the securities linked to the US subprime mortgages in their portfolios. Therefore, panic became widespread on international financial markets. The high degree of opacity of structured financial instruments (mainly traded on unregulated or over-the-counter markets) made it impossible to single out just those assets related to subprime mortgages. Hence, a wide range of securities were no longer traded, liquidity disappeared from several markets, prices collapsed, bid-ask spreads increased, and stock markets recorded mounting losses.

The market for asset-backed commercial papers (ABCP) was the first one to be hit by the crisis. Rising insolvency rates on subprime mortgages reduced the quality of collaterals, thus increasing the interest rate spread on those securities, and also caused a significant drop in market transactions.

Hence, intermediaries operating in the shadow banking system could no longer roll-over short-term borrowing on commercial paper markets and were forced to draw on their credit lines with several US and European banks. Then, the crisis also affected commercial banks, whose difficulties became clear in the interbank market as counterparts were no longer willing to grant liquidity because of the fear they might need it too. Interbank interest rates (Euribor and Libor) rose to the point that central banks had to be involved. On 9 August 2007 the European Central Bank (ECB) undertook a short-term liquidity initiative worth 45 billion Euro, followed by five more initiatives, for a total value of 250 billion Euro. The FED also took similar measures. Nonetheless, interbank and commercial paper interest rates remained very high for the rest of the month.

On 19 September the crisis hit Northern Rock. The British bank was heavily relying on wholesale short-term funding and the lack of liquidity on international financial markets was challenging its solvency. Panicking depositors made long queues outside the bank's branches evoking movies recalling the Great Depression.

Market turmoil was temporarily eased by sovereign wealth funds' recapitalisation of the banks worst hit by the crisis. However, in November the situation got painful again as it became clear that total losses caused by the subprime mortgage crisis (approximately 200 billion dollars) were largely underestimated.

At this juncture, extraordinary measures were needed to avoid a dangerous deflationary spiral (see also Chapter 2 for how this relates to Minsky's instability hypothesis). Two options were available: (a) giving brokers the liquidity they needed, so that they would not be forced to sell some of their assets; (b) buying the securities that brokers were willing to sell, thus preventing a drop in prices. Initially the FED followed the first option, but lacking visible improvement, shortly after it followed the second option too. Moreover, the FED implemented various new monetary policy instruments to support financial markets. For instance, on 12 December it launched a Term Auction Facility (TAF) programme, targeted to commercial banks, with significant advantages compared to discount operations. As this instrument is used by the ECB on a regular basis, the ECB just made more short-term liquidity available to European banks, without changing its policy rate (see Chapter 9).

Following these initiatives, short-term interest rates recorded a significant reduction, but the situation got worse again at the end of January 2008. Financial markets were shocked by the potential downgrade of some major bond insurers. This prospect scared the markets which, between 21 and 22 January, reported unprecedented losses and forced the FED to further reduce its policy rate by 75 basis points in the first emergency meeting ever called since 1982.

After a period of apparent calm, new fears emerged in March. The liquidity crisis affected an increasing number of banks and on 11 March the FED announced a new credit line called Term Securities Lending Facility (TSLF). Moreover, a few days later, the FED, with the Primary Dealer Credit Facility (PDCF), committed itself to granting short-term loans also to investment banks. As the rate on this type of operation was the same applied to commercial banks at the discount window, this initiative marked the opening of FED facilities also to investment banks. This decision came under heavy scrutiny because investment banks were not subject to FED regulations and, in theory, would not be entitled to use public funds. During those days, markets experienced significant strains because of the difficulties of Bear Stearns. One of the five most important investment banks was in trouble because it could not roll-over its short-term loans due to the deterioration of its assets. Bear Stearns was a counterpart in many derivatives transactions and its bankruptcy might have started a dangerous domino effect. Thus, on 24 March JP Morgan Chase received 29 billion dollars from the FED to buy Bear Stearns and partially reassure the markets.

