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The American real estate bubble of 2003-2007 that originated the financial subprime crisis

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The American real estate bubble of 2003-2007 that originated the financial subprime crisis

Introduction

This thesis treats a very complex topic that has been debated hundreds of times in the last decade, on which there is not yet an agreement between academics, probably because too little time is passed from the conclusion of the event (if we can consider it concluded) and people are still emotionally involved. For this reason, is worth to produce a paper with the aim to clarify the phenomenon at the origin of the biggest world financial crisis since the Great Depression that upset the world in the ’20 and ’30 and only stopped thanks to the rush to war in the end of the decade. Great Depression will be mentioned many times in the pages below, as it is considered the most similar event to the Subprime Financial Crisis (talking about magnitude), even if the surrounding environment is completely different, so any comparison must be carefully managed. The first part of the thesis is focused on the understanding of the main argument, the real estate bubble. Chapter 1 starts with the description of an asset bubble and few examples in the past, to conclude with the common characteristics of the real estate bubbles. Once the reader has a clear comprehension of the grounds of the argument the main part comes into play: the causes of the real estate bubble. This chapter is the outcome of a huge work of condensation of all the theories regarding the bubble and goes from the analysis of the monetary policy to the excessive use of credit default swaps, passing through the role of the rating agencies and the global saving glut. The aim here is to make people understand that such a complex phenomenon was not originated from a single cause or a trigger event, but is a mixture of human behaviours, exotic financial instruments, monetary policies and other environmental characteristics that generated the spiral effect well explained below. So the conclusion of the central part of this paper does not identify a single cause that triggered the bubble and the consequent financial crisis, but a series of

events that together generated a particular environment, where people got involved in the seek of easy profits in the real estate market, apparently with no risk. I the last part we will briefly analyse how Federal Reserve and the United States government stopped the decline in house prices and the subsequent crisis and how much effective has been their political and economic action, considering that, at that point, the crisis were become global; a lot of countries were suffering a severe recession. To conclude is worth in my opinion to mention few macroeconomic solutions that could be useful for the prevention of such events, even knowing that economy is made by cycles, so bubbles and crisis are an essential characteristic of the capitalism.

1- What is a real estate bubble?

1.1- What is an asset bubble and historical examples.

Very often we hear the word "bubble" or "crisis" in this new millennium, characterized by a diffused financial instability, where a sentiment of uncertainty about the future is fostered by recent economic depressions, wars, energetic crisis and climatic change. What we are not aware of, is that not always the word "bubble" is used appropriately by the media, that sometimes are more concerned about generating interest in the public than giving reliable information in a way that can increase collective knowledge about financial phenomena. So, this first section aims at explaining in an exhaustive but comprehensive way what a bubble is, how and why does it generate, and what are its requirements. In the final part there will be a brief description of the first bubbles spotted in the history (at least the oldest we learnt about) which will give an interesting historical perspective.

"Historically, bubbles, crashes, and financial crisis have occurred with striking regularity. There is evidence for bubbles and crises during all time periods for which we have financial data"[1], but only in the second half of the 20th century, economists started to study in depth, and mathematically, what a bubble is. What comes out after more than 50 years of literature, and various new bubbles occurred all around the world, is that a bubble is a large sustained mispricing of an asset. The term "sustained" should serve as a boundary between a bubble and a temporary mispricing, but a bubble has also other specific features. Features that are quite easy to declare, but not as much easy to spot in the movements of the price of an asset, otherwise no bubble would ever been existed! (even if, we know that there is a time frame between when the first investor spots the bubble and the trigger event that creates the "panic selling"; this is the period in which speculators "ride the bubble" following a specific behavioural pattern that I will explain later). Quoting the famous book "*The Big Short"* written

[1] MARCUS K. BRUNNERMEIER, MARTIN OEHMKE, *Bubbles, Financial Crisis, and Systemic Risk,* Handbook of the economics of finance, Volume 2, part B, 2013, p. 7.

by Michael Lewis after the subprime crisis of the first 2000s: "The first characteristic of a bubble is that no one is aware of its existence".

Kindleberger defines a bubble as "an upward price movement over an extended range that then implodes"[2]. This could be at the same time complete and useless as description. Economists arise few doubts about how much and how quickly the price must rise to be qualified as a bubble, because we know that demand and supply are variable in the lifecycle of a product, so large price movements can occur naturally, especially in some kind of products (like fashion accessories). For this reason, is useful to introduce a new definition, the "fundamental" value of an asset. Being the fundamental value "the expected value of all dividends the asset yields over its lifetime, properly discounted", it is clear that "if the price of the asset exceeds this value, it can be legitimately viewed as overvalued"[3]. But estimate the fundamental value of an asset is not always a straightforward process, and it needs some mathematics to develop a formal definition: let's consider an asset that yields an exact stream of dividends, where d_t is the dividend paid in time *t,* and q_t is the price of a bond that pays one dollar at time *t*. If we assume that all investors can access to the bond, they will give the same value to a dollar at time *t* and q_t dollars today, so the fundamental value of the asset would be

$$F = \sum_{t=0}^{\infty} q_t \; d_t$$

A bubble is a situation where the price of an asset (P) does not coincide with its fundamental value (F), that is, P≠F. More strictly, we find a bubble when the price exceeds the fundamental value, so P>F. Suppose now that the stream of dividends at time *t* is not certain, and that it depends on a specific state of the world, ω_t, in a set containing all the possible outcomes (Ω_t). This particular set has a probability of ω_t, so the dividend would have the value $d(\omega_t)$ and the bond that pays one dollar at time *t* would have the value $q(\omega_t)$, depending on the particular state ω_t. In this case, the fundamental value of an asset is calculated as

[2] CHARLES P. KINDLEBERGER, Manias, Panics and Crashes: a History of Financial Crisis, Wiley, 1996.
[3] GADI BARLEVY, Economic theory and asset bubbles, Economic Perspectives, 3Q/2007, p. 46.

$$F = E\left[\sum_{t=0}^{\infty} q(\omega_t)d(\omega_t)\right]$$

In the case where the expectations about the state of the world differ across investors, there will not be a unique fundamental value. So, the definition of fundamental value is getting more complicated and " as Harrison and Kreps (1978) and Allen, Morris, and Postlewaite (1993) point out, it is still possible to talk about an asset unambiguously overvalued if it exceeds the fundamental value *any* trader in the market would assign to it"[4]. If any trader thinks that is not worth to purchase the asset with the aim of holding it forever, we can define that asset a bubble (P>F for all traders in the market). The last complication could arise from policy: until now we considered q_t and p_t as fixed values, but they can be modified by policymakers in order to modify asset's price for some reason, but at the moment we can take fixed policies for the seek of simplicity. Action of policymakers will be treated in detail in chapter 2, as one of the causes of the real estate bubble of early 2000'.

Now we have a quite simple, but technical definition of a bubble, so the doubt is on when a bubble occurs. According to the studies of Tirole (1982) at least one of the following assumptions must be true for the occurrence of a bubble: there are infinite many traders, there are differences in the initial belief of traders or traders are irrational, and there are inefficiencies in resource allocation. Talking about the number of traders, Tirole argues that "in a dynamic framework with a finite number of agents, a rational trader will not enter a market where a bubble has already grown, since some traders have already realized their gains and […] it is not possible for everyone to find a buyer and avoid getting stuck with a hot potato "[5]. Under this logic, no investor would ever buy an overvalued asset, not having the guarantee that another investor will buy it in the future taking on the risk. With an infinite number of traders, even with the same initial belief, the game of the "hot potato" can continue, inflating the bubble. Second, if we assume that traders have different initial beliefs about the fundamental value of an assets or, they behave not rationally, they can try to profit at the expense of other traders with different beliefs. Harrison and Kreps on this topic argue

[4] GADI BARLEVY, Economic theory and asset bubbles, Economic Perspectives, 3Q/2007, p. 47.
[5] JEAN TIROLE, On the Possibility of Speculation under Rational Expectation, Econometrica, Vol. 5, Sep. 1982, p. 1180.

that "[B]eginning with the view that stock prices are created by investors, and recognising that investors may form different opinion even when they have the same substantive information, we contend that there can be no objective intrinsic value for the stock".[6] This reasoning is valid for all the assets and is clear that this conditions can lead to the existence of a bubble. In this scenario, the task of policymakers could be to educate traders on the recognition of the true fundamental value of assets. The third Tirole's assumption is the inefficient allocation of resources that, creating different level of wealth among investors, could allow traders to sell the overvalued asset to someone who will not be worse off from buying it. To conclude, the existence of a bubble can be ruled out if we assume that traders are rational, and markets are efficient; in other conditions (as the real one) bubbles can emerge and is not so easy to spot them in time.

Before going in the field of practical examples, the last worth to mention concept is related to Minsky and Kindleberger's studies on the anatomy of a bubble (1978). They found that not two bubbles are alike, but all share a common structure. This particular phenomenon is characterized by five consecutive phases. The starting point is the *displacement* generated for example by a new disruptive technology, that increases the expectations for an outstanding growth. The second phase is the *boom*, where prices and investments start to increase gradually, but with a low volatility; at some point in this phase, prices start to exceed fundamental value, but the bubble is not been formed yet. At this point starts the *euphoria*, the overvalued asset is traded with high volumes, the market is frenzy, the demand is at the top and the price goes to the roof. But sophisticated investors start thinking times is going to change, so they start reducing their long positions; anyway, less informed investors continue to foster the demand: this is the *profit taking* phase. Finally, when all investors have the same belief about the mispricing of the asset, starts the *panic* phase, characterized by a rapid fall in prices where investors dump the asset. As we experienced in the last real estate bubble, "if the run-up was financed with credit, amplification and spillover effect kicks in, which can lead to severe overshooting also in the downturn"[7]. As you can see from the table below, the phases of a bubble can be interpreted in different ways, but the final outcome in the same, as

[6] J. MICHAEL HARRISON, DAVID M. KREPS, Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations, The quarterly Journal of Economics, Vol. 92, No. 2, 1978, p.334.

[7] MARCUS K. BRUNNERMEIER, MARTIN OEHMKE, *Bubbles, Financial Crisis, and Systemic Risk,* Handbook of the economics of finance, Volume 2, part B, 2013, p. 13.

the step followed from the inflation to the burst. In this specific table, the profit taking and panic phases, are considered together.

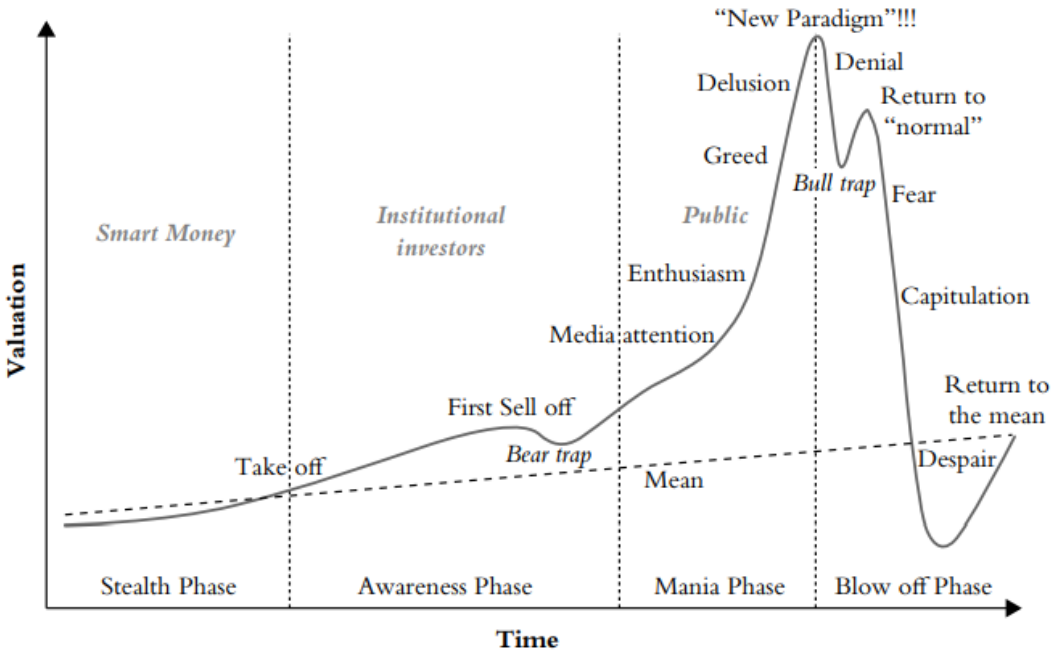

Table 1: Anatomy of a bubble from (https://www.variantperception.com/2017/09/22/the-anatomy-of-a-bubble/)

As reported in the first page, history is disseminated by bubbles. Even if the first documented one dates back to 17th century, this kind of phenomena have always happened since trading exists, what lacks in the previous centuries, is the financial information to examine in order to understand price movements and variations in demand and supply of assets.

The interesting story of the "Tulip Mania" is the first of a long series of bubbles: all started in the late 16th century when someone imported in Holland this beautiful flower originating from Asia, through the Ottoman Empire. Botanists started to cultivate Tulips and create hybrids, while Dutch people loved them more and more, until the moment when some merchants discovered that trading the bulb, and not the flower would have been more profitable, especially particular bulbs, infected by a sponger, that generated flowers with outstanding colours (Holland was one of the richest country in Europe where trading were well developed). People started exchanging bulbs with money and the demand increased exponentially, but

the supply were stable: we have the bubble. From 1633 to 1637 the prices increased by almost 20 times, bulbs were used as currency and houses or properties were bought for few of them; all the Dutch people were involved, and every family had part of its wealth invested in Tulips. At a certain point, prudent people decided to capitalize, and the domino started, prices fell down to the original values of the beginning of the century, people were no more able to honor their credits. When government decided to intervene offering to honor the insolvent contracts at one tenth of the face value, it created an even worse situation. Many families were ruined by this crazy "Tulip Mania" and Holland took many years to recover from the subsequent crisis.

More complex but with a similar ending, is the South Sea Bubble, occurred in England in 1720. The story started with the foundation of the South Sea Company in 1711. The company, taking inspiration from the successful East India Company, promised to take over part of the national debt (issued for the war of Spanish succession, 1701-1714) in exchange of the monopoly of the trades with the Spanish colonies in South America. The fortune of the company was related to the outcome of the war, that didn't match the expectations, so no voyages had been undertaken until 1717. Anyway, in the following two years, the South Sea Company was able to convert other portions of national debt for shares, circulating false claims on successes and South Sea riches. The company's share became widespread in England. At this point we enter in the "bubble year" (1720) when the company share's price rose from 128£ in January to 1050£, in June. From the half of the year onward, the reliability of the company, that was not supported by facts, started decline and investors' confidence began to wane. By three months the price dropped to 175£. Even if formal investigations for corruption and bribery were conducted, institutions and individuals reported huge losses.

Another speculative event occurred in England, almost one hundred years after the South Sea bubble was the British Railway mania of the 1840s. That mania was characterized by an extensive enthusiasm for investing in railways shares. Initially, the industry was begun in 1830 with the development of the world's first recognizably modern inter-city railway (the Liverpool and Manchester railway). At that time (in the late 1830s and early 1840s), the British economy was slowing down, interest rates were rising, and government bonds had become a very attractive investment option. However, in the mid- 1840s, since the economy was now improving rapidly, the Bank of England cut interest rates and the newly developed manufacturing industries began to expand. In that environment, government bonds became

an unattractive investment and existing railway company shares began to increase in value, as more and more of people became willing to invest in railways. It is worth mentioning that many middle-class families invested their entire savings in the prospect of the 'railway revolution'. In the wake of this, railway share prices showed a nearly exponential growth in price. Between January 1843 and August 1845, prices almost doubled as several railway companies were formed. As with other bubbles, the railway frenzy had uncovered another self-promoting cycle of over-enthusiastic speculation. In late 1845, investors began to realize that shares of railways companies were not as profitable as was believed, and most importantly, that railways were not as easy to build as they had been led to believe. In addition to this, the Bank of England raised its interest rates and alternative investments became more attractive. All of these factors caused a slowdown in the share prices of railway companies. By November 1845, railway stock prices had declined by 18% compared to their peak in August 1845. After a small recovery, prices continued the correction process until April 1850 marked a decline of about 58% in total on a peak to bottom basis, causing many families and individual investors to lose almost everything. However, unlike with some other asset bubbles, there was actually a tangible net benefit of the railway bubble: the vast expansion of the British railway system.

These well-known past crisis and bubbles should have served as a warning signal on how to behave in the stock market and with the speculation in general, but we know that "history repeats itself", and in the 20th and 21st centuries these events occurred and are occurring with a higher pace. Moreover, the complexity and the interconnection of the global market, amplifies both the inflation and the burst of the bubbles. In particular, after the first World-War, the need to rebuild houses and infrastructures, together with the increasing wealth and modernization of populations, led to periods of high demand for real estate. This phenomenon contributed to the creation of the modern world, but sometimes resulted in real estate bubbles followed by financial crisis. In the remaining part of this chapter we will analyse real estate bubbles, starting from an historical overview of the real estate bubbles occurred in the last century; following this path we are moving close to the central part of this thesis, that is the mid 2000' real estate bubble.

1.2- Historical description of real estate bubbles in the past and their consequences.

The last century was characterized by a lot of different periods, technological innovations, wars, and political revolutions. The high level of instability and the constant technological innovation originated waives of outstanding growth followed by marked recessions. Few of these recessions were related, among other things, to speculative real estate bubbles: I'm going to illustrate some of them.

The first worth to mention housing bubble in the 20th century is the one occurred in the early 1920s in United States of America. This episode is generally labelled as "the forgotten real estate boom of 1920s" because it precedes the recession of 1929 that shocked the U.S.A. first, and then the rest of the civilized world. Everybody knows that the Great Depression was originated by a stock market bubble, but, even if "the collapse of the housing market did not derail the economy […], it explains the autonomous drop in investment on the eve of the Great Depression and seriously weakened the balance sheets of many households and banks. It was the one of a one-two punch."[8] So, as we are going to see, the housing bubble of the 1920s has many common characteristic with the one object of this thesis and is interesting to notice how the same mistakes are made over a span of 80 years. For a bubble to emerge, some particular circumstances are needed, to "prepare" the environment for the future five phases above descripted. In this case the fundamentals can be divided in real and monetary factors. The first real factor is the post-World War I recovery: during the war, the demand for real estate fell near zero (especially residential houses, as explained in the figure 1) so, is logic to expect that the repressed demand fuelled the post war boom. The second factor is related to a technological innovation that allowed people to move freely and fostered the suburbanization: the diffusion of automobiles. Furthermore, the first world war accelerated the transition form an agrarian nation toward an industrial nation, through the diffusion of the mass production and the electricity. But this is not enough to justify a bubble. Indeed, there are other macroeconomic factors, like a decrease of money market volatility prompted by the Federal Reserve, now called a "Greenspan put"[9] , that encouraged people to undertake

[8] EUGENE N. WHITE, The Great American Real Estate Bubble of the 1920s: Causes and Consequences, Rutgers University and NBER, Department of Economics, 2008, p. 1.

[9] Refers to the monetary policy approach that Alan Greenspan, the former Chairman of the United States Federal Reserve Board, and other members exercised from late 1987 to 2000. According to the policy, in periods of crisis,

riskier economic decisions and the low interest rates. Moreover, the twenties', has been characterized by a boom in mortgage financing (from 45% before the World War I to 60%) followed by a shortening of the contract length and an increase in the loan to value ratios. Now we have all the necessary ingredients for a bubble, we just need a trigger.

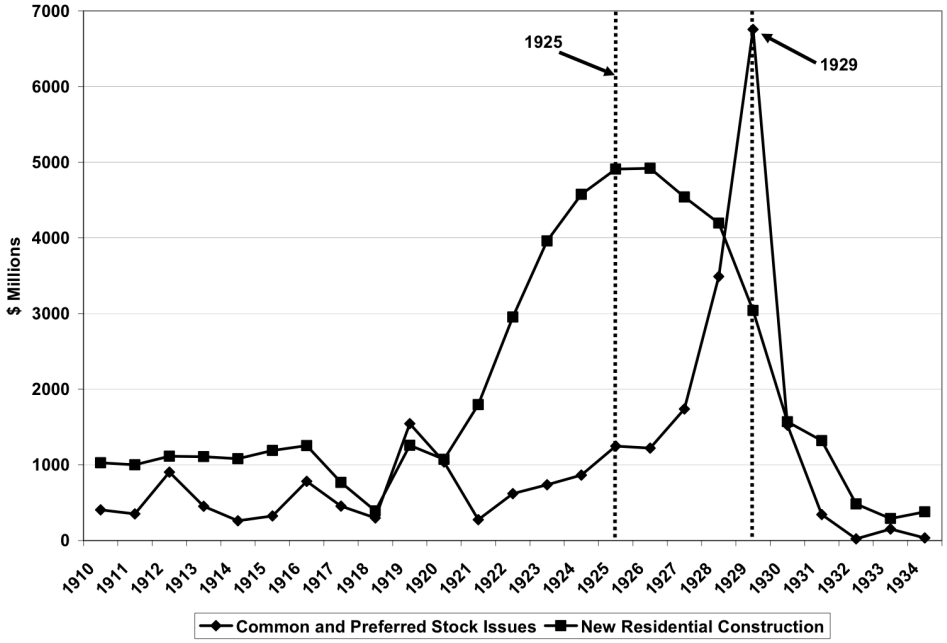

Table 2: The Double Bubble, New Housing and New Stocks, 1910-1934 (from Eugene N. White, The Great American Real Estate Bubble of the 1920s: Causes and Consequences, Rutgers University and NBER, Department of Economics, 2008, p. 2.)

