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Diploma Thesis

**The 2007 credit crisis:
causes, evolution, and its consequences**

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Declaration:

Hereby I declare that I elaborated this thesis independently and used only the listed sources and literature.

Prague, May 20, 2007

Jan Vrzal

Abstract

In August 2007, a financial crisis started and spread all over the developed world, as a result of the collapse of structured financial products that were connected to the defaulting sub-prime segment of American mortgage market.

This diploma thesis is divided into six chapters. After a brief overview of recent financial crises and basic models of such crises in chapter 1, chapter 2, characterizing the global macroeconomic situation in 2000s, follows. The next part – chapter 3 - analyzes the American housing market, its main features and the recent development – the housing bubble. The mortgage market is discussed, as well. Further in chapter 4, the phenomenon of securitization and structured products is described. Chapter 5 focuses on the development on financial markets in 2007 and at the beginning of 2008, too – that means it describes the situation before the crises and the crises itself. Finally, Chapter 8 offers an overview of the main causes of the market breakdown. Moreover, signals foreseeing the turmoil are discussed, as well as its possible consequences.

Abstrakt

V srpnu 2007 vypukla finanční krize a okamžitě se rozšířila na všechny rozvinuté trhy jako důsledek kolapsu strukturovaných finančních produktů, které byly napojeny na sub-prime část amerického hypotečního trhu.

Tato diplomová práce je rozdělena do šesti kapitol. Po stručném přehledu nedávných finančních krizí a základních modelů krizí v kapitole 1 následuje kapitola 2, charakterizující globální makroekonomickou situaci po roce 2000. Další část – kapitola 3 – analyzuje americký hypoteční trh, jeho hlavní charakteristiky a nedávný boom cen. Hypoteční trh je také diskutován. Dále v kapitole 4 je popsán fenomén sekuritizace a strukturovaných produktů. Kapitola 5 se zaměřuje na vývoj na finančních trzích v roce 2007 a na začátku roku 2008 – popisuje situaci před krizí a krizi samotnou. Poslední kapitola rekapituluje hlavní příčiny krize, důsledky a diskutuje možné signály jejího vzniku.

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Introduction

The global economic situation in 2000s was very favourable. The macroeconomic situation was stable and financial markets were enjoying a period of liquidity flood, low volatility and low risk aversion. Investors were willing to invest into new financial products, which stimulated a rapid development of market for new structured instruments such as CDO and CDS. The housing market was growing, too, and the US market for mortgages was enjoying a sound development. This was possible thanks to the massive development of securitization, using especially structured financial products.

However, this ideal development did not last forever. The US housing market started to stagnate, decline and then fall. As the prices did not grow anymore, first problems of the mortgage markets appeared and in the end, the whole securitisation market collapsed, as the structured products proved themselves to be worthless and so the infamous 2007 credit crisis started.

The aim of this thesis is to provide an overview of the causes, evolution and consequences of the 2007 credit crisis. Main emphasis is given to the housing market developments, the description of selected new structured instruments and the detailed discussion of individual events within the credit crisis.

The structure of the thesis is as follows. Chapter 1 provides the reader with a survey of relevant past crises and reviews the theoretical literature related to financial and currency crises. Chapter 2 describes the global economic situation before the start of the crisis, with concentration on the USA. The macroeconomic situation is characterized, as well as the situation of financial markets. We also focus on the “flood of liquidity”, a feature typical for this period, including a detailed discussion of its origins and its usage. Chapter 3 concentrates on the American housing market. Briefly describes its history and the very recent development. It reviews the bubble period and discusses the house price developments by individual cities and regions. It also covers possible causes of the steep price increase as well as other indicators of the housing market. The main

features of the mortgage market are characterised and the very recent development is discussed.

Chapter 4 introduces the phenomenon of securitisation and its main principles. Furthermore, it focuses on the very recent phenomenon, namely the structured financial products, mainly the collateralised debt obligations (CDOs). The market situation before the crisis is described, as well. In Chapter 5, the credit crisis is described in detail, starting with the situation on the financial market in the first half 2007 is described including the February 2007 corrections, discusses several developments that gave way to the start of the crisis and provides an overview of the main events within the crisis. Chapter 6 recapitulates the main causes of the crisis, as well as its consequences. It also discusses whether there were any signals foreseeing the crisis.

Chapter 1: Overview of past crises and survey of relevant literature

This chapter provides an overview of the most important crises in the past, their timing and characteristics. It is interesting to see that if there was a crisis in a developed market, it was often associated with a real-estate bubble (for example Sweden or the USA in 1980s). The chapter also reviews the relevant theoretical literature, discussing the three basic generations of theoretical models, providing us with proper understanding of a crisis.

1.1 Short overview of previous crises

Mexico 1982

During 1970s the Mexican economy profited from the high oil prices. The earned money led to a populist policy, undertaking too big projects that needed additional sources, which the government obtained by borrowing money in the US dollars. At the same time, the country followed a fixed exchange rate regime, with peso linked to the US dollar.

The problems occurred when interest rates increased in the USA, and therefore the interest costs for the Mexican government rose substantially. At the same time the oil prices began to decline. Lenders stopped being willing to lend Mexico money and the result was that the country found itself in a state of not being able to repay its debt. The currency had to be devaluated, all banks were nationalized and a long period of stagnation and high inflation started. Relevant literature argues that the costs of the crisis (borne mainly during 1980s) were rather high (the 1980s were labelled as a lost decade in Mexico, see Bergoing, et al., 2002).

Chile 1982

Chile experienced the same problems as Mexico did. The country was heavily indebted and as the lenders refused to pump additional money the country found itself in a state of insolvency, heavily indebted banks at the edge of bankruptcy were taken over.

In comparison to Mexico, Chile managed to recover from the crisis faster. This was mainly thanks to reforms of the banking system undertaken prior to the crisis (Bergoing, et al., 2002). The economy recovered relatively quickly, and since the country has built a strong financial sector that allowed the country to avoid the financial turmoil observed during 1995 and 1997-98 in other emerging market economies (Barandiarán, et al., 1999).

US Savings and Loans Crisis in the 1980's

Savings and Loans companies (also called the thrifts) experienced a period of liberalization in 1980s. They were structured on the principle of long-term assets (loans) and short-term liabilities. However, as the yield curve became inverted (long-term assets yielded less than short-term assets), the thrifts had to invest into riskier assets in order to earn money. Logically, this situation could not last for a very long time, so many of these companies went bankrupt (see (Curry, et al., 2000)). Also many classical banks were affected, many of them went bankrupt, too. The following credit crisis lasted until 1995.

European Monetary System (ERM) 1992-1993

In late 1980s and early 1990s, the European Communities were applying some rules for the member countries' exchange rates that were creating a predecessor to the current European Monetary Union. The system called Exchange Rate Mechanism (ERM) was based on the principle that each currency had set a certain exchange rate to the Deutsche Mark and the currency could float only within certain limits, otherwise the central bank had to intervene. The anchor currency was the Deutsche Mark, as the German central bank (Deutsche Bundesbank) had the biggest reputation in curbing inflation and sustaining a stable GDP growth.

The problem occurred when Germany reunited and massive structural changes were taking place within the country (Eichengreen, 2000). New money were printed (as the Eastern Mark was changed for the Western Mark), therefore inflation pressures intensified and Bundesbank was forced to raise interest rates. This however created inflow of capital into Germany and the Deutsche Mark appreciated. The appreciation

went so far that the regime started to be unsustainable and harmful for other countries. As a result, the floating ranges were loosened that much, that it in fact meant abolishing the regime. The crisis was different from the typical industrial-country crisis that preceded it. It was more virulent. It was more contagious. It was more disruptive to output (Eichengreen, 2000).

Sweden in 1992-1993

Sweden was experiencing a period of financial sector liberalisation. This resulted in banks loosening their lending standards, thus massive credit expansion combined also with real-estate boom. The weak link was the fact, that there were many loans denominated in foreign currency (whose advantage were lower interests). Also, the government was indebted, the majority of which was borrowed abroad.

However when a speculation attack in 1992 related to the disruption of the ERM¹ came, the fixed exchange regime turned out to be unsustainable and the currency was devaluated and floated, the foreign denominated loans became far more expensive. At the same time, the foreign lenders lost confidence in the Swedish market and reduced or withdrew their credit lines. Banks thus demanded quicker repaying of loans denominated in foreign currency. For borrowers it was however impossible to repay immediately the debt that was suddenly more expensive.

The consequences of this were far-reaching. The GDP fell by 5%, the unemployment rocketed, asset prices including the real property declined or stagnated. It took about two years for the confidence in the economy to return and the Swedish krona was depressed for a long time by the repayment of foreign loans (Heikensten, 1998).

Mexican peso crisis of 1994

In 1994, Mexico was in a quite good shape. Inflation was curbed, investors were pumping money into the economy, the NAFTA agreement was signed.² The only problem was a growing current-account deficit. The peso was depreciating in nominal

¹ The Swedish koruna was not a part of the ERM, as, obviously, Sweden was not at that time an EU member. However, given the large economic integration, the country followed a fixed exchange rate regime with a peg to the Deutsche Mark.

² A free-trade agreement among Canada, USA and Mexico.

terms constantly (with the floating range being reset regularly). Despite this, it was believed to be overvalued, as it was constantly appreciating in real terms (Whitt, 1996).

During 1994, there were many pressures on peso further depreciating (mainly because of the wild political situation) for which the central bank used a substantial part of its foreign reserves. There was an aversion against tightening monetary policy, because of fear of the economic slowdown. At the end of the year, the pressures revived. The central bank answered with devaluing the currency and two days later it announced abandoning the fixed exchange rate regime. The market response was immediate: the peso lost 50% of value against the US dollar, inflation soared and a severe recession began. Mexico had to seek for help at international institutions.

East Asian crisis of 1997

The East Asian crisis hit almost all countries in that region, starting in Thailand. Thailand was experiencing a strong GDP growth, however its exchange rate was pegged, and its sustainability was questionable. The country suffered from large current account deficits, rising short-term external debt, and unstable financial system that was to a large extent based on non-banking financial institutions engaged in lending that were financed via issuing short-term debt in foreign currency (and purchased by foreign investors). However the authorities decided not to intervene.

The bubble-like developments in Thailand finally led to a loss of confidence, withdrawal of foreign capital and a speculative attack on the Thai baht, which in the end resulted in floating the currency. Later the crisis spread into other countries in the region, with similar problems: Philippines, Malaysia, Indonesia. Also additional countries were hit (although these were not suffering the same shortcomings as the previous ones): Singapore, Taiwan, South Korea and Hong Kong. Countries experienced depreciations of their currencies, higher inflation, sharp slowdown of money and credit growth, GDP decreased, corporate and financial sectors were substantially weakened. There were also some spillovers to other non-asian emerging markets, including the Czech koruna turbulence of 1997. One lesson to be learnt from

this crisis is that crises are prevented by pragmatic policymaking that recognizes and addresses problems early, even when the going is good (Kochhar, et al., 1998).

Russia 1998

Russia had to face a serious problem of not being able to collect enough money on taxes. Moreover, oil prices were stagnating. Thus, investors were not willing to invest into government bonds as it became unclear whether it will be able to repay them. Also because of this situation, ruble was highly anticipated to be devalued. This is what the government was forced to do. Finally, as also the stock market collapsed. The Russian government issued a moratorium on its debt and stopped repaying it for some time. The Russian crisis, similarly to Asian crisis, had also contagion effects on other emerging market economies and also in the US financial system. The large hedge fund LTCM had collapsed mainly because of the Russian crisis (see (Lowenstein, 2000))

The recovery was quite fast, thanks to again growing oil prices in 1999 and also, the depreciated currency made imported goods expensive, and thus encouraged the domestic production. The lessons to be learnt from the Russian crisis are that the modern currency crisis is a symptom of an ailing domestic economy (Chiodo, et al., 2002).

Brazil 1999

Brazil was another country experiencing a speculative attack resulting in devaluating currency and releasing the floating system. The Brazilian float of January 1999 was a very benign event, denying all the expectations of disaster based on the experience of other emerging economies (Lopes, 2003). The economy went over to the new conditions without any substantial macroeconomic changes.

Argentina 2001-2002

Over the 1990s, Argentina was enjoying a period of stable growth, low inflation and an overall prosperity, maintaining a fixed exchange regime in its strongest form (currency board) with a peg to the US dollar. On the contrary the fiscal policy continued in taking on further debts, and resigned to any reforms. At the end of 1990s, the country suffered

from a recession related to a real appreciation of the currency and loss of competitiveness in comparison with its peer countries that did not have such a strong peg to the US dollar.

The situation escalated at the end of 2001 when government had to admit that it is not able to repay its debts. This resulted in bank runs, sending money abroad and as a response freezing all accounts. Investors lost interest in investing in Argentina.. Another problem was that the economy was highly dollarized, although the just a fraction of the trade was realized with the USA. Government was forced to devalue the overvalued currency and subsequently renew the floating system. The currency plunged.

A key lesson from Argentina is the need to adopt economic and political institutions that align incentives to face hard choices and facilitate timely reforms, and in particular that are less prone to amplifying economic cycles (Perry, et al., 2003).

1.2 Survey of relevant literature on financial crises

Existing literature on financial crises (mainly on currency crises, as the preceding part showed) differentiates among three generations of theoretical models.

The so-called “first generation” models of crisis were described by Krugman (1979) and Flood and Garber (1984). It is a type of currency crisis model where the collapse of a fixed exchange regime is caused by unsustainable fiscal policy (Burnside et al., 2007). That was in the end financed by printing money. This resulted in depleting foreign currency reserves. Once the reserves dried up, a speculative attack followed, that made the fix exchange regime unsustainable. In the aftermath of the speculative attack, the central bank is forced to float the currency (Pesenti, et al., 2000). These models were applicable for the time of Bretton-Wood system collapse in the end pf 1970s and for the debt crisis in Latin America during 1970s and 1980s.