1.2.2 Phase 2

During this phase, the US financial system faced significant challenges. Liquidity problems turned into solvency problems, because subprime mortgages were just the tip of the iceberg and the prolonged downturn in house prices forced many investors to write-down a wide range of securities. Fannie Mae and Freddie Mac, the mortgage market giants, were badly hit by the crisis and in just a few months their market value went down by more than 70 per cent. So, on 7 September the US Treasury had to nationalise the two financial companies, which held more than 50 per cent of the mortgage loans originated in the US. The collapse of Fannie Mae and Freddie Mac intensified concern on the stability of the US financial system and operators shifted their attention to large investment banks. Lehman Brothers suffered the most because of its exposure to the real estate market through complex derivatives transactions. Markets were looking forward to some initiatives by US authorities, similar to the ones they had already undertaken for Bearn Stearns, but no such measure was taken. On 15 September Lehman Brothers, after being in business for 150 years, announced the largest bankruptcy in US history with 613 billion dollars liabilities.

1.2.3 Phase 3

Lehman's bankruptcy marked the beginning of the worst period of the crisis. On 16 September, the FED was forced to lend 85 billion dollars to AIG (American International Group). The largest insurance company in the world was on the edge of bankruptcy due to its hazardous dealing in Credit Default Swaps (CDS) derivatives offering counterparties insurance against default on many structured securities linked to the US real estate market.

Later on, the FED authorised Morgan Stanley and Goldman Sachs, the last two "pure" investment banks after Merrill Lynch had been bought by the Bank of America, to turn into commercial banks. This put an end to a form of capitalism that had been dominating Wall Street for more than 30 years (see Chapter 6 on the different contribution to financial instability by the various bank business models).

It became clear that resorting to ad hoc actions could not solve the crisis. In fact, a comprehensive strategy was needed to tackle the problem. During the last week of September, the Treasury Secretary Henry Paulson submitted a plan whereby the Government would buy the financial market securities that were causing the bankruptcy of many banks up to 700 billion dollars. The US Congress did not initially approve the plan, with subsequent losses on all international stock exchange markets (see Chapter 8

on how the drop in asset prices weakened financial intermediaries). The state of agitation continued even after the second week of October, when the plan was eventually passed.

At the end of September, the crisis hit the European financial system too. Lack of liquidity forced Iceland to nationalise the Glitnir bank, Germany to support Hypo Real Estate, Benelux to rescue the financial giant Fortis and support Dexia Group, the UK to nationalise Bradford & Bingley, Ireland to guarantee the deposits of the six main national banks (see also Chapter 7 for the role of international banks in the global transmission of the initial shock and Chapter 5 for this issue within the European context). On 8 October the British Government announced a plan to nationalise a significant portion of its banking system, worth more than 460 billion Euro (see Chapter 11 on government rescues of troubled financial intermediaries).

Between October and November, the subprime crisis completed its world tour contaminating also Asia and Latin America. The brisk global economic slowdown, through a sudden drop in the demand for raw materials, negatively impinged on those export-oriented economies like Chile, Peru, Argentina, Brazil and Venezuela; but even Australia, Japan and Singapore did not go unscathed.

1.2.4 Phase 4

In spite of timely and heavy government interventions, this phase was characterised by a significant degree of uncertainty on the stability of the international financial system.

Public financial stability plans encouraged stock markets' recovery, but the continuity of the recovery was still hindered by lack of specific details on the actions, the effects of the crisis on the real economy and the high degree of uncertainty about financial intermediaries' balance sheets. In January 2009, the International Monetary Fund (IMF) estimated 2,200 billion dollars of total write-downs related to the financial crisis.

Bearing in mind the experience of the Great Depression, central banks reacted jointly and consistently to the crisis. Within the context of a significant drop in aggregate demand and a drop in the inflation rate, policy rates were slashed to almost zero.

1.2.5 Phase 5

This phase was characterised by a slow return to normality in many key market segments: volatility abated, equity markets improved and the premium on corporate bonds decreased.

This retreating trend has been triggered by the fiscal and monetary efforts deployed to stop the crisis (see Chapter 10). More specifically, markets have welcomed the implementation of non-conventional monetary policies. On this front, central banks have resorted to three main instruments: (i) additional liquidity; (ii) establishment of extra reserves in commercial banks (quantitative easing); (iii) outright purchase of public or private bonds (credit easing). The first measure was undertaken already during the first three phases of the crisis to ease the liquidity crisis, while the last two were undertaken during phase 4 and phase 5 to reduce the medium and long-term interest rates.

