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Human Behavior During Financial Crisis of 21th Century

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Abstract*—Present study was conducted to analyze human behavior during financial crisis of 21th century, which offers an alternative way to analyze economy and especially financial markets. The crisis was analyzed for the presence of psychological influence, including emotion, cognition and aspiration. Of the behavioral biases proofed, many were present during the bubble. However the most significant influences were shown to have been overconfidence, over-optimism, underestimation of risk and herding. The study shows that human behavior seems to be significantly biased in different way and thus causes the financial market to be biased as well. The article reveals that findings of behavioral finance may help to understand mistakes done by human and thus avoid disturbing the stability of financial markets.

***Keywords*—human behavior, financial crises, biases**

I. *Introduction*

The Great Recession following the financial crisis of 2008 was and still seems to be influencing the world economy; it has been the most severe crises since the Great Depression. Economists generally agree that the financial crisis has its roots in the U.S. housing, real estate, bubble. There were conducted several studies about the housing bubble, its origins and consequences. However there is no clear answer what has caused the crises.

We investigate the housing bubble and extensionally the financial crisis and search for triggering mechanism of the crises. Real estate bubble was driven by high grow of house prices and cheap money, but why nobody cared about these and many other "red indicators" lightening? The article focuses on searching the answers in behavioral finance, one of the most promising alternative theories.

II. Behavioral fiannce versus neoclassical paradigm

A. *Efficient market*

The efficient-market hypothesis describes the markets as informational efficient or reflecting all known information. In that case market participants cannot outperform the market using any already known information. The efficient-market hypothesis requires rational market; the average of the population is correct – rational. This requirement is fulfilled only if the distribution is normal. There are many reasons why the efficient-market hypothesis is not working including the diffusion of information or great power of some market participants. Moreover, bubbles cannot exist in the rational market and the look into the history shows that there are couples of them repeating nearly regularly. Thus creates the need for other methods that not only admit existence of bubbles but even try to explain their causes.

B. *Behavioral finance*

Long before behavioral finance theory there appeared the first seeds of this direction in explaining the bubbles; one of them is the "feedback theory" or in academic words a price-to-price feedback theory, which describes the beginnings of bubbles. Originally successfully investors attract the attention of broad public and high expectations of price increase drive the market and "new era" investing happens self-prophesying. "*The presence of such feedback is also by research in cognitive psychology, which shows that human judgments of the probability of future events show systematic biases (Shiller, 2003).*" At the first sight such a process is remarkable by all past crises, which creates the need to study psychological point of the crises. Exactly this is done by behavioral finance, which concentrates on human behavior at financial markets.

Behavioral finance study the influence of psychology on behavior of market participants, the research goes from reality to theory and behavioral models are created on the base of received knowledge. Behavioral finance is a young developing field and thus somewhat *piecemeal*. The main core is concentrated on the study of behavioral biases, which can be explained as errors in judgment.

Even this paper does not aim to give a complex overview of all possible biases. The goal of the article is to show the possible links between the housing bubble and biases defined by behavioral finance. Chosen behavioral biases and their role during the housing bubble are described and studied in the following part.

III. Behavioral finance analyses of origins of the Financial crises

A. *Economical backround*

For further analyses there will be briefly mentioned the macroeconomic background to give the overview of the economic and political situation in the U.S. The fundamentals of financial crises are connected with growing instability and increasing demand of U.S. economy. U.S production didn´t suffice the consumption and thus the U.S. economy was exposed to growing external account deficit. The central government dept reached 64% of GDP in 2008 and the

external account deficit was $600 billion in the same year. The fact that USA borrows a lot of money from the whole world was seen by many economists optimistically. For Example Alan Greenspan[1] considered those, who were afraid of the external account deficit, as alarmist. According to Greenspan (Reinhartová, Rogoff, 2013) the growing external account deficit mirrored the trend of financial globalization. On the other side even the internal budget deficit was growing cause of tax cuts and economic slowdown.

The period was also affected by fiscal policy of Federal Reserve System[2], with its low interest rate. American central bank´s interest rate went down from more than 6% in 2000 to less than 2% in 2001. Low interest rates were hold till 2005, when began the growth of the FED interest rate and stopped in 2006 nearly at its original level from 2000 (in 2007 the interest rate reached 5,2%). FED did not consider the high houses´ prices risky, according to the logic that market can recognize the correct real estate price as good as every official. Even if the market value of American houses doubled within a few years FED stayed calm.

The gains of financial companies and investment banks concentrating on small customers like Goldman Sachs, Merrill Lynch or Lehman Brothers were growing. The representatives of these institutions attributed the gains to innovative products and thus tent to underestimate latent risks. All of the factors mentioned before created the ground for ongoing economic boom and increasing dept financing. From 2005 not only the interest rates growth but also ongoing growth of real estate prices and external account deficit led the the U.S. economy and, thanks to the size of American economy and the intensity of the mortgages losses the crisis quickly spread internationally, the world economy to the financial crises.