The second generation models of crisis were described by Obstfeld (1986) and Dellas and Stockman (1993). This model is a more complex one. The model is based on the interaction between market players’ expectations and the actual outcomes. The interaction between investors’ expectations and actual policy outcomes can lead to self-

fulfilling crises (Pesenti, et al., 2000). Given a certain macroeconomic situation, various different outcomes can occur, depending on expectations. If for example market participants expect a certain situation to happen, they adjust their behaviour, accordingly, which can worsen the situation on the market (f.e. by tightening certain rules) and this corroborates the original expectations. On the other hand, if participants do not expect any major changes, they will not act accordingly and thus not affect the whole situation. This type of models refer to the European monetary system (ERM) crisis in the early 1990s.

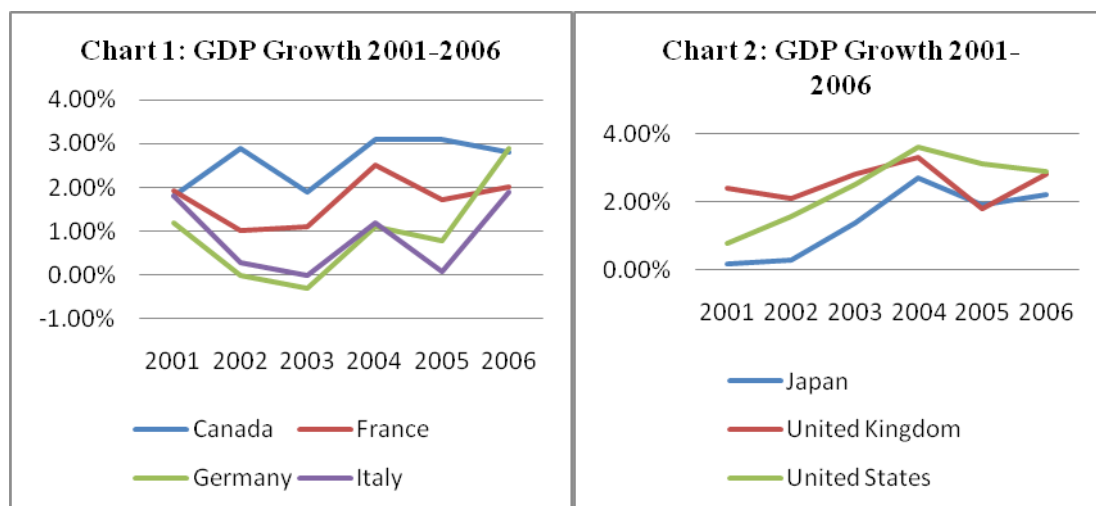
The third generation models were described by Krugman (1999) and Aghion, Bacchetta and Banarjee (2000, 2001). In contrast to the first two generations, here the models capture a number of different characteristics of the countries and thus differ among each other (i.e third generation models are actually models that deal with financial crisis of the type Asia or Russia but do not have the mechanisms of the first two generations). The idea behind one of the most famous models is that banks in emerging markets suffer from mismatches on their balance sheets: they borrow in foreign currency and lend in local currency. Also they finance long-term projects by short-term borrowings (Burnside, et al., 2007). As there may be some currency attacks, the banks' balance sheets get into great imbalances and because banks are the ones who supply source for investment projects, the contagion then spreads into the whole economy. The fragility in the banking and financial sector reduces the amount of credit available to firms and increases the likelihood of a crisis (Chiodo, et al., 2002). This type of crisis refers mainly to the east-Asian crisis in 1997.

Chapter 2: Macro-financial situation before the 2007 credit crisis

In this chapter, the global macroeconomic and financial situation since 2000 is summarized. This helps us to understand better the main causes of the upcoming 2007 crises. The situation in which the world was found at the beginning of 2007 was a peak of the whole growth period after the dotcom bubble³, i.e. since 2001. The global economic situation of the last decade is often described as “Great Moderation” (Butier 2007) and is characterized by a low and stable inflation and stable real GDP growth. Moreover, and partly thanks to the low volatility of real economic variables, the world experienced a period with flood of liquidity, low risk aversion, low financial market volatility and growing stock prices. On the other hand, there were also some imbalances accumulating because of this benign environment, such as the U.S. current account deficit.

2.1 Main macroeconomic indicators

The major world economies⁴ were enjoying a long period of real output growth.



Source: IMF

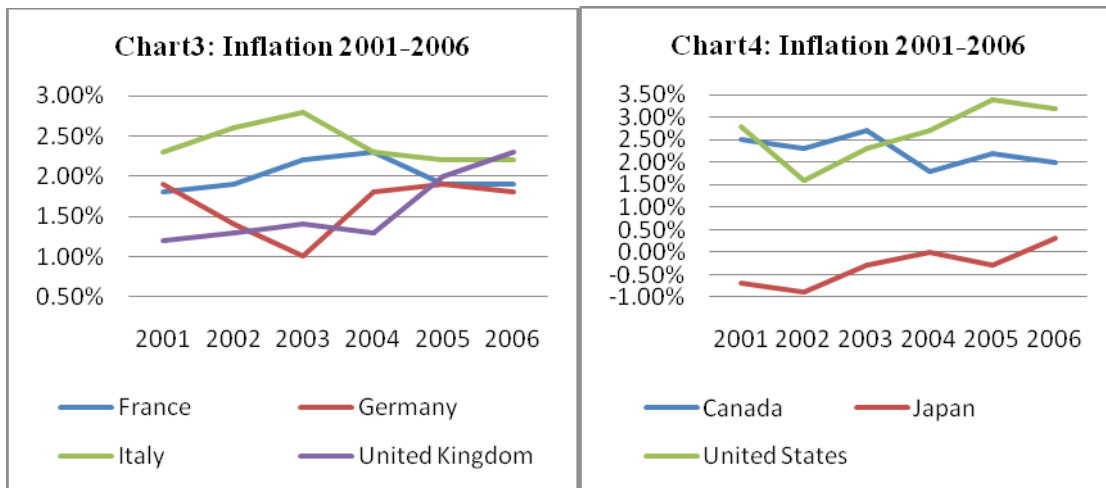
Source: IMF

³ The dot-com bubble appeared 1995-2001, and was connected with massive investing into companies operating in the internet sector.

⁴ By major world economies, I meant the world most developed countries – the G7 group.

Charts 1 and 2 show the GDP growth development for selected developed countries since 2001. The major player, the United States, went through a short period of stagnation in years 2000 and 2001⁵, from which they recovered very quickly and since then they keep a stable pace of growth. The expansion was started thanks to massive interest rate cuts (see Chart 7), which made credits cheaper and started a large increase in consumption financed by credit and home equity. The 2000s' growth is believed to be mainly driven by the consumption (The Economist, 2007), however at the expenses of savings.

Charts 3 and 4 show inflation rates in the most developed countries within this period.



Source: IMF

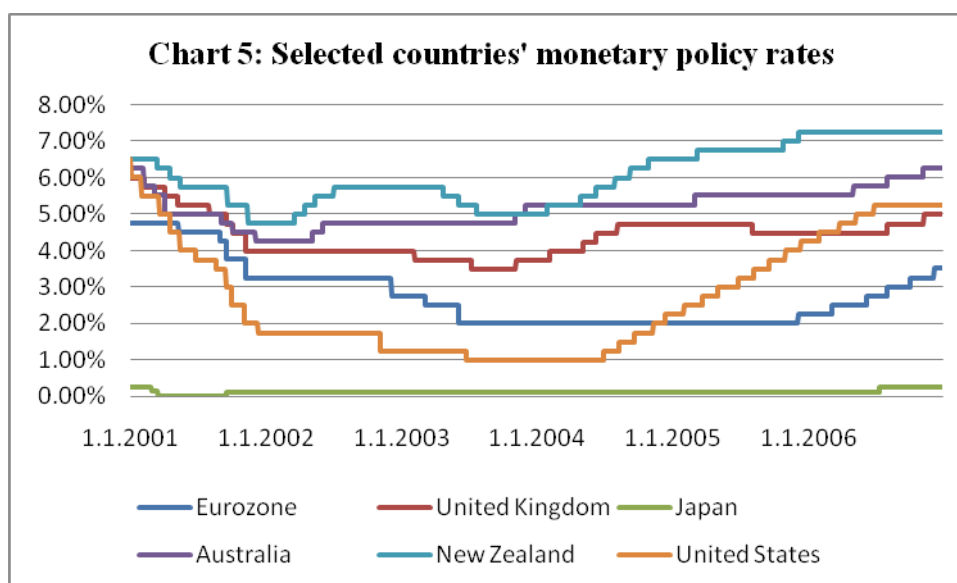
Source: IMF

Inflation was not a problem in any of these countries. On the contrary, Japan, for example, suffered from deflation. This suggests that the housing market boom (analyzed in Chapter 3) was not because of huge inflation. In 1970s, in the period of very high inflation, investors were leaving the stock market and were looking for some stock-substitutes, simply because the stock market growth was not high enough to beat the inflation. So they turned, among others, to housing (Schiller, 2007). As we can see, this time, it was not this case. The inflation was low, so investors had no reasonable

⁵ The stagnation came thanks to the dot-com bubble burst and 9/11 terrorist attacks.

incentive to leave the market because of the inflation.⁶ Other factors, such as the stock market growth, are discussed further below in the thesis.

Another feature typical for this period were the low (both nominal and real) interest rates that encouraged borrowing and decreased the incentives to save. Chart 5 illustrates the monetary policy rates in major economies. As we can see, the euro area (Eurozone) and United States (and traditionally Japan) kept their interest rates on low levels for quite a long time.

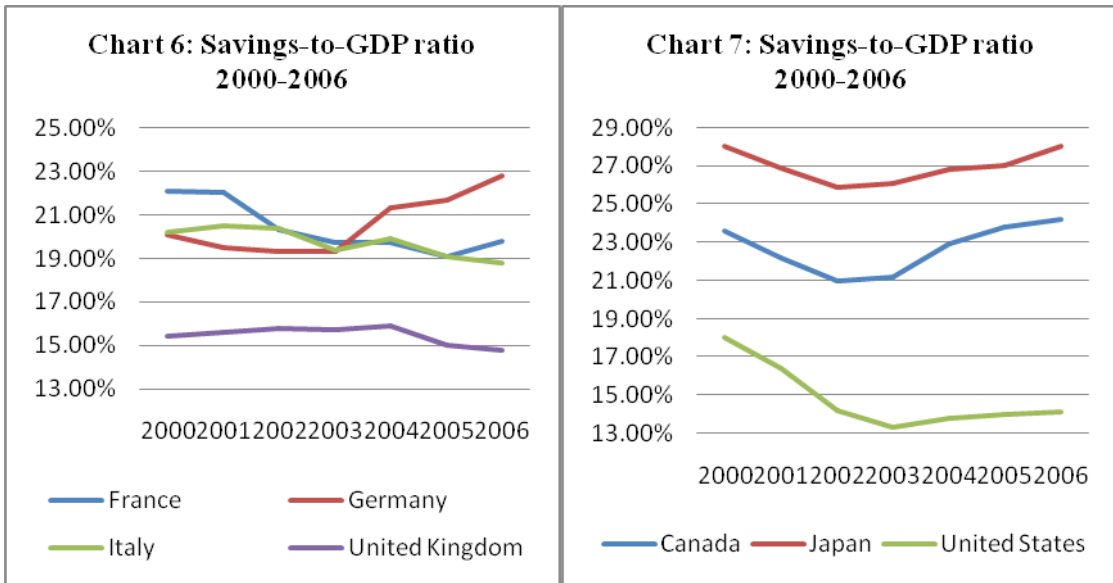


Source: econstats.com

As the Charts 6 and 7 show, the savings rate (as a proportion to the GDP) declined in the USA from 18% in 2000 to 13.3% in 2003 and then rose to 14%. In comparison with other countries, we can see that such a development is rather exceptional, as in the other

countries the rate was kept more or less stable. For developed countries, this ratio is usually around 20%. This development was mainly because of very low interest rates in the US.

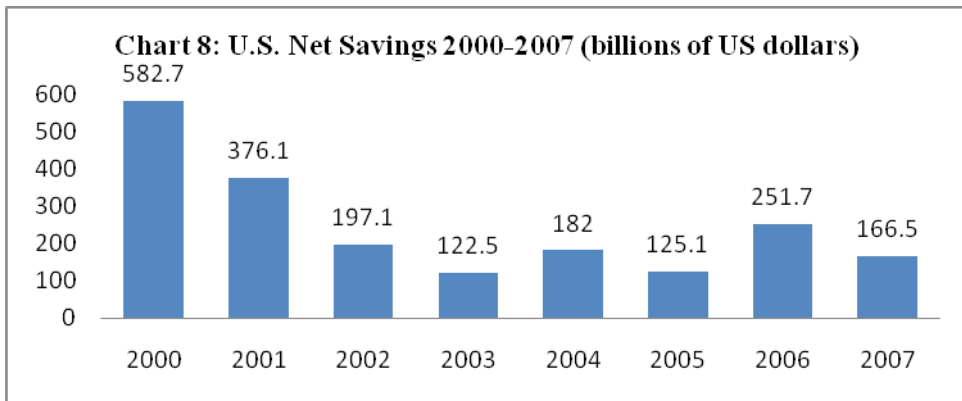
⁶ But there are claims, that in a globalized world like this – an inflation measured according to a classical consumption basket is obsolete. (Economist, 2006) Once there are countries disposing of cheap labour, the price of “classical” goods remains low and the inflation will be transformed into an inflation of “unconsumed” goods – equities or housing.