In the summer of 2009 some encouraging signals (green shoots) emerged, indicating that probably the recession–deflation spiral had stopped. The oil price was rising again, industrial production had resumed growing in many areas in Asia and also business confidence bounced back. One of the most favourable signals was the Organisation for Economic Co-operation and Development (OECD) leading indicator, whose downtrend stopped. The indicator became again positive for the Euro zone and, though still negative, it showed some signs of improvement in the US and Japan.

1.3 ORIGIN OF THE CRISIS: MACRO ELEMENTS

Why did the crisis occur? For the sake of exposition, we classified the causes of the crisis as macroeconomic and microeconomic. Macroeconomic causes deal with global imbalances and low interest rates, while microeconomic causes address the impact of securitisation processes, financial regulation and the rating agencies.

1.3.1 Role of the Global Imbalances

Global imbalances are the first macroeconomic cause of the crisis. This problem was generated by the high and long-lasting current account deficit in the main industrialised countries, particularly the US, which was funded by massive capital inflows from the emerging economies.

The causes of the global imbalances remain the subject of a lively discussion. Some claim that the current account deficit might be due to the low savings ratio in industrialised countries, namely, the US, which requires the inflow of foreign capital to fund investments. Another option is that global imbalances – and the US deficit in particular – were caused by expectations of significant income growth in the US, which led the private sector to incur debts in order to smooth income over time. The third opinion is that insufficient domestic demand in the rest of the world, and in Asia in

particular, caused an enormous capital inflow into industrialised countries. According to the fourth and most accredited explanation, the large current account deficits in developed countries were mainly due to: (i) increasing surplus in the raw material exporting countries, resulting from growing prices; (ii) increasing economic growth in Asia where saving propensity is high; (iii) increasing currency reserves of the Asian central banks to avoid another crisis, like the 1997 one. So, between 1997 and 2007, these trends significantly contributed to boost international savings, to the point of exceeding real investment potentials in these countries and causing a “saving glut”, which then moved to industrialised countries (Bernanke, 2005).

Although the discussion on the causes of global imbalances is still open, the financial globalisation – that is, international financial markets being increasingly integrated – allowed surplus savings to flow to many industrialised countries, such as the US, the UK, Spain and Ireland. Having very low interest rates in these countries, investors searched for higher yields in different markets and real estate markets in particular. For example, Aizenman and Jinjark (2009) analyse the situation in 43 countries (25 of which were OECD countries) between 1990 and 2005 and find a very strong positive correlation between current account deficits and real estate price increases: on average, a 4 per cent deficit increase is associated, over the years, with a nearly 10 per cent increase in real estate prices. Specifically, in the US house prices increased even more: while the current account deficit went up from 1.5 to above 6 percent of GDP over 1995–2005, household sector borrowings grew from 71 to 100 per cent of GDP and house prices more than doubled over 2000–06 (see also Chapter 4).

Besides fuelling a strong increase of real estate prices, the inflow of foreign capitals also weakened the relation between short-term interest rates, affected mainly by the domestic policy rate set by the central bank, and long-term rates influenced much more by international factors. The first signs of this weakness and its perils emerged a few years before the beginning of the crisis. Between 2001 and 2004, the possibility to cash the difference between the market value of property and the loan value, by using different types of funding such as home equity loans, allowed many American households to afford levels of consumption that would have otherwise been impossible. Thus, after the first half of 2004, the risk of deflation caused by the burst of the “dotcom” bubble seemed a distant memory; and there were even signs of overheating. To keep inflation under control, the FED raised the policy rate but, contrary to other phases of monetary tightening, long-term rates remained low and, to a large extent, neutralised the effectiveness of monetary restrictions. Even then, the president in charge of the FED, Alan Greenspan, was surprised and called

the gap between the policy rates and long-term rates a conundrum (Wu, 2006). As a result, the costs of the fixed-rate loans remained substantially unchanged, the property boom continued, and the speculative bubble kept inflating.