Probably, that nationwide speculative bubble started in Florida, where people tried to emulate the residential success of selling Southern California with the aim to get rich. People started to buy residential estates as first home or for leisure time, and prices started to increase. At a certain point the reason for investing in Florida was forgotten and the entire market was made of speculators. "By the height of the land boom of the 1920s, a single piece of land was changing hands as many as six times a day"[10]. Florida became a popular place for vacation until the fall, in the 1926 where some people started to default on their payments and all the scheme collapsed rapidly, leaving the owners with a great loss or a default. The same happened in most part of the nation, with different intensity. The foreclosure rate increased in the years following the 1926 and even worsened after the crisis of 1929. Even if the information is not enough to assess the magnitude of the losses, and the Great Depression

the "Fed" would lower the rates and inject liquidity. This resulted in an investors perception of protection that give rise to the moral hazard and the speculative bubble of 2008.

[10] DONALD RAPP, Bubbles, Booms, and Busts, The Rise and Fall of Financial Assets, Springer, 2009, p. 165.

intensified the downturn, is clear the similarity with the 2007 housing bubble burst that resulted in a world financial crisis in the following years.

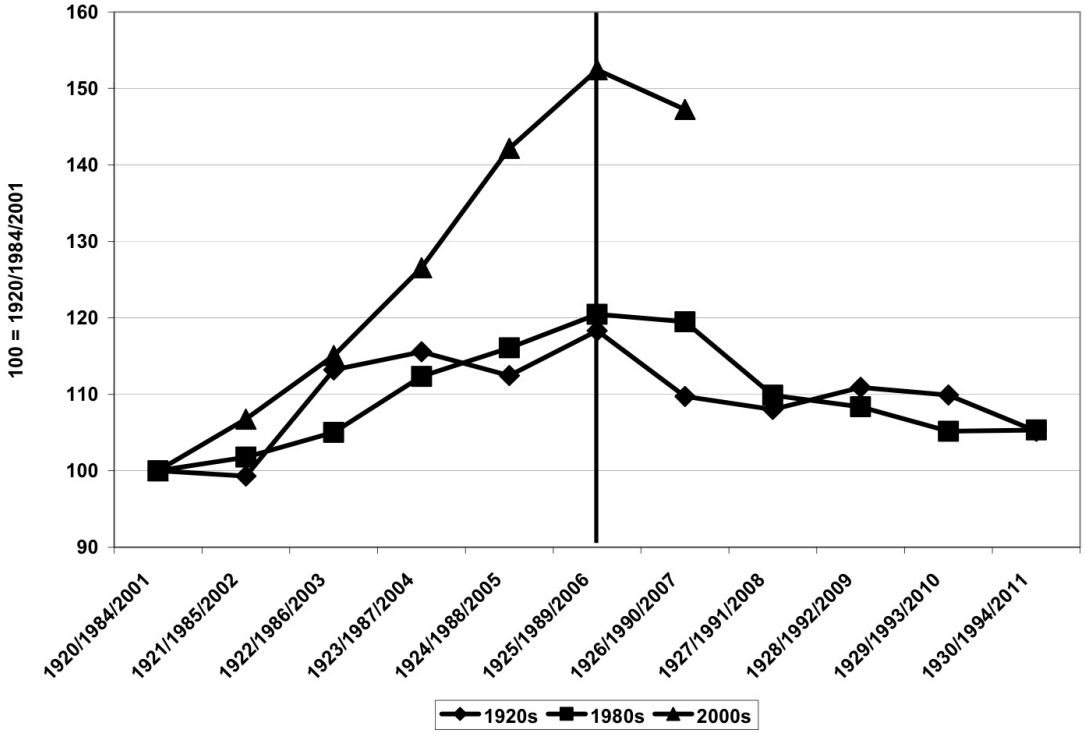

Table 3: Real Estate Booms Compared (from Eugene N. White, The Great American Real Estate Bubble of the 1920s: Causes and Consequences, Rutgers University and NBER, Department of Economics, 2008, p. 9).

Let's bounce now at the end of the century. Different historical period, different nation but similar occurrence and in some sense, similar underlying factors. We are talking about the real estate-stock market bubble of the 1980s in Japan. In this case the two asset bubbles showed up at the same time leading to the phenomenon of the "Lost Decades" that slowed down Japanese economy for almost 20 years. After the defeat in the World War II, Japan experienced a period of positive trend and in the seventies, giant conglomerates like Mitsubishi dominated the global market thanks to innovative production methods. Foreign markets were becoming more and more important for national companies. So, the Japanese government started to deregulate financial markets and lower interest rates, especially with the "Yen-Dollar Agreement" that further opened the national financial market. Tokyo became a large international offshore market and the financing behaviour of Japanese companies changed, raising most of their capital on financial markets. At this point, the higher value of shares and lands made easier for the banks to grant bigger loans (as the value of the collaterals were higher than before) and "a reciprocal process of rising prices of land and stocks on the one hand, and lending on the other, started. […] For banks, competition intensified with lower

interest and profit margins. They responded by investing more in riskier projects where higher yields could be achieved".[11] This environment, strengthened by a diffused positive mood, was the perfect one for the raise of a speculative bubble. The trigger event occurred in 1985, when a slowdown of the economy related to an excessive appreciation of the Yen against the Dollar, successive to the Plaza Agreement[12], forced Japanese government to further improve monetary and fiscal stimulation. This injection of liquidity inflated the prices and accelerated the run to the real estate; on average the prices of houses doubled between 1984 and 1989, but in Tokyo and Osaka prices quadrupled. The same was for share prices. The herd behaviour reduced the efficiency of the markets, moreover tax on properties were low and taxes on sales of lands were high. So, demand increased, supply decreased, and the assets were by far overvalued, as represented in the graphic below.

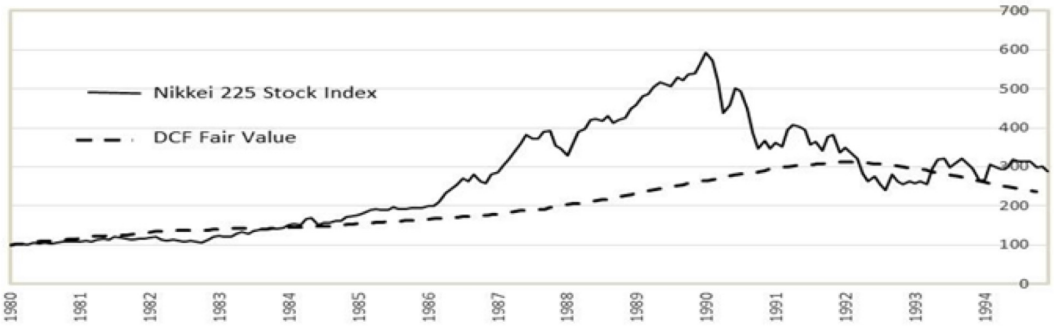

Figure-3. Japanese Stock Market and DCF-fair value estimates

Table 4: Japanese Stock Market and DCF-fair value estimates (from The Japanese Asset Price Bubble: Evolvement and Consequences, Andrè Tomfort, Asian Journal of Economics and Empirical Research, Vol. 4, No. 2, 132-141, 2017, p. 137).

In 1989 became evident that the expansionary monetary policy didn't create a real growth but just inflation. Central bank decided to raise interest rates and the collapse started. The inflated balance sheets of the financial institutions were losing most of their value and the same was for real estate prices. Measures undertaken by the government aiming at reducing the downturn of the economy worsened the situation in the long term, generating the "Lost Decades", characterized by deflation and slow or no growth. Still in 2004, the real estate

[11] ANDRE TOMFORT, The Japanese Asset Pricing Bubble: Evolvement and Consequences, Asian Journal of Economics and Empirical Research, Vol 4, 2017, p. 134.

[12] Plaza Agreement was an agreement signed by France, West Germany, Japan, United Nations and United Kingdom, aimed at depreciating the Dollar against Japanese Yen and German Detusche Mark. The agreement was forced by the United States that had serious troubles with exportation. The effect was an appreciation of the Yen against the Dollar that afflicted the Japan's export-dependent economy and led to the expansionary monetary policies.

market in Tokyo is 10% of the value of 1990, when "the value of the Imperial Palace grounds in Tokyo was greater than that of the real estate in the entire state of California."[13]

In this paragraph we analysed few real estate bubbles occurred in the last century, that contributed to the formation of the economy we are dealing with in the new millennium. Other interesting phenomena would be worth to mention, and a higher degree of detail should have been adopted, but this is not the target of this thesis. What is important in this place is to understand that populations remember past crises but tend to forget underlying reasons that generate them and tend to repeat it. An historical review helps us in creating an overall picture of the real estate bubbles and allows to identify some common characteristics.

1.3- Common characteristics of real estate bubbles.

Every real estate bubble has its determinant factors, related to the historical period and to the economic/societal conditions of the environment surrounding the bubble. So, all these kind of events are worth to be analysed specifically but, as we can observe from the examples mentioned before and as we will see in a more exhaustive way later on, there is a common framework of economic conditions and human actions/behaviours necessary to the inflating of a housing bubble. The aim of this section is to highlight some recurring features of the real estate bubbles, like they were the basic "ingredients" for a receipt that, can be interpreted, cooked and served in different ways, but the basic ingredients have not to change. I'm going to mention some of the most cited characteristic of a real estate bubble; authors and academics don't give the same importance to all these features, and for some of them there is still a debate, but most of them are generally accepted by the literature.

Housing as an investment

Case and Shiller executed two surveys, in 1988 during a residential boom in some metropolitan areas in the United States and in 2003 in Los Angeles, San Francisco, Boston and Milwaukee, in order to spot an upcoming housing bubble in the first 2000s. Moreover, they

[13] LINK LEGRAND, 6 Historical Economic Bubbles To Learn From As The Biggest Bubbles Ever Builds, 2017.

collected data on fundamentals from 1985 to 2002 and they performed regressions on different factors more or less correlated to the bubbles. One of the clear results of the 2003 survey is that " A tendency to view housing as an investment is a defining characteristic of a housing bubble [...] That is what a bubble is all about: buying for the future price increases rather than simply for the pleasure of occupying the home." [14] Here is clear how the expectations for future appreciation in price overcome any consideration on the price payed for a new home. This behaviour is amplified if buyers perceive little risk in investing in the overvalued asset (precisely what happened in the first 2000s, when reliability on financial market was damaged by the ".com bubble"). The following table, from Shiller and Case, well explains the perceptions of homebuyers in the two different periods.

Percent of responses except where stated otherwise

	Los Angeles		*San Francisco*		*Boston*		*Milwaukee*	
Question	*1988*	*2003*	*1988*	*2003*	*1988*	*2003*	*1988*	*2003*
In deciding to buy your property, did you think of the purchase as an investment?								
It was a major consideration	56.3	46.8	63.8	51.8	48.0	33.9	44.0	50.3
In part	40.3	46.2	31.7	34.4	45.0	56.2	45.7	42.2
Not at all	4.2	7.0	4.5	9.8	7.0	9.9	10.3	7.5
No. of responses	238	143	199	164	200	203	243	187
Why did you buy the home that you did?								
Strictly for investment purposes	19.8	7.5	37.2	10.6	15.6	8.2	18.7	13.8
No. of responses	238	142	199	164	199	203	246	187
Buying a home in [city] today involves								
A great deal of risk	3.4	7.9	4.2	14.8	5.1	7.8	5.9	4.3
Some risk	33.3	47.5	40.1	51.9	57.9	62.5	64.6	57.3
Little or no risk	63.3	44.6	55.7	33.3	37.1	29.6	29.5	38.4
No. of responses	237	143	192	164	197	203	237	187

Table 5: Survey Responses on Housing as an Investment, 1988 and 2003 (from Karl E. Case and Robert J. Shiller, Is there a Bubble in the Housing Market?, Cowles Foundation for Research in Economics, paper n. 1089, Yale University, 2004. P. 322)

The attention that media gave to the possible housing bubble in 2002-2003 increased the perception of risk associated with the purchase of a home but didn't affect the "investment feeling" surrounding real estate, at all. People did not realize they were in midst of a bubble.

[14] KARL E. CASE and ROBERT J. SHILLER, Is there a Bubble in the Housing Market?, Cowles Foundation for Research in Economics, paper n. 1089, Yale University, 2004.

This feeling goes hand in hand with overconfidence of investors about the future of the housing market. In general, real estate is considered a safer investment with regard to the financial markets, thanks to its tangibility. This is true only in part because also the real estate market can suffer huge drops in price; for sure the physical buildings will remain untouched (not considering here the risk of natural disaster like heart quake, fire, tornado, etc.) but their value can change significantly over time and the lower liquidity of the market could create problems in selling the asset during downturn periods. In bubbles periods, people tend to forget the risk related to investing in real estate, that are offset by the excitement and the believe that the "dream" will never have an end.

Word of Mouth and Herd Behaviour

We are still on the side of the buyers. This argument is supported by Keynesians and behavioural economists, that define the psychological factor among participants as the principal driver of any bubble. In this case is worth to mention the theory of the "Irrational Investor", the base of this section. Lot of literature has been written on this argument, during the years, and the topic is still discussed. The same author of the survey about the housing bubble cited above (Robert Shiller), wrote an entire book trying to explain how stock market booms are influenced by information asymmetry and by irrational behaviours among investors (the title is "Irrational Exuberance"). To make a long story short, we can state that "Humans are by nature momentum-traders and not value investors."[15] When an uptrend in the price of an asset is occurring, people rapidly get excited and start talking. A traditional finance academic could commit the mistake to not consider the importance of the day-by-day dissemination of information among individuals; here comes into play the Behavioural Finance[16] . According to this theory, the word-of-mouth transmission of the excitement about

[15] MEELIS ANGERMA, Asset Price Bubbles in the Perspective of New Keynesian Theory, University of Tartu, Estonia, p. 38.

[16] One of the primary conventions of financial theory holds that participants in an economy are essentially rational "wealth maximizers," meaning that they will make decisions based on the information around them and in a way that is as reasonable as possible. However, in actuality there are countless instances in which emotion and psychology have undue influence upon our decisions, and the result is that "rational" actors can display unpredictable or irrational behaviors. The branch of economics which is concerned with this paradox is called Behavioral Finance. This relatively new field seeks to combine behavioral and cognitive psychological theory with conventional economic theory in order to propose explanations as to why people might make irrational financial decisions.

the real estate's prices appreciation is fundamental, in such a way that Case and Shiller treat it as the hallmark of a bubble. Probably this is due to the high importance that people give to what other people think (especially if they are relatives, friends, gurus or whoever is considered reliable) with respect to media, financial institutions, professional investors or governments that might have better information but are on "the other side of the fence" and not acting in the interest of the common investor. This is because, according to Shiller, interpersonal communications, particularly face-to-face, still have the most powerful impact on our behaviour. Word-of-mouth is only the first part of the behavioural mechanism that contributes to the inflate of a housing bubble. If we considered people as "rational investors", the fact that they talked each other would not influence their rational decisions, that are undertaken being aware of financial and macroeconomic information rather than excitement and frenzy. But in reality, we know that "people who communicate regularly with one another think similarly", so " if the millions of people who invest were all truly independent of each other, any faulty thinking would tend to average out, and such thinking would have no effect on prices, but if less-than-mechanistic or irrational thinking is in fact similar over large numbers of people, then such thinking can indeed be the source of […] booms and busts."[17] The Herd Behaviour is the sociological explanation of this peculiarity of the markets. The foundation of the Herd Behaviour, Shiller argues, is in the fact that people simply think that all the other people could not be wrong. The human intrinsic fear to contradict a large group of people makes irrational decisions to lead the market even when this action contradict matter-of-fact judgement. In such an environment, even a completely rational investor is encouraged to enter in a group behaviour, that is irrational, and this arise from what Shiller calls an information cascade.[18] Shiller concludes considering that in examining a bubble, "one must also understand some parameters of human behaviour, of limitations of human information processing, that are relevant to the transmission of information and the potential for speculative bubbles."[19]

[17] ROBERT J. SHILLER, Irrational Exuberance, Princeton University Press, Princeton, New Jersey, 2000, p. 148.
[18] A situation of rational behavior with no limitation of intelligence, but limitation on revealed information. Each actor in the market decides not knowing the information that led the other actors to decide, but it doesn't want to take the risk of going in a different direction with respect to the herd, so it forgets its rational information and follows the trend. This behavior disseminates the failure of information about the true fundamental value.
[19] ROBERT J. SHILLER, Irrational Exuberance, Princeton University Press, Princeton, New Jersey, 2000, p. 153.

Speculation

In periods of normal growth, or recession, what drives the real estate market is the need of households for new homes where to live, or the need of young people to emancipate from their parent's home. This is why, historically the housing market is related to various social and economic factors. The correlation with indicators like employment rate, new births, interest rates (one of the main reason of the 2000s boom that we will analyse in depth in the following chapter), GDP level and financial stability in general, is high. All these factors generate fluctuations in demand and supply, with different magnitude and in different time frame: to make an example, a huge drop in birth rate would create an effect in the housing market, form 20 to 30 years ahead, while an increase in the unemployment rate would create an immediate effect in the market forcing people to prefer rent instead to buy a home and obliging credit issuers to reject demands for mortgages for which the underwriting standard were not met (this did not happen in 2003, when "no-doc" mortgages allowed people to borrow huge amount of money without any guarantee about the ability to repay the debt). Resulting to these processes, the price of real estate can change in different ways, but this will not create any problem of mispricing because is the fundamental value that is changing; what contribute to create a mispricing is the speculation. Tirole defines speculation as "a process for transferring price risks. […] The social function of speculation is thus to shift price risks from more to less risk averse traders or from trader with riskier position to those with less risky position."[20] In the same paper, Tirole cites Harrison and Kreps introducing a new motive for speculation: "investors exhibit speculative behaviour if the right to resell an asset makes them willing to pay more for it than they would pay if obliged to hold it forever." This is the point in our discussion. In a bubble, what fosters the mechanism of the price increase is not the households that buys their first home, but investors with speculative behaviour that buy aiming at resell at a higher price in the short term. In this case they "ride" the bubble, inflating it. They are aware of the risk that the price sooner or later could stop to increase, but this low risk is offset by the huge gains achieved without any effort. Moreover, being the speculation short-term oriented (remember the land boom in Florida in the 1920s) the possibility to "get stuck with the hot potato" are relatively low. Obviously, as Tirole argues, speculation can

[20] JEAN TIROLE, On the Possibility of Speculation under Rational Expectation, Econometrica, Vol. 5, Sep. 1982, p. 1163.

happen only under irrational expectations, so in an environment characterized by information asymmetry and in which people are driven by emotions or herd behaviour. Exactly the environment we found during the typical inflation period of a housing bubble. Is interesting to observe how this mechanism of speculation forces normal people to buy homes, even if they are not sure they can afford them. What pushes people to act irrationally is the fear that if prices continue to rise (at a higher pace with respect to the income), they will not be able to buy a home in the future.

Price to income ratio/ Nominal housing debt service to disposable income

These two particular indicators have common characteristics with some of the ratio used in corporate finance in the process of evaluating a company. Here, they have been adapted in the field of housing as a benchmark to assess the variation in affordability of homes during periods of bubbles. Brian Scott Armine conducted a study of housing bubbles in five countries (Australia, Denmark, Ireland, United Kingdom and United States) in order to analyse the common characteristics between the bubbles (the analysed period includes the years around the 2000) and what came out is that in all five countries studied, among other parameters, the rise of the residential real estate bubble was accompanied by a substantial rise in debt service to disposable income per capita (and thus, a rise in price to income ratio).[21] A Lot of affordability measures have been considered by the academics in the study of the housing affordability. In this context I decided to report the nominal housing debt service to disposable income, the one preferred by Brian Scott Armine in his analysis, and for the sake of completeness, the price to income ratio. The first "represents the share of disposable income that the average household has devoted to spending in housing. As a share of income, this number cannot continue to rise forever since it is limited to 100% of income."[22] Due to that, even at a slight increase in this ratio must be given proper importance, meaning that households would have decided to spend less in other categories or to save less.[23] The latter is considered the basic affordability measure for housing. It is expressed as the ratio of median

[21]BRIAN SCOTT ARMINE, Origins and Characteristics of Recent Residential Real Estate Bubbles, Undergraduate Economic Review, Volume 7, Issue 1, Article 7, Wake Forest University, 2010.
[22] BRIAN SCOTT ARMINE, Origins and Characteristics of Recent Residential Real Estate Bubbles.
[23] Is clear the link with the view of houses as an investment, a typical behavior of bubble periods. People think that they can save less, having a lot of money invested in an asset whose value will continue to increase over time. Moreover, the widespread overconfidence pushes the people to think that reals estate was the safer investment possible.

house prices to median household income, expressed as a percentage or as years of income. As you can see in the table below, this ratio has an absolute value, and is widely diffused also thanks to its simplicity and to the accessibility of the information required, that allow to analyse housing affordability in past periods of which data are insufficient and concise. Obviously, during a period of frenzy and speculation, household income growths at a lower rate with respect to home prices, and this generates an anomalous increase in the above-mentioned indicators.