Source: IMF

Source: IMF

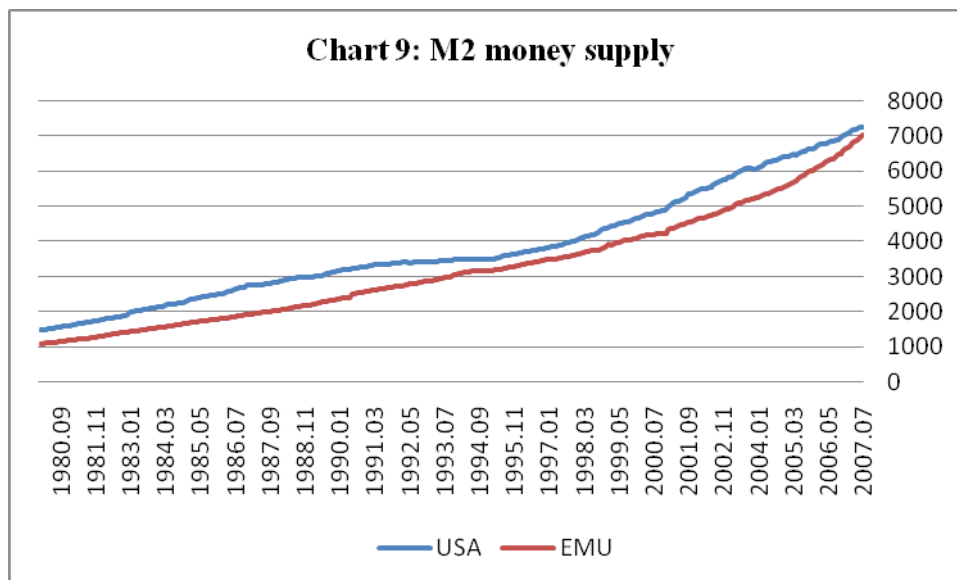
This drop in savings can also be illustrated by the decline in the net savings (Chart 8). The usual level of net savings in the US was between 200 and 300 billions USD. At the end of 1990s, this level was pushed a bit higher, above 400 billions.



Source: bea.gov

The period since 2001 is also characterized by a rapid increase in liquidity. That can be illustrated by the rise in the M2 supply (see Chart 9). The U.S. supply of money has increased its pace in the late 1990s (the annual growth was around 4-6%, in exceptional

years as in 2001 almost 10%).⁷ In the period 2002-2006, the average annual increase was 5.2%.



Source: econstats.com

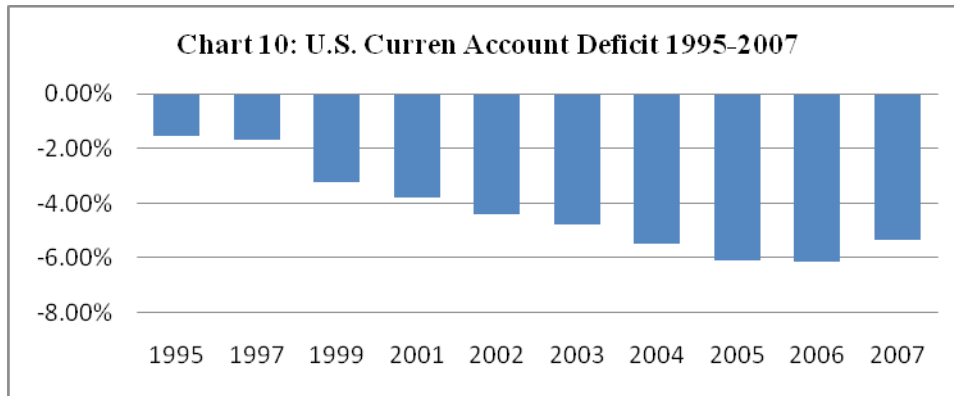
The rapid increase of liquidity started already in late 1990s, and all above described factors such as low interest rates, low volatility of the macro-environment and low inflation contributed to the growth of M2 aggregate⁸ (not all at the same time, but during the last ten years). However, some authors claim that they created imbalances so massive that attempts to resolve them now would risk plunging the world into a re-run of the 1930s (Connolly, 2007).

The U.S. current account deficit rose over the past years to unbelievable 6% of the GDP (see chart 10). The deficit was financed by foreign capital inflows.⁹ In the long run, this situation is not sustainable, because a deficit increases the country's net debt to foreigners. This can be balanced only by higher borrowing or higher net exports. In order to get the net exports rising, the dollar has to fall (Labonte, 2005). This is exactly what happened later, as the dollar depreciated fiercely.

⁷ Often – higher money supply leads to higher inflation – this was not the case thanks to successful sales of government bonds to foreign investors (McHahon, 2006).

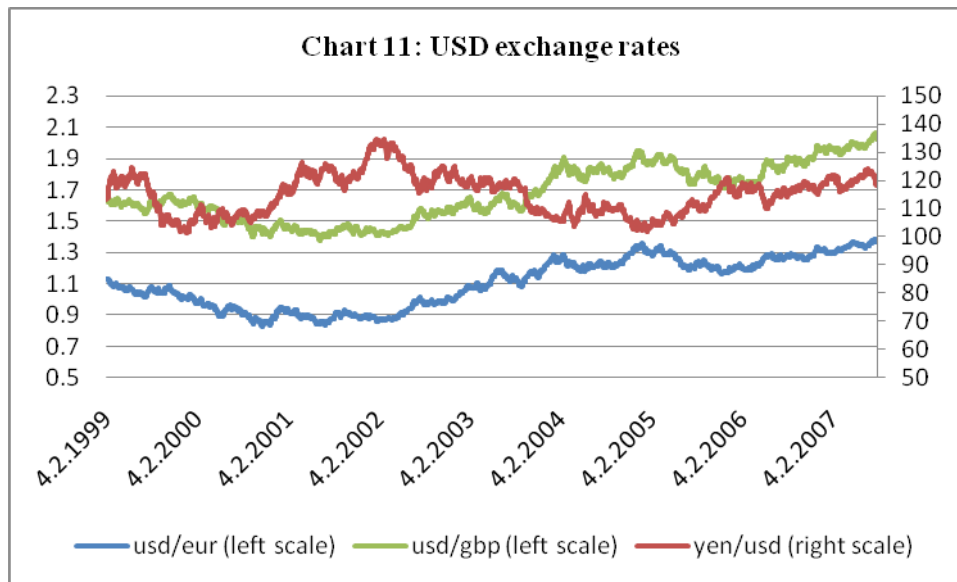
⁸ Dot-com bubble, EMU founding, housing bubble, Asian boom, carry trades, easy credits

⁹ This is not surprising, having in mind the overhang of liquidity.



Source: www.imf.org

The 2000s were a period of the depreciating dollar (Chart 11). This was the result of massive current account deficits, as mentioned, and it encouraged exports (which is a way how to address the current account gap). On the other hand, the weak dollar helped many countries (those ones not pegged to the U.S. dollar) to adapt better on the high commodity (mainly oil) prices of the late 1990s and early 2000s. Thus, the price shift was not such a massive shock for them.



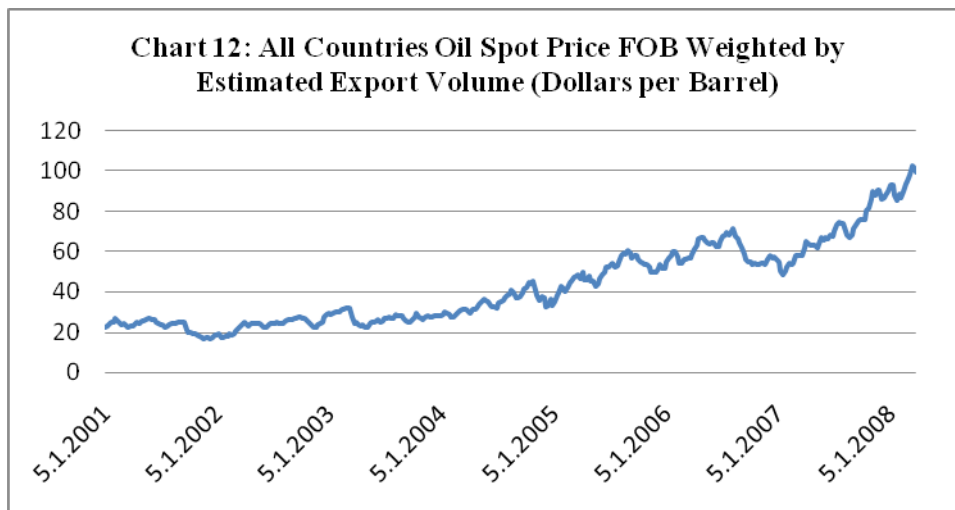
Source: econstats.com

2.2 Liquidity surplus

One of the basic characteristics of this period was the enormous supply of liquidity. It was estimated that the global liquidity increased by \$3,9 trillion over the years 2002 – 2006.¹⁰ There were three main sources of liquidity: growing oil prices, enormous savings in Asian countries and easily accessible credits thanks to low interest rates and financial innovations (securitization).

High oil prices led to a large revenues (petrodollars) for oil-exporting countries that were invested abroad, mainly in the US. Oil prices rose more than four times between 2001 and 2007. In the Chart 12, we can see how the oil price developed since 2001.

The main factor for the oil price growth is the shortage of supply. Since 2000, the demand for oil rose, as Asian countries recovered from the crisis and also the post-communist countries started to recover from the shock caused by the economy transition. On the other hand, the supply remained unchanged, or even decreased, mainly due to strikes in Venezuela, war in Iraq and other political conflicts in the oil-producing regions. The OPEC countries did not adjust their daily oil production, as the growing demand would demand.



Source: tonto.eia.doe.gov

¹⁰ Source: JP Morgan

The second most important source of liquidity were savings in Asia. Asian countries enjoyed a period of growing GDP. Because of the export-oriented profile¹¹ of the most relevant countries on this continent and usually fixed-exchange rate regimes, the central banks were forced to accumulate huge amounts of foreign countries' reserves in order to keep their currency stable (Buiter, 2007). For many countries, reserves more than doubled. China is an extreme case; reserves rose more than three times (having in mind the huge amount of China's reserves already in 2002).

Table 1: Asian countries' reserves (billion U.S. dollars)

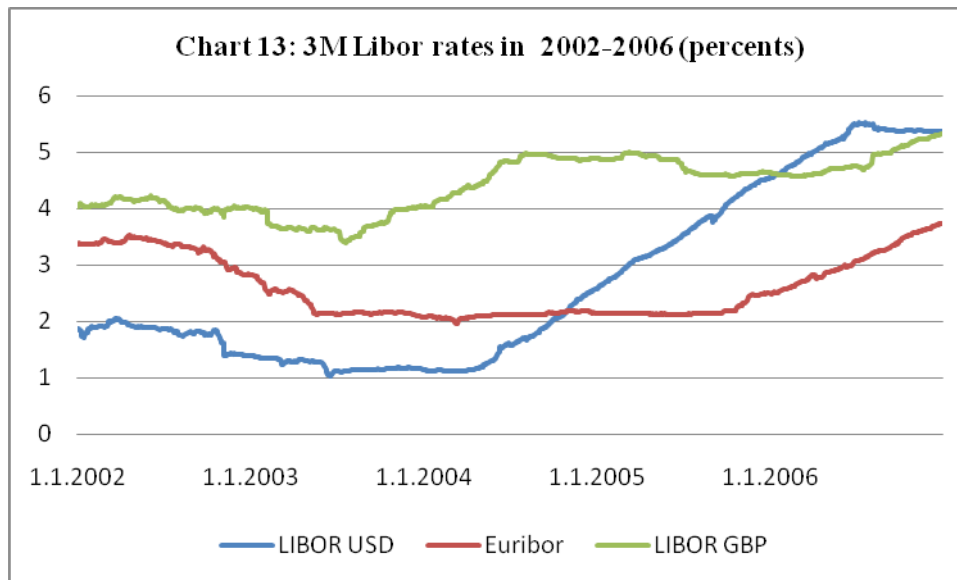
| | 2002 | 2004 | 2006 |
|-------------|--------|--------|--------|
| China | 292 | 615.5 | 1069.5 |
| Korea | 121.3 | 199 | 238.9 |
| Malaysia | 33.7 | 66.2 | 82.3 |
| Philippines | 16.4 | 16.2 | 23 |
| Thailand | 38.924 | 49.832 | 66.985 |
| Vietnam | 3.7 | 6.3 | 11.5 |

Sources: GSO, SBV, IMF, WB

Estimates predict that the reserves represent 50% of the liquidity, whereas the petrodollars 40% (The Economist, 2007).

Easy credit also contributed to the rapid liquidity growth. Thanks to low nominal and real interest rates it was very easy for anyone to borrow money. Chart 13 illustrates the low interest rates in selected countries.

¹¹ Either oil exporting (Gulf States, Russia), or consumer goods exporting (East-Asian countries)



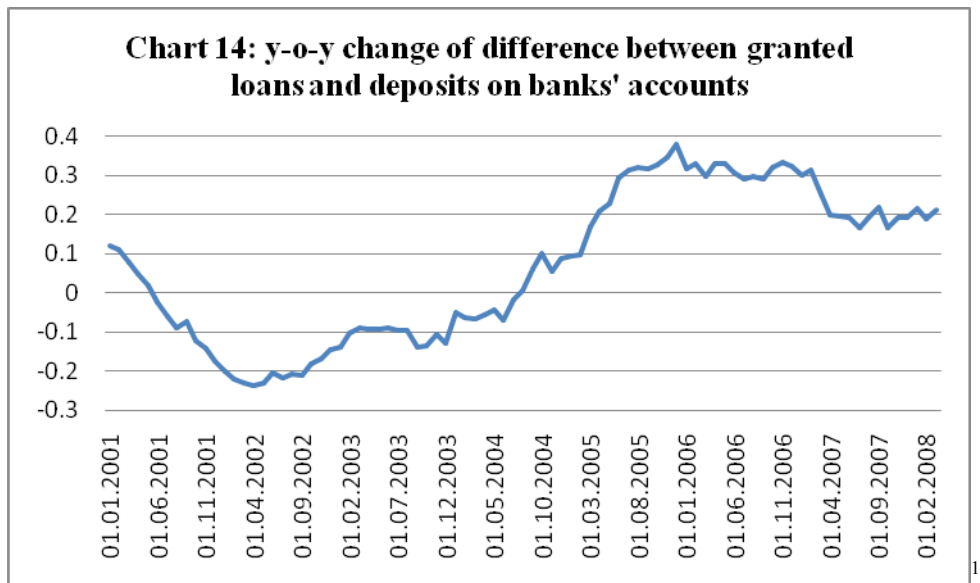
Source: econstats.com

European, American or Japanese interest rates were relatively very low during this period. This encouraged massive demand for credits. For example, just in USA alone, the total value of outstanding credits rose by 44%, from \$3 695 732 billions in the fourth quarter of 2001 to \$ 5 331 872 billions in the fourth quarter of 2006 (whereas, in the previous period, between 1996 and 2001, the value of credits rose only by 10%).¹²

A large amount of liquidity due to easy credit was also due to financial innovations, mainly securitization of granted loans. Chart 14 illustrates that since 2004, the amount of credits granted to borrowers rose faster than amounts deposited in banks (in the USA). This was possible only thanks to the possibility of selling the loans on the secondary market and thus obtaining the granted money back much faster than when waiting for the customers to repay their loan. The banking system has largely changed from the “originate-and-hold” strategy to “originate-and-distribute” model.