1.3.2 Role of the FED's Monetary Policy

The overly easy monetary policy by the FED is the other macroeconomic cause of the financial crisis. The policy rate was kept too low for too long by the FED to ease the recessionary consequences following the burst of the “dotcom” bubble.

Two feedback mechanisms amplified the perverse effect of the overly easy monetary policy (see also Chapter 3).

The first circular mechanism, the balance sheet channel, is at work in the real estate market, where the supply of loans is closely related to the value of collateral assets. Specifically, very low interest rates reduced the cost of debt and increased the demand for houses. Therefore, real estate prices increased allowing households to get more credit, thanks to the rise of collateral values, which, in turn, inflated house prices even more. This because, in the short term, rapid growth of the demand for houses collides with a limited supply. In fact, at the beginning of the year 2000, in spite of the increasing efficiency of the US building sector, the technical time to build new houses was still long. As a result, house prices ballooned as shown by the Case-Shiller index that grew by more than 100 per cent between 2000 and 2006 (Figure 1.1).

The increasing employment rate following the 2001 recession, low interest rates and easier access to credit played a very important role, but were not enough to explain the huge house prices appreciation. Yale economist Robert Shiller claims that this is a typical example of a speculative bubble in which property prices increase so much because households and investors expect them to increase even more in the future. In his famous book *Irrational Exuberance*, Shiller describes a simplified model of bubbles based on the interaction between prices and expectations. According to the author, with a supply of houses relatively inelastic, that is, hardly reactive to the short-term price, fundamental factors like the increasing rate of employment and the availability of credit increase the demand and generate a remarkable growth of the market price. At this point, people searching high yield push up the demand for houses, because the gains grow very rapidly in the initial stages of the bubble. Thus, demand grows more than supply and paves the way to a period of steady price increases. Because of their irrational exuberance, some subjects believe that the price of property will keep growing indefinitely. Hence, more people invest in

Source: Authors' elaborations on Thomson Datastream Data.

Figure 1.1 US home price indices

real estate, prices and appreciation expectations go up and the speculative bubble keeps inflating.

The second circular mechanism, the bank lending channel, is strictly linked to the spreading out of securitisations and is at work in financial markets: rising real estate prices increase the value of the financial assets originated via the securitisation of mortgages, in turn allowing financial intermediaries to raise additional funds to be invested in acquiring more assets. Usually, these new investments are in mortgage-securitisation-originated securities and, thus, contribute to raise the funds for granting new mortgages on the primary market.

This mechanism was very important in the subprime crisis and the following example is very useful to understand it (Adrian and Shin, 2008). Let's assume that a financial intermediary uses mark to market accounting (whereby the value of a financial instrument reflects the current market value of that instrument) and wishes to keep a leverage (defined as the ratio of total assets to equity) of 10. For example, he might have assets worth 100 Euro funded with 10 Euro of equity and 90 Euro of debt. Let's now have a look at the relationship between leverage and balance sheet size. If, for example, the value of the securities (assets) grows by 1 per cent, from 100 to 101 Euro, keeping the value of the bonds unchanged, the value of the equity gets to 11 Euro ($10 + 1\%$ of $100 = 11$), while leverage drops to 9.18 ($101 \text{ €} / 11 \text{ €}$). To keep leverage unchanged, the bank has to get funds and issue bonds to buy more securities, so that: $\text{total assets/shares} = (101 + \text{new securities}) / 11 = 10$. The equation shows that the bank has to issue 9

Euro worth of bonds and use them to buy 9 Euro of securities. Hence, the 1 per cent security price increase has allowed the bank to issue new bonds, which have increased the assets value by 9 Euro.