B. *Behavioral part of the crises*

However, in all the above mentioned we don´t find the trigger mechanism for growing and bursting the housing bubble, such a situation could leave without any bubble if the individual investors didn´t get involved by buying houses and borrowing money. The question is what made the people to get involved? Human mind is influenced by psychological influence, including emotion, cognition and aspiration, and social network. These can be considered to be potential links to the real estate bubble. According to Statman and Shefrin (Statman, Shefrin, 2011) investors are guided by fear and greed and because of these they fail to diversify; investors´ decisions are biased.

Human behavior is very complex and each part of it can include number of systematic errors in judgment, biases. Thanks to the biases investors may conduct misbalanced decisions and tend to fail portfolio diversification. Psychology, social network and interpersonal support influence the judgment of market participants. In the following part there are described and studied significant biases for presence at the real estate bubble and thus at the beginning of the financial crises.

One kind of biases is cognitive errors; behavioral biases, which are caused by market participants evaluating their environment based on internal and external settings of particular moment. All information is usually incomplete or too complex or difficult to threat, thus create space for perception disturbance like selective perception of particular information and/or information overload. "*Nothing can be more absurd than to claim that everyone knows how to solve complex stochastic optimization model* (Shiller, 2003)."

The consequence of selective perception and information overload can be called representativeness bias. It is the tendency of people to decide based on small sample data. Predictions and decisions are done not only on the base of small samples but also on unimportant information, e.g. past rates, anchors. Both of these we can observe by the formation and growth of bubbles on the markets.

In the case of reality bubble, the forecast of future market development was based on observation of extremely short past period, which was not sufficiently predicative for forecasting. "*The sales prices of the median single –family home more than doubled from $104 500 in 1987 to nearly $241 000 at the peak of housing bubble in 2006*" (Cox, 2011). Not only individuals but also banks, rating agencies and regulator were influenced by representativeness by their future predictions of real estate prices. The biases of the banks are conspicuous by considering the involvement of mortgages by house purchases. Houses were paid nearly exclusively by mortgages. Rating agencies supported the idea of growing market by their high rating of banks, thanks to the fact that they didn´t expect or didn´t want to expect any change in the future development; possibly because they were paid by security issuers requesting the rating. From 2005 to 2007 there were 56% of the total 11261 mortgage-backed securities downgraded (Barth, Li, Lu, 2009). The rating of securitized assets was extremely high and banks were allowed to offer additional mortgages. With the increase of mortgage securitizing banks sold the risk in the secondary market, door to extremely risky loans were opened and risk was moved to lenders (individuals investing into securities). In 2008 59% of total value of housing was securitized. Barth, Li and Lu (Barth, Li, Lu, 2009) show that "*conventional mortgages securitized by Freddie Mac increases from $25 billion in 2005 to $ 159 billion in 2007."*

Another explanation of the development is the over-extrapolation. There is a belief based theory of evaluation arguing that bubbles arise from extrapolating past outcomes too far in the future (Barbies, 2011). Due to representativeness heuristic people tend to overestimate importance of past data for future forecasts. By real estate bubble home buyers over-extrapolated future house prices. However their over-extrapolation would not be sufficient if we consider that houses are usually paid by mortgages. In this causes banks had to help home buyers and thus were also over-extrapolated. To get the funds to finance the mortgages banks needed to sell

[1] Alan Greenspan was the Chairman of the U.S. Federal Reserve from 1987 to 2006.
[2] Federal Reserve System, FED,is the central bank of United States and one of its purposes is to care about monetary policy.

their securities and that was possible only with high rating of rating agencies. However the chain is still not at the end, banks wouldn´t get the money if investors were not enthusiastic about the future development of their investment.

Small sample data can be accepted also thanks to the confirmation bias, the natural ability to seek information that confirm previously done decision to avoid the "pain" of contradiction. Although some smart investors could find out that property prices are too high, the majority didn´t want to hear that voices. Smart investor would recognize that investment into houses is not safe and advantageous since the average house price grew more than 110 % from 1999 to 2006. The lender would consider the mortgage - backed securities riskier and most probably would not invest into them.

However, the judgment of individuals is determinate by the ability to reduce cognitive differences and heuristics. Consequently can be preserved certain decision, made earlier with different information level can lead to illusion of control. Illusion of control describes people´s tendency to believe that they can control outcomes thanks to their abilities and knowledge. At the time of property bubble, the buyers of the houses believed that they will be able to pay back their mortgages and that the banks were sure, that they will get back their money. Everyone controlled the outcome in his believes. Commonly heard was that some types of investment, as property, could not bring loses.