This means there were two major sources of the easy credits: low interest rates and securitization. The low rates encouraged the demand side via making it attractive for borrowers to borrow; financial innovations encouraged the supply side via the possibility of selling the loans. This might have also let lenders to loose their lending policy and standards, demonstrated by lending to less solvent customers.

¹² Data source: economagic.com



Source: FED

2.3 Financial markets developments

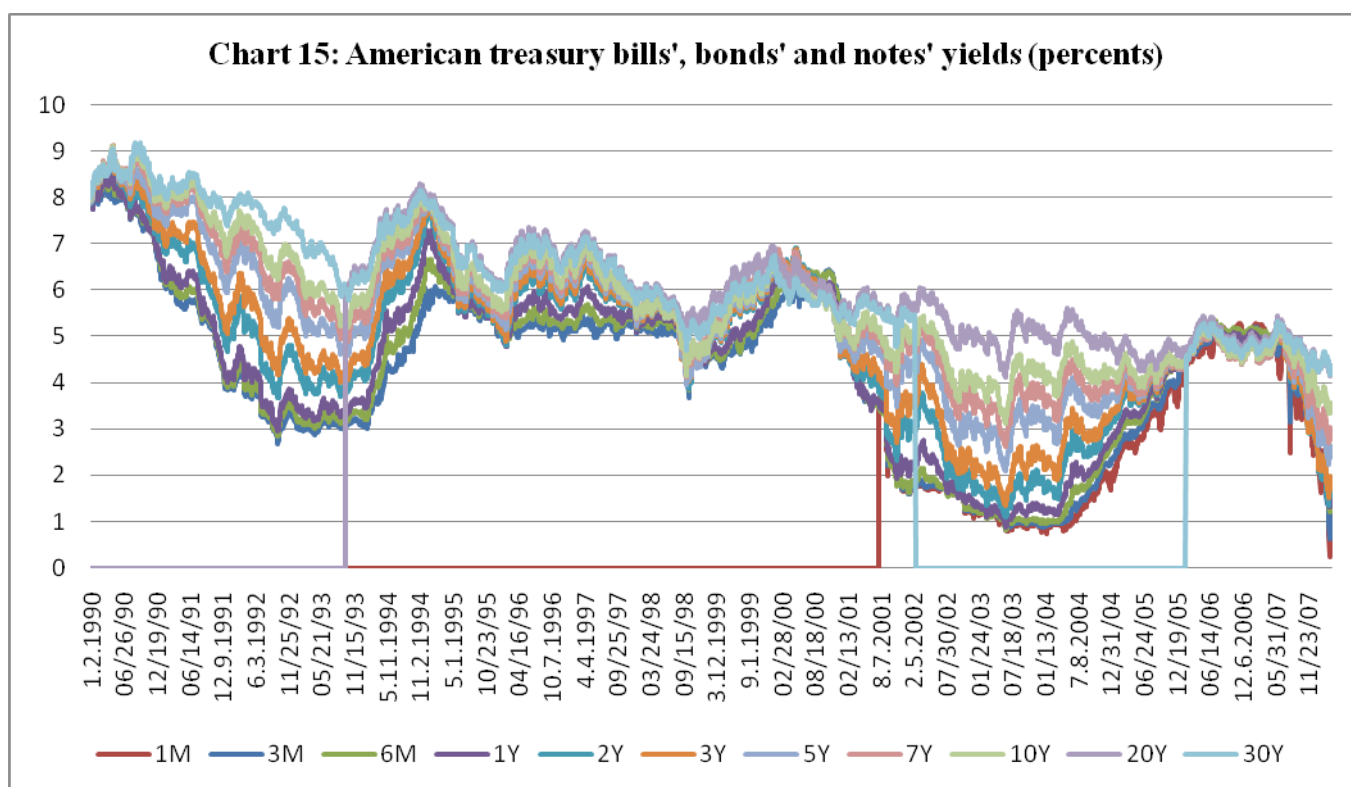
Because the excess liquidity was enormous, investors were eager to put their money into any financial market instruments. Since many countries, where the liquidity comes from, have their currency pegged to the U.S. dollar, the most feasible possibility was to invest into U.S. bonds, equities or other USD-denominated instruments. However, as large inflow of petrodollars and investments from Asian surplus countries put downward pressure on government bond yields across the globe, financial institutions were looking for alternative investments in order to safeguard previous returns in an environment of low short-term and long-term interest rates. This led to a “search for yield” that manifested itself in large investments in all possible sorts of risky assets such as equities, emerging market assets or structured products (see further below).

The American bond market is considered to be the most liquid market in the world. Chart 15 shows the yields by the type of instrument (i.e. mainly maturity). We can see that in the first half of 2000s, the yield curve returned to the “classical” shape, in the previous period a flatter yield curve was more common. This was given by loose monetary policy, as short-term yields mirrored the shifts in Fed’s target rate.

¹³ The chart is computed as year on year change in granted loans minus deposits on banking accounts.

The long-term rates continued in their declining trend. The reasons for this trend are often described, in a way, that investors have faith in the economic situation, they do not consider any serious problems such as high inflation to occur in the long run. In the past decade, however, a large part of the decline can be attributed to the demand from Asian central banks and oil-exporting countries willing to invest their dollar reserves into liquid instruments (Bernanke, 2006).

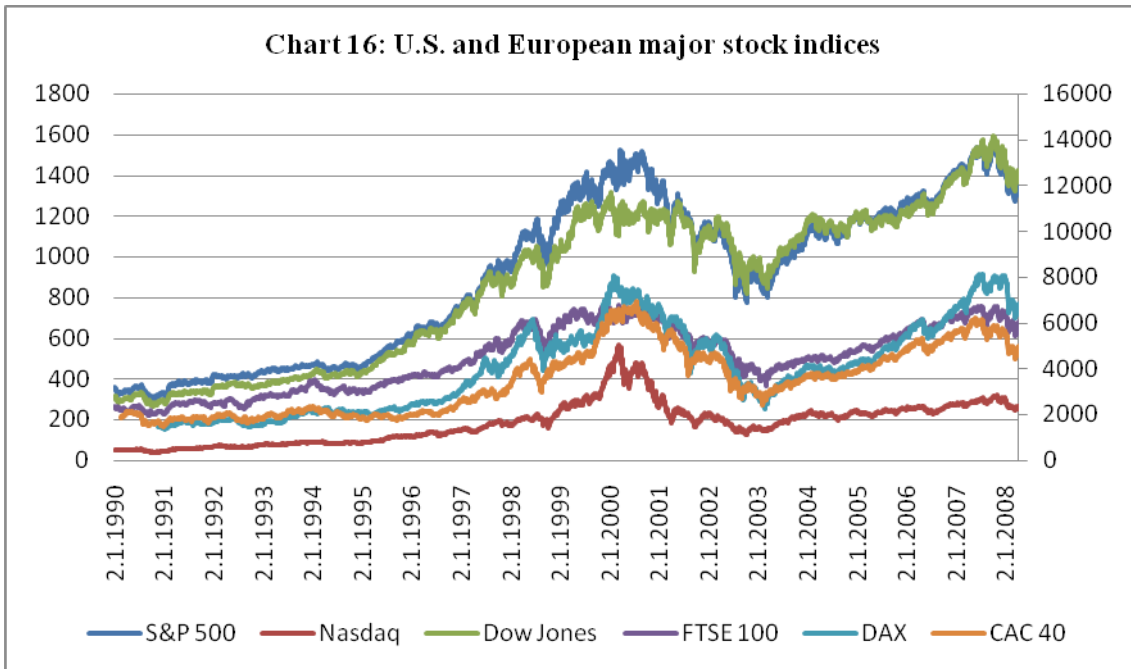
As the monetary policy started to tighten again (since the second half of 2004), but the long-term rates more or less continued in their downward trend, the yield spread¹⁴ narrowed.



Source: treas.gov

Stock markets went through a „déjà vu“ period in the 2000s. Firstly, stock prices grew rapidly in the late 1990s, then lost almost all of the gain in 2001 and 2002. After that they rose again into similar heights as during the first bubble (see Chart 16).

¹⁴ The spread is compounded as the difference between 10-year note and 3-month bill.



Source: finance.yahoo.com

The Asian and emerging market stocks increased by a larger extent than their American and European counterparts. This reflects both that Asian and emerging market economies were reviving after the crisis in late 1990s and enjoying an expansionary period, but also the search for yield (see table 11 for selected stock indices growth).

Table 2: Selected stock indices¹⁵¹⁶

| | | | |
|---------|-----------------------|-----------------------|-----------------------|
| | 01.01.00- 01.01.03 | 01.01.03- 01.08.07 | 01.01.00- 01.08.07 |
| S&P 500 | -37.53% | 61.25% | 0.73% |

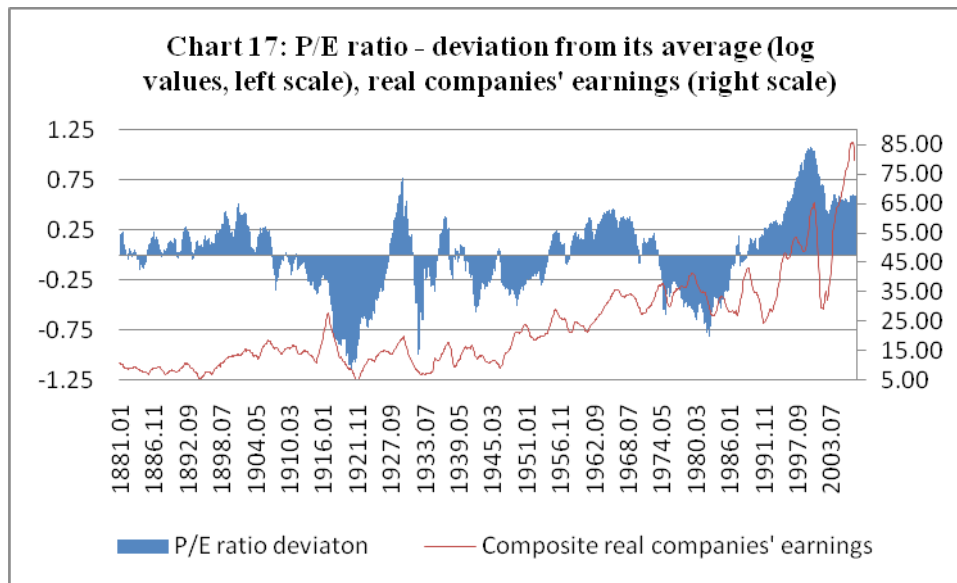
¹⁵ BSE30 – Bombay stock exchange index, IPC – Mexico city stock exchange index, Bovespa – Sao Paulo stock exchange index

¹⁶ I divided the time into these two periods, because stock prices peaked in the first quarter of 2000, fell to their lowest points in the first quarter of 2003 and then rose again until August 2007.

| | | | |
|-----------------|---------|---------|---------|
| Nasdaq | -66.48% | 84.41% | -38.18% |
| Dow Jones | -24.21% | 55.24% | 17.65% |
| FTSE 100 | -39.82% | 55.89% | -6.19% |
| CAC 40 | -46.01% | 76.97% | -4.45% |
| Nikkei 225 | -54.15% | 93.62% | -11.22% |
| Hang Seng | -46.08% | 139.77% | 29.28% |
| Straits Times | -48.28% | 156.87% | 32.86% |
| Shanghai | | | |
| Composite | -3.46% | 216.76% | 205.79% |
| Seoul Composite | -40.02% | 192.28% | 75.30% |
| Bovespa | -31.46% | 367.41% | 220.34% |
| IPC | -12.04% | 382.67% | 324.55% |
| BSE 30 | -37.40% | 343.85% | 177.87% |

Source: finance.yahoo.com and own computation

Stocks were pushed up by the huge excess of liquidity (as almost every possible instrument available on financial market and bearing some yield). Of course, companies' very good performance results contributed to the growth too, but still – the P/E ratio was dangerously high (see chart 17 for the deviation of the composite American P/E ratio from its long-term average). This means that stocks were still highly overpriced – not that much as in 2000, but still remained very high (Wolf, Financial Times, 2006).



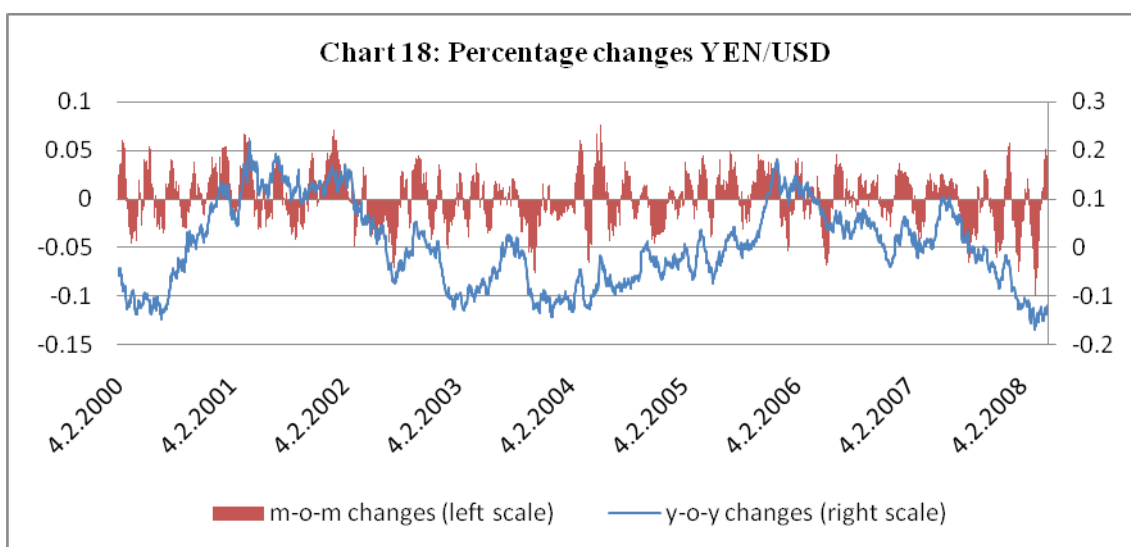
Source: own computation based on data from: www.irrationalexuberance.com

If we look at the P/E ratio deviation, it is interesting, that even in times of the lowest share prices in the 2000s, the ratio still remained on one of the highest level ever. That would probably mean that if the companies' performances do not increase higher to further ever high levels, one can expect a severe price fall.