As the price of securities goes up, the demand for them increases, rather than going down as would say the law of supply and demand. The growing demand increases securities price even more, thus triggering a process that, by reducing the leverage, pushes the price of securities up. The bank's balance sheet is now as follows: assets 110 Euro (securities), liabilities 110 (shares 11 € and bonds 99 €). If the price of securities drops to 109, keeping the value of the bonds unchanged, equity makes up for the reduction in the assets value and the bank's balance sheet is as follows: assets 109 Euro (securities) and liabilities 109 (shares 10 € and bonds 99 €). Leverage is now too high: $(109/10) = 10.9$ and, in order to get it back to 10, the bank has to sell securities that are worth 9 Euro and use the funds to pay off some of the issued bonds (deleverage), so that the values of the balance sheet are as follows: assets 100 Euro (securities) and liabilities 100 Euro (shares 10 € and bonds 90 €).

Also this mechanism is not in line with the law of supply and demand, because the price of securities goes down, but their supply increases. A negative sloped supply curve may trigger a circular process contrary to the one that was previously described: a drop in securities price increases the leverage level, pushes supply up and brings their price further down. This is the reason why the leverage of some intermediaries may cause pro-cyclical effects: during periods of price growth, increasing assets value pushes the demand for securities up, thus amplifies the upward trend. On the contrary, when prices drop, decreasing assets value pushes the supply of securities up amplifying the effect of the downward trend. Hence, leverage can be notably pro-cyclical and amplify the financial cycle. During the economic expansion between 2002 and 2006, US interest rates increased the banks' assets value and generated a surplus that had to be invested somehow, possibly on high-rating and high-yield instruments, such as senior tranches of CDOs, obtained from the securitisation of real estate loans.

The strong demand for these instruments made enormous amounts of new funds available for investments in real estate, but it also increased the market value of these securities, thus swelling financial operators' balance sheet. The availability of funds on the real estate market was so ample that mortgage originators, seeking loans available for securitisation, accepted significantly reducing their credit standards. As a consequence, rapid product and process innovation radically changed the US primary loan market. Before the beginning of the subprime crisis, it had become very common to obtain loans covering 100 per cent (or more) of the real estate value, to have loans granted for property already mortgaged (i.e.,

second line mortgage) and to obtain home equities loans. In particular, this last type of loans is quite usual at times of significant growth in real estate prices, as clients obtain funding – equal to the difference between the market value of the property and the value of the mortgage – to sustain their consumption.

From the loan origination point of view, the main innovation was in the Internet, which prevented many clients from going to banks and allowed them to provide limited documentation (low doc loans) or, in some cases, even unreliable documentation (liar loans). Mortgage brokers were very active in this field: they were not subject to strict financial supervision and, at the end of 2006, accounted for nearly 80 per cent of the new loans, twice the figure in 1996. As they profited to a large extent from commissions paid on the origination of loans, they did not have a long-term relation with their clients and were focused more on loan quantity than on loan quality. In addition, the possibility of grouping loans and selling them to other brokers relieved them of the burden to select clients accurately.

Without detailing all the products available in the US market, a differentiation should be made between prime mortgages, alternative-A mortgages and subprime mortgages. Prime mortgages are granted to clients with good payback features, while alternative-A mortgages go to those clients who declare high credit standards, but do not provide the needed documentation to prove it, so they might in effect be covert subprime mortgages. Finally, subprime mortgages are given to clients with low payback ability that are poor credit standards, which are considered as very risky clients. According to the most accredited definition provided by the Interagency Expanded Guidance for Subprime Lending Programs, typical subprime borrowers generally display a range of features, including one or more of the following: (a) two or more 30-day delinquencies in the last 12 months; (b) one or more 60-day delinquencies in the last 24 months; (c) judgment, foreclosure, repossession or charge-off in the prior 24 months; (d) bankruptcy in the last five years; (e) a credit score (FICO) of 660 or below; (f) debt service-to-income ratio of 50 per cent or greater. The growth of subprime and Alt-A mortgages, and related securities, was huge. For example, between 2001 and 2006, the value of originations increased by 215 per cent for subprime mortgages and by 566 per cent for alternative-A mortgages; likewise the issuance/origination ratio went up from 46 to 75 per cent for subprime mortgages and from 19 to 91 per cent for alternative-A mortgages (Ashcraft and Schuermann, 2008). Thus, the higher the number of originations, the fewer the loans in the balance sheets of those who originated them.