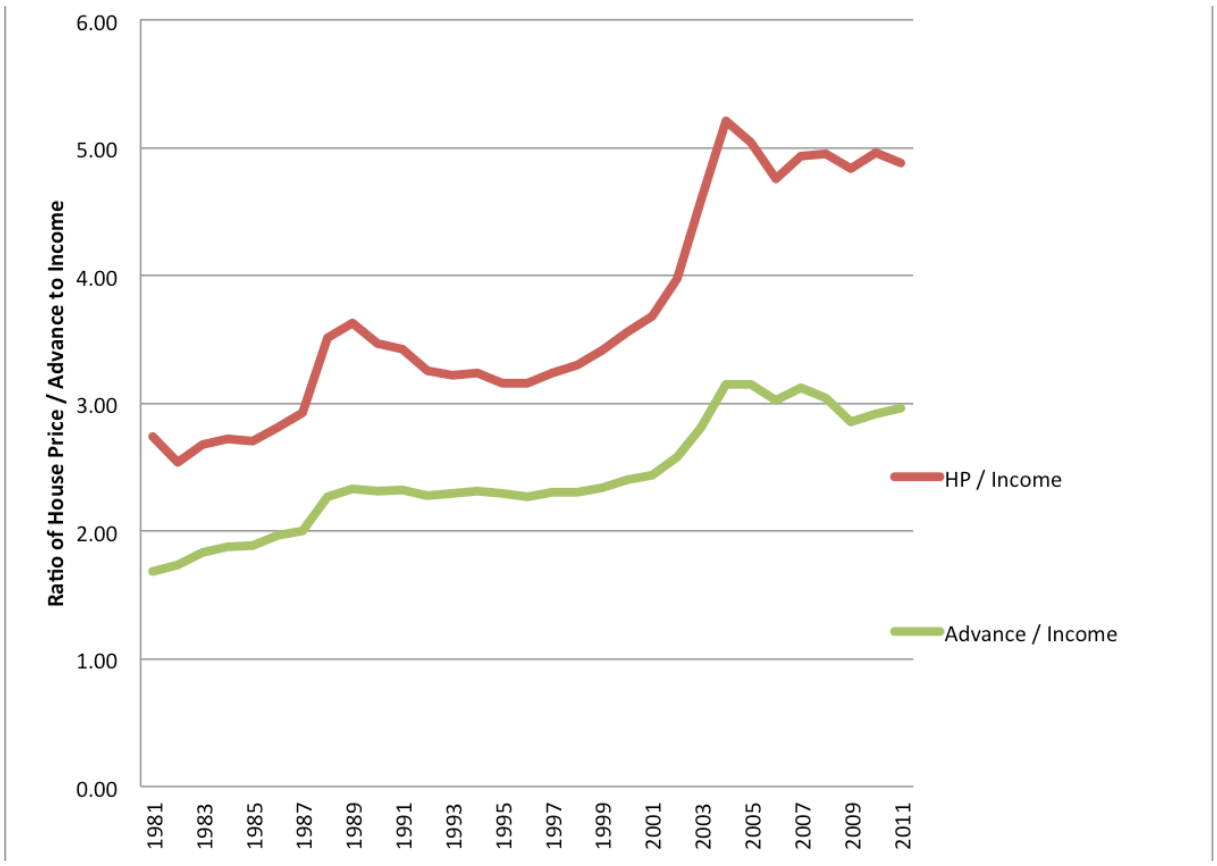

Table 6: House Price/Income for United Kingdom (from https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=2ahUKEwjE9bLa3czgAhUJDewKHbeSC8gQjhx6BAgBEAM&url=https%3A%2F%2Fwww.economicshelp.org%2Fblog%2F5568%2Fhousing%2Fuk-house-pri

Housing starts and home ownership rate

These indicators are somehow related each other even though they originate from different situations and they show up in different periods. While housing starts reflects the number of

new residential construction projects begun during a particular period, home ownership rate is the percentage of homes that are owner-occupied on the total occupied households. During a real estate bubble, both indexes observe high values, as you can denote in the tables 7 and 8. Several reasons can imply an increase in the housing starts, for example the potential speculation, the reduction in the construction PPI (producer price index), interest rates, demographic changes or cultural changes. Not all these phenomena are symptoms of a bubble, but they need to be analysed in a wider context in order to have some significance for the argument treated in this paragraph. Home ownership rate is in some sense similar but gives us information about the mortgages underwriting standards, the feeling of the people about the future trend of prices, and the general wealth of households. A high level of home ownership rate reveals that more people have the possibility to buy a new home, or that they believe is a good investment in that moment to buy a home, or both, like what happened in United States in the first 2000s thanks to the expansive monetary policy of the federal reserve.

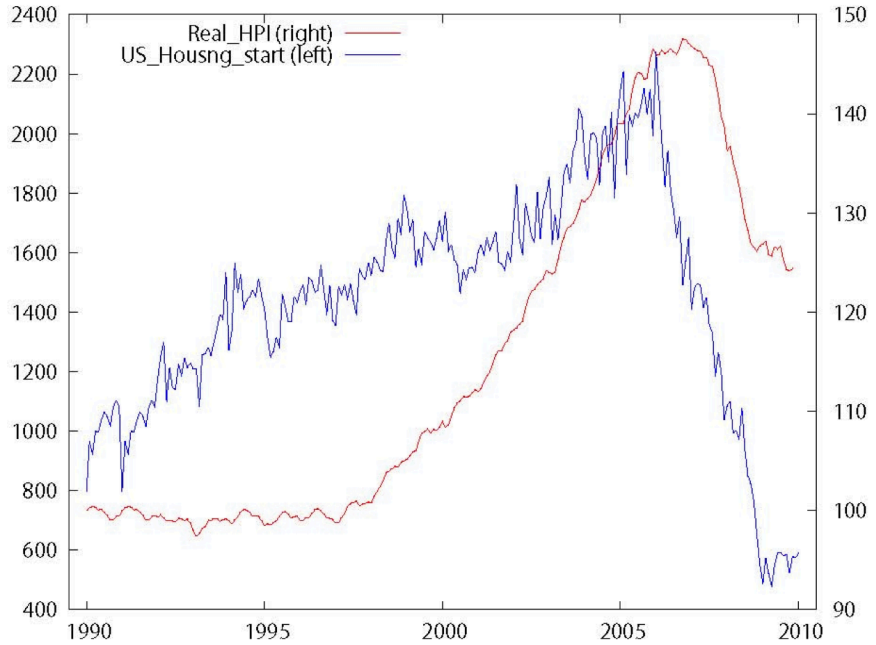

Table 7: United States Housing Starts (in 1000s) (from Brian Scott Armine, Origins and Characteristics of Recent Residential Real Estate Bubbles, Undergraduate Economic Review, Volume 7, Issue 1, Article 7, Wake Forest University, 2010)

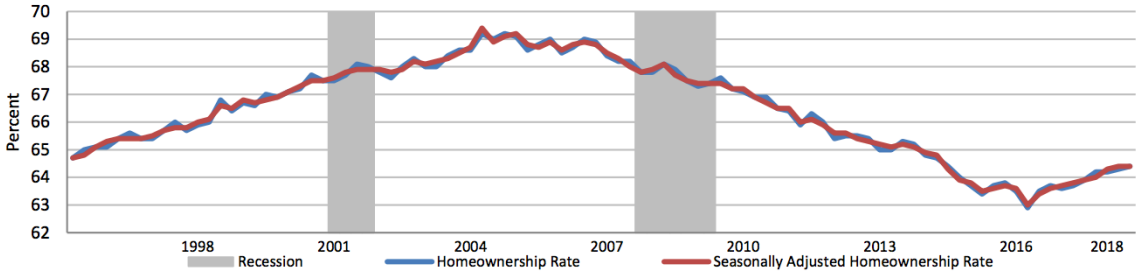

Table 8: Quarterly home ownership rates and seasonally adjusted homeownership rates (from U.S census Bureau, www.nber.org)

The aim of this paragraph was to articulate some of the most recurrent behavioural, socio-economic and political characteristics of an environment affected by a bubble in the housing market. These characteristics include all the aspects of the economy but also of the day-by-day life of citizens and households, and this makes so difficult to spot these symptoms all together before the burst of the bubble. A lot of other factors are typical of a housing bubble and each single bubble has its characteristics. In the next chapter we will go more in depth with the peculiarities of the real estate bubble of the first 2000s, from the political environment of the end of the second millennium to the complex/exotic financial instruments issued from 2005 that originated the Ponzi scheme of the subprime credit. The last worth to mention consideration, before entering in the core part of this thesis, is the peculiar characteristic of real estate that, compared to other intangible assets, is difficult to short sell.

1.4- Difficulty in short-selling real estate.

Short selling is a widely diffused technique in financial markets, as is opposed to the classic long position, and allows the short seller to grasp profit from a negative performance of an asset, generally in a shorter period with respect to the long position. Short sale is a technique appropriate for experienced and institutional investors, because it requires a strong knowledge of the shorted asset and involves a high risk (as traders usually say: “limited potential gain, unlimited potential loss”). The procedure is quite easy: the investor sells borrowed assets with the expectation of a price decline in the short term, in this way the investor can buy the security at a lower price at a later date and return it back to the broker-dealer through which he placed the order. Obviously, there are costs for borrowing assets,

transaction costs and high margins are required, in order to avoid the default of the investor in case of unexpected price movements. Every short position requires an equal long position on the other side, so is a zero-sum game, the gain of one investor is the loss of the other, whichever was the price movement.

It is now clear how difficult is to short sell real estate and how investors devised particular solutions to overcome the problem, during the first 2000s. Being every parcel of real estate unique, the short seller cannot meet its delivery obligation; "Thus, to short sell New York real estate, one would have to sell the Empire State Building, the Chrysler Building and Rockefeller Center without actually owing them, and then manage to buy them at a lower price before the closing of the first sale!"[24] So, without the possibility to directly "bet" against a specific market, a thoughtless increase in price cannot be contained by the short sellers that, with their investments, foster the possibility of a drop pushing people to mitigate their frenzy (we have already talked about the psychological factors that drive the markets). For this reason, "markets with short sale constraints are particularly susceptible to assets bubbles. It is possible, however, to short mortgages indirectly through credit-default swaps (CDS). A CDS is a form of credit insurance in which one party (the protection buyer) agrees to pay a regular premia to its counterparty (the protection seller) until, and unless, a defined credit event occurs on a reference asset. […] Thus, the protection buyer is short and the protection seller is long on the reference asset, without either having to own the reference asset."[25] This instrument is not characterized by transparency in price, in fact the dealer (usually one of the big banks of Wall Street, during the subprime bubble) has no exposure , collecting the spread from the ultimate short seller (the investor) and the ultimate long buyer (an insurance company like AIG, that assured tons of CDS in 2006, collecting millions in fees). This contributed to the Ponzi Scheme at the origin of the increased number of subprime mortgages granted, to satisfy the market's "hunger" for CDS and CDO, but this will be treated in the next chapters.

For the sake of completeness, there is a direct way to short sell real estate, even if is not in the interest of this thesis and is related to the single household. In a situation where a homeowner is "underwater" with the installments of his home's mortgage, so the home is in

[24] ADAM J. LEVITIN & SUSAN M. WACHTER, Explaining the Housing Bubble, Georgetown Law Journal, 2012, Vol. 100, n. 4, p.1242.

[25] ADAM J. LEVITIN & SUSAN M. WACHTER, Explaining the Housing Bubble, p.1243.

a pre-foreclosure situation, could be better for the owner to short sell his home and pay down the mortgage with the gain achieved. The advantages are that the gain in short selling could be higher with respect to the auction related to the foreclosure and also the credit score of the owner could not be influenced negatively as when a foreclosure is occurred. The process of short selling a home could be long, and needs the approval of the bank, but could be an efficient solution in case of insolvency.

2 – Causes of the real estate bubble of 2004-2007

2.1- Environment in the early 2000s.

The worldwide economy is made by cycles, that tend to repeat during the years. Generally, there are uptrend periods, so period of expansion, and downtrend periods, so period of recession that usually last few years until a new recovery. Busts and declines can be caused by various factors, like environmental situations, wars, macroeconomic variables, political tensions, and so on, but what we have just experienced is that such periods are not lasting too long.

What happened instead, in the years before the housing bubble and consequent financial crisis, was an unexpected and long period of positive macroeconomic environment which probably led to an excessive relaxation of the markets and an uncontrolled deregulation. This specific period, that lasted from the mid 1980s to the first 2000s is called the "Great Moderation" and is quite important to understand its specificities in order to have a clear interpretation of the roots of the global financial crisis that interrupted the period of prosperity. As Charles Bean stated in the Annual Congress of the European Economic Association in 2009, "The Great Moderation was a period of unusually stable macroeconomic activity in advanced economies. This was partly thanks to good luck, including the integration of emerging market countries into the global economy, and partly a dividend from structural economic changes and better policy frameworks. The longer this stability persisted, the more markets became convinced of its permanence and risk premia became extremely low. Real short and long term interest rates were also low due to a combination of loose monetary policy, particularly in the US, and strong savings rates in a number of surplus countries."[26] Beans emphasises three possible reasons for the explanation of this particular period of

[26] CHARLES BEAN: The Great Moderation, the Great Panic and the Great Contraction. Text of the Schumpeter Lecture by Mr Charles Bean, Deputy Governor for Monetary Policy and Member of the Monetary Policy Committee, Bank of England, at the Annual Congress of the European Economic Association, Barcelona, 25 August 2009.

prosperity, for which there is no agreement among economists. “First, it could just have been an happy accident, if this was a period characterised by unusually small, or a benign sequence of, shocks. In particular, access to a cheap source of manufactured goods as result of the rapid development of China and other emerging market economies created a terms of trade gain for the advanced countries and a beneficial “tailwind”, which only mutated into a “headwind” towards the end of the period as rapid global growth put upward pressure on oil and other commodity prices. Second, changes in the structure of the economy could have meant that similar sized shocks had smaller macroeconomic effects. Candidate structural changes included the shift from manufacturing to services, tighter control of inventories leading to an attenuation of the inventory cycle, increased competition in product and labour markets, and innovation in financial markets that facilitated the greater spreading of risk and an enhanced ability to smooth spending in the face of shocks to income or wealth. A final possibility is that better macroeconomic policies, including improved policy frameworks, had moved economies closer to the eponymous Taylor frontier which traces out the lowest achievable inflation volatility for a given volatility of the output gap”[27]

2.2- Monetary Policy in United States before the crisis.

All industrialized countries (and nowadays almost all countries in the world) are characterized by complex economies made by internal exchanges, external exchanges in different currencies, loans between countries and an extremely liquid market for treasury bonds. These peculiarities of the ongoing globalization could lead to undesired problems for a specific state, like uncontrolled inflation or excessive high rates, if the free market was not somehow monitored by sovereign authorities. This necessity of control and coordination is carried out by central banks like European Central Bank in Europe and Federal Reserve in United States. These institutions, in harmony with economic-political projects and objectives, implement the

[27] CHARLES BEAN: The Great Moderation, the Great Panic and the Great Contraction. Text of the Schumpeter Lecture by Mr Charles Bean, Deputy Governor for Monetary Policy and Member of the Monetary Policy Committee, Bank of England, at the Annual Congress of the European Economic Association, Barcelona, 25 August 2009.

Monetary Policy [28] considered to be most effective for each period, evaluating the macroeconomic and the microeconomic environment. Given that, is clear how Monetary Policy can influence investing and spending decisions of households, also in the field of housing. The relation with the United States' monetary policy of the early 2000s and the argument of this thesis is easy to spot and is concentrated in the way the Federal Reserve controlled interest rates in the years of the housing boom. Interest rates that are among the principal drivers of demand and supply of mortgages. But before entering in the debate of which rate should have been adopted for deflate the bubble, if there is one, I consider useful to mention an interesting tool, that dates back to the 1990s, and suggests how central banks should change interest rates to account for inflation and other economic conditions: the Taylor Rule. This model was theorized by the famous economist John B. Taylor[29] and states that the Federal Reserve should raise interest rates when inflation and GDP (Gross Domestic Product) are growing to faster and should lower interest rates when inflation and GDP are below the required level; this should adjust the economy in the short term and the inflation in the long term. The results are supported by a mathematical formula that I'm going to report, for the sake of completeness.

$$I = R^* + PI + 0{,}5(PI - PI^*) + 0{,}5(Y - Y^*)$$

Where:

I = nominal fed funds rate

R^* = real fed funds rate

[28] Monetary Policy is the plan of action, taken by central banks, that determines the key drivers of the economic activity of a country. Principal activities consist of managing money supply and interest rates, with the aim of controlling inflation, consumption, liquidity and growth. In practice, central banks act buying or selling government bonds, modifying interest rates and deciding the quantity of reserves banks have to hold in their balances. Monetary Policies are very complicated macroeconomic processes but can be sorted into contractionary policy, characterized of high interest rates, generally pursued to tame inflation, or expansionary, characterized by low rates and high money supply, with the aim of boost the economy when a recession comes out. Quantitative Easing is an extremely expansionary policy undertaken in the recent years, made of a strong government acquisition of the private and public debt.

[29] Famous Economist born in Yonkers, NY, in 1946 and formed in Princeton and Stanford. Is considered a new Keynesian economist and he had a profound influence on monetary theory.

PI = rate of inflation

P^* = target inflation rate

Y = logarithm of real output

Y^*= logarithm of potential output

A lot of considerations are intrinsic in the model, as factors that drive inflation and the economic output, but basically the rule proposes an equilibrium rate that influences the other three factors: interest rate, inflation rate and GDP rate. The central part is that the inflation is the difference between real and nominal interest rate. Thanks to Taylor's contribute, is possible to determine the ideal interest rate (the nominal Fed funds rate in the formula) for each given economy, starting from the macroeconomic conditions. Obviously, this is not a mathematical theorem, and we know reality is much different from theory. In any case the Taylor Rule is considered a reliable tool by academics and is widely used as benchmark in evaluating Monetary Policies, as we will see below. The question now is: how practically does the FED control the interest rates? Through a Monetary Policy framework that interprets the mandate of the Federal Reserve to promote price stability and full employment. "To implement this mandate, the Federal Open Market Committee (FOMC) sets a target for the overnight rate in the fed funds market where banks trade reserves balances or "reserves". Changes in the fed fund rate are, in turn, expected to be transmitted to other interest rate and, ultimately, the real economy."[30]

The central point here, supported by Taylor's empirical analysis, is that "after 2000, the Federal Reserve held interest rates too low for too long. Low rates produced artificially cheap mortgage credit, which led to excessive demand for mortgages. Because mortgages are the largest form of leverage for consumers, housing was the asset class in which a bubble was most likely to form. […] Taylor's counterfactual regression suggest that housing prices would have been far less inflated if the fed adhered more closely to the Taylor Rule in the wake of the 2000 stock market crash".[31] Taylor indeed, in 2007 produced a counterfactual scenario according to his rule, where the housing boom is analysed under a different interest rate; the results are in the figures below.

[30] ALEXANDER KROEGER, JOHN MCGOWAN, ASANI SARKAR, The Pre-Crisis Monetary Policy Implementation Framework, Federal Reserve Bank of New York, Staff Report No. 809, March 2017.

[31] ADAM J. LEVITIN & SUSAN M. WACHTER, Explaining the Housing Bubble, Georgetown Law Journal, 2012, Vol. 100, n. 4, p.1222.

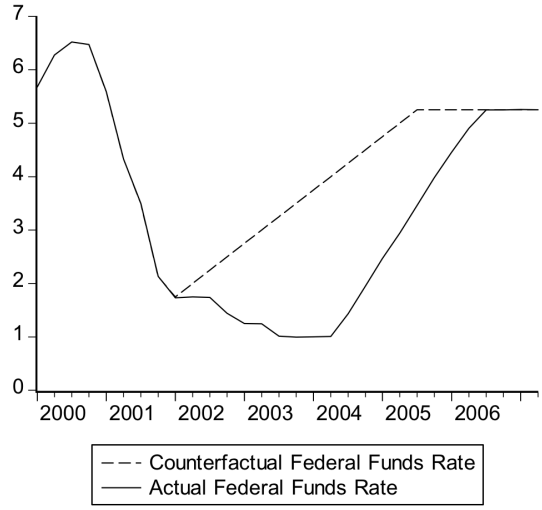

Table 9: Actual Fed Funds rate and Taylor's counterfactual rates (from John B. Taylor, Housing and monetary Policy , National Bureau of Economic Research, Working Paper 13682, 2007)

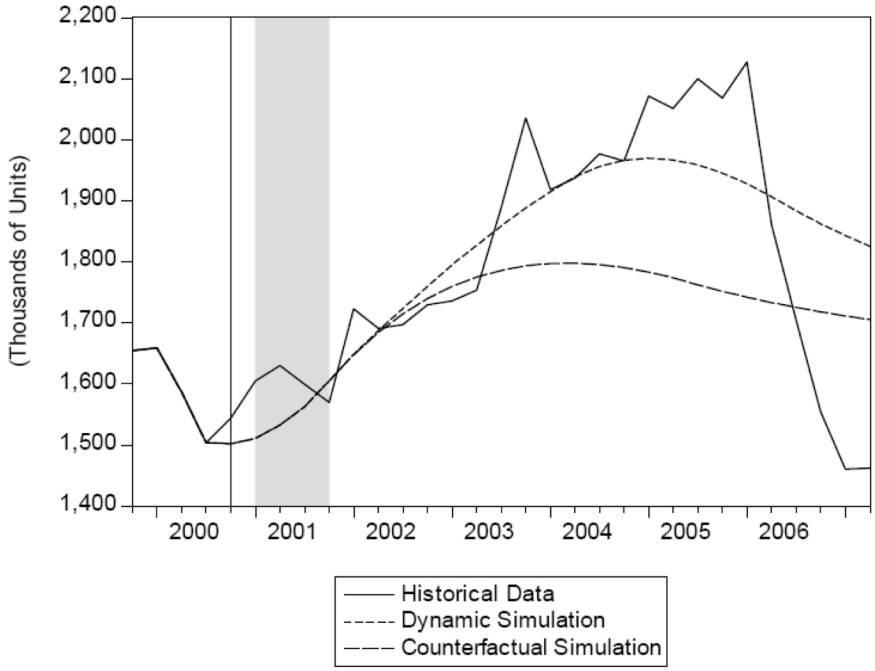

Table 10: Housing starts in different scenarios (from John B. Taylor, Housing and monetary Policy, National Bureau of Economic Research, Working Paper 13682, 2007)

This apparently inexplicable monetary policy, that deviated from the successful one adopted in the "Great Moderation" years, from the 1980s to the 2000s, could explain the boom of refinancing occurred between 2001 and 2003, and why housing price appreciation exceeded rental cost appreciation. But, as we will see later, is not enough to explain the rest of the

bubble. Taylor supposes that the reasons for such low rates in that years were the fear of the deflation that occurred in Japan in the mid 1990s (subsequent to the stock market-housing crises analyzed in chapter one). He agrees with the author cited above, stating that "During the period from 2003 to 2006 the federal funds rates were well below what experience during the previous two decades of good macroeconomic performance - the Great Moderation – would have predicted".[32] Following this pattern, low rates increased demand for housing, high demand for housing fostered housing price inflation and housing price inflation accelerated demand for housing: the upward price spiral was created in this way. Moreover, higher home prices reduced foreclosure and delinquency rates on mortgages, and this led to better credit ratings, and so, more mortgages were granted. Obviously, when rates returned to normal levels, the framework collapsed, but this is not the right moment to talk about the burst of the bubble.