Moreover is the cognition of information influenced by the availability of information. This bias is called availability bias and (Pompian, 2006) allows people to estimate the probability of an outcome based on how prevalent or familiar that outcome appears in their lives. Real estate, especially houses, is commonly discussed topics among people. The spread of information was thus especially fast and effective, good examples of people buying their own houses were all around. Moreover, all the media reported optimistic stories about people buying their new houses, about the new, better, era of living. Housing topic and most of all the possibility to buy own house was familiar to everyone. Thanks to the information spread through media, neighbors, friends, economists and government promotion of homeownership people felt well informed and capable to decide. In reality they knew only one side of the coin. The American dream of homeownership was becoming true, something what started with low - prices at the suburb continued with exaggeratedly high - prices everywhere in the U.S. Homeownership was growing since 1940 from 44 % in that year to 62% in 1960 and even 69% in 2006 (Cox, 2011).

Together with the cognitive biases there can be seen the complexity and difficulties of news. Innovations are usually welcome, even more if they promise miracles. In the case of real estate bubble the possibility to invest into securities was introduces as new and extremely advantageous but also complex. The complexity makes investors to believe that the product is perfect, because they cannot find any mistakes by themselves. This may then lead to market the innovation too aggressively (Barbies, 2011)

Another influence on human mind is given by the social network, especially problematic during bubble times seem to be herding behavior. Herding generates social pressure on individuals, who are pressed to behave in the same way like the herd. Herding behavior is the tendency to follow the herd without own consideration because going against the crowd pains and trigger fear. On the financial market we can observe this during the period when some assets are so popularized that everyone has to invest into/buy them. Before financial crises such popular assets were houses in U.S. The real estate market was growing significantly, because the investors acted collectively at the same time. The investors were convinced about future growth not based on fundamental date but on the basis of observation of current increases. As it is common during the largest moves in market, the movement was unrelated to anything that might be classed as fundamentals.[3] However, even investors who invest based on market price, fundamental data, seem to be expected to fail. The herd changed the prophecy in one self-fulfilling. A culture of homeownership, encouraged and pressed by the herd, was signing its mortgage. (Sanders (2007) in Shefrin, Statman, 2011) "*I will tell you that most people are so focused on getting into their new home that they have no idea what it was they just signed.*" Typically herding behavior can be observed during the period of blowing and bursting the bubble, property bubble and financial crises were this case. In the blowing period there were influenced individual investors struggling for owning houses and banks trying to make gains on lending money to this people. Even professionals tend to be affected by herding during the growth of the financial crises. Financial institutions were approving risky mortgages even for people without regular income, permanent employment or any material assets. "*(Cox, 2011) states that from 2000 to 2007 the value of gross residential mortgages in the United States rose $ 4,8 trillion more than the household income.*" To securitize the mortgages banks accepted bought houses, whose prices were growing. The bursting period was going in the opposite direction, all the investors, home owners, tried to sell their properties, and banks as well wanted to sell irrationally all assets without considering the background of each case. Thus the decrease, the financial crises, was even more dramatically then the reality, also irrational and excessive.

The processing and evaluation of information is influenced by the quality and quantity of relevant information as well. Market participants have limited capacity and processing tempo. Our brain is not a computer and our ability to process information is limited. (Montier, 2010) *The whole investment industry is observed with learning more and more about less and less, until we know absolutely everything about nothing.* Decisions are influenced by the order of processed information, whit the difference between long and short time memory. Even the format of information influence if the information is processed, more familiar format leads to immediately processing of information. During bubble times noisy trades spread the information among investors. Many

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researches showed that more information don´t lead to a better solution, however the quantity of information make individuals to feel overconfident.

Overconfidence is one of the basic biases that are connected with the behavior on financial markets. We define it as a not reasonable belief in own perception skills, knowledge and abilities. Overconfident investors overestimate their personal assessments and even the precision of their information. With overconfidence is closely connected ungrounded optimism and unrealistic expectation.

Overoptimism is our habit to see the market, economy, future performance too positive. The overly optimistic investors believe that their investments will make good, the performance of chosen asset cannot go wrong. The confidence of individual investors and institutions that homes can be owned by everyone is another relevant topic. Overconfidence influenced directly the disproportionate mortgage expansion and thus excessive market liquidity. During the growth of the housing bubble market participants, not only investors but also banks, rating agencies and regulator got into the euphoria, which aroused baseless self-confidence and overoptimism about future market development. "*Market value of American houses doubled between year 1999 and 2006…rising from $10,4 trillion in 199 to a peak of 22,7 trillion in 2006" (Cox, 2011).*The overoptimistic expectation forecasted additional extremely fast growth. Also news at the market, like securitization, could base the overconfidence.