1.4 ORIGIN OF THE CRISIS: MICRO ELEMENTS

The subprime crisis also identified several microeconomic issues in the international financial system. The main problems are about securitisation processes, financial regulation and the rating agencies.

1.4.1 Securitisation Processes

Securitisation drastically changed the banking industry. Many financial intermediaries shifted from the “originate to hold” (OTH) to the “originate to distribute” (OTD) business model (Figure 1.2).

In the first model, loan origination is a simple operation that involves just two subjects: a bank and a borrower. The bank gets the funds from depositors and originates loans that it holds until their maturity. As the bank is exposed to the credit risk, it has strong incentives to accurately select borrowers (screening) and follow up their behaviour once the loan is granted (monitoring). On the contrary, in the second model loan

Source: Authors' elaborations.

Figure 1.2 Banking business models

origination is a more complex operation, similar to a production process, which involves several subjects. Upstream of the production chain, investors provide the funds that are needed to originate the loans; downstream, the bank grants loans to clients. Along this chain, many subjects – each of them specialised in a specific phase of the production process – use complex financial instruments to transfer the funds from investors to the bank and credit risk from the bank to investors. The main advantages of this business model are specialisation and risk distribution. On the one hand, specialisation favours: (i) a more efficient use of a bank's capital; (ii) a reduction of loan's cost; (iii) a high degree of financial innovation; (iv) an enlargement of clients eligible for a loan. On the other hand, the fact that many financial instruments – with different risk/return combinations – are issued renders the financial system more stable and allows investors to diversify their portfolios.

But the increase in efficiency has a cost, which sometimes could be very high. The transfer of the credit risk from banks to investors may distort the incentives of the “originate to distribute” model and create more low-quality loans. Moreover, due to their complexity, the risk of the financial instruments resulting from securitisations is very often difficult to evaluate. Errors made by the rating agencies in estimating the default probability of these instruments – which were too complex even for them – and investors' undue self-confidence in underwriting them reduced the stability of the international financial system.

In this framework, the US financial deregulation not only favoured the development of new loan types – questionable as they may be (for example the ninja mortgages granted to clients with no income, no job and no asset) – but also complicated the estimate of potential credit losses and the identification of the most exposed subjects. Therefore, it is not surprising that the defaults of the last link in the complex US financial chain (subprime clients) rapidly affected the whole sector. Lack of transparency of the instruments and players involved hindered the reduction of the exposure to the subprime mortgages and also entangled those intermediaries and financial instruments that were not closely related to the real estate market. Hence, the crisis started in a small segment of the US real estate credit market soon expanded to the whole US credit system and the wind of globalisation soon spread it to all the international markets.

Technical aspects of securitisation

Securitisation processes greatly exacerbated the effects of the US real estate bubble burst. Since the 1980s, this financial technique had been growing exponentially and expanded from real estate loans to many other sectors of the US financial system, such as credit card loans or loans to buy a car.

The securitisation can be divided into three phases: (a) identification of a group of homogeneous credits in the portfolio of a financial institution that – possibly through a broker – originated them (originator); (b) sale of credits to an ad hoc vehicle (conduit, SIV or SPV); (c) placement, by this vehicle, of asset-backed securities (ABS), whose interest rate payment and repayment when due depend on the cash flow generated by the underlying credits. For instance, in the case of securitisation of real estate loans, in phase 1 a bank (originator) issues the loans, which are then sold to another broker (arranger), who will also be entitled to get the cash flows of the loans and the collateral asset rights. In the second phase, the arranger groups the purchased loans and sells them to another subject (issuer), who has been specifically established to perform securitisation operations. In the third phase, the issuer issues the bonds backed by the purchased loans, whose cash flows match loan cash flows.