If is quite straightforward that the Federal Reserve's Monetary Policy had somehow an impact on the creation of the bubble and on the successive burst, there is not an agreement on the extent of that impact and on the contribution in all the phases of the run up of the bubble. As we are going to see, there is still a debate on the real influence of the monetary policy among the other macroeconomic and microeconomic variables of that period. As Philip Turner summarizes in his paper, "the substantial increase in the Federal Funds rate from mid-2004, reinforced by higher policy rates elsewhere, did not prevent further increases in risk-taking in the financial market during this period. […] The prime culprit for the GFC[33] was the failure (of both regulators and markets) to recognize the new dangers created by financial innovation."[34] According to Turner, there are three reasons for which higher rates would not have prevented the financial crisis. The first is that the increase in rates by 425 basic points after the mid-2004 for the successive two years, did not calm down the high propensity for risk of global financial markets. On the contrary, markets expected a rate cut form the mid-2006 (the drastic cut happened few months later), that did not happen, and this is part of the pattern of "too much, too late", typical of monetary tightening. The second objection is based on the fact that long term interest rates are endogenous and not determined by the policy rate, but in large part

[32] JOHN B. TAYLOR, Housing and monetary Policy, National Bureau of Economic Research, Working Paper 13682, 2007, p. 2.
[33] Great Financial Crisis.
[34] PHILIP TURNER, Did central bank cause last financial crisis? Will they cause the next?, LSE Financial Markets Group Paper Series, Special Paper 249, November 2017, p. 7.

from global economic and financial developments like liquidity preferences and shifts in risk sentiment. The third reason is the relation between short term interest rates and exchange rates. Countries like United Kingdom kept higher interest rates facing the risk of over-appreciate their currency: in UK, the fear of a further boosting in house prices led government to keep higher rates (at the time rate in United States were 1%, in United Kingdom were from 3,5% to 4,5%) thinking that "it would be preferable to have a lower exchange rate and higher interest rates form the point of view of economic conditions and balance more generally"[35] as reported by the Bank of England's Monetary Policy Committee. Anyway, higher rates didn't save the United Kingdom from the financial crisis but made them take an increasing risk of over-appreciation.

In conclusion, we cannot blame the unusual American Monetary Policy as the only one reason of the housing collapse and the subsequent great financial crisis, and is difficult to imagine that an alternative path in the Federal funds rate form 2003 would have prevented the crisis. Nevertheless, this is one of the factors worth to be considered in the complete analysis that we are going through, together with the lack of supervision of the rating agencies, the "laissez faire" politic of the official bodies, the moral hazard of banks and the "opacity" of the securitization products that were flooding the market at that time. Reporting Taylor in his analysis of the crisis: "A key lesson here is that large deviation form business-as-usual policy rules are difficult for market participants to deal with and can lead to surprising changes on other responses in the economy."[36]

2.3- Decline in underwriting standards for sub-prime mortgage credit.

Another important current in defining the "prime suspect" for the 2007 subprime mortgage financial crisis is followed by academics that blame the excessive relaxation of underwriting standards, especially from 2004 to 2007, especially for subprime lending. In this section I will

[35] PHILIP TURNER, Did central bank cause last financial crisis? Will they cause the next?, LSE Financial Markets Group Paper Series, Special Paper 249, November 2017, p. 27

[36] JOHN B. TAYLOR, Housing and monetary Policy, National Bureau of Economic Research, Working Paper 13682, 2007, p. 8.

analyse the debate that is still open nowadays, trying to grasp a conclusion that would help us to better understand a complex phenomenon for which reams and reams have been written. Before starting with the literature on this argument, is worth to spend few words on the definition of subprime credit, central point of this paragraph. If we consider as prime loans, loans with average credit characteristics, offered to wealthy people with full documentation and a good credit history, is quite straightforward what a subprime loan could be. "Subprime loans are those which carry a premium above the prevailing prime market rate that a borrower must pay. […] The denotation of subprime is not solely based on the poor characteristic of the borrower (typically a borrower having a FICO[37] score below 620 would result in the loan being designated subprime). But a loan could also be classed as subprime if it was originated by a high-cost lender, or if it had certain features – for example if it was a 2/28 hybrid[38]."[39] Another particular type of loans diffused in the bubble period, that have been classified as subprime, are "Alt-A" or "No-Doc" loans: the peculiarity here is that loans have been granted to people with good credit scores but with incomplete or missing documentation, for example people with high income but a precarious job. Going more in practice, Seda Durguner defines subprime lending as "the practice of making loans to borrowers who do not qualify for standard market interest rates due to their deficient credit histories. That is, borrowers are served by the subprime market if they have experienced judgment, foreclosures, repossessions, or non-payment of a loan in the past 48 months, or experienced bankruptcy in the last 7 years, or have FICO score below 620."[40]

Now that is clear what a subprime mortgage is, is also clear why the relaxing of underwriting standards is considered by some academics (not by all academics, as we will see below) one of the causes of the real estate bubble and the subsequent 2007 subprime mortgage crisis. Sure enough, supporters of this thesis claim that under the "classic" underwriting procedure,

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[37] FICO score is a credit score created by Fair Isaac Corporation. Is used by lenders to assess credit risk and to determine whether to extend credit. It can range from 300 to 850 and it takes into account, with different weights, factors like payment history, accounts owed, length of credit history, new credit and credit mix. In general, scores above 650 are considered good and scores below 620 are considered difficult to get access to credit.

[38] A 2/28 hybrid ARM was one of the most diffused type of mortgage during the subprime boom, where ARM stands for "Adjustable Rate Mortgage". Is a 30 years mortgage where the first two years are fixed rate and the other 28 have a floating rate based on an index plus a margin.

[39] LAURENCE WILSE-SAMSON, The Subprime Mortgage Crisis: Underwriting Standards, Loan Modifications and Securitization, February 2010, p.5.

[40] SEDA DURGUNER, The 2007 Subprime Mortgage Crisis: Evidence of Relaxed Lending Standards, job market paper, University of Illinois at Urbana-Champaign, p.2.

continued from 1980s to the first 2000s, the most part of the subprime mortgages that contributed to inflate home prices (and the Ponzi scheme of the Securitization and Credit Default Swaps) would not have been granted. Considering that, the share of subprime mortgages on the total mortgages allowed increased from 7-8% in 2000 to 2003 to 18-20% in 2004-2006 (also due to the higher fees that this kind of contracts generated for lenders) , this would have reduced the magnitude of the bubble and the wave of foreclosures and repossessions occurred after the decline of home prices. Obviously, underwriting standards cannot reduce by themselves, or simply because an increasing portion of low-income households were asking for a mortgage. There is the need for some economic and market reasons to induce lenders to carry the higher risk of default, or to transfer it to other institutions. In the remaining part of this paragraph I'll try to highlight some of the key factors that could have led to a decline in the underwriting standards during the first years of 2000, until the restriction occurred in form 2007.

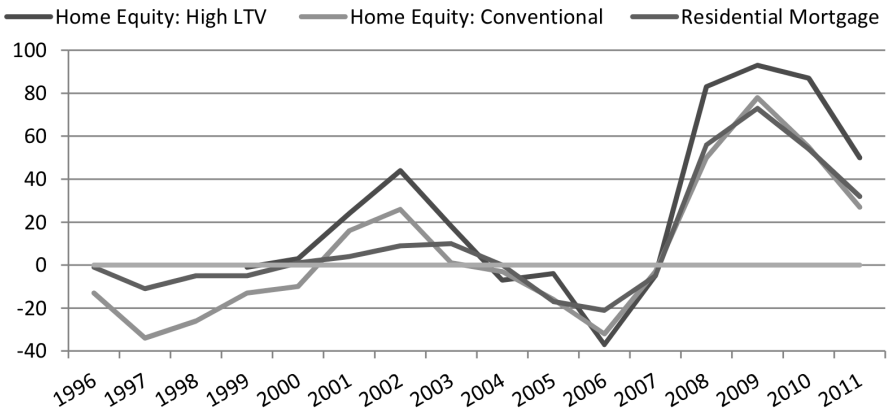

Table 11: Changes in underwriting standards for residential real estate loans,1996-2011. Net percentage of national banks tightening underwriting standards (from Seda Durguner, The 2007 Subprime Mortgage Crisis: Evidence of Relaxed Lending Standards, job market paper, University of Illinois at Urbana-Champaign, p. 228.)

The modern history is characterized by a diffused liberalization in term of trading and markets, and the United States are the state that most believes in this philosophy all around the world. This sentiment is true also for the United States' policy makers that take competition as a pillar in the economy, but not always the faith in competition lead to good results. Three times the competitive mortgage securitization has been tried in North America, during the 1880s, the 1920s and the 2000s and every time this led to a financial crisis. First of all, let's define the word securitization. Securitization is a method of financing that bundles loans receivables or

other cash flows into securities and sells it to investors. The securitization of mortgages in particular, is composed by four functions, that generally are carried out by different financial institutions. The first part is the *origination*, when the loans are granted to individuals, the second is the *servicing*, the collection of payments from borrowers, the third is *securitization* and consists of buying loans from the originators, packaging them into investments that can be sold. To conclude, the *funding* is the act of buying mortgage backed securities (MBS) form securitizers and holding them as investments. Is worth to say, and I will discuss it later on, that securitization is a method to transfer the loan specific risk that borrowers will default to someone with less information about borrowers (investors), exploiting the information asymmetry.

In his study about competition in mortgage securitization, Michael Simkovic states that "In the mid-2000s, competition between mortgage securitizers for loans led to deteriorating mortgage underwriting standards and a race to the bottom that ended in the late 2000s financial crisis. Underwriting prevents losses at the front end by basing loan approval decisions and lending terms on data-driven predictions of the likelihood of default, or failure to repay, and the severity of losses to lenders in the event of default. Loose underwriting involves making loans that are likely to default."[41] But the road to this conclusion is long and it starts after the Great Depression, when government discovered that private investors are not successful in evaluate the risk associated with securities composed by pools of mortgages. So, government decided to start bearing credit risk through agencies like Federal Housing Administration (FHA, established in 1934), Department of Veteran Affairs (VA, established in 1944), Farmers Home Administration (FmHA, established in 1946) and Federal National Mortgage Association ("Fannie Mae", established in 1938). All these agencies are considered Government Sponsored Enterprises (GSE), as they are national agencies. In 1968 government privatized Fannie Mae, but with the commitment to rescue it if it ever became insolvent (so the agency is still considered a GSE) and in the same years created other two GSEs: Federal Home Loan Mortgage Corporation ("Freddie Mac") and Government National Mortgage Corporation ("Ginnie Mae"). Despite the high number of GSEs acting in the securitization market, in the 1980s the private mortgage securitization re-emerged and in the mid-2000s the competition between GSEs and non-GSEs intensified, until the 2005 when private

[41] MICHAEL SIMKOVIC, Competition and Crisis in Mortgage Securitization, Seaton University School of Law, Indiana Law Journal, Volume 8, Issue 1, Article 4, Winter 2013, p. 215.

securitizers surpassed GSEs in share of total mortgages. So, in the first 2000s, the market was overflowed by private securitizers, and the opportunities for originators became wider. Therefore, the first conclusion is that "increased competition undermines financial institutions' ability to screen borrowers, because the institutions may not wish to invest as much in screening borrowers who may ultimately take their business elsewhere and because institutions have less information about borrowers who deal with multiple institutions."[42] Thanks to competition, loan quality deteriorated sharply from 2004 to 2007 and as a consequence, mortgage origination shifted from "prime" mortgages to "subprime", moreover, loan-to-value ratio (LTV) increased.

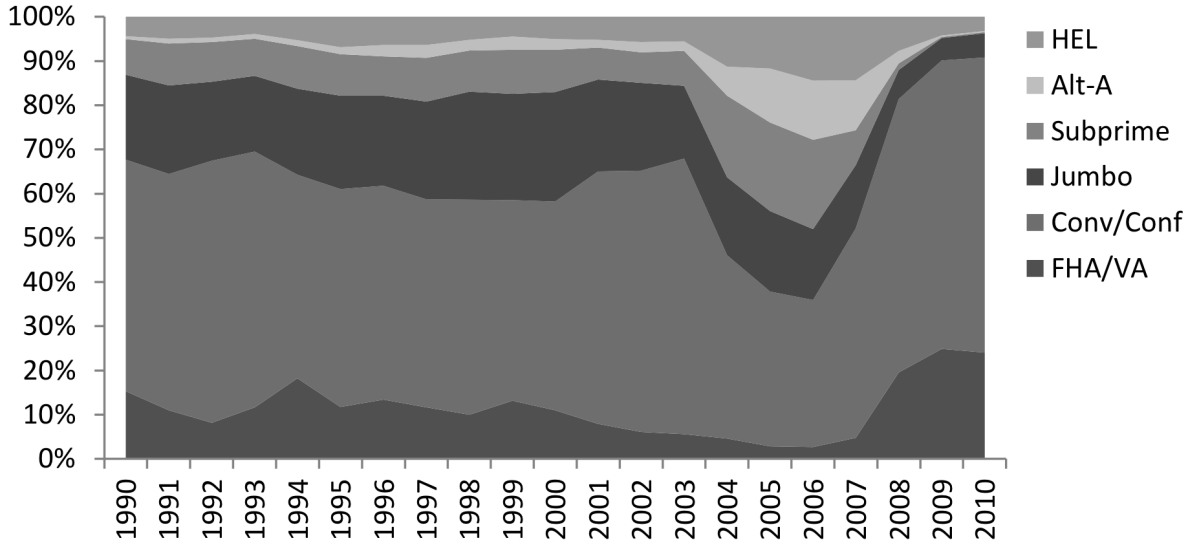

Table 12: U.S. residential mortgage origination, by product, 1990-2010. Market share, percent (form 2011 Mortgage Market Statistical Annual, Vol. 1, p.20.)

Another issue originated by competition is related to the reduction of the market share controlled by GSEs, that historically controlled originators through rules and standardized underwriting documents. Another features that GSEs have, and non-GSEs not, is the possibility to sell back to the originators loans that are not conforming with their rules and to "end their relationship if the originator fails to comply with GSE underwriting standards or if there is an unusual increase in defaults of the originator's loans"[43] These peculiarities helped to control

[42] MICHAEL SIMKOVIC, Competition and Crisis in Mortgage Securitization, Seaton University School of Law, Indiana Law Journal, Volume 8, Issue 1, Article 4, Winter 2013, p. 223.

[43] MICHAEL SIMKOVIC, Competition and Crisis in Mortgage Securitization, Seaton University School of Law, Indiana Law Journal, Volume 8, Issue 1, Article 4, Winter 2013, p. 234..

the securitization market in the years before the bubble. But standards are useful only if there are not alternatives for originators; so, the augmented influence of non-GSEs agencies undermined GSEs' ability to control originators. Now that there is the lack of a market leader, the power is shifted from GSEs to originators that can easily choose to which institution to sell their mortgages, no matter what's the quality of underline loans. As we can denote form the following table, GSEs were still market leaders for prime mortgages, market that suffered a low rate of delinquency or foreclosure.

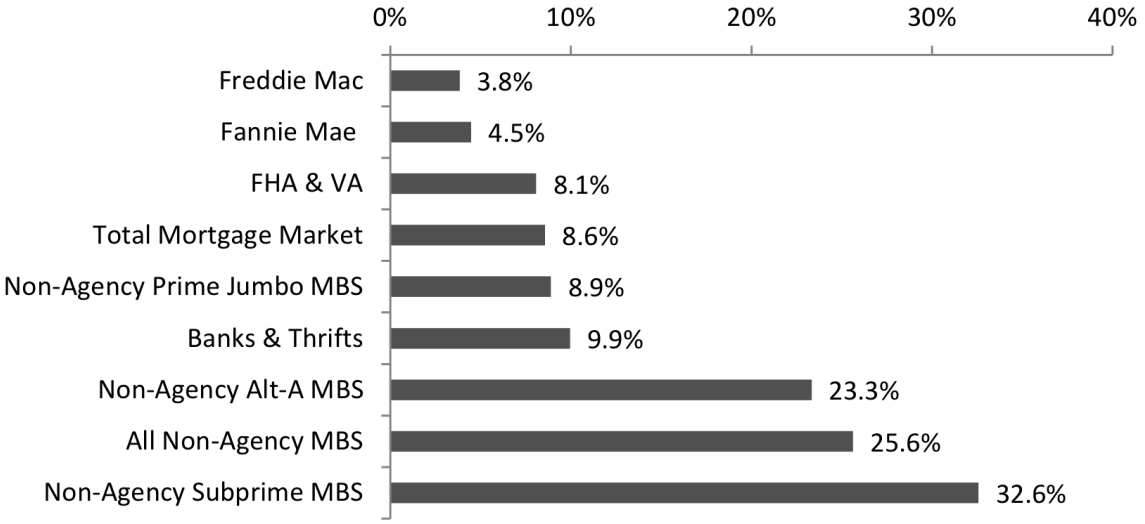

Table 13: Seriously Nonperforming Loans, Dec 31, 2010. Percent of each entity's loans that are 90+ days delinquent or foreclosure (form Freddie Mac Office of the Chief Economist)

The mechanism here is clear: the indiscriminate private securitization (originated by the increasing appetite of investors for AAA MBS) originated a spiral of decline in underwriting standards of originators for many reasons. The first is that neither originators nor securitizers have to bear the risk of default or delinquency on the loan granted, because the first sells directly (and rapidly) loans to the latter, which packages them into MBS and sells them to investors with few information about the real composition of the product. At the same time, huge streams of money flowed in the opposite direction, as fees, from investors to securitizers, form securitizers to originators and from subprime borrowers to originators, like a sort of arbitrage. Moreover, considering increasing competition in securitization and the increasing volume of that market, originators were sure that no matter what kind of mortgage, it would have been acquired by some private agency. Someone argues that also the irrational sentiment that house prices were going to increase at that rate for a long period, is itself a decline in underwriting standards, as the most part of subprime mortgages where home

equity loans (HEL)[44] or first home loans based on the fact that mortgages could have been refinanced in the future, exploiting the continuous increase in the asset value. This led originators to grant unaffordable mortgage with the aim to refinance them thanks to the increase in home's value. In the moment house prices stopped to rise, even before to start decrease, a lot of subprime loans defaulted, and the value of securities linked to that loans dropped to zero.

An argument of which the debate is still open is on whether the shift from manual to automated underwriting could have contributed to the decline in underwriting standards. This process started in the 1990s, when some GSEs projected the first AU (Automated Underwriting) systems exploiting the increasing computing power of computers and the diffusion of the World Wide Web (usually called "internet"). In 1995 the FICO score was introduced with the aim of standardizing the prime mortgage underwriting and to avoid broker manipulation of loan eligibility. Now an automatic underwriting occupies 15 minutes instead of days of office work; this obviously accelerated the market and probably resulted in less screening, being the decision entrusted by a machine that works on a "constructed" credit standard like FICO. Anyway, evidences for this thesis are hard to find in literature and are not supported by empirical research, so I considered useful to mention it but not to go to much in the details. The only one thing sure is that the shift to automated underwriting accelerated much the procedure of lending and as a consequence, the number of mortgaged increased, but we cannot blame that as a cause of the bubble.

To summarize, the increasing competition in subprime securitization and the high number of private securitizers that flowed into the market, created first a lack of information about borrowers, that shifted from an agency to another, and second a lack of supervision of originators from GSEs that gradually lost their "regulatory" power in favor of non-GSEs. The final effect was a decline in underwriting standards, an exponential increase in subprime loans and an increase in loan-to-value ratio: all factors that contributed to inflate the housing bubble. But as I said at the beginning, there is not a common agreement on the wisdom that the deterioration in underwriting standards was central to the inflation of the housing bubble that

[44] Home equity loan is a kind of second mortgage on home, and allows the consumer to borrow against his home's equity. The total amount of the loan is based on the difference from the value of the house and the homeowner's mortgage balance due. This kind of loan is particularly favorable in periods when home prices are constantly increasing, as in the case of a bubble, but lead to severe problems in case of an opposite trend.

lead to the subprime financial crisis. There are indeed studies that find different evidences. For example, Geetesh Bhardwaj and Rajdeep Sengupta present evidences that the effectiveness of FICO scores at origination in gauging default risk did not deteriorate over the years, and that while underwriting may have weakened along some dimensions, it also strengthened in others. They also precise that the standards were probably poor from the beginning and that they did not deteriorate over the bubble time[45]. According to this study, seems that lenders offset the increased risk of subprime loans increasing the quality of borrowers, often requiring higher FICO scores; numbers tell us that in 2000 only 30% of borrowers had credit score above 620, while in 2005 the percentage was 50%. A borrower with low or no documentation has a significantly higher FICO than a similar borrower providing full documentation on the loan, and regression coefficients indicate that underwriters attempted to adjust for borrower's riskier attributes by requiring higher average FICO scores.[46] They conclude stating that probably the mistake was the excessive reliance on FICO scores as a predictor of default, instead of the size of down payment or the type of loan.