The timing of stock markets falls in 2000 and 2001 covers with the timing of the main house boom period (which is dated from 2001, see Chapter 3). There can be an explanation that people were looking for an instrument to invest that would be stable enough to help them to overcome the inflation and moreover to ensure them a certain yield. In the perspective of falling stock markets, the houses had to seem to be a convenient substitute for shares. On the other hand, since the year 2004 the stock prices have proved to be following the growing trend again and so there seems to be no reason why the housing market should have been growing at such an eminent pace as it did in the last years of the boom.

Over the past two years, there were several correction in the stock markets that tested whether the benign environment, low risk aversion and large appetite for risky assets is going to continue. The biggest ones were in February 2006, May/June 2006 and in February/March 2007.

A search for yield environment contributed to an increase in a number of investment strategies that provided above-bond yield return but were relatively risky. The most famous were the so-called carry trades. The principle of this strategy lies in borrowing money in currency with low interest rates (and best also with overvalued currency¹⁷), and lend/deposit it in a currency with higher rates. As the Chart 18 prompts, the country convenient for money lending was mainly Japan (or Switzerland), on the contrary a country convenient for money depositing was for example New Zealand.¹⁸



Source: econstats.com and own computation

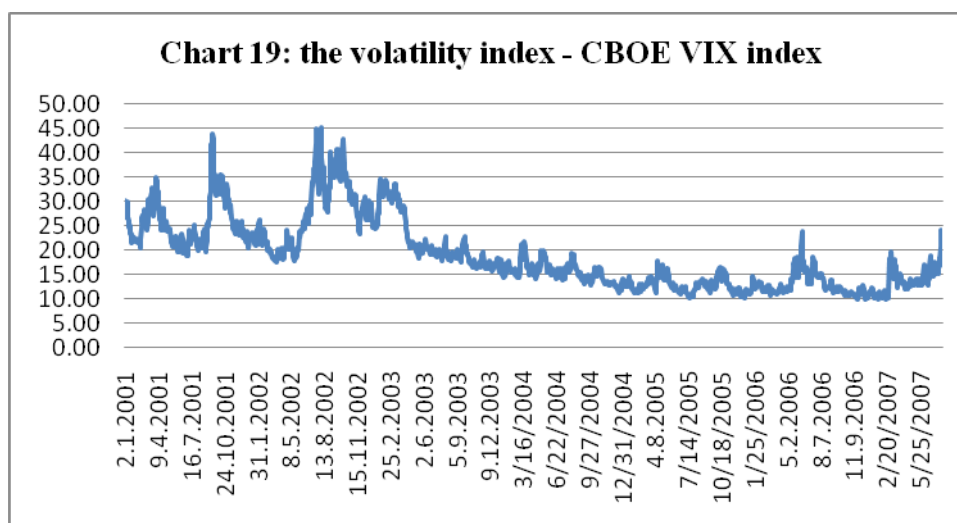
The development in the yen/US dollar market is illustrated in the chart. In year on year terms the currency was depreciating since the second half of 2005 until the beginning of August 2007, illustrating the use of it for the carry trades. In monthly changes the currency was more volatile, but still since 2005 the digits are similar – the currency was in the proportion to dollar more losing than gaining, which documents the role of the Yen in carry trades.

¹⁷ This is the case of Japan: The Japanese economic was experiencing a stagnation or just a slow pace growth since the beginning of 1990's, and the yen value was moving accordingly – for this whole period yen was moving around a long-term level, at which it was set when the Japanese stagnation started. However, when later (in 2007) yen started to appreciate, it created a serious threat for all such investors (making their loans more expensive). See the chart 11 for the exchange rates values.

¹⁸ Due to low interest rates, in 2006 and first half of 2007 the Czech koruna might also have been used as a financing currency for carry trades.

However, since August 2007, as the risk aversion increased globally as a result of the credit crisis, the carry-trade positions were being closed, and as a result yen (and other financing currencies) appreciated.

Overall, all financial markets (be it bond, stock or FX market) were characterized by very low volatility (see chart 19). The overflow of liquidity and its easy sources freed investors from their fear from risk, from rapid price shifts – and it was surely not only the excess of liquidity that convinced them to stop being afraid. There was also the uninterrupted stock prices growth since 2003. This all was confirmed by the CBOE Volatility Index¹⁹ (in the USA). This index measures the market anticipation of S&P 500 30-days volatility. Taking into account that it is quoted in annual volumes, the expected volatility was low. The median over the years 2005 and 2006 was 12.31%, that means that the expect 30-days volatility was 3.5%. A period with a low volatility similar to this can be already found during the first half of 1990s.



Source: cboe.com

There is a visible trend in the chart (since 2003) that the index was decreasing. Although some disturbances appeared, after the situation calmed down the index always returned to the same low levels as prior the event. We can see two more significant spikes in the chart in the very last period – in May and June 2006 and in February/March 2007. These are the times of the two market corrections. After the second correction, the index

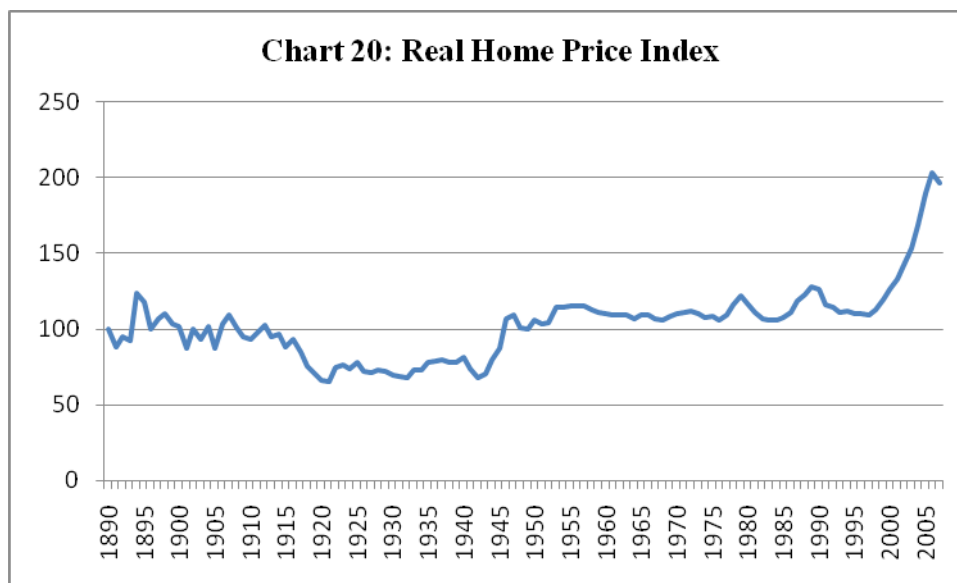
¹⁹ Sometimes also called as the fear index.

started to increase again, partly expecting future developments in financial markets starting with summer 2007 disruptions.

Chapter 3: American housing and mortgage market

This chapter describes the basis features and characteristics of the American housing market, recapitulates the very recent progress and characterizes the mortgage market as well. The recent development in the housing market was very unusual in the historical context (see Chart 20). Home prices turned away from its long-term equilibrium and rose by almost 100% (in real terms) over the past decade, however the change is not ever-lasting, as the prices are currently falling at a similar pace as they rose earlier.

The growing prices (together with low interest rates) enabled the massive development of mortgages and also the massive development of new structured products related to mortgage loans.



Source: irrationalexuberance.com

3.1 Development of the housing market in the period 1945 - 1995

The modern history of the American housing market can be dated back to the end of the Second World War. At that time, massive changes in the American society started to take place, and a change in the housing market was just one of them. After the Second World War, the US experienced a baby boom, as well. But this time, together with growing economy, people began to want a new home for their new family, they did not

want to live in one room together with their parents, as generations before them did, they wanted to live on their own. This started a new era in the history of the housing, the era of home building. Suburbs experienced a massive development, as new houses were building there. The demand was extreme, real home prices were being pushed up. In the first two years of the post-war period, prices went up by 26.5%.²⁰ The magnitude of the price progress from this period is very similar to the one taking place in the 2000s. (Schumer, Maloney, 2007)

As we can see in the Chart 20, after this massive development came a short slowdown and later on, in the late 1950s, the changes were absorbed in the market and there were no substantial changes in real home prices for a long period of time.

In the late 1970s, the first market bubble appeared. The housing appreciation was a reaction to the stagflation period of the early 1970s, people were looking for an investment tool that would beat the massive inflation of that time and partially found it in the form of a real-estate investment. This housing boom was taking place mainly in the western states, mainly in California. Home prices appreciated by more than 10% over the years 1977 – 1979.²¹

Another housing bubble came ten years later, in the late 1980s. This time, the development was contrary to the one in the 1970s. The bubble started to grow on the east coast first, namely in Boston, and then spread on the west coast and other parts of the country. The real home prices increased by 18% over the years 1985 – 1989.²² Unlike to the previous market boom, this time the economic situation was different, the stagflation period was over long time ago. This bubble started from rather speculation reasons, although the spread of the boom into other parts of the country could be influenced by the stock market crash in 1987. Also the liberalisation of rules for savings and loans companies (see Chapter 1) contributed to the price growth.

^{20,21} Data source: www.irrationalexuberance.com

²¹

²²

In the late 1990s, the real home prices started to rise again. This growth turned into another boom after 2000. This boom was longer and bigger than any time before and thanks to the development on the mortgage market, the consequences could be felt all over the world.

3.2 Housing market development after 1995

For the subsequent part, the price boom is defined as a nominal year-on-year price increase greater than 10%. The Standard & Poor's - S&P/Case-Shiller® Home Price Index is used for the analysis.²³

House prices started to grow rapidly in 1997 for the first time in some cities, the massive boom started after 2000 and lasted until the mid of 2006 (the end of the boom differs region to region). After the peak of the boom, which came in the second half of 2006, a seemingly soft landing came (until the first half of 2007). After the 2007 credit crisis started in summer 2007 (see next chapters further below), prices started to decline, first slightly, but later on began to fall more rapidly, mainly in the second half of 2007. At the beginning of 2008 a negative price change of more than 10% was not an exception. Prices have fallen way below trend because they soared way above trend during the boom time.²⁴

Detailed description of the situation is given in the Box 1.

²³ This index observes the home price situation in following cities: Atlanta, Boston, Cleveland, Dallas, Denver, Detroit, Charlotte, Chicago, Las Vegas, Los Angeles, Miami, Minneapolis, New York, Phoenix, Portland, San Diego, San Francisco, Seattle, Tampa, Washington; I compare nominal monthly year-on-year data.

²⁴ David Seiders – National Association of Home Builders Chief Economist

Box 1: Home prices development

The first city, where home prices grew by more than 10% was Portland in March 1997, however this was the only month, when prices exceeded the 10%-level. (The boom returned back later in 2004.) For the whole year 1998, home prices were booming in Seattle, which was the second city experiencing price increase greater than 10% in this period. Similarly to Portland, the boom returned in 2004. At the same time, the price boom arrived to California – all major cities: San Francisco, Los Angeles and San Diego started to grow by more than 10% in 1998. In this state the huge price growth lasted until the end of 2005 (in Los Angeles even a half year longer).

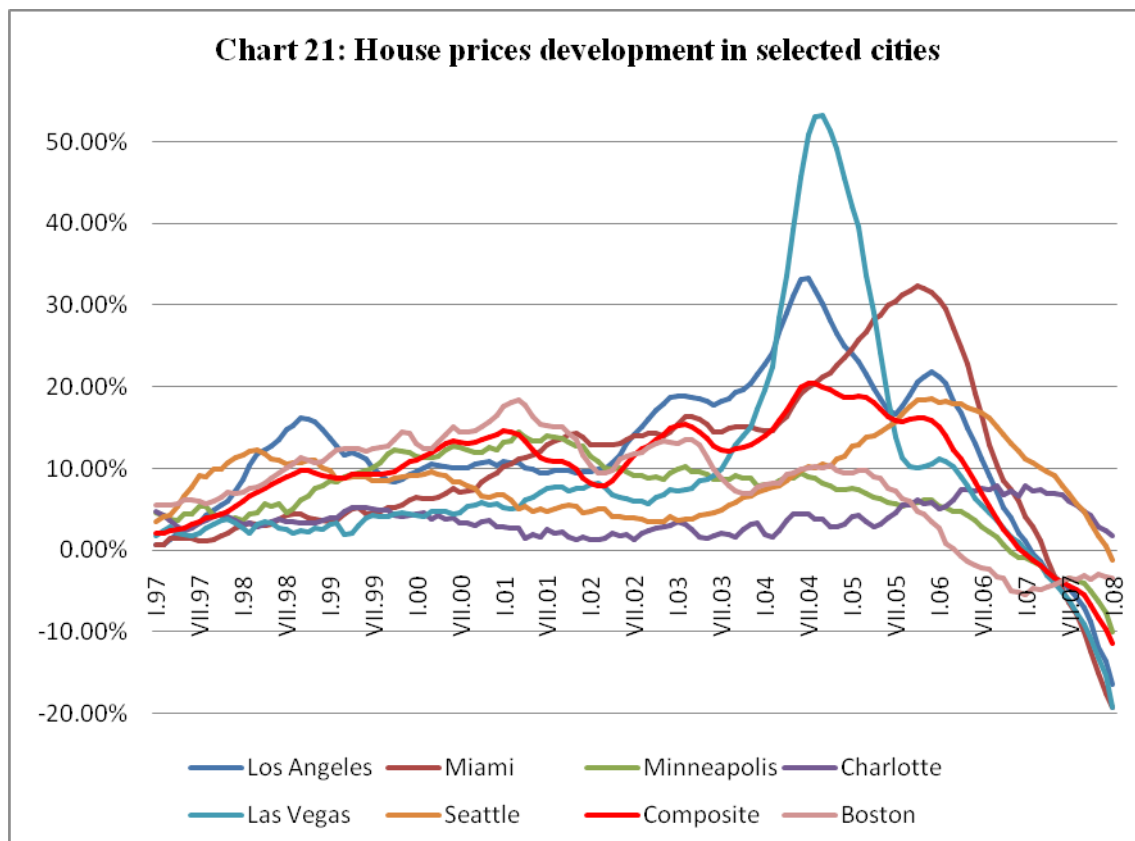
In the second half of 1998, the price boom occurred on the east coast – in Boston. In Boston the price boom lasted until the first half of 2003, and later returned for a short period of time in the second half of 2004. In 1999 prices started to grow by more than 10% in Denver and in Minneapolis. But in these cities the boom did not last that long as in other major cities. It ended in 2001, respectively in 2002. This year began the price boom also in New York, but unlike to those two cities, prices did not stop to boom in New York until the mid of 2006. In 2000 occurred the price boom in Washington and in 2001 in Miami and Tampa. In 2003 to Las Vegas and in 2004 to Phoenix. In March 2005 arrived the high price increase also to Chicago, but in this city it lasted only one month (but it is worth mentioning that in Chicago rose the prices at rates bigger than 8% for a long period of time).