The bonds issued during the third phase are called structured bonds and can be classified as follows:

- Asset-backed commercial paper (ABCP);
- Mortgage-backed security (MBS) with residential mortgage-backed security (RMBS) or commercial mortgage-backed security (CMBS) depending on the collaterals type;
- Collateralised debt obligation (CDO) in which the ABS or MBS portfolios are securitised once again and are sliced into tranches. Depending on the type of collateral security, they can be further sub-classified as follows:
 - Collateralised mortgage obligation (CMO) guaranteed by residential mortgages;
 - Collateralised loans obligations (CLO) guaranteed by business loans;
 - CDO squared obligations, CDOs guaranteed by CDO obligations;
 - CDO cubed obligations, CDOs guaranteed by CDO squared obligations;
 - Synthetic CDO guaranteed by credit default swaps (CDS) portfolios. This instrument allows the special-purpose entity not to buy bonds, but rather to commit itself to paying back the nominal value of the MBS or CDO in case of default; receiving in exchange a quarterly premium.

Issuers can meet the different investors' risk propensity by splitting the bond issue into multiple tranches, each one with its specific risk-return profile. Junior tranches get higher yields, but are first in line to absorb losses, should borrowers default. Mezzanine tranches get lower yields

than junior tranches, but are attacked only when the collateral security defaults exceed the junior tranche value. Finally, senior tranches get the lowest yields, but losses are recorded only if the default exceeds junior and mezzanine tranche values.

The tranching activity creates structured financial products whose risk is lower than that of the securitised assets average. This is the main justification to the significant growth in the issue of CDOs, whose senior tranches, also thanks to the triple A granted to them by rating agencies, were perceived by investors as risk-free bonds, with yields higher than those of the corporate obligations with equivalent ratings.

Specifically, the risk class of each tranche depends on two variables: degree of subordination and credit enhancement. The degree of subordination of a tranche is given by the total value of the lowest seniority tranche, while the most common level of credit enhancement is over-collateralisation. A common type of over-collateralisation is the creation of a tranche equity that is not placed on the market, but remains in the vehicle and is the first one to get losses, in case of a collateral default. Another type of over-collateralisation can be the creation of excess spread, resulting from the difference between the total yield of collateral securities and the yield of the obligations issued by the vehicle. In such a case, the first losses will be absorbed by this buffer and, should the losses be less than the excess spread, the difference will be assigned to the equity tranche; if the losses exceed the excess spread, the equity tranche does not get any premium and the other obligations will be attacked (according to their degree of subordination).

The possible relations between these instruments are shown in Figure 1.3. Initially, a special-purpose entity buys the subprime mortgages (1) and issues the mortgage-backed securities. The MBS are then bought by other entities, which use them as collateral securities to issue CDOs. High-quality tranches are used to issue high-grade CDOs (2), while low-quality ones are used to issue mezzanine grade CDOs (3). Finally, the low-quality tranches of the mezzanine CDOs are bought by another vehicle that uses them as collateral securities to issue the squared CDOs (4).

It should be kept in mind that senior tranches are less risky than other tranche types, only if the correlation between the collaterals default is low. For example, if the assets are 100 loans, all of them issued to very low-income households in the suburbs of New York, it is very likely that all the families will default at the same time should an economic slow-down occur. As a consequence, even the CDO senior tranches will probably get losses. On the contrary, should the 100 loans be issued to different clients, with very low to very high incomes in 100 different cities, the likelihood that all the clients default concurrently, should an economic slow-down

Source: Authors' elaborations.

Figure 1.3 MBS: mortgage-backed security, CMO: collateralised mortgage obligation, CDO: collateralised debt obligation

occur, is much lower. In such a case the senior tranches are less risky than the others.

Government-Sponsored Enterprises (GSEs) were the first issuers of mortgage-backed securities. These government companies, like Fannie Mae and Freddie Mac, buy loans from the originator banks and issue MBS guaranteeing the cash flows on these instruments, in case of borrowers' default. For a long time this mechanism had granted liquidity to banks on the primary market, and also developed a large secondary market of MBS. Thanks to their crucial role, GSEs had always benefited from the implicit guarantee of the US Treasury, which became explicit in July 2008, allowing them to collect funds by issuing bonds (agency debt) at a rate only slightly higher than that on Treasury bonds. However, to minimise moral hazard behaviour, the US Treasury allows the GSE to

buy just conforming loans, that is, good-quality loans which meet specific requirements, for instance, in terms of size and loan to value ratio.