The consequence of overoptimism and overconfidence is the underestimation of risk. Investors are blinded, don´t care about risk, by reaching higher and higher rates. Banks accepted riskier and riskier mortgages to satisfy investment fund managers and corporate managers demanding high returns. The underestimation risk bias is the tendency to perceive unlikely results as impossible and highly probable results as sure. Such a underestimation of risk occurred in the market when people were sure that the house prices will develop positively, the risk of failure was played down.

Another relevant topic within behavioral finance biases is anchoring and adjustment. Anchoring and adjustment describe the tendency to adjust our approximation to anchors, regardless how the anchor war chosen. "*People are generally better at estimating relative comparisons rather than absolute figure*."(Pompian, 2006) Banks didn´t assessed mortgage applicant comparing them unaffectedly. The applicant´s assessment was exaggeratedly simplified and underestimated. All applicants were assessed to be solvent based on market development, not on their income or property. Credit history became secondary indication for solvency assessment.

Thanks to all above mentioned the quality of mortgage applicants and even worse debtors dramatically decreased, even people without permanent employment applied for mortgages. House prices and household income were in general equilibrium till 1970. With the beginning of the housing bubble houses prices started to grow faster than incomes, more and more had to be paid by mortgages with lower and lower applicant solvency.

How could bank, desk of banks, underestimate all the risks? Banks were required to deal the securities to satisfy all the investors and debtors. On one side earn the securities returns higher than funding cost on the other side it is well known that subprime – linked securities carry significant risks, and why did the banks underestimated the risks? One explanation can be provided by risk underestimation. Another explanation can be that (Barberies, 2011) "*they were not facing the consequences of the risks they were taking"*. (Barberies, 2011) adds that moreover they were compensated on the size of the deal.

After the burst of the bubble there could be observed another bias, loss aversion. Loss aversion was observed by Kahneman and Tversky in 1979 and describes the tendency to feel losses twice as strong as gains. People influenced by loss aversion bias seem to sell the winning investment and hold the losing ones, they refuse even investment that would be accepted previously the loss. The experiments show that people who experienced loss in the near past get more loss averse. Such a behavior we could observe after the burst of the bubble, banks were rejecting inter-banking loans thanks to the fear of low liquidity. Although investing into cheaply bought security assets would generate gains in the form of interest rates. Rational thinking subject would consider the risk relatively low, however for loss aversion banks these investments were unacceptable.

Within the reality bubble seem to be significant even the ownership effect, supporting the price growth of properties. Ownership effect is the tendency to evaluate own asset higher that when not owned. Homeownership evoked emotions and cognitive errors and blinded the people. Higher property prices were widely accepted and considered to be real. Ownership effect supports the feeling of home owners that the prices of houses reflect their real value. In the case of reality bubble the house prices more than doubled within 19 years unreasonably.

During the property bubble there were present several biases; their occurrence is demonstrated in following diagram. The diagram shows possible occurrence of behavioral finance biases at the market before, during and after the real estate bubble. However the occurrence is not complete and final, further analyzing would most probably expand the relevant biases. However, the most significant influence seem to have during the bubble overconfidence, unrealistic optimism and illusion of control that caused people to underestimate the risk and thanks to selective perception, especially confirmation bias, didn´t recognize the incorrect market pricing. Herding allowed the bubble to grow faster and faster and then led the market to deeper financial crises than in reality needed.

All the biases mentioned in the study are still present at the market, thus it is only the question of the time, when they will get stronger and cause further crises.

TABLE I. Role of human behavior

Economic background	Human behavior	
Growing markets	Biased	Expectable bubble
	Non biased	

The study proved that human behavior influences financial markets, as the table shows if growing markets are misunderstood by investors, their biased behavior creates the space for growing the bubble.

IV. Conclusion

Housing, or real estate, bubble and following Great Recession, also called Great Financial Crisis, cannot be completely explained by classical theories and fundamental data, the trigger mechanism seems to be based in psychology, social network and interpersonal support. Human behavior is an important part of financial markets and thus has to be part of economical theory. As the behavioral study of the housing bubble shows, not only investors were subject of biases even professional institutions as banks, rating agencies and even regulator were driven more by emotions than by rational methods and fundamental data.

Of the biases studied herding and underestimation of risk driven by overconfidence and overoptimism seems to be extremely significant. However, additional behavioral biases were present at the behavior of market participants at the financial market and contributed to the bubble growth.

The evidence shows that human behavior, thus also behavioral biases, was building up the housing bubble. The challenge for the future is to monitor human behavior and its link to fundamental data on markets more closely and learn from historically repeating bubbles.

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