In conclusion, what emerges from the analysis of this particular hypothesis is that nothing is completely straightforward in the evaluation of such a big and complex phenomenon that has its roots in all the sectors of the economy of a heavily industrialized country as United States. Anyway, we can, and we have to deduce a conclusion from the literature examined and from the "big picture" that is taking shape during the writing of this thesis. The conclusion is that probably, together with lot of other factors, a decline in underwriting standards took place during the first years of the millennium, more specifically from 2003-2004 to 2007, as a result of what I described above. This itself is not enough to justify a bubble of such dimension, but it could have contributed to the generation of the high volume of subprime mortgages that did not overcome the period of falling home prices, considering that subprime mortgages are more sensible to variation in price of the underlying asset. Now, let's continue with the construction of the "big picture" analyzing other possible determinants of the subprime financial crisis of 2007.

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[45] GEETESH BHARDWAJ, RAJDEP SENGUNPTA, Where's the Smoking Gun? A Study of Underwriting Standards for US Subprime Mortgages, Federal Reserve Bank of Sant Louis, September 2009.

[46] GEETESH BHARDWAJ, RAJDEP SENGUNPTA, Where's the Smoking Gun? A Study of Underwriting Standards for US Subprime Mortgages, Federal Reserve Bank of Sant Louis, September 2009.

2.4- Global saving glut and increased demand for U.S. assets.

When it comes to this argument, even though a lot of literature have been written about, is considered correct to start mentioning what Ben Bernanke[47] argued, back when no one would have imagined, in 2005.

"Over the past decade a combination of diverse forces has created a significant increase in the global supply of saving - a global saving glut - which helps to explain both the increase in the U.S. current account deficit and the relatively low level of long-term real interest rate in the world today. The prospect of dramatic increases in the ratio of retirees to workers in a major of industrial economies is one important reason for the high level of global saving. However, as I will discuss, a particularly interesting aspect of the global saving glut has been a remarkable reversal in the flows of credit to developing and emerging-market economies, a shift that has transformed those economies from borrowers in international capital markets to large net lenders."[48] At that time, in 2005, United States were in the midst of the bubble, stock market was back to high levels (after the downturn of 2000-2001 related to the ".com bubble"), housing market was considered a safe investment and the unemployment was relatively low. For sure Ben Bernanke did not imagine what would have happened in the following years, starting from the subprime mortgage crash first, and the subsequent worldwide financial crisis. Anyway, in this speech, he identified an issue that in 2005 was just a "warning signal", but few years later is blamed to be one of the causes of the housing bubble through mechanisms that I'm going to explain. Going back to Bernanke's thesis, he recognises two perspectives in the analysis of the saving glut: the first related to a trade imbalance that views imports outstripping exports in United States generating an account deficit filled by foreign borrowers, and the second, mainly emphasised by Bernanke, related on international financial flows and based on the fact that saving and investing of a country have not to be equal in each period. The starting point is that all new investments need to be financed in some manner, and the fact that in an open economy not all investments have to be funded by the country's national saving. This means that "if a country's saving is less than the amount

[47] Ben Bernanke is an American Economist, he served two terms the Chair of the Federal Reserve, from 2006 when he succeeded Alan Greenspan to 2014. In 2005, when he pronounced this speech, he was a Member of the Board of Governors of the U.S. Federal Reserve system.

[48] BEN SHALOM BERNARKE, The Global Saving Glut and the U.S. current account deficit, Board of Governors of the U.S. Federal Reserve System , at the Sandridge Lecture, Virginia Association of Economics, Richmond, Virginia, 10 March 2005.

required to finance domestic investment, the country can close the gap by borrowing from abroad. In the United States, national saving is currently quite low and falls considerably short of U.S. capital investment. Of necessity, this shortfall is made up by net foreign borrowing."[49] According to Bernanke, the thesis of the inadequate national saving does not completely explain the deficit in United States account. The driver instead is the emergence of the global saving glut in the last years that completely overturned the global situation in terms of account balances, transforming emerging countries from borrowers to lenders and industrialized countries from lenders to borrowers.

Countries	1996	2003
Industrial	**46.2**	**-342.3**
United States	-120.2	-530.7
Japan	65.4	138.2
Euro Area	88.5	24.9
France	20.8	4.5
Germany	-13.4	55.1
Italy	39.6	-20.7
Spain	0.4	-23.6
Other	12.5	25.3
Australia	-15.8	-30.4
Canada	3.4	17.1
Switzerland	21.3	42.2
United Kingdom	-10.9	-30.5
Developing	**-87.5**	**205**
Asia	-40.8	148.3
China	7.2	45.9
Hong Kong	-2.6	17
Korea	-23.1	11.9
Taiwan	10.9	29.3
Thailand	-14.4	8
Latin America	-39.1	3.8
Argentina	-6.8	7.4
Brazil	-23.2	4
Mexico	-2.5	-8.7
Middle East and Africa	5.9	47.8
E. Europe and the former Soviet Union	-13.5	5.1
Statistical discrepancy	**41.3**	**137.2**

Table 14: Global current account balances, 1996 and 2003 (from Ben Shalom Bernanke, The Global Saving Glut and the U.S. current account deficit, 10 March 2005).

The previous table highlights the metamorphosis happened at the developing world in the beginning of the millennium, changing their structure from net users to net supplier of resources; this drastic change has to somehow impact to a global economy like the American one. Another key point in Bernanke's analysis is the sharp rise in oil price in the last years, that moved a lot of money form industrialized countries to developing ones (like in the Middle East and Africa); on the other side, the motivation to save have declined substantially in the industrialized countries for many reasons (some of which already mentioned, like the increase in household wealth and the expectation of growing incomes). As a consequence, capital flowed to Unites States contributing to inflate stock and house prices, and at a later stage, to

[49]BEN SHALOM BERNARKE, The Global Saving Glut and the U.S. current account deficit, Board of Governors of the U.S. Federal Reserve System , at the Sandridge Lecture, Virginia Association of Economics, Richmond, Virginia, 10 March 2005.

increase the demand for MBS. Bernanke has been somehow prophetic, concluding that "In longer term, however, the current pattern of international capital flows – should it persist – could prove counterproductive."[50]

Obviously, this is only one point of view on this argument. I considered it worth to be mentioned first because Bernanke was the first to talk about this particular situation in 2005. Moreover, must be considered that a conflict of interest could emerge in the explanation of Bernanke, that was member of the board of the Federal Reserve during the period of excessive low short-term interest rates and in charge as chairman when the bubble burst. In his post-crisis writings indeed, he has never mentioned the low interest rates as one of the causes of the housing bubble. To be more precise, if it is undeniable that an important account deficit existed during the first 2000s in United States, and is supported by numbers, not all economists agree on the role of the saving glut and banking glut (that I'll describe later) in the housing bubble and subsequent subprime crisis.

Someone also considered the saving glut together with the banking glut in the analysis of their impact on United States economy, attributing them between one third and one fourth of the increase in house prices and household debt. Where the saving glut (SG) is considered the one explained by Ben Bernanke in the paper cited above, is worth to introduce the definition of banking glut (BG) before analysing their impact of the housing bubble: "the banking glut refers to large gross inflows of foreign capital from advanced economies, mostly Europe, which were matched by similar outflows, resulting in small net flows and minor changes in the U.S. trade balance. Compared to the portfolio allocation of the SG countries, which was concentrated in Treasury and agency debt, the composition of the European gross capital inflows was more widely spread across assets classes, with a particular concentration in private-label ABS, corporate bonds and (to lesser extent), equity."[51] According to this study, the European banks, acquiring a lot of AAA tranches of ABS form American institutions, contributed in the easing of financial conditions (interest rates, lending standards) during the boom at least to the same extent of the purchase of government debt by developing countries; this is why these two factors are analysed together, despite they have different roots. So, the increase in number

[50] BEN SHALOM BERNARKE, The Global Saving Glut and the U.S. current account deficit, Board of Governors of the U.S. Federal Reserve System , at the Sandridge Lecture, Virginia Association of Economics, Richmond, Virginia, 10 March 2005.

[51] ALEJANDRO JUSTINIANO, GIORGIO E. PRIMICERI, ANDREA TAMBALOTTI, The Effects of the Saving Glut and Banking Glut on the U.S. Economy, Federal Reserve bank of Chicago, June 2013.

of players due to European banks compressed the spread between borrowing and lending rates at the point that the spread between mortgage rates and treasuries with the same maturities declined from 150 to 50 basis points in few years (especially for subprime ABS). Therefore, the lower interest rates pushed households to shift their demand on houses inflating the prices, and the higher prices pushed them to borrow more increasing the consumption of nondurable goods.

The effect of the banking glut must be examined simultaneously with the effect of the saving glut already mentioned here, but could be helpful to cite the conclusion of Justiniano, Primiceri e Tambalotti about the empirical analysis they performed on the argument: "The desire of foreign agents to purchase more U.S. assets decreases real interest rates and induce the domestic lenders – the owner of the assets – to reduce saving and increase consumption. In our calibration, the SG reduces nominal interest rates by approximately 150 basis points, which is broadly consistent with some recent empirical studies on the effect of the SG on asset returns. Lower interest rates also stimulate the demand for nonresidential investment and real estate by the domestic lenders, by making these durable goods relatively more desirable than nondurable consumption. The resulting upward pressure on house prices relaxes the collateral constraint on the borrowers."[52] To conclude, with higher house prices, the debt increases as a consequence as households can borrow more on their collaterals. The main finding of these economists is that the banking glut together with the saving glut contributed to some of the macroeconomic developments happened in the years before the crisis, that led to a boom in investment and a run-up in the housing price. The cumulative effect of these two phenomena led to a substantial increase in importance of U.S. assets in global portfolios, that in 2004 reached the level of 17%.

[52] ALEJANDRO JUSTINIANO, GIORGIO E. PRIMICERI, ANDREA TAMBALOTTI, The Effects of the Saving Glut and Banking Glut on the U.S. Economy, Federal Reserve bank of Chicago, June 2013.

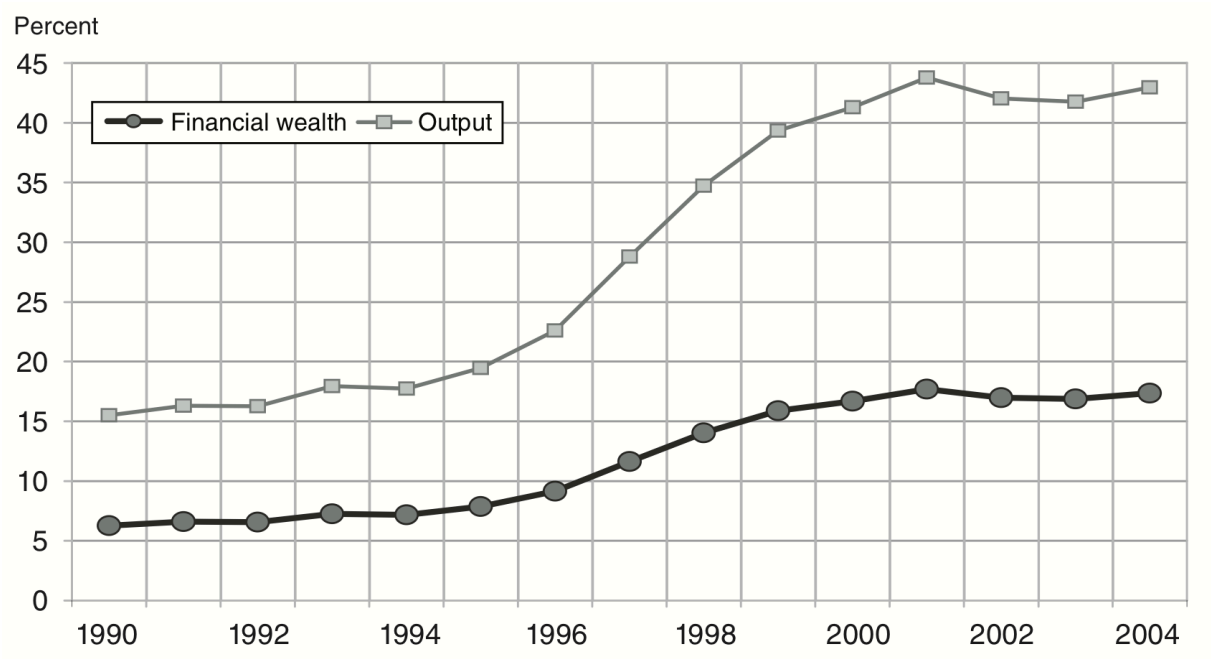


Table 15:Share of U.S. assets in rest of the world's output and financial wealth (from Ricardo J. Caballero, Emmanuel Farhi, and Pierre-Olivier Gourinchas, An Equilibrium Model of "Global Imbalances" and Low Interest Rates, American Economic Review, 2008).

Unfortunately, as I clamed also in the previous chapters, there's no a common agreement on the principal causes of the crisis, and each economist have his personal explanation and his personal "list" of the causes ranked by importance. Is somehow normal, if we consider such a big phenomenon that affected tens of countries and millions of people. How could have it been explained in such an easy way? The crisis would have not existed. So, needless to say that the saving glut was not the only one, or the principal determinant of the bubble (as Bernanke maintains), but it was one of the determinants among all the others cited in this thesis, and probably others that I will not mention. To conclude I mention the paperwork of Giancarlo Bertocco who performed a critical analysis of Bernanke's explanation: "The first result of this paper is to show that the Global Saving Glut hypothesis elaborated by Bernanke does not satisfactorily explain the financial crisis arising out of housing bubble. [In fact] the accumulation of financial resources by emerging countries and the consequent trade balance surplus are not the cause of the housing bubble, but the consequence of the decision of the U.S. financial system to expand credit to households and firms, and the responsibility of the financial system for the crisis was not that it was not able to "recycle" savings in an orderly way, but rather that it financed, by creating new money and mobilising the existing money, economic operations made by agents who did not obtain sufficient yields to repay the loans,

whether these were firms that intended to make productive investments, or individuals who asked for financing to buy real estate or speculators who gambled on the continuous rise in housing prices.

2.5- Rating agencies excessive ease in providing high rates.

"[A]ny user of the information contained herein should not rely on any credit rating or other opinion contained herein in making any investment decision." I decided to start mentioning the usual disclaimer that is printed at the bottom of Standard & Poor's credit ratings[53], in a way that could be clear from the beginning of the paragraph, where the problem was. Talking about the role of the rating agencies in the real estate bubble of the first 2000s and in the consequent financial debacle of 2007-2009, I decided to start quoting the disclaimer at the bottom of any of the rating issued by one of the "big three" CRAs.[54] This statement gives us, in few lines, a clear understanding of how problematic was (and still nowadays is) the situation in which the future of governments, big enterprises and financial instruments depends on the judgements of rating agencies that are not accountable for their work. Moreover, the rating market is characterized by an "issuer pays" model that generates a clear problem of conflict of interest and the regulation enforced by the SEC[55] during the years created barriers to entry that eliminated the competition in the market, generating an oligopoly. These are few of the reasons why public opinion blames CRAs for not have stopped the Subprime securitization market and for have attributed high ratings for Subprime MBS with high risk of default. But before entering in the detail analysing the role of the credit rating agency in the subprime crisis I consider useful to explain what a credit rating agency is and how they evolved in the history, since their creation in the late 19th century.

[53] LAWRENCE J. WHITE, Credit Rating Agencies and the Financial Crisis: Less Regulation of CRAs Is a Better Response, Journal of International Banking Law and Regulation, Stern School of Business, New York University.
[54] Credit Rating Agencies.
[55] Security and Exchange Commission. Is an independent agency of the United States federal government. The SEC holds primary responsibility for enforcing the federal securities laws, proposing securities rules, and regulating the securities industry, the nation's stock and options exchanges, and other activities and organizations, including the electronic securities markets in the United States.

One of the biggest problems in finance has always been the uncertainty, in this specific case the uncertainty that the borrower will or will not repay the lender that granted him a loan. The core of this issue is based in the information asymmetry: the lender has not the same information of the borrower about the latter's ability to repay the loan. This is why, to mitigate the risk of insolvency, lenders try to gather lots of information about creditworthiness of the borrowers. Credit rating agencies help lenders to take sound decisions offering judgments and ranking borrowers according to their trustworthiness: "CRAs asses credit risk of borrowers (government, financial, and non-financial firms). A credit rating can be defined as "an opinion regarding the creditworthiness of an entity, a debt or financial obligation, debt security, preferred share of other financial instrument, or of an instrument, issued using an established and defined ranking system of rating categories". A rating only refers to the credit risk; other risks, like market risk […] or liquidity risk […] are not covered."[56] As I said before, in the world there are about 150 CRAs, but the most important three, that are Standard & Poor's Rating Services, Moody's Investors Service and Fitch Ratings, share more or less 95% of the market, with the first two having both 40% and the third only 15%. As we can see form the table below the three agencies have different statements regarding the characteristic of a credit rating, but in the end, they can be considered more than similar.

Fitch	"Credit ratings express risk in relative rank order, which is to say they are ordinal measures of credit risk and are not predictive of a specific frequency of default or loss. Fitch Ratings' credit ratings do not directly address any risk other than credit risk, ratings do not deal with the risk of a market value loss on a rated security due to changes in interest rates, liquidity and other market considerations."
Moody's	"There is an expectation that ratings will, on average, relate to subsequent default frequency, although they typically are not defined as precise default rate estimates. Moody's ratings are therefore intended to convey opinions of the relative creditworthiness of issuers and obligations...Moody's ratings process also involves forming views about the likelihood of plausible scenarios, or outcomes—not forecasting them, but instead placing some weight on their likely occurrence and on the potential credit consequences. Normal fluctuations in economic activity are generally included in these scenarios, and by incorporating our views about the likelihood of such scenarios, we give our ratings relative stability over economic cycles and a sense of horizon."
Standard & Poor's	"Standard & Poor's credit ratings are designed primarily to provide relative rankings among issuers and obligations of overall creditworthiness; the ratings are not measures of absolute default probability. Creditworthiness encompasses likelihood of default and also includes payment priority, recovery, and credit stability."

Table 16: Credit ratings by the big three (from Jakob De Haan and Fabian Amtenbrink, Credit Rating Agencies, De Nederlandsche Bank, DNB Working Paper, No. 278, January 2011, p. 4.)

[56] JAKOB DE HAAN AND FABIAN AMTENBRINK, Credit Rating Agencies , De Nederlandsche Bank, DNB Working Paper, No. 278, January 2011, p. 3.

CRAs express ratings on a scale of letters and figures, based on factors that have different weights for different agencies. For this reason, can happen that different ratings are provided for the same entity, especially talking about sovereign ratings. With the increasing globalization and financialization, from the 1990s, ratings have played a crucial role in financial markets in evaluating the credit risk for different financial instruments. In this way, the rating of a particular instrument can highly influence the interest rate borrowers have to pay. Is well-known how a downgrade of a sovereign creditworthiness can generate catastrophic effects on the economy of a nation, and the same for a corporate bond. This problem is emphasized by the fact that central banks and regulatory institutions, require a bond or a financial instrument to have a minimum rating to be traded in specific markets, for the safety of investors. So, emerges in today's financial markets, the need for objective and reliable ratings to ensure the correct functioning of the worldwide economy.

Interpretation	Fitch and S&P	Moody's
Highest quality	AAA	Aaa
High quality	AA+	Aa1
	AA	Aa2
	AA–	Aa3
Strong payment capacity	A+	A1
	A	A2
	A–	A3
Adequate payment capacity	BBB+	Baa1
	BBB	Baa2
	BBB–	Baa3
Likely to fulfill obligations, ongoing uncertainty	BB+	Ba1
	BB	Ba2
	BB–	Ba3
High-risk obligations	B+	B1
	B	B2
	B–	B3
Vulnerable to default	CCC+	Caa1
	CCC	Caa2
	CCC–	Caa3
Near or in bankruptcy or default	CC	Ca
	C	C
	D	D

Table 17: Credit ratings (from Jakob De Haan and Fabian Amtenbrink, Credit Rating Agencies, De Nederlandsche Bank, DNB Working Paper, No. 278, January 2011, p. 4.)