Until the mid-1990s, Fannie Mae and Freddie Mac controlled almost all the market of MBS. However, later on a shadow banking system emerged, challenging GSEs. Non-bank intermediaries like SIVs, SPVs, Conduits, investment banks and hedge funds got in the securitisation business. Most of the intermediaries that operate in the shadow banking system use short-term funding to make long-term investments, such as structured bonds. They share with traditional banks many features, such as asset maturity transformation, but operate in the shadow of the financial regulation. Their low degree of capitalisation gives them a powerful leverage effect, but also renders them very fragile. This explains why the liquidity crisis erupted in August 2007, exactly in the shadow banking system, turned quickly into a solvency crisis with enormous systemic effects, amplified by opacity of the instruments, financial techniques and operators involved.

1.4.2 Financial Regulation

Basel I regulation contributed to the growth of securitisation by assigning lower capital charges to securitised assets (Demirguc-Kunt and Servén, 2010). Hence, to reduce regulatory capital in the years before the crisis, many US banks established some special-purpose entities to which they could sell the originated loans through securitisation (Acharya and Richardson, 2009). Special-purpose entities funded the procurement of the loans by using ABCP guaranteed by the sponsoring bank. This guarantee has two important effects: first, the special-purpose entity can collect funds with low interest rates because the rating agencies give high rates to ABCP thanks to the bank's guarantee. Second, no capital charge is expected from the bank if the guarantee refers to ABCP with a less than 12-month maturity (the most common on the market).

1.4.3 Credit Rating Agencies

Financial regulation's reliance on ratings gave a significant contribution to the development of securitisation and, as a consequence, to the activity of the rating agencies.

The capital charge of banks, insurance companies, broker-dealers and pension funds depend on the rating level of their assets: the higher the rating, the smaller the regulatory capital they need. The demand for high rated and high yield instruments encouraged the growth of structured bonds, because by creating different types of tranches it is possible to issue many bonds with a rating higher than that of the average pool

of securitised assets. In 2007 outstanding structured bonds amounted to almost 11,000 billion dollars, circa 35 per cent of the total US bond market; 60 per cent of them were triple A. This is a very high value if one considers that less than 1 per cent of the corporate bonds had such a rating (Fitch Ratings, 2007).

However, since July 2007, the quality of structured bonds rapidly decreased: in November of that year there were more than 2,000 downgrades, with 500 tranches downgraded more than ten notches (i.e., from AAA to BB+, since the one notch downgrade is between two contiguous grades). The downtrend continued in 2008, too, with more than 11,000 downgrades of structured bonds that had been given a triple A (Benmelech and Dlugosz, 2009). CDOs were the most badly hit; in fact, they were the core cause of loss of the main international financial institutions involved in the crisis. Because of the numerous downgrades, investors no longer trusted the rating system and the demand for structured bonds, which is highly dependent on the rating, collapsed. In 2008 private MBS, CDO and ABS issues decreased by 96, 88 and 82 per cent, respectively.

The main rating agencies were harshly criticised for declaring some bonds nearly risk-free (triple A), which then defaulted a few months later. The main cause of this debacle is probably the deep conflict of interest in the rating industry. On agencies' side, receiving the fees from the subjects who ask the rating can be an incentive to overestimate the quality of the bonds in order to meet the issuers' rather than the investors' needs (in literature this phenomenon is referred to as rating inflation). On firms' side, the possibility to be rated by multiple agencies and communicate only the highest rating to the market is like going shopping for the agency that is willing to grant the best rating. Moreover, some agencies also provide consulting services on how to organise the issues and structure the tranches to get the highest possible rating.

NOTES

1. This chapter partly draws on a more comprehensive explanation of the GFC published in V. D'Apice and G. Ferri (2010), *Financial Instability: Toolkit for Interpreting Boom and Bust Cycles*, Palgrave Macmillan Studies in Banking and Financial Institutions.
2. The pandemic crisis triggered by the spread of the COVID-19 virus is not analysed in depth in this book. Indeed, the shock originated outside the financial system and thus cannot be classified as a financial shock. However, given its importance, many parts of the book analyse its possible effects on the financial system.

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