Other big cities, like Atlanta, Chicago, Detroit, Charlotte, Cleveland and Dallas were not hit by the price boom at all. That of course does not mean that the prices in these cities did not grow at all, they did, but simply their growth did not exceed the 10% level, that we have set as a frontier for the price boom. The development in these cities can be divided into two groups. The first group forms cities, whose price growths were close to 10%, that means higher than 8%. Into this group belongs however only Chicago. The other cities grew typically by less than 5%.

The price fall started on the east coast, in April 2006 decreased the price in Boston and Detroit for the first time. Most of the remaining cities joined in the second half of 2006

or in the first half of 2007. It is interesting, that even cities that did not experienced any boom started to fall – f.e. Detroit or Cleveland (so far the only city, where prices have not fallen yet is Charlotte).

Chart 21 illustrates the development in selected cities.²⁵



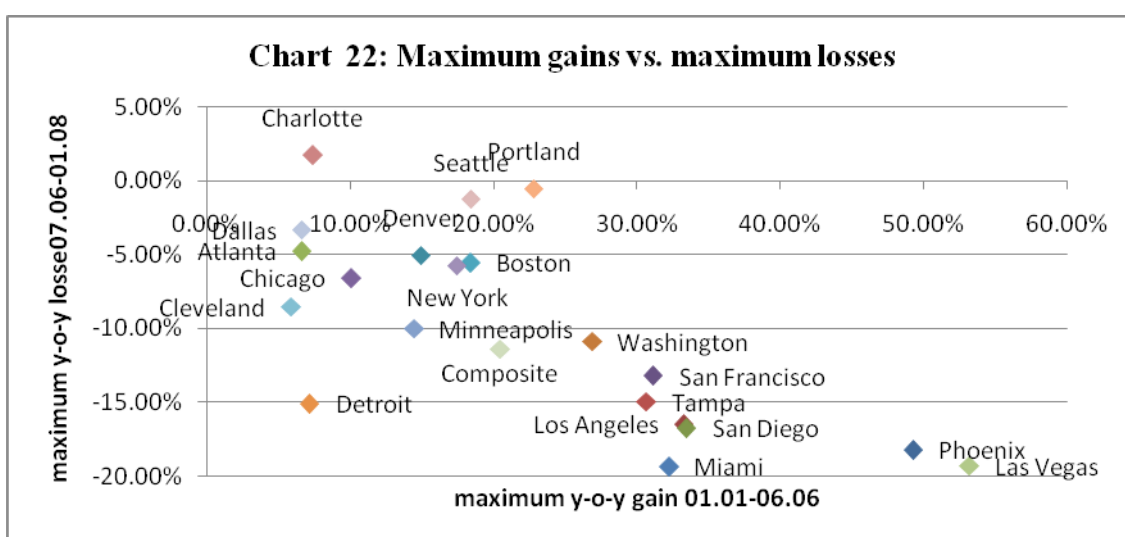
Source: irrationalexuberance.com

The composite indicator shows, that there were two peaks in the development of house prices. The first one came during 2000 and the first half of 2001 (this is the first time, when the price growth exceeded the 10% level) with its peak in first month of 2001, the

²⁵ I selected only some of those cities on the Standard & Poor's - S&P/Case-Shiller® Home Price Index to be illustrated in the chart – because some of them moved in very similar ways as other ones, so please note: San Diego and San Francisco bear similarities with Los Angeles (a very long period of the boom – almost from 1998 until 2006), Washington and Tampa with Miami (the boom started in after 2000 and lasted until 2006), Phoenix with Las Vegas (the boom started quite late – in comparison with other cities, but the price gains were enormous), Atlanta, Chicago, Detroit and Dallas with Charlotte (the boom never occurred), Portland with Seattle (the boom showed up in 1997 or 1998 for the first time and then returned in 2004), Denver with Minneapolis (the boom only in 1999 and 2000) and New York with Boston (the boom started in 1998, 1999 and lasted until the very end in 2006, but was not as fierce as in Los Angeles).

second boom arrived in the second half of 2002 and peaked over the second half of 2004 and first half of 2005).

According to the very recent data (February 2008), the fall is just starting to speed up, so any conclusion would be preliminary. However, if we plot the data of every city's maximum growth against its maximum loss (so far available, see Chart 22), we can see that those cities experiencing biggest price gains previously are currently also experiencing biggest losses. The direct proportion between the height of the gain and the depth of the loss is visible.

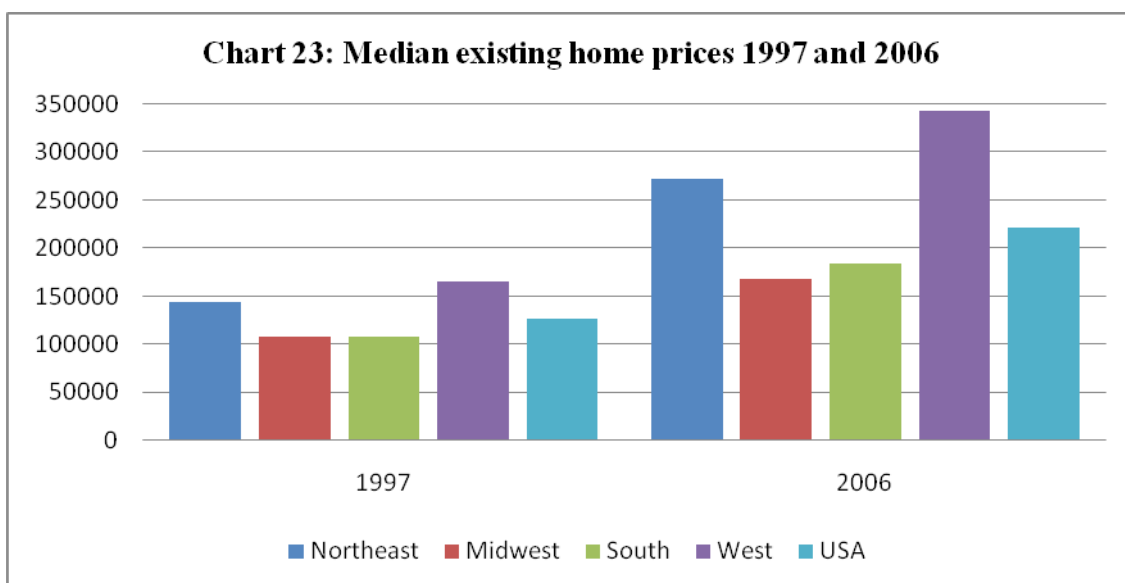


Source: irrational exuberance.com, own computations

The biggest price increases took place in Los Angeles (235%) and in San Diego (218%). The average growth of all observed cities was 122.72%, the median was 125.46%. The most booming months experienced San Diego (85) and Los Angeles (84). The average home price increase was 15.27% in Los Angeles. The fiercest monthly growth was recorded in Las Vegas (53%).²⁶ Altogether, the Standard & Poor's - S&P/Case-Shiller® Home Price Index grew by almost 170% nationally, over the years 1998 – 2006. The real prices went up by 80% nationally.

²⁶ The price boom came to Las Vegas and Phoenix quite late in comparison with other booming cities – in the middle of 2003, 2004 respectively. But the later the bubble arrived, the fiercer it was. In Las Vegas home prices were not growing by less than 45% in the second half of 2004, in Phoenix they were growing by more than 40% in the second half of 2005.

Chart 23 illustrates actual prices in 1997 and 2006 and their proportional distribution among the four main U.S. areas: Northeast, Midwest, South and West. The proportion of prices remained almost identical – although West is in proportion to the others more expensive than it used to be (31.5% to 35.5%), on the other hand, Midwest is cheaper than before (20.5% to 17%).



Source: realtor.org

Home prices rose nationally, although not everywhere with such a fierce pace as in the most growing regions. This was the first time, when prices rose nationally. However, prices are also declining nationally, in the recent time, for the first time since the Great Depression.

3.3 Home prices in comparison with other prices and indicators^{27,28}

What has contributed to such an increase in house prices? Some factors that might play some role had no or rather limited influence on the price growth. This is true mainly for building factors costs, rents, wages, inflation, or stock prices. The impact of some other factors was of a greater importance: mainly low interest rates and securitization leading to easy credit discussed above. The increase in house prices has been also accompanied

²⁷ All prices and indicators changes are measured in nominal terms over the period 1998 and 2006.

²⁸ Most of the facts are later discussed in the chapter 4, again. That is why, they are mentioned here rather briefly.

by the developments in homeownership rate, building permits, home sales and units for sale.

Prices of building material were moving to various directions – some were declining, some rising and some stagnating. Overall, building costs went up by 30%, home maintenance costs by 32%, rents grew by 40% (Schiller, 2007). Weakly wages went up by only 4%.²⁹ These factors did not encouraged the price boom.

The inflation remained low for the whole period of time (see Chapter 2), investors did not have any intention to invest into housing because of high inflation, as it was the case of 1970s.

In the time of the starting housing boom, stock market went through a period of the dot-com bubble, which burst at beginning of 2000. Later on, stocks began to rise fiercely again, this time because of the huge overhangs of liquidity in the global financial market.

As the year 2001 is being considered as the starting year of the biggest boom, it can be explained by the need of investors to look for a substitute to falling housing prices. However, the shares then started to rise again, so there should not have been any reason for home prices to continue growing, but as we know – they grew further and even more.

Federal Reserve is widely blamed for keeping interest rates too low for too long and thus inflating the house prices. The low interest rates are widely considered as the main factor enabling the home prices to go up so much – mortgages and loans became easily accessible to anybody and the demand grew rapidly (The Economist, 2007; Connolly, 2007; Roubini, 2008).

Homeownership rate increased - this home price boom was among others unique in increasing the homeownership rate. This indicator moves generally between 63.5% and 65%.^{30 31} Recently it climbed up to 69% in 2004, which is the highest number ever.³²

²⁹ Source: data.bls.gov - the Bureau of Labor Statistics web page

³⁰ The homeownership rate tells us what proportion of all houses is own by their residents.

³¹ Source: .census.gov, the U.S. Census Bureau Web Page.

³² Since 1965, when the measurement started.

Interesting is the fact, that this rate experienced larger increases in the earlier stages of the price boom, before 2001. In 2001 the rate value was 67.9% (in 1994 it was 64%). This is in contrast with what one would expect, that it that the homeownership rate would increase in times of biggest home price increases and of more favourable mortgage rates (both after 2001). Most affected groups by the homeownership increase were people younger than 25 years (1994: 14.9%. 2005: 25.7%)³³. followed by all other categories younger than 45³⁴, in categories of older than 45 the ratio increase was by one or two percentage points. The recent development of this ratio indicates, that ratio might slowly decline to its previous equilibrium levels (2007: 68.2% - that is slightly under the 2003 value).

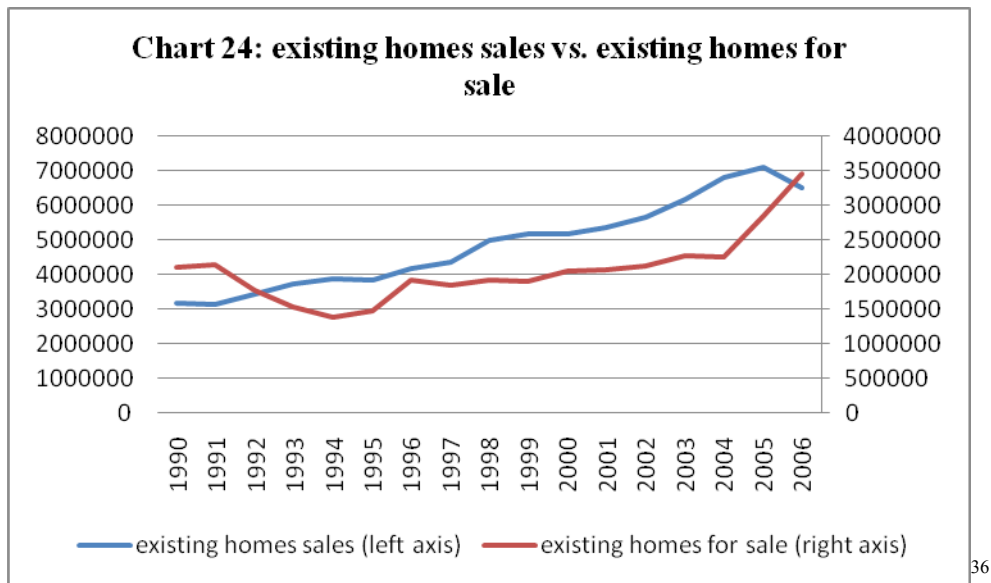
The number of issued building permits grew from 1991 until 2005. It more than doubled over this period of time.³⁵ The level of the permits is quite unusual, although not record-breaking, the surprising factor is the length of the growing period, fourteen years is definitely a highly unusual number. Similarly to this indicator, number of building starts, houses under construction and completed houses was developing, however always with a small delay, given the nature of the building process.