History tells us that bonds started to be somehow rated around the end of the 18th century in the United States, but the first who did it systematically was John Moody in 1909 (mostly

treating railroad bonds). He was followed by the Poor's Publishing Company in 1916 and by the Fitch Publishing Company in 1924, in the period before the establishment of the SEC. in that period, publicly traded companies were not obliged to issue any financial statement, so the rating agencies were just satisfying a market demand from investors. The business model was "investor pays", so agencies were selling their ratings in manuals to bond investors who needed more accurate information. All changed in the 30s, when the too weak regulation was blamed for causing the Great Depression; lot of banks failed and changes in regulation were necessary. "These changes culminated in 1936 with a federal regulatory prohibition on banks' being able to invest in "speculative investment securities" as determine by "recognized rating manuals". "Speculative" were those that were below the "investment grade" […]. Thus, if banks wanted to invest in bonds, they were restricted to investing only in "investment grade" bonds (e.g. bonds that were rated BBB or better on the S&P scale). […] This regulatory edict (which still applies to U.S. banks today) caused an important change in the provision of information to the bond market. [B]anks were now constrained to heed the judgments of the publishers of recognized rating manuals."[57] Is clear how, under these conditions, CRAs are endowed with the force of law, especially after the 1975, when the SEC created the category of "nationally recognized statistical rating organization" (NRSRO) and forced brokers-dealers to rely only on NRSRO's ratings. The SEC created with this decision, a significant barrier to entry in the credit rating market and gave a huge power to the "big three" that have been able to dominate the market and absorb any new entrant with merges or acquisitions. Another worth to mention happening is the change, in the 70s, from the "investor pays" model to the "issuer pays" model, in which the issuer of the bond has to pay the CRA for the rating, before the emission. There are four apparent reasons for this shift:

- CRAs were afraid of losing revenues because of the "free riding" related to the increasing diffusion of the photocopies.
- The shock for the Penn-Central Railroad's bankruptcy lead issuers to be willing to pay for more accurate certifications.
- Ratings were essential to issuers and they would have paid more.

[57] LAWRENCE J. WHITE, Credit Rating Agencies and the Financial Crisis: Less Regulation of CRAs Is a Better Response, Journal of International Banking Law and Regulation, Stern School of Business, New York University, p. 7.

- CRAs realized that in a "two-sided market" both the issuers and the investors could have paid for ratings, with no difference in the final result for the organization.

An analysis of the background, even if quite simple and concise, is necessary to understand and evaluate which was the role of the credit rating agencies in such a complex situation as the housing bubble was. Like the other factors analyzed above, the role played by CRAs is not straightforward; academics have different opinions about the argument and there are different currents of thoughts, from the most common to the less diffused. We will try to deduce the real process of the events starting from the conventional wisdom: the conflict of interests.

This thesis is supported by the Noble Prize-winning economist Joseph Stiglitz[58], who pointed out that: "[t]he incentive structure of the rating agencies also proved perverse. Agencies such Moody's and Standard & Poor's are paid by the very people they are supposed to grade. As a result, they've had every reason to give companies high ratings, in a financial version of what college professors know as grade inflation."[59] The same was highlighted in one of the press releases of the Security and Exchange commission, in the midst of the crisis, in July 8, 2008: "we've uncovered serious shortcomings at these firms, including a lack of disclosure to investors and the public, a lack of policies and procedures to manage the rating process, and insufficient attention to conflict of interests" said the SEC Chairman Christopher Cox. "When the firms didn't have enough staff to do the job right, they often cut corners."[60]What we can deduce from the events occurred in the period before the crisis, is that the shift to the "issuer pays" model, for the convincing reasons I explained before, generated the problem of the conflict of interest that is not possible to eliminate under actual circumstances. This shortcoming in the market for ratings gives the companies the possibility to shop around the different CRAs for the best rating and therefore pushes the agencies to grant higher ratings in order to maintain their market share (and their high profits). The aforementioned conflict of

[58] Joseph Eugene Stiglitz is an American economist, public policy analyst, and a professor at Columbia University. He is a recipient of the Nobel Memorial Prize in Economic Sciences (2001). He is the former senior vice president and the Chief Economist of the World Bank. Moreover is a former member and chairman of the United States Council of Economic Advisers.

[59] CLAIRE HILL, Why Did Rating Agencies Do Such a Bad Job Rating Subprime Securities?, Scholarship Repository, University of Minnesota Law School, 2010, p. 594.

[60] CLAIRE HILL, Why Did Rating Agencies Do Such a Bad Job Rating Subprime Securities?, Scholarship Repository, University of Minnesota Law School, 2010, p. 595.

interest gains relevance only understanding that the role of the credit rating agencies in the expansion of the subprime securitization market was notable. Especially if we consider that mortgage backed securities first, and collateralized debt obligations later, would not have been issued without a high rating granted by CRAs on pools of mortgages with high probability of default. The main problem here was the excessive confidence in the American economy given by twenty years of continuous economic growth, a period where mortgages gradually became the pillar of that growth. In this case could be mentioned the concept of the "too big to fail", a theory under which the dimension of the parts involved in a particular field is too big to experience serious problems. So, considering that the biggest banks and insuring companies in the world were involved in the subprime securitization, the rating agencies didn't even consider the possibility that such a "tail event" (consider that they were not aware of being in a bubble) could happen, hence they granted the requested ratings with levity, fueling the spiral of house prices and decline in underwriting standards.

Going back to the credit rating agencies, there is another worth to mention aspect of the conflict of interest. At a certain point of the subprime bubble, CRAs started to act as consultants for securitizers: the agencies, worked together with the issuer in the securitization process advising it on how to package mortgages in a way that would have obtained the higher rating possible. Is clear how the situation was out of control. The issuers knew how to securitize products bypassing the regulatory restrictions and the agencies earned two separate fees in the process, one as consultants and one as raters. For the most part of academics who studied this phenomenon, this system looks totally crazy, and this is why the conflict of interest of CRAs is considered one of the main causes of the crisis.

As I said at the beginning of this paragraph, there is no conventional agreement on the role played by the credit rating agencies in the inflation of the housing bubble, even if the conventional wisdom is the one just mentioned of the conflict of interest. However, there are also differing theories based on as much reliable elements that are worth to mention. Claire Hill argues that conventional wisdom can't be completely right, for few reasons. The first is the fact that the "issuer pays" model has been dominant for quite some time (since the 70s), but ratings started to be misleading only in the years before the crisis; nobody suggests that regular corporate bond ratings are being bought and sold during the 80s and the 90s, the ratings of corporate and government bonds instead, are blamed to be too conservative over time. Second, there are particular types of transactions that require a rating from a specific

agency, so the agency has no incentive to provide high ratings in order to improve the market share, because the rating is mandatory. Moreover, probably the most important fact to consider is the long-term cost of the conflict of interest. If investors though that rating are worthless, the agencies would loss all their businesses: the short-term payoff is not enough to balance the long-term loss generated by the lack of credibility.[61] This different point of view leads to a quite simple, but not less credible result: incompetence. Lots of important financial analysts were wrong in evaluating structured instruments during that years and they lost billions and billions, so why CRAs couldn't have been wrong? For sure the long period of prosperity (interrupted only by the ".com" crash) contributed to lower the guard, together with the fact that so many "big players" were engaged in the subprime mortgage securitization. In addition, is relevant the fact that both financial analysts and rating agencies were facing new and complex products, for which they hadn't any benchmark. The result is a very difficult procedure of rating, if we consider that the pools of mortgages were organized in a way that was so difficult to go back to the original loans, especially for CDO, synthetic CDO, or cubed CDO that were essentially not directly related to pools of loans but to other securities, that in turn were related to other securities, and so on. All was organized to "hide" the fundamentals of this products, that were in the most part made of predatory lending.[62] I've already mentioned the fact that no one criticized ratings on corporate bonds before the crisis, because bonds are simple financial products with centuries of history[63], so the procedure to evaluate them is well known and straightforward. This is not the case of such exotic instruments as mortgage backed securities and their derivatives. No tested procedure was available for the CRAs in the process of credit evaluation of these products and there was no

[61] CLAIRE HILL, Why Did Rating Agencies Do Such a Bad Job Rating Subprime Securities? Scholarship Repository, University of Minnesota Law School, 2010.

[62] Predatory lending is an umbrella term that is used to describe cases in which a broker or originating lender takes unfair advantage of a borrower, often through deception, fraud, or manipulation, to make a loan that contains terms that are disadvantageous to the borrower. Is defined predatory lending a loan that include the following peculiarities:

- Excessive fees
- Excessive interest rates
- Single-premium credit insurance
- Lending without regard to ability to repay
- Loan flipping
- Fraud and deception
- Prepayment penalties
- Balloon payments.

[63] The first bond was issued in the 1693 by the bank of England to finance the war against France.

benchmark to which refer, moreover there was a lot of pressure from the big institutions to have a positive rating as soon as possible and from the originators that had a lot of new loans to sell in the market. To conclude, it doesn't matter which is the most diffused opinion on the role of the credit rating agencies in the housing bubble, is undeniable the fact that agencies had not the expertise and competence necessary to correctly evaluate the risk of default of the aforementioned products.

The last diffused critic on the credit rating agencies, in some sense is an integration of the other, and also in this case, is difficult to repudiate, due to its objective nature. To explain this last part could be useful to go back to the first lines of this paragraph where is reported a typical disclaimer present at the bottom of any rating issued by one of the most famous CRAs. Is clear that, by law, credit ratings are considered just opinions and have no legal relevance in case of wrong valuation. So, rating agencies didn't have any responsibility for misrating (except for the loose of credibility in the long-run) and they were not too much worried about the accuracy of their inspections, if we consider the pressure that they suffered from the sell-side companies. The shortcoming of this process is quite evident: there is a situation in which ratings are essential for the survival of the financial market (because they are mandatory by law) but at the same time agencies are directly paid by the issuers of the products that need to be evaluated, and moreover agencies have no direct legal responsibility on their work. Is outstanding the fact that the entire worldwide economy was (and still is) based on the ratings and so little importance was given to this sector during the years of the boom.

It emerges in this paragraph that the entire system was very unstable, and that it was just a matter of time for a catastrophic event to occur. The more we go in depth with the analysis of this period, the more we understand that there's not one single truth, and that all the factors of the crisis are interconnected and they foster each other; is quite difficult or even impossible to identify a trigger event in this circular mechanism. Anyway, the right way, and the aim of this paper, is to create a collective framework of all the causes and events occurred in such a complex period.

2.6- The role of the sub-prime mortgage securitization.

"While securitization breaks the link between loan originator and the loan risk, asset securitization is an important and prominent financial tool in modern economies. By isolating specified assets from its originator and then securitizing them, the originator is able to fund its operations at a lower effective interest rate compared to traditional financing method. Theoretically, securitization should improve the efficiency of capital markets via risk tiering and geographic diversification, while on the other hand it reduces transaction costs and enhances flexibility in financial operations. Securitization can transfer risks from the banking sector to outside investors and hence is capable in scattering financial risks across the economy, while allowing banks to reduce regulatory capital requirements. From a theoretical point of view, securitization reduces intermediation costs, increases risk sharing and diversifies the risk. This paves the way for mortgage assets to be more liquid and risk is shared by a larger group. Securitization is capable of extending the pool of available fund sources without confining to conventional lenders." [64] It appears, form this introduction, that securitization process was a good financial tool, useful in various situations to improve liquidity of bond market and to spread risk among investors, but we know that during the boom and the bust of the housing bubble, things went in a different way. So, if it's commonly accepted that securitization played a major role in the recent Global Financial Crisis, what did go wrong with this process? And especially, what did go wrong with the securitization of the sub-prime mortgages? In this paragraph I'll try to analyze this phenomenon starting from a brief description of the financial tools above mentioned and their derivatives, and concluding with the particular situation that took place in the first years of the millennium and culminated with the excessive exposure of banks and insurance companies in high rated but too risky products. Before the crisis, the belief that such a small market as the subprime mortgage market could not seriously affect the global financial market was diffused, but in that period, people were not aware of the magnitude that the securitization process was reaching and how many people and companies were exposed to that. What people, and often financial analysts were not understanding was the complexity of the securities market, because, at that point, "not only securities were traded directly, they were also repackaged to create more

[64] SHANUKA SENARATH, Securitization and the Global Financial Crisis: Can Risk Retention Prevent Another Crisis?, Griffith University, Department of Accounting Finance and Economics, Australia, p. 2.

complicated financial instruments, such as collateralized debt obligations. The derivatives were again split into various tranches, repackaged, resplit and repackaged again many times over. This, most likely, was one of the mechanisms that amplified problems in the subprime securitized market, and the subsequent subprime-related losses. Each stage of the securitization process increased the leverage financial institution were taking on […]. With the growing leverage and inability to value the securities, uncertainty about the solvency of a number of large financial firms grew."[65] This process increased the complexity of the markets more than what expected, and under these conditions the positive aspects of the securitization market above cited become negatives, that are, among the others:

- Securities should not be created with sub-prime mortgages
- The shift from the originate-to-hold to the originate-to-distribute model could result in moral hazard
- In the process of securitization too much reliance is given to the mathematical models
- Investors are led to over-rely on rating agencies' ratings.

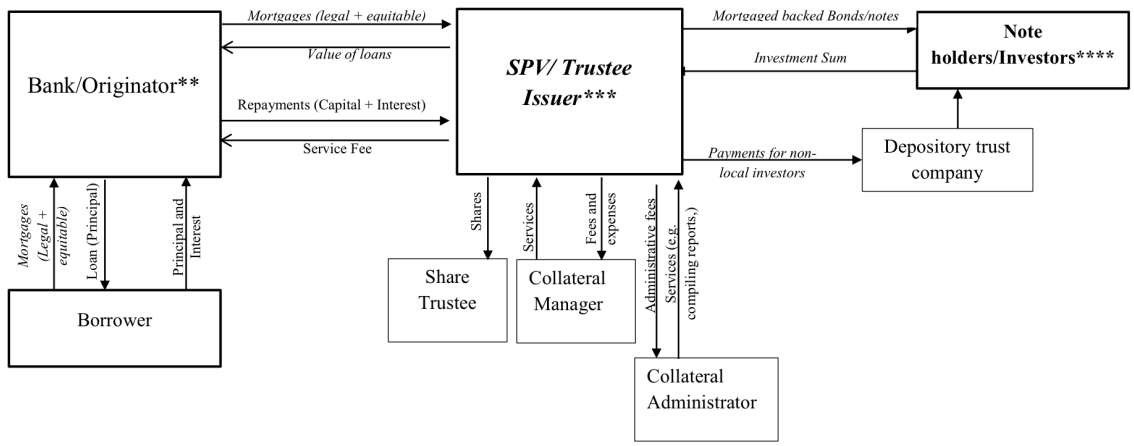
Before to dive in the explanation of the blame that securitization and its derivatives have in the excessive supply of mortgages linked to the housing boom and to the subsequent financial crisis, is better to clarify some concepts, starting from the main one of this paragraph, the process of securitization (that I have already briefly described in the paragraph 2.3).

"Securitization is a financing technique that involves the creation and pooling of categories of similar assets and securities from many borrowers, and the subsequent sale of the income stream they generate. The assets are then re-packaged, underwritten and sold as asset-backed or other securities. Securitization is used to transfer credit risk and liquidity risk, to lower bank funding costs, for products diversification, and for balance sheet management purposes."[66] More practically, the process starts with the bank granting a loan (a mortgage in this specific case) to the borrower. Then, the bank sells the rights on this loan to a Specific Purpose Vehicle (SPV), that pays the bank issuing securitized bonds and notes based on the underlying assets. Now the bank is just covering the role of "servicer", collecting payments on behalf of the SPV and earning a fee for her service. In this way, illiquid assets like houses, are

[65] ROBERT W. KOLB, LESSONS from the FINANCIAL CRISIS, Causes, Consequences, and Our Economic Future, Kolb Series in Finance, Essential Perspective, 2010, p. 92.

[66] SHANUKA SENARATH, Securitization and the Global Financial Crisis: Can Risk Retention Prevent Another Crisis?, Griffith University, Department of Accounting Finance and Economics, Australia, p. 7.

transformed into liquid and tradable debt securities, and investors are paid by the stream of cash flow deriving from the mortgage payment. As long as all the underlying loans are solvent, each stage of the process generates a profit. The securitization can be either a pass-through or a pay-through one. In the first the SPV is only acting as a vehicle, collecting loans and packaging them. Then, the stream of cash flow deriving from the packaged loans is just split among the participants. In the latter instead, the SPV is more similar to a company, that purchases the asset from the originator but can also invest in new assets in order to bridge the gap between maturity of assets and liabilities.



* This securitization follows the general structure of an inter-jurisdiction securitization scheme. If the securitization program is domestic, the originator, SPV and other entities will be in the same jurisdiction in contrast to this diagram.

** In a practical sense, the originator needs not to be the lender. In practice smaller banks would sell their mortgages to banks that sponsor securitization programs.

*** Also known as the Special Purpose Entity (SPE), Financial Vehicle Corporation (FVC) or trustee

**** Normally there are a number of classes of investors (note/bond holders). This particular securitization scheme consist four classes. Namely Class A, Class B, Class C and Subordinate note class.

Table 18: Structure of a securitization program (from Shanuka Senarath, Securitization and the Global Financial Crisis: Can Risk Retention Prevent Another Crisis?, Griffith University, Department of Accounting Finance and Economics, Australia, p. 8.)

Securitization was originated in the 1970s exactly with the sale of securities linked to residential mortgages in United States, by a bond trader called Louis Ranieri. In the following years the process expanded to a variety of assets like credit card receivables, municipal rates and automobile loans, but even to unconventional assets: is famous the David Bowie Bond, issued in 1997, with which the singer securitized the royalties from his music catalog in the amount of 55 millions of dollars.

The Bowie Bonds (1997)	
Underwriter	Pullman Group at US investment bank Fahnstock
Issue	$55 million
Assets	Rights to David Bowie's master tapes and publishing catalogue transferred into a vehicle company (Bowie's 25 records sell 1 million units/year)
Yield	7.9 per cent (10 to 15 points above average corporate credits in 1997)
Average maturity	Ten years
Credit rating	AAA (moody)
Purpose	Higher advance than possible from new distribution deal with record company; enabled Bowie to buy back publishing rights in some songs owned by a former manager and invest in internet companies
Buyer	Prudential Insurance Co. of America (institutional investor)

Source: Kretschmer *et al.* (2001)

Table 19: Securitization of the Bowie Bond (from https://www.moneysurfers.com/blog/le-5-cose-che-ho-imparato-da-david-bowie-sulla-ricchezza-a6125.php)

The securitization generates the credit derivatives, but the process is not as simple as I described, indeed there are few types of credit derivatives. The most related to the mortgage market are ABS (RMBS in this case), CDS, CDO, CDO^2, and I'm going to briefly describe them with the aim to understand their role in the real estate bubble. Each credit derivative is generated to overcome an imperfection of the market, so under the "perfect market" assumption, credit derivatives would not exist. But considering that the market in which we move is characterized by a lot of imperfections (transaction costs, low liquidity, difficulties in short sell, incomplete market and arbitrage opportunities) we can understand how these kinds of securities were created.

ABS (Asset-backed securities)

Asset-backed securities are the first step of securitization, as they contain untraded loans in their collateral pool. ABS are similar to liabilities issued by corporation, even if they are issued by special purpose vehicles. The collateral pool consists in a collection of loans, in this case mortgage loans, and this is why these securities are more specifically called Residential Mortgage Backed Securities (RMBS). To purchase the assets (loans), the SPV issues debt. "The debt is issued in various tranches or slices, from the senior bond tranches to the mezzanine to the junior bond tranches. These bond tranches have different claims to both the cash flows from the collateral pool and any losses realized on the collateral pool. The cash flows, consisting of interest and principal payments, are paid to the most senior bond first, then the mezzanine bonds, then the junior bonds, with the residual going to the equity. The cash flow and loss allocation across the various bond tranches is called the waterfall, [so] the senior

bond tranches are the safest with respect to default risk, while the equity are the riskiest securities in this regard."[67]

Assets	*Liabilities*	*Waterfall*	
collateral pool	senior bond tranches	cash flows !	losses "
	mezzanine bond tranches		
	junior bond tranches		
	equity		

Table 20: The Cash Flow and loss Waterfall to an ABS (from Robert A. Jarrow, The Role of ABS, CDS and CDOs in the Credit Crisis and the Economy, Johnson Graduate School of Management, Cornell University, Ithaca, New York, 2011, p. 10.)

Before to be issued, the ABS need to be evaluated by at least one credit rating agency, that gives a rating based on the ability of the borrower to repay the loan (we have already analyzed the process of credit evaluation). What happened in reality is that during the period of the housing bubble, not only senior tranches received a AAA rating (in the case of Fitch and S&P, or Aaa in the case of Moody's), but also the mezzanine tranches, that were composed of doubtful loans. This is the reason for which this kind of securities were created, especially CDOs and CDO^2s: the rating process were transforming risky bonds in investment grade bonds. The high demand for ABS bonds originated from the high demand of CDOs and CDO^2s, that need ABS to be created, but is better to first explain what a CDS is.

CDS (Credit default swap)

"Credit default swaps (CDS) are insurance contracts written between two counterparties insuring the face value of a particular corporate, sovereign, or structured debt issue for a fixed period of time. For selling the CDS, the insurer receives premiums, paid regularly (usually quarterly) over the life of the CDS contract. […] The premium payment is based on the notional value of the contract. The notional value of the contract is the aggregate dollar value of the insured bond. […] if a default credit event occurs, the contract terminates and the seller of the CDS either pays the face value of the debt and receives the debt issue (if physical settlement) or pays the difference between the face value and market price of the debt."[68] CDS increase

[67] ROBERT A. JARROW, The Role of ABS, CDS and CDOs in the Credit Crisis and the Economy, Johnson Graduate School of Management, Cornell University, Ithaca, New York, 2011, p. 10.
[68] ROBERT A. JARROW, The Role of ABS, CDS and CDOs in the Credit Crisis and the Economy, Johnson Graduate School of Management, Cornell University, Ithaca, New York, 2011, p. 13.

the value of the debt market because allows investor to short sell debt, increasing the liquidity and the informational efficiency of debt market. CDS could also be "naked", in the case trader doesn't own the underlying debt issue. Moreover, given the high risk of these contracts, strong collaterals are required for CDS traders, but due to the fact that CDS market were part of the strongly unregulated over-the-counter market (OTC), a high rated financial institution could sell CDS with no need for collaterals, assuming in this way the credit risk of a bond without any capital guarantee. This process increased the risk of the bond market and the leverage of the financial institutions like AIG, that sold tons of CDS for which it hadn't enough capital guarantee when housing prices started to decline, mortgages defaulted, and CDOs value fell to zero.

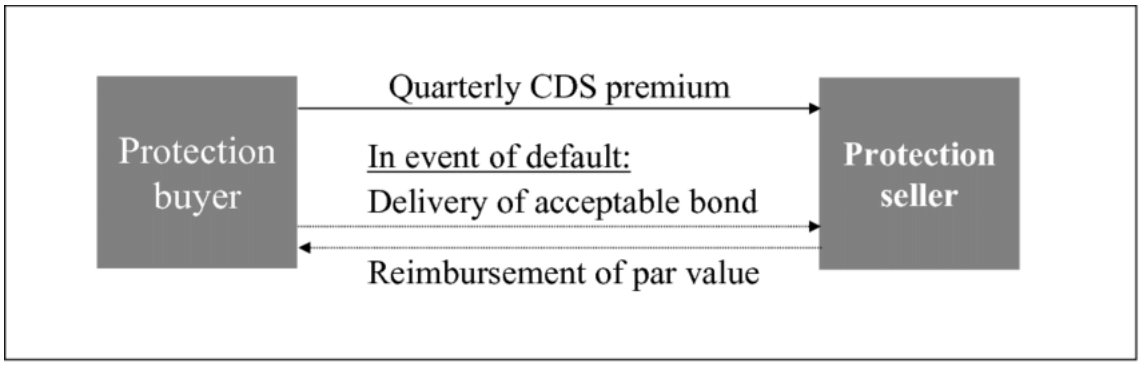


Table 21: CDS structure (from https://www.researchgate.net/figure/Cash-Flow-Scheme-for-a-Credit-Default-Swap_fig6_5124979)

CDO, CDO^2 (Collateralized debt obligation)

Collateralized debt obligations (CDO) are divided in two types: cash flow and synthetic. "A cash flow CDO is a type of ABS. The key difference between an ABS and a CDO is in the composition of the collateral pool. A subprime ABS has a majority of subprime residential mortgage loans in its collateral pool. In contrast, a subprime CDO has a majority of mezzanine ABS bonds, rated AAA, in its collateral pool. […] CDO^2 are CDO in which the collateral pool mainly consists of mezzanine, junior or even the equity tranche bonds form subprime CDO. Thus, a CDO^2 is a CDO whose collateral pool consists of other CDO bonds [and] the market imperfection that enabled CDO and CDO^2 to exist was a violation of the no-arbitrage assumption."[69] So, CDO do not exist to complete the market, but to exploit an arbitrage

[69] ROBERT A. JARROW, The Role of ABS, CDS and CDOs in the Credit Crisis and the Economy, Johnson Graduate School of Management, Cornell University, Ithaca, New York, 2011, p. 15.

opportunity generated by the rating agencies that granted high ratings to ABS mezzanine tranches. CDO^2 played a similar economic role: equity holders of CDO having difficulties in trading mezzanine and equity tranches of CDO, repackaged them in CDO squared (CDO^2) which "obviously" received high ratings, turning again "junk bonds" in "gold".

A synthetic CDO instead, is an ABS where the underlying collateral pool consists entirely of ABS CDS. No physical bonds are purchased for inclusion, so the cost of construction is smaller than that of a cash flow CDO.

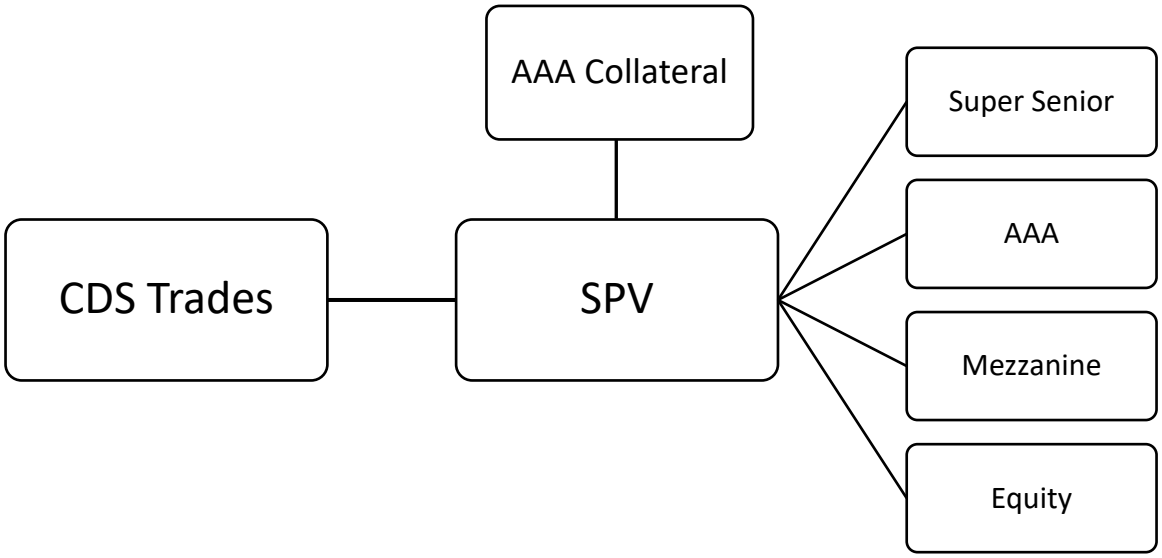


Table 22: A simplified Synthetic CDO.

This is a brief description of the securities related to the sub-prime mortgages, that gained a huge market share during the period of the housing bubble, contributing to increase the supply of mortgages and to reduce the lending standards in order to satisfy the great appetite of investors for products that are high rated (so less risky in theory) but promising higher yields with respect to corporate or government bonds with the same rating. Obviously, such exotic products should deserve an entire paper just for the explanation of their intrinsic nature and their specificities; I consider this brief description, even if incomplete, useful in this context, to understand the happenings that upset the world a decade ago. Anyway, there are few

factors that played a central role in the inflation of the bubble, directly related to the securitization process.

The aforementioned originate-to-distribute model encourages the allowing of "lemon mortgages", given the fact that the originator can sell the loan to a securitizer without any trouble, even if it's a sub-prime one. Following this path, a lot of non-recourse mortgages were granted. A non-recourse mortgage is a loan secured by a collateral (the house in this case), but it's peculiarity is that in case the borrower defaults, the issuer can seize only the collateral and no other issuer's asset, even if the value of the collateral does not cover the full value of the loan. ABS and its derivatives where composed in part of this kind of loans, and when house prices started to decline, so the value of the collateral was lower than the value of the loan, borrowers started to default, even deliberately causing a sharp decline in the value of the securities. This triggered the chain of events that lead to the failure of big banks, financial institutions, and recession.

But the situation was far more complex than this, thanks to the various layers of repackaging of mortgages. Without the huge amount of securitization and re-securitization, the problem would have been delimited only to the mortgage sector and the crisis would have not become global. In fact, in the years before the crash the situation was so out of control that for a single loan there were millions and millions in securities and insurances (in the form of CDS) for which no guarantee was asked to be hold in the balance sheet of the issuing institutions. This process generated a noteworthy increase in the leverage in the financial institutions and banks, starting from the first years of the millennium, that culminated in the 2007-2008 when the world-wide economy was engaged in the "trap" of the sub-prime securitization.

Moreover, the oversupply of mortgages generated by the securitization process is linked with an argument already analyzed in this thesis: the decline in underwriting standards. This specificity has already been treated in the paragraph 2.3, but is worth to mention how " credit risk transfer instruments reduce banks' incentives to monitor borrowers, especially when there is informational asymmetry between the seller (bank) and the buyer (investor), and this situation is harmful in terms of social welfare. In an empirical study on default rates of mortgages in America, Keys et al (2009) identifies that mortgages that are for securitization have 20% higher default rate compared to mortgages that are not for securitization. This study concludes that existing securitization practices did adversely affect the screening incentives of subprime lenders. Further, Dell'Ariccia et al., (2008) concludes that securitization on one

hand results in a decline in the average quality in credit in the economy, while on the other hand it results in a decline in the average quality of mortgages, where lending standards decline more than justified by economic fundamentals."[70] This is a typical situation where the moral hazard comes into play, as originators are pushed to issue more mortgages with the aim of earning higher fees, with the certainty to resell the loans to a bank, which, in turn is pushed to buy more mortgages in order to repackage and sell them to investors or other institutions, and so on… The risk is continuously shifting from one agent to another, but the total risk of the economy is increasing at each transaction.

To conclude, "collateralized debt obligations (CDOs) and private-label mortgage backed securities (MBS) backed by nonprime loans were at the heart of the recent financial crisis. Issuance of these securities grew exponentially from 2003 to early 2007 before collapsing in mid-2007. […] The demand for these securities helped feed the housing boom during the early and mid-2000s, while the rapid declines in their prices during 2007 and 2008 generated large losses for financial intermediaries, ultimately imperiling their soundness and triggering a full-blown crisis."[71]

2.7- Speculation in the CDS market.

Credit default swaps are included in the securitization instruments related to mortgages analysed in the previous paragraph as they are part of the process of repackaging of loans and they were also used as collateral for synthetic CDO. Nonetheless, they have different characteristics with respect to the other mentioned securities, so they deserve a separated analysis. In contrast with other securities, CDS, if properly used, reduce the market risk, allowing the owners of ABS and CDO to edge the risk of default of the underlying bond, paying a commission based on the riskiness of the asset. As Friedman and Friedman state in their writings, "CDS were originally developed to insure bond investors against default, but they

[70] SHANUKA SENARATH, Securitization and the Global Financial Crisis: Can Risk Retention Prevent Another Crisis?, Griffith University, Department of Accounting Finance and Economics, Australia, p. 4.

[71] SERGEY CHERNENKO, SAMUEL G. HANSON, ADI SUNDERAM, The Rise and Fall of Demand for Securitizations, 2014.

took on a life of their own and were used for speculation purposes. A CDS encourages speculation since the owner of the CDS does not actually have to own the underlying security. This is equivalent to buy fire insurance on someone else's house."[72] This is exactly what happened during the housing boom, when the demand for CDS increased exponentially (fueling the demand for underlying securities and consequently the supply of mortgages) and financial institutions and insurance companies sold tons of swaps without the need for any coverage, thanks to the deregulation promoted by the Commodity Future Modernization Act of 2000.[73] For these reasons, is worth to spend few more lines in describing the principal characteristic of CDS and their role in the 2008 global financial crisis.

Credit default swaps were born in the 1990s during the period of financial innovation, probably in the derivatives team of JP Morgan, in the Unites States. They belong to the family of the swaps, contracts in which both the contract parties trade cash flow streams according to the contractual terms in a certain period. The jargon system developed for the CDS was similar to the one used in the insurances, but CDS were not defined insurance in order to avoid the regulation of which insurances are subjected. In such contracts, the subject transferring the risk is called the "protection buyer" and the subject receiving the risk is called the "protection seller". The first pays periodically (usually quarterly) the protection fee, called "premium" or "risk spread", to the latter, that takes the risk of a so called "credit event", like bankruptcy or liquidation of the underlying asset. These new jargons were accepted by the OTC derivatives industry organisation, that is called ISDA (International Swaps and Derivatives Association). In case of credit event, the protection seller has a compensation duty, and it could be a "physical settlement" where the protection buyer delivers the ownership of the debt to the seller and the seller pays the notional amount of the debt to the former, or it could be a "cash settlement" under which the protection seller has to pay to the buyer the difference from the notional value and the market value of the debt. Cash settlement CDS are

[72] ROBERT W. KOLB, LESSONS from the FINANCIAL CRISIS, Causes, Consequences, and Our Economic Future, Kolb Series in Finance, Essential Perspective, 2010, p. 33.

[73] The Commodity Futures Modernization Act of 2000 (CFMA) is a United States federal legislation that officially ensured modernized regulation of financial products known as over-the-counter (OTC) derivatives. It was signed into law on December 21, 2000 by President Bill Clinton. It clarified the law so most OTC derivative transactions between "sophisticated parties" would not be regulated as "futures" under the Commodity Exchange Act of 1936 (CEA) or as "securities" under the federal securities laws.

particularly attractive for speculation, as the buyer has not to physically own the underlying debt instrument for which he is buying protection.

During the years of increasing financialization, many types of CDS emerged in the market: the original contracts are called the single-name CDS or "plain-vanilla CDS", in which the underlying is a singular entity or corporation. They were the most commonly traded CDS before the explosion of the speculation and they are the grounding brick to the multi-name CDS, also called Index CDS. Index CDS are similar to stock indexes, containing a multiple indexed underlying reference; they saved a lot of time for banks allowing institution to insure against a diversified basket of reference entities. The synthetic CDO instead, could be considered a CDS inasmuch its collateral pool is composed of CDS, so investors buying the synthetic CDO equal to selling CDS protection to that portion of CDO securities. In this way, the public securities investors are the ultimate risk protection sellers.[74]

As previously explained, CDSs can be used both for hedging and for speculation. In the case of speculation, they are treated like shares and futures, where speculators bet on the happening of a credit event. In other cases, the speculator could buy the protection and resell it when its value is higher, so when the premium fee is higher. Thanks to their liquidity, index and synthetic CDS are the most used for speculation.

As I said at the beginning of this paragraph, credit default swaps deserve a particular treatment due to their specific characteristics, that made them so attractive for financial institutions and investors during the housing boom. The three more distinguishable features of the CDS are:

- The high leverage, so speculators could enter in the market with little initial investment (in 2007 the leverage of Bear Sterns was near to 33:1. thanks to the CDS)
- Off-balance trading: according to the reporting standards, CDS don't need neither to be reported in the balance sheet of the institution which trades them, nor to be disclosed to the public, so the entire financial market was scattered of misleading information.
- Over-the-counter trading, that means that they can be traded just signing a private contract between the parties.

[74] ZHOU JIE, Credit-Default-Swaps and the 2008 Financial Crisis --- The Underlying Legal Origins and the European Union's Regulatory Reforms, Università di Bologna, Dottorato di Ricerca In Diritto dell'Unione Europeo, 2015.

Once explained the nature and specificities of these exotic products, the next step is to analyze the role that they played in the inflation of the real estate bubble and the consequent global financial crisis. In fact, exactly in the period before the crisis, CDS viewed their market size to increase exponentially, so is clear that somehow, they have impacted on the formation of the bubble. Statistics tell us that in 2004 the worth of the outstanding CDS contracts was about 6 billion U.S. dollars, then their value almost doubled every year reaching a peak of 58 billion in 2007.

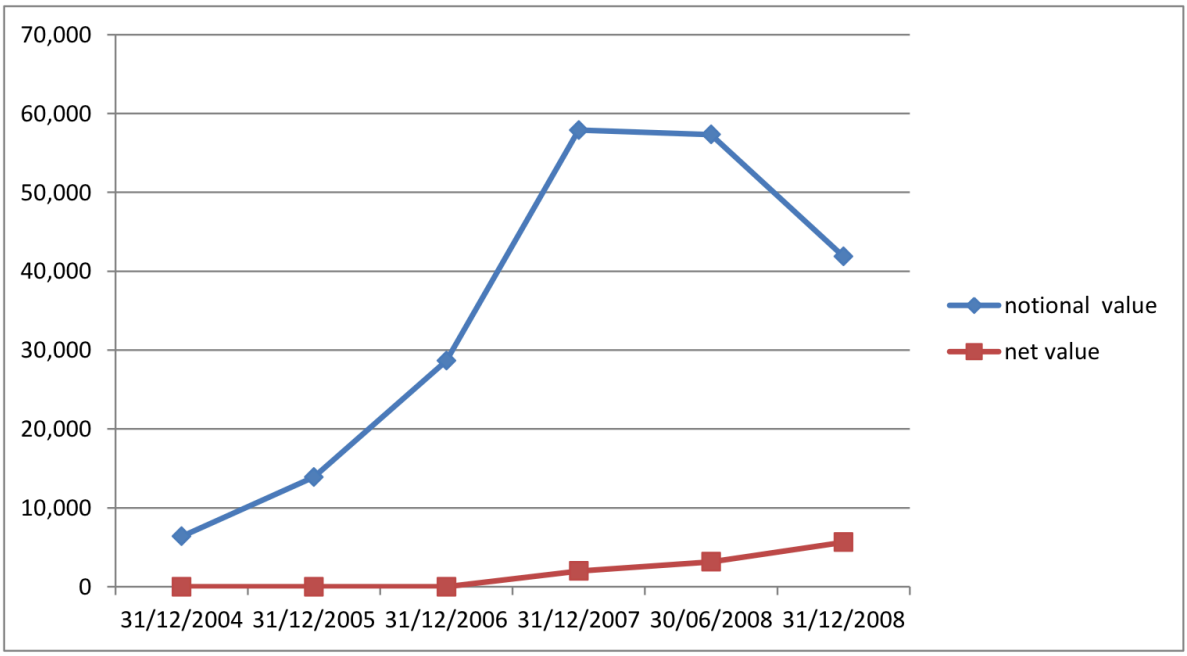


Table 23: The size of CDSs market, in billion of U.S. dollars (from Bank of international Settlements)

The opinion that the CDS facilitated the granting of subprime mortgage loans inflating in this way the real estate bubble is commonly diffused, but how did they do that? "[M]arket participants encouraged the creation of CDO containing low quality mortgages, as they could bet against them using CDS, and they encouraged their clients to purchase CDO while simultaneously betting against them, without legal obligation of disclosing the latter bet. In short, mortgage-related securities investors could buy CDS protection against the default of these securities, hence CDS helped to expand the market for the creation of MBS and CDO. Therefore, the securitization of mortgages and the buying of CDS protection are the two

crucial nodes in this credit chain of mortgage loans."[75] Just to make an example, the sole AIG sold about 80 billion in CDS protection against CDO. To conclude, as stated by the Financial Crisis Inquiry Commission, the CDS facilitated the securitization of mortgage loans, and from doing so fueled the U.S. housing bubble.

2.8- The decline in house prices and the burst of the bubble.

In the pages above, I tried to reason on the main elements considered the cause of the real estate bubble that blew up during the years 2007-2008, resulting in one of the worst financial crises that the modern economy has ever faced. As I mentioned several times, things are not so easy as they are described in the books, especially when happenings are influenced by the human behaviours, guided by a completely irrational thinking. Moreover, reality often is not like a mathematical formula, that given the same elements returns always the same result; reality is like a mathematical formula with infinite variables, in which even a little change in one of these, could generate a completely different result. So, the aim of these paper is not to "complete" the equation that led to the economic crisis in order have a list of what to avoid and how to behave in case of future bubbles and price movements. Such a reasoning would be as dangerous as the irrational behaviour kept by some financial institutions during the house bubble because, as I've already said, each economic and historic period has its characteristics that are influenced by the surrounding environment. So, what has been considered a wrong economic behaviour in the past decade, could be considered the correct one in a future environment with different specificities. Hence, the objective of this paper is to give the readers the instruments to analyse the situation in which they are, in a way that they can evaluate by themselves which is the correct economic behaviour to pursue. Subprime crisis sure enough, was largely caused by scarce economic understanding of the investors, moral hazard of bankers and institutions, and herd behaviour that accelerated both the boom and the burst of the bubble. Said that, is also important to analyse the series of happenings

[75] ZHOU JIE, Credit-Default-Swaps and the 2008 Financial Crisis --- The Underlying Legal Origins and the European Union's Regulatory Reforms, Università di Bologna, Dottorato di Ricerca In Diritto dell'Unione Europeo, 2015.

that led to the housing bubble and the financial crisis of the last decade, in order to understand which was the starting point and which was the trigger that made the bubble to explode. I mentioned few times, also in the title of this paragraph, that what caused the collapse of that crazy, unsustainable system was the decrease in house prices after a decade of huge increase. This soon generated an increase in the foreclosure rates, as households hadn't the possibility to refinance their mortgages (which installments where high due to the adjustable rate mortgages) thanks to the appreciation of their house's value. Banks were forced to resell the foreclosed houses increasing the supply and contributing to the fall in prices. At this time the system entered in a spiral, similar to the one that inflated the bubble, but with a negative sign. People started to panic and sell their houses, no matter how good the price was. At that point the downturn was unstoppable. Moreover, the process of overfinancialization and excessive securitisation pushed by banks, financial intermediaries and insurance companies just to earn more fees over subprime mortgages, created a strong link between housing market and the entire economy that experienced a crash comparable with the one occurred in the Great Depression.

The question now is, why did house prices start to decline? Honestly, there is not an answer to this question, as we know that prices started to fall when foreclosure rates increased, but foreclosure rates increased because of a decrease in the prices, so it seems like a circular path with no beginning and no end. Someone argue that simply high prices cause high prices to fall and low prices causes low prices to rise[76]: this is the classic example of an economic cycle. Is normal in the economy for price cycles to happen, the problem in that particular situation occurred in the first decade of the 2000s was that the speculative behaviour of investors and the herd behaviour of households pushed house prices far over their fundamentals. So, when the trend started to change, lot of investors started to panic-sell in order to realize their gain from the housing investment, and the entire system collapsed. In this way the asset pools of the RMBS lost their value and banks and financial institution found themselves with huge losses to cover, for which they didn't have any guarantee in the balance sheets. In that moment, Wall Street discovered that the "small" (if compared to the U.S. economy) housing crisis, had affected the entire global financial system.

[76] Why did the house prices fall during the global financial crisis? https://www.quora.com/Why-did-the-house-prices-fall-during-the-Global-Financial-Crisis.