In Chart 24, we can see the development of existing and new homes sales - this is the demand and the supply of the home market. The home sales – both for existing and new homes, were the biggest sales ever, peaking 2005. The home sales more than doubled since the early 1990's. Unfortunately, so did homes for sale, which increased by 54% since 2004. That stands for a proof, that the price boom is over (besides the falling prices) – if the supply is greater than the demand, one cannot expect prices to grow further.

³³ For this category, it does not hold, that the biggest increases were before 2001, on the contrary – the biggest increases were in the most recent times, mainly thanks to the mortgage companies' politics targeting the previously not perspective groups.

³⁴ 25-29: 1994 – 34.1%. 2006 – 41.8%; 30-34: 1994 - 50.6%. 2004 – 57.4%. 35-44: 1994 – 64.5%. 2005 - 69.3%;

³⁵ 1991: 948 800, 2005: 2 147 600 building permits, source: <http://www.census.gov>, the U.S. Census Bureau web page



Source: realtor.org

3.4 Housing finance

The American mortgage market is quite different in comparison to other mortgage markets. Almost nowhere both borrower and lender enjoy such freedom, meaning that the borrowers are free to borrow as much as they want and the lenders are free in setting any rules they want (Green, Wachter, 2005).³⁷

The free rules are of following character: the maximum allowed loan-to-value ratio³⁸ is 97%³⁹; borrowers are allowed to take on another mortgage, they are not limited to have only one mortgage; most of the mortgages have fixed mortgage rates⁴⁰; the possible future prepayment of the mortgage is free of charge. For comparison with other countries, see Table 3.

Table 3

³⁶ A very similar development experienced also the market for new houses.

³⁷ The more free are those mortgage lenders, that are not regulated by the law, that means various mortgage brokers etc. These institution are free in setting any lending rules they want to, but it must always be within the frame of the law. The mortgage brokers are often blamed of abusive lending.

³⁸ The loan-to-value ratio is the proportion of the loan amount to the value of a collateral, in this case a house.

³⁹ Although the prevailing value is somewhere 75%.

⁴⁰ However, the share of adjustable mortgage rate grew in last years – mainly with the expansion of subprime mortgages.

| country | typical LTV | maximum LTV | for mortgage | 2nd 10-20 years | fixed-term range 20+ | fixed-term range 20+ | repayment by fee-free redemption |
|-------------|-------------|-------------|--------------|-----------------|----------------------|----------------------|----------------------------------|
| U.S. | 75% | 97% | A | A | A | A | A |
| Denmark | 80% | 80% | A | A | A | A | A |
| France | 67% | 100% | L | A | L | N | N |
| Germany | 67% | 80% | A | A | L | N | N |
| Italy | 55% | 80% | A | L | L | N | N |
| Netherlands | 90% | 115% | A | A | L | N | N |
| Portugal | 83% | 90% | A | N | N | N | N |
| Spain | 70% | 100% | A | L | L | N | N |
| UK | 69% | 110% | A | L | N | L | L |
| Japan | 80% | 80% | | A | A | L | L |
| Korea | 40% | 75% | N | L | N | A | A |
| Canada | 65% | 90% | A | N | N | N | N |
| Australia | 63% | 80% | A | N | N | L | L |

(A = available, N = not available, L = limited availability)

Source: Green, Richard K.; Wachter, Susan M.: The American Mortgage Market in Historical and International Context

Customers also enjoy a great variety of mortgage types: fixed-rate mortgages (FRM), adjustable-rate mortgages (ARM), option ARM⁴¹, balloon mortgage⁴², FHA mortgages⁴³, dual index mortgages⁴⁴, interest-only mortgage⁴⁵, graduated payment mortgages⁴⁶, etc.

⁴¹ This is a special ARM, the borrower can set the interest rate freely – however this setting holds for usually just one month, then the rate is increased at the standard rate plus a margin.

⁴² This is a mortgage that looks like a 30-years mortgage, with the exception, that after certain years (usually seven years) the outstanding amount has to be repaid in full.

⁴³ This is a mortgage, that is insured against default by the Federal Housing Administration. The borrower has to fulfil certain rules in order the mortgage to be insured.

⁴⁴ A mortgage, whose interest rate changes monthly according to two factors, which it is indexed on – for example a price index and a wage index.

⁴⁵ The borrower pays only interest for a certain period of time (f.e. 5 years), the annuity repayment is therefore postponed.

⁴⁶ This mortgage is a FRM, but the amount of instalments differs – in first years it is lower, in later it is higher.

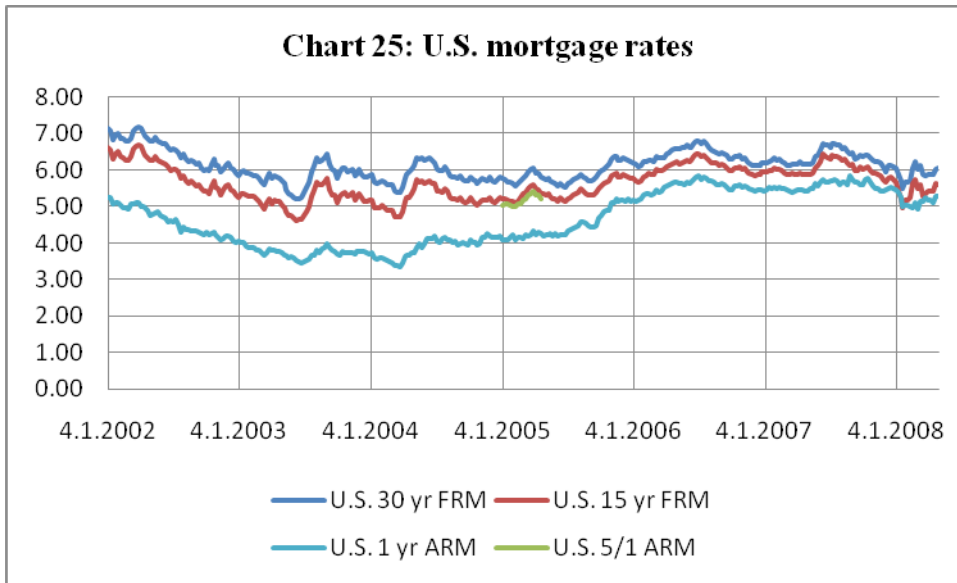
Another feature typical for the American mortgage market is a considerably developed secondary market. On the secondary market⁴⁷ lending institutions sell (securitize them) issued mortgages to third persons in the form of asset-backed securities (see Chapter 4). The secondary market serves as a finance source for mortgage lenders. It plays a vital role in the United State's housing finance system by making sure primary mortgage lenders have enough funds to lend home buyers (Introduction to Fannie Mae, 2007). The secondary market exists, because housing market are inherently local in nature but housing financing need not be (Cummings, DiPasquale, 1997).

After the 2001, the Federal Reserve's interest rates were set at their historical minimum, from July 2003 to June 2004 – at 1% level. Thanks to this, mortgage rates decreased as well. However, in June 2004 started a three-year period of seventeen consecutive interest rates increases, which of course had an impact on the mortgage market

Chart 25 shows the development of mortgage rates since 2002. Under the influence of declining interest rates, so did the mortgage rates go down to their historically minimum levels. Years 2003 and 2004 can be regarded as years very favourable for mortgage borrowers. As table 4 shows – mainly the year 2003 was record-breaking in the amount of granted mortgages. But in comparison to previous development, all years after 2000 are exceptional – so far in all years until 2005 the level of \$ 2 000 000 was trespassed. This had never happened before – the highest mortgage amount granted within a year was \$1 450 000 in 1998, the average amount of granted mortgages was \$875 104 throughout the 1990s.⁴⁸

⁴⁷ The primary market is the market, where money is being lend to homebuyers, on the primary market act only borrowers (homebuyers) and lenders (banks, mortgage lenders).

⁴⁸ Source:oftheo.gov, the Office of Federal Housing Enterprise Oversight web page



Source: http://www.freddiemac.com/pmms/pmms_archives.html

| Table 4: Single-family mortgages after 2001 | | | | | |
|---|-------------|-------------|-------------|-------------|-------------|
| Year | 2001 | 2002 | 2003 | 2004 | 2005 |
| mortgage amount | \$2 215 000 | \$2 885 000 | \$3 945 000 | \$2 920 000 | \$3 120 000 |
| ARM | 17% | 22% | 22% | 40% | 37% |
| FRM | 83% | 78% | 78% | 60% | 63% |

Source: ofheo.gov

Over the first half of the 2000s the proportion of ARM mortgages was rising.⁵⁰ The ARM was often chosen by people with lower income, living in lower-wealth household, very often single-headed. Further, these rates taken by minority group members –

⁴⁹ Types of shown mortgage rates:

U.S. 30 yr FRM – 30 years fixed rate mortgage rate

U.S. 15 yr FRM – 15 years fixed rate mortgage rate

U.S. 1 yr ARM – adjustable mortgage rate – fixed for the first year and then resetting once a year

U.S. 5/1 ARM – adjustable mortgage rate – fixed for the first five years and then resetting once a year

⁵⁰ Although if we look at the ARM proportion since the beginning of 1990's, with two exceptions (1998, 2001) the ARM share has never fallen below the 22% level, the highest shares – 40% - occurred in 1994 and 2004.

Hispanics, Afro-Americans.⁵¹ The adjustable rate was typical for subprime mortgages⁵². Subprime mortgages are issued to higher risk borrowers. They typically have inconsistent credit histories, lower levels of income and assets, or other characteristics that increase the credit risk to lenders (Schumer, Maloney; 2007).

Mortgage rates seemed to be stable during this period, therefore no interest risk was expected. But then Fed started raising interest rates and mortgage rates reacted accordingly. There was no risk for borrowers at the fixed rate, since their interest rate remains the same for the whole time of repaying, but the borrower at the adjustable rate felt the interest rate increase considerably. In 2003, the average 1 yr ARM was 3.76%, whereas in 2006: 5.54% - this represents a jump by 47% , that means these kinds of mortgages were almost 50% more expensive and the same repeated in 2007, when after a decline in the second half of 2006 and first half of 2007 the rates climbed again to the same heights as before (since then rates have declined again) – this in result had disastrous consequences.

These changes in interest rates and further mortgage rates did not hit the American housing market in full immediately. Mortgage companies covered the possible loss of not providing that much mortgages as in previous years by inventing products accessible to wider groups of customers (in result one could obtain a mortgage even if not having any regular incomes) and a great marketing campaign.⁵³ This supports also table 2, where we can see the amount of newly granted mortgages for year 2005 was even higher than a year before. The share of sub-prime mortgages thanks to this campaign jumped to 40% of newly originated securitized mortgages in 2006 from 9% in 2001 (DiMartino, 2007)

The other factor softening the implications of higher mortgage rates were the fact that the most used types of mortgages were the “2/28” and “3/27” hybrid adjustable rate

⁵¹ Source: Finke Michael, Huston Sandra, Siman Emilian, Corlija Mel: Characteristics of Recent Adjustable-rate Mortgage Borrowers, Association for Financial Counseling and Planning Education, 2005

⁵² Subprime loans are made to those who have impaired credit. Generally have higher interest rates than prime loans, Such loans are tied to borrowers' credit ratings, expressed as letter grades, such as A-, B, D. Prime loans' credit is most often A. – Definitions by The 2007 Mortgage Market Statistical Annual, Bethesda, Maryland: Inside Mortgage Finance Publications, 2007

⁵³ But this in result even worsened the whole situation – mortgage companies concentrated on customers with lower solvency and thus boosted the sub-prime mortgage sector.

mortgages (Schumer 2007). That means mortgages with fixed rates for first two, respectively three years. Changes in rates would not reveal themselves in a massive scale until the first resetting of these mortgages, that is two or three years after the deal is signed, which would mean in 2006, and that is exactly what happened. Rates were reset – sometimes the new interest was almost 100% higher, as follows from the graph. The consequences were massive – the default rates rose substantially which resulted in the collapse of some part of the securitisation market.

Chapter 4: Structured products

Structured products are hybrid investments that combine the characteristics of two asset classes or more – usually a derivative and a financial asset – to provide synergistic and unique advantages relative to decreasing risk and increasing reward for the sophisticated investor.

Structures of these products are designed to overcome risks and increase yields in a way a single common product would never be able to produce. The name structured products comes from the fact, that these products are combinations of more structures together.

A usual structured product's design is very similar to bonds. On the beginning an investor invests money. He receives interest payments (coupon payments) over a certain period of time and at the end of this period the invested amount is redeemed (the nominal value is paid back).

4.1 Securitization

The reason why the structured products are so popular is that they are used as a tool for securitisation of loans, mortgages or various credits in general⁵⁴. The advantage of it is that it transfers the risk away from the lender to the investor willing to bear the risk.

Banks use the securitisation for decreasing the amount of regulated capital. Once they have a loan on their balance sheets, they are required to hold some reserves. When they decide to sell the loan, it is obvious this requirement is abolished.

The process of securitisation was used for the first time – at that time however the structure products were not used yet – asset backed securities⁵⁵ (ABS) were used instead. CDOs (collateralized debt obligations, see further below in this chapter) were used for the first time in the late 1990s, but since then their usage became massive – until last August 2007, when the whole market collapsed and broke down. The market is not expected to renew until 2009 or 2010 (van Duyn, et al., 2008).

⁵⁴ For example: credit card loans, student loans etc.

⁵⁵ Asset backed securities are in general loans turned into bonds.

There are many institutions operating on the secondary market (as the securitisation market is called). One government-owned: Ginnie Mae⁵⁶, two government-sponsored or shareholder-owned companies with a public mission (Introduction to Fannie Mae, 2007): Fannie Mae⁵⁷, Freddie Mac⁵⁸ and many others institutions as: foreign central banks, insurance companies, commercial banks etc.