3 – Empirical considerations: how to prevent a real estate bubble

3.1- How the decline has been stopped

As described in the introduction, the bulk of this paper is to give the reader useful instruments to understand the big, fragmented picture of the real estate bubble of 2003-2007, not aiming at answering the question of "which was the cause of the financial crisis of the last decade". Surely, these two topics are interconnected, and in some sense, they could analyse overlapping arguments. Anyway, I do not pretend to answer the "million-dollar question" considering that hundreds of academics spent years of research without reaching a worldwide accepted solution. Moreover, too little time is passed from this catastrophic event, and there is still a debate on whether the downturn is concluded or not. With these premises, is clear that the time is not ripe to have an "outside" and impartial vision of the events occurred. This is because too many people are or have been involved in the crisis and we know that conflicts of interest and resentments don't go hand in hand with the scientific reasoning.

Said that, is time to go back to reality, because the crisis is a real event; people lost their homes, their savings, their jobs and the faith in the institutions that have not been able to spot the bubble before the burst, or even worse, they acted pursuing the interest of speculators or big financial institutions. Soon after the collapse of the subprime mortgage derivatives, that at that time had affected the entire financial system (thanks to the different instruments I spoke about in the paragraphs 2.6-2.7) causing the biggest U.S. banks undergo severe troubles (or even to go bankruptcy in the case of Lehman Brothers), the entire economy faced a credit crunch[77] comparable to the one occurred during the Great Depression. But even before the

[77] A credit crunch, also known as "credit squeeze" or "credit crisis", occurs when the general availability of credit declines considerably. We also use the term when it suddenly becomes more difficult to get a bank loan. The decline in the availability of credit occurs regardless of interest rates. In other words, the availability of credit falls whether interest rates rise or stay the same. Banks and other creditors become reluctant to lend money during a credit crunch. Both individuals and companies notice the change. Banks become reluctant to lend because of the greater risk of defaults. This is due to either political problems or adverse economic conditions. During a credit crunch, lenders become much more selective about who they lend to. Their focus shifts to quality

credit crunch, there were another pressing problem: with lot of banks being in bankruptcy risk, thanks to the aforementioned herd behaviour and the word of mouth, people (not only investors or mortgage possessors) started to panic, and what happened was a bank rush to withdraw all the money form their accounts. Basic notions of the banking system are enough to understand that this is the worst situation, and the result was an acceleration of the crisis, with queues outside the banks of people not sure to get their money back.
At this point the government was forced to act, in order to avoid the complete debacle of the national and international economy. There are few ways in which the government could intervene facing a financial crisis, and the most cited include:

- State-guaranteed lending
- Direct equity injections
- Purchase of distressed assets by the government

Each way has its positives and negatives, and they both have a short-term and a long-term dimension. If the short-term objective is to face the liquidity crisis, the long-term one is to prevent any possible such failure in the future. Being clear that "immediate action by governments worldwide has helped to dampen the consequences the recent financial crisis has on global economic development and wealth, […] the way how this short-term government intervention should be conducted is subject to lively discussion. One important question is whether financial institutions in distress should be rescued by the government and consequently by the taxpayers? […] In the long run, this would lead to an increasing risk appetite at financial institutions, as a lender of last resort equips shareholders of financial institutions with a put option on their firm and the result would be an even more unstable financial system, which is clearly not desirable."[78] As usual, there is a need to find a trade-off in order to pursue the preferable results, for the tax-payers, the economy, the investors, and so on, so in deciding whether or not to rescue a financial institution what is considered is the overall cost of bankruptcy for the economy opposed to the cost of the rescue (government

rather than quantity. This reduction in the availability of credit may prolong an economic recession. It might also slow down a recovery. This occurred in the Great Depression.
[78] BASTIAN BREITENFELLNER, NIKLAS WAGNER, Coping with the Financial Crisis, Illiquidity and the Role of Government Intervention, Passau University, p. 3.

intervention). In case the rescue resulted in lower costs for the entire economy in the long-term, the best solution would be the government intervention. In the long run instead, other factors need to be examined, and other approaches should be used.

Being the securitization blamed as the root of the crisis, probably a need for a redesign of such instruments could emerge, as "securitization markets in their current form are characterized by a misalignment of incentives among relevant players. This misalignment can be overcome by committing originators to retain a share of the securitization transaction on their own books. Another issue related to securitization markets is the enormous complexity of its products."[79] The argument relating the future of securitization is going to be treated in the next paragraph, analysing few solutions to overcome the problems of such instruments and the institutions managing them.

3.2- The future of securitization

Securitization is a good way to allocate risk with capital, as it avoids inefficiencies and allows companies to access capital markets at a lower cost than the cost of issuing direct debt. But securitization have also negatives, that have been revealed by the financial crisis. These negatives are principally four: during the bubble period securitization was made with assets that should not have been securitized (sub-prime mortgages), the moral hazard generated by the discussed originate-to-distribute model that replaced the originate-to-hold model in the first years of the millennium, the servicing conflicts and the overreliance on mathematical models. The fifth possible shortcoming, that emerged during the crisis is the overreliance of investors in rating agencies. The first one is already treated in this paper and is related to the fact that the failure of sub-prime mortgage securitization is intrinsic in the specificities of mortgage granted during that period, mortgages characterized by adjustable rates, high loan-to-value ratios, and non-reliable borrowers. " The failure of subprime mortgage securitization was thus caused by its almost absolute dependence on home appreciation. […] Parties in structuring securitization transactions can minimize future problems by excluding, or at least

[79] BASTIAN BREITENFELLNER, NIKLAS WAGNER, Coping with the Financial Crisis, Illiquidity and the Role of Government Intervention, Passau University, p. 6.

limiting and better managing mortgage loans as an eligible type of underlying financial asset, and also by conservatively assessing the payment prognosis for other types of financial assets underlying securitizations[80]. This way is also great to avoid that the securitization of flawed assets could magnify the origination of that kind of asset, creating the aforementioned spiral. The discussed question of the moral hazard is well explained in the previous chapter. What is not discussed is how to fix this model in order to minimize any potential risk of moral hazard without threaten a model that is critical to the funding liquidity of banks and institutions. The solution could be to require originators or mortgage lenders to retain a part of the risk associated with mortgages they sell, for example, overcollateralizing the receivables sold to the Standard Purpose Vehicles. Someone suggests regulating the loan underwriting standards applicable to mortgage lenders or imposing a sort of minimum real-estate-value-to-loan collateral coverage ratio on all loans secured by the real estate financed. This could be useful to protect the economy from such crisis, but it will not protect from different kind of financial crisis.

We know that the problems generated by the securitization of mortgages derive from the fact that the beneficial of the loans are no more the mortgage lenders but a long list of financial institutions, insurance companies and investors, in few words, whoever have an interest in MBS and their derivatives. We also know that theoretically, servicers should fill the gap between mortgage lender and final investor, pursuing the interest of the latter. What happen in reality is that often servicers prefer foreclosure over restructuring a debt, as foreclosure costs are reimbursed and the procedure is ministerial, so there is no risk of litigation. Considering that often in the securitization process, cash flow from interest and from equity are divided in different tranches, restructuring the debt for example reducing the interest rate could affect negatively one part of the investors, generating a "tranche warfare". "These problems can, and in the future should be fixed. Parties should write underlying deal documentation that sets clearer and more flexible guidelines and more certain reimbursement procedures for loan restructuring, especially when restructuring appears to be superior to foreclosure. And they should try to minimize allocating cash flows to investors in ways that create conflicts."[81] Anyway, I'll treat this argument later on speaking about the mortgage bankruptcy.

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[80] STEVEN L. SCHWARCZ, The Future of Securitization, Duke University, p.2.
[81] STEVEN L. SCHWARCZ, The Future of Securitization, Duke University, p.2.

The fourth shortcoming of securitization is the overreliance on mathematical models, derived from an abandonment of common sense. What should be considered in this case is that not always the model and the inputs are reliable, so the outcome in this case could be completely misleading; precisely what happened in the credit risk evaluation of the tranches of MBS and CDO. This problem in theory, should be self-correcting, as the recent crisis made people to lost faith in the complex and incomprehensible mathematical models and their way to measure risk. But we know people tend to forget lessons learned from the past, so how long will this alert behavior last in the future? To conclude, securitization is too much useful to eliminate it completely form the financial sector, this process just needs a refocus on his basic structure and asset type.

Going back to the servicing conflicts, there is the common belief that "a major fact behind the private market's failure to address the foreclosure crisis is that for most mortgages, loans are no longer owned by a single entity; instead they are securitized, so that thousands of investors have a fractional interest in a pool of loans. […] Securitization creates a variety of obstacles to efficient and socially constructive loan modifications instead of foreclosure, [so] permitting modification of mortgages in bankruptcy is the only certain and realistic way to address the impediments to loan modifications. Bankruptcy modification is an immediately available form of foreclosure relief that has no cost for taxpayers, does not create moral hazard, can address both unaffordable and underwater mortgages, and provides an important future defense against systemic financial risk."[82] The problem created by securitization on loan workouts (the process of restructuring of distressed loans to make them affordable) derive from three different aspects: contractual, practical and economic. The first is related to the limitation that servicers have on the modification of loans they collect, as the law imposes them to buy the modified loans at the new face value, and sometimes the modification is completely forbidden by contract. The practical difficulties consider the lack of the adequate number of personnel, in the servicing companies, to handle the huge volume of loan modifications and the contacts with customers. The third problem, and the most important, are the economic disincentives that servicers face in the process of restructuring of a distressed loan. As I mentioned above, the restructuring process could generate lawsuits from MBS holders that believe the process could affect their investments in favour of other classes of investments (tranche warfare).

[82] ADAM J. LEVITIN, Modification of Mortgage in Bankruptcy, Georgetown University Law Center, p. 2.

Moreover, often foreclosure is more profitable for servicers in terms of effort and risks related to reimbursement. There are two possible approaches to face the issue of loan workouts, and Levitin defines them "carrot and stick". "The carrot approach is to offer lenders and servicers an incentive to engage in more modifications and more meaningful modifications that they otherwise would. […] It would use taxpayer dollars to benefit a limited subgroup of citizens-defaulted homeowners, some of whom borrowed irresponsibly or even fraudulently; another limited subgroup of citizens-investors who stand to lose more in foreclosure than in a workable loan modification; and loan servicers, who as a fiduciary matter should be doing the modification anyhow in many cases. It also creates a poor precedent that could encourage moral hazard."[83] The stick approach instead, is more direct and simply would remove servicers from the loan modification process, amending the bankruptcy code in a way that all consumers could modify their distressed loans. The shortcoming here is clear, as the debtor is free to modify his loan whenever he decides to do that, acting on the interest rates, the amortization schedule and negative equity. Anyway, "bankruptcy modification helps solve these very issues and can do so more effectively and cheaper than any other proposed solution. Bankruptcy modification is also the only way to bypass the contractual, legal, practical, and economic problems created by securitization."[84] No risk for moral hazard is intrinsic of this procedure and most important, there is no cost for taxpayers; for these reasons, bankruptcy modifications has to be considered the best and less invasive way of stabilizing the housing market.

Other crucial actors in the process of securitization are the aforementioned GSEs, playing the role of connection between investors and homebuyers. Since the post great depression, GSEs acted as protagonists in the mortgage market, and even if in the last years of the bubble they have been outscored in market share by private securitizers, their importance has not changed. The two most active GSEs at the time of the bubble were Fannie Mae and Freddie Mac, and as a result, like the other actors in the securitization market, they faced a serious liquidity and solvency crisis. As a result, in September 2008, Fannie Mae and Freddie Mac were rescued by the Treasury and the Federal Housing Finance Agency, that purchased GSE debt and MBS in fact acting as a guarantor for the companies. So there is uncertainty in the future

[83] ADAM J. LEVITIN, Modification of Mortgage in Bankruptcy, Georgetown University Law Center, p. 3.
[84] ADAM J. LEVITIN, Modification of Mortgage in Bankruptcy, Georgetown University Law Center, p. 4.

of these two GSEs, but as Ben Bernanke states in 2008, they are an important asset for the U.S. economy and must be restructured: "Our task is to begin thinking about how best to reestablish a link between homebuyers and capital markets in a way that addresses the weaknesses of the old system. In light of the central role that the GSEs played, and still play, any such analysis must pay particular attention to how those institutions should evolve." This situation was analysed by Dwight M. Jaffee in a paper where he suggests a three-step process to determine the proper regulatory structure for the GSEs once they are released from their conservatorship. The first Is to identify the mortgage market function that the GSE could continue to serve, identified in the promotion of the stability and liquidity of the secondary market for mortgages.[85] The second step consists of evaluating alternative mechanisms that may serve this function. According to Jaffee these alternatives are three, and could be the old government anciencies of FHA (Federal Housing Administration) and Ginnie Mae mortgage insurance programs, the Ginnie Mae MBS that unlike the first two does not receive government guarantee (but a government intervention is presumed in case of bankruptcy), and the Private Label Securitization (PLS) that is a completely private transaction generally including larger and riskier mortgages. To conclude, is necessary to determine which would be the best way to reregulate Fannie Mae and Freddie Mac. Even in this case, there are three different proposals:

- Private market mechanisms, considering that in 2006 the PLS accounted for more than a half of the market they could take the primary role in the future, with some restrictions like the low risk of the underlying mortgages, a stable underwriting quality and appropriate interest rates. In this case Fannie Mae and Freddie Mac would become private entities with no government guarantees.
- A public utility model for reformed GSEs where these entities would be recreated with new regulatory controls like safest standards, maximum rate of return for shareholders and restrictions on executive compensations. The government would explicitly guarantee for the GSEs obligations. The problem here is the well-known incompatibility of private firms with public missions, that tend to be overpowered by the private interests.

[85] DWIGHT M. JAFFEE, Regulating Fannie Fannie Mae and Freddie Mac, Finance and Real Estate School of Business, University of California, Berkeley, p.2.

- A government Mortgage plan for Middle-Income borrowers would bring the critical mortgage functions of the GSEs directly into a federal government agency. The borrowers would be charged an additional fee as the FHA is doing for 75 years for low-income borrowers. In this way the private sector would be enhanced, and the household would have their mortgages guaranteed.[86]

As usual, perfect solution doesn't exist, but have to be chosen the solution that best fits the actual environment, taking in consideration that all depends on the human behaviour.

[86] DWIGHT M. JAFFEE, Regulating Fannie Fannie Mae and Freddie Mac, Finance and Real Estate School of Business, University of California, Berkeley, p.2.

Conclusion

Is not an easy task to draw an overall picture of an event of such magnitude, that involved the most part of the countries in the world and influenced the lives of millions of people in the last years, shaking the convictions about the Capitalism-based economic system that poses its foundations in the industrial revolution, more than two-hundred years ago. Many times in the long life of this system called Capitalism, something happened that made people doubt on its effectiveness, but the sub-prime crisis originated by the real estate bubble was the first time that the shock hit everyone in the world, no matter their wealth, nationality, occupation, religion, and knowledge about the economic cycles. Taking in consideration the particular situation, however, is possible to objectively analyze what happened in that crazy period, even if is important to remember that the downturn period is not ended yet, and probably the picture will be more clear in the future when this crisis will be just an old memory.

Anyway, I think this paper could be useful in understanding first, what really happened and second the overlapping series of causes that generated the upward spiral in house prices. The identification of the culprit and which singular institution to blame is not part of this work for many reasons, and the most important is that the economic-academic focus should be directed in avoiding such events in the future rather than in blaming someone for an event already occurred (for that we must have faith in the legal system).

Having this in mind, I considered useful to start clarifying what an asset bubble is, introducing the concept of fundamental value and the deviation from it. Without going in depth with mathematics, we are now able to identify a bubble and its peculiar characteristics. Knowing that "history tends to repeat itself", in the process of approaching the bulk of the thesis, a little part of history could help to better enter in the argument, describing some of the oldest known asset bubbles like the Dutch Tulip Mania or the South Sea Bubble. Staying in the field of history is important to briefly analyze the past real estate bubbles that will be compared to the one subject of the paper, like the Great Depression or the Japanese recession. Is interesting to note the similarities from one to another because they are treated in the paragraph 1.3. As I wrote above in the text, every bubble has its own history, but we can identify some common aspects that are principally related to the behavioral part of the economy. A warning signal could be the diffused perception of housing as an investment (so

buying with the only aim to resell at a higher price), the word of mouth that spreads the conviction of an ongoing increase in the prices, the speculation that contributes to inflating the bubble, and some financial/wealth indicators like the housing starts and the price to income ratio. A this point the reader should have the necessary knowledge to understand and critically analyze the central part of the paper: the causes of the real estate bubble of 2003-2007 that led to the sub-prime financial crisis. This part is a concentration of academic studies and researches on the various arguments blamed to have played a role in the real estate bubble. I could have missed someone, but I preferred to focus on the ones the most academics consider important. The order of the elements is not important in this case, as they need to be analyzed all together and there's not a hierarchy based on how much to blame a single element or which element caused the more economic damage. All the situations, behaviors, policies and entities cited in this chapter, contributed unquestionably to the formation of the bubble, but as much unquestionably they interacted each other in the complex environment of the early 2000s and for sure they were not able singularly, to generate such a crisis.

In the study of a bubble or a financial crisis, is interesting to start analyzing the environment where the event occurred, as often it could give us some hints. The U.S. economy entered in the third millennium after an unusual 20-years period of economic prosperity characterized by low inflation, high occupation and constant economic growth. The only one interruption of the "Great Moderation" was the ".com Bubble" of the end of the 20th century, but the entity of that crash was little if compared to the growing economy, and moreover, it was contained to the internet companies, so the downturn was not spread to other sectors. This wellness contributed to lower the guard of the policymakers that, being scared of the inflation and recession occurred in Japan, decided to lower the interest rate for three consecutive years, reaching the minimum of 1% and deviating by far from the limit suggested by the Taylor rule (Table 9). The consequence of this move was a cheaper credit for homeowners that led to a boom in refinancing and new mortgages with the variable rate, that would have become unbearable when rates would have come back to normal levels. Another contribution to the increase in the granted mortgages was a clear decline in underwriting standards. The moral hazard linked to the originate-to-distribute model, the increasing market share of the private securitizers with respect to GSEs, and the high demand for mortgages to repackage in the securitization process, led to a relaxation of the standards in the mortgage generation, and lot of unaffordable borrowers received a high loan-to-value mortgage. Still more debated is,

instead, the question of the saving glut and banking glut occurred in the transition period from the 20th to the 21th century. Is sure that the globalization, the economic development of the emerging countries and the increase in wealth for oil producers' nations, originated a reverse trend in the global accounts. The emerging nations transformed in less than ten years, from borrowers to lenders towards the industrialized nations (principally United States and Europe), originating in this way, a massive flow of money from outside to inside the U.S. economy. This, added to the stream of money deriving from the European banks for the acquisition of obligations, securitizations or equity (banking glut), pushed the increase in the prices and the decrease in the rates in the U.S. Even if not all academics agree on this view of the worldwide economy, this is a worth to mention analysis of the international situation at the time of the bubble. Less debated, and also more publicized, is the question of the rating agencies. Rating agencies are blamed to have granted high ratings (AAA) to risky products, complex securities and mezzanine tranches of MBS and CDO. So, when the downturn occurred, thousands of products were declassed in their ratings, but it was too late. The mistake committed by rating agencies is clear, but the reason is not: someone argues on the conflict of interest, as the CRAs are paid by the issuer of the product to rate it, others simply mention the incompetence and scarce knowledge of such complex securities. To conclude, the lack of responsibility for their actions played a central role on the rating agencies in the misrating of securitized products. Anyway, the misrating contributed to the invasion of complex and risky products in the market, increasing the total risk of the economy and generating high demand for new mortgages to securitize. Another critical role in the formation and expansion of the bubble was obviously played by the securitization process and its huge expansion in the first years of the millennium. As described in the paragraph 2.6, securities were borne to overcome market inefficiencies and they are good as they allow to spread the risk and to easily access to credit. The problem was the excessive and wrong use of them also permitted by the law. Banks and financial institutions sold tons of securities collecting fees and not having the collateral to cover an eventual loss. The complexity increased with the creation of CDO, CDS and CDO^2. At that time, banks could collect fees from selling CDO to the public and at the same time bet against them buying CDS protection from insurance companies like AIG, without showing them in the balance sheet. The insurance market related to mortgages worthed, in 2007, more than ten times the value of the underlying assets. The speculative use of CDS worsened the situation, generating an increase in the demand of the asset they were betting against. Also in this

situation, is the use of the financial product that makes the difference, as CDS, if correctly used, could allow investor to short sell the real estate, calming down an eventual increase in the price. But in the 2004-2007 bubble they were used in speculation without having any interest in the underlying mortgages. Moreover, they were repackaged and sold again to the investors as AAA CDO^2 collecting other fees and exposing the market to additional risk.

Is clear that this crazy upward spiral could not have lasted forever. At a certain point, in 2007, house prices started to decline, homeowners' mortgages started to default, and the entire system collapsed in less than one year, revealing to the world the weakness of an economy based on speculation, conflict of interests, and incompetence. At that time the mortgage securitization had affected the entire industrialized economy, and the recession showed up quickly. Governments interventions allowed to somehow stop the credit and liquidity crunch, but the effects in the long term are still present. A lot of proposals are arising for reregulate the mortgage and securitization market in order to avoid that such an event could repeat.

To conclude, we can state that the last sub-prime crisis was originated from the process of over-financialization and from a values meltdown, but we can also say that crisis are endogenous in capitalism and little can be done to avoid it, except a radical change in the pillars of this system.

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