Ginnie Mae, Freddie Mac and Fannie Mae's main goal is to ensure enough liquidity for mortgage lenders, so that housing is affordable for everyone (that means also for minorities) and everywhere (that means in less developed regions), being less risky at the same time. They are committed to helping support community development, create strong communities, and stabilize neighbourhoods. (An introduction to Fannie Mae, 2007).

How does the secondary market works in practice? In practise, borrower and mortgage-lender sign a contract. Having the deal signed, if the loan-to-value ratio exceeds the level of 80%, then the mortgage is required by the lender to be insured against default.⁵⁹

If the lending institution does not want to keep the mortgage in its portfolio (which is very unlikely these days, since deposits have lost their value in the favour of various funds and other investment tools, and therefore the lending institution does not have enough money to finance the mortgage only from its own resources), then it chooses out of two possibilities. Either the mortgage can be sold directly to an investor, or to an conduit⁶⁰, that repackages mortgages into securities and sells them further to investors (usually, bonds tied up with the mortgage are issued, or mortgage-backed securities).

Picture 1 shows the structure of the secondary market.

⁵⁶ Full name: The Government National Mortgage Association

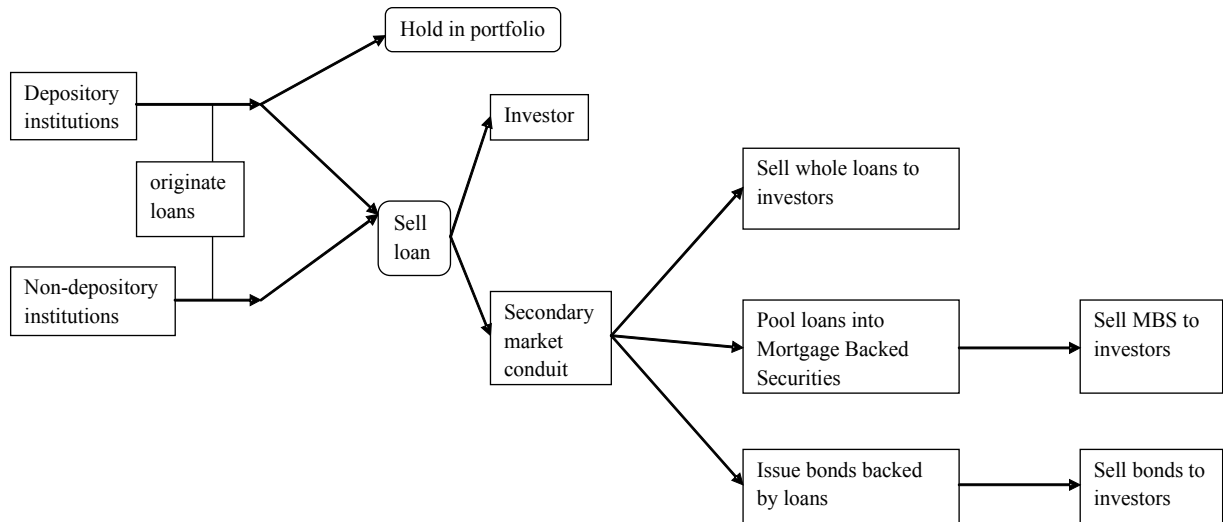
⁵⁷ Full name: The Federal National Mortgage Association, this is the oldest institution of the three, it was initially created in 1938 as a part of the Roosevelt's New Deal program, in order to create the secondary mortgage market.

⁵⁸ Full name: The Federal Home Loan and Mortgage Corporation

⁵⁹ The biggest insurance company is the government owned Federal Housing Administration

⁶⁰ Or SPV or SPV-lites

Picture 1: Mortgage market process



Source: DiPasquale, Wheaton: Urban Economics and Real Estate Markets

4.2 Credit default swap (CDS)

CDS is a swap designed to transfer the credit exposure of fixed income products between parties. The protection buyer pays LIBOR and default protection fee, the protection seller pays LIBOR⁶¹ and in the case of a default⁶², he pays transfers also the lost principal to the protection buyer.

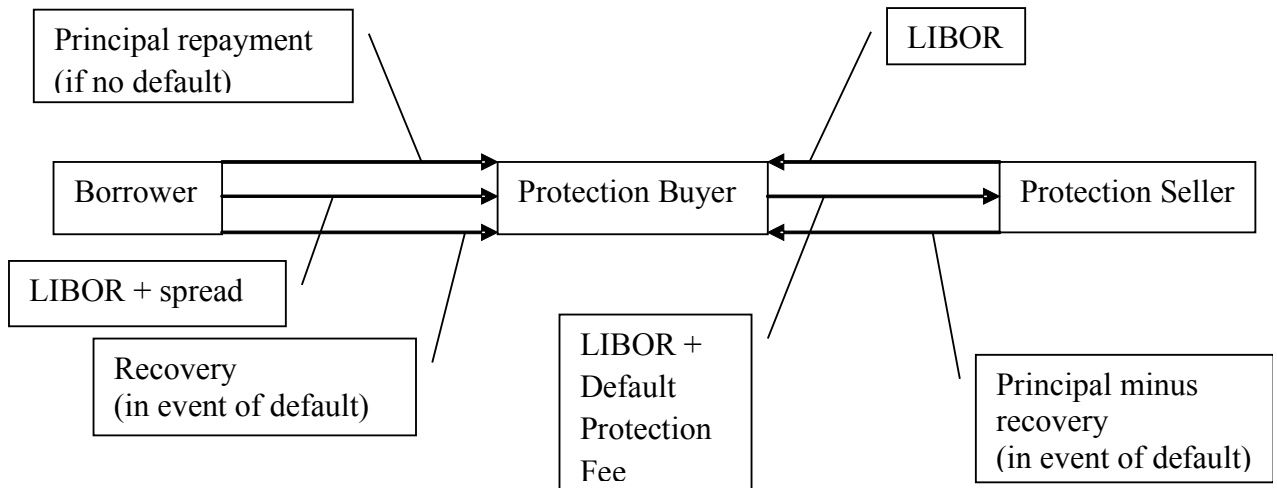
The CDSs are currently widely used as a part of the synthetic CDOs (see further in this chapter).

⁶¹ Because the netting is often applied, the transfers look as following: the protection buyer pays the fee and the protection seller repays the principal in the case of default.

⁶² The protection seller pays not only in the case of default, but also in cases such as: default on credit payment, debt restructuring, downgrading, general decline of market etc. – the contract can be set in various forms.

Picture 2: Credit default swap scheme

Credit default swap (source: IMF, Pimco – taken from RGE Monitor)



4.3 Collateralized debt obligations (CDOs)

Collateralized debt obligations (CDOs) are interest rate structure products. They belong into the category of Credit linked notes. The Credit linked notes are products designed to allow investors to capture returns on a single underlying bond/loan or a portfolio of bonds/loans (Das, 2006).

For an issuer the credit linked notes represents a useful way how to delegate the credit risk on another market participant. On the other hand, investors like these products, because they represent a way how to replicate exposure to a bond or a loan without direct investing into them. A direct investing into loans is often impossible for private investors, since bank loan markets are not opened for them. The increasing popularity, CDOs were experiencing for the last ten years showed, that it is cheaper to create a structure like that, than directly invest into a portfolio of loans or bonds. (Gibson, 2004)

The major attraction of this format for credit derivatives is the capacity to create synthetic exposure to the underlying credit (Das, 2006). This is done mainly via

structuring the liabilities of the SPV, via which the CDO is issued, into different tranches with different risk and yield profile.

Banks, on the other hand, like these products, because they help him to decrease the level of the regulatory capital requirements on the credit risk.⁶³ Further, CDOs help investors overcome market imperfections associated with the illiquidity of bonds and loans. Effectively managing portfolio credit risk is a dominant motive for commercial banks' participation in credit derivative markets (Gibson, 2004).

In practice, there are two major groups of CDOs: balance sheet transactions – these are designed to remove loans from a bank's balance sheet, to hedge credit risk or to remove some regulatory capital from a bank's balance sheet; therefore are primarily driven by the needs of the selling bank; and arbitrage transactions. Arbitrage transactions can be both cash flow and market value CDOs, whereas balance sheet transactions are only cash flow ones.

Key participants of CDOs' structures are seller, investor, issuer, SPV, asset manager and trustee. Seller (sponsor) is a company that has originally issued the portfolio of loans, which are the underlying of the CDO – a bank, a mortgage company, etc. Investors are those who put their money into the CDO, which is being offered them in the form of various tranches. They take on exposure to a particular tranche, effectively selling credit protection to the CDO issuer (Gibson, 2004). Issuer is usually an investment bank playing the role of the “heart” of the whole transaction, administrates all needed things, in order the transaction to be carried out smoothly; a creator of the special purpose vehicle (conduits, SPV-lites); it prices the CDOs. Special purpose vehicle (SPV) (conduits, SPV-lites)⁶⁴ is a legal entity, artificially created, that becomes the owner of the loans, and the issuer of tranches

Asset manager plays a substantial role in purchasing loans for an underwriter before the CDO is issued and after the issue it should look after the portfolio of loans, purchase new loans in case some mature or default. Trustee assumes complete control of the release of any cash and/or securities of the transaction, and pre-approves all trading

⁶³ This reason was more truthful at the beginning of CDOs, nowadays, with prevailing popularity of synthetic structures, the capital shift does not play such an important role.

⁶⁴ The difference between conduits, SPVs and SPV-lites are in the level of their leverage (conduits are the least leveraged one, SPV-lites the most ones) and also in the level of their portfolio diversification and thus risk they are bearing (conduits being the most diversified, SPV-lites the least one).

decisions. (Fabozzi, Goodman) The trustee often also plays the role of a collateral administrator – the administrator provides regular information about the underlying assets.

Typically, there are 3 types of tranches: senior tranche, mezzanine tranche, subordinate/equity tranche.⁶⁵ (However, rules are set in a way, that if there are not investors for all tranches, then the CDO cannot be started, that is why single-tranche structures have been introduced⁶⁶.) The senior includes loans with a rating A or better, mezzanine tranche includes loans with a rating BBB or better, equity tranche consists from all loans that do not fit the previous ones.

The tranches system functions the following way: when the loan instalments are received, firstly are paid senior tranche investors, following by mezzanine tranche investors and as the last the regular payment is paid to the equity tranche investors. The equity tranche is the most risky one, on the other hand, it pays the highest premium.

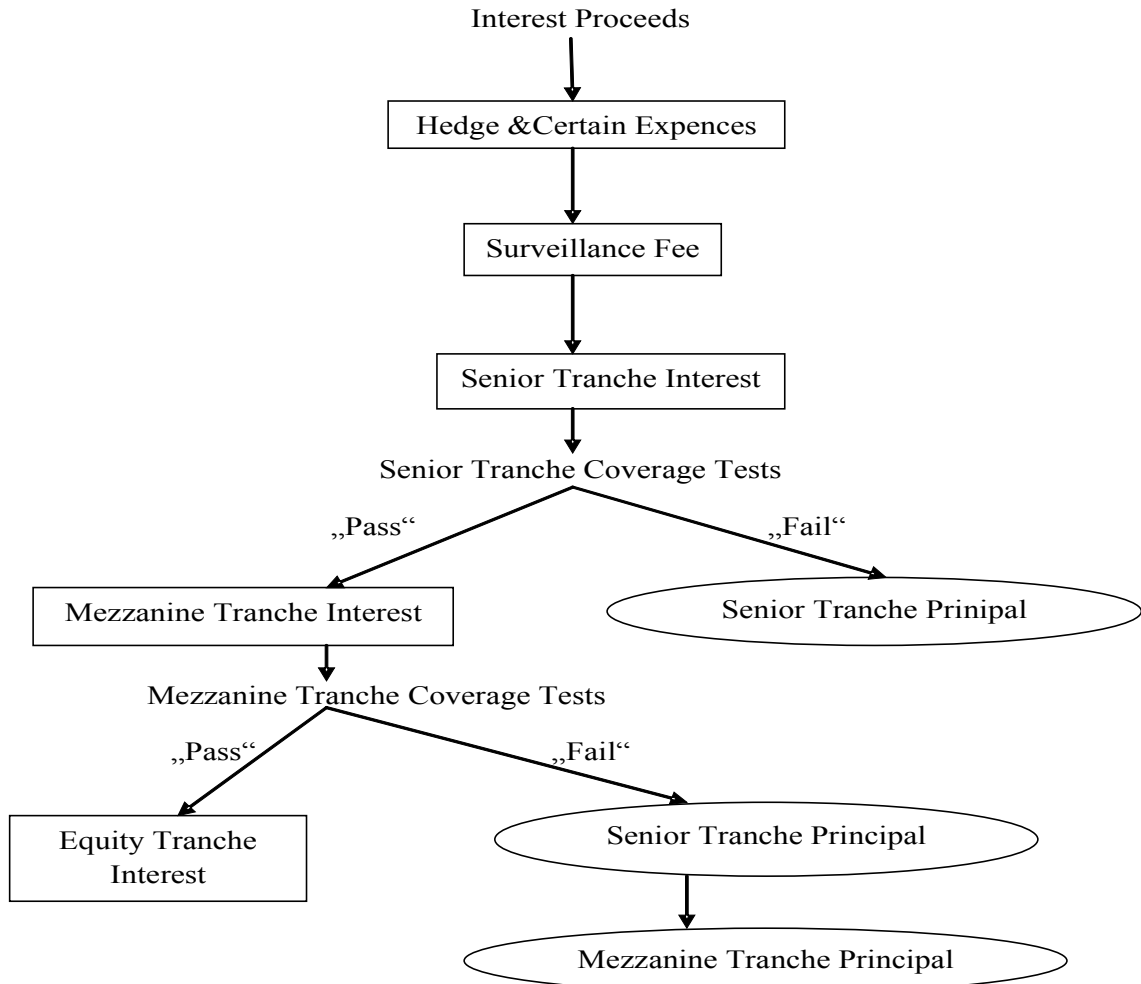
Picture 3 shows the principle how the cash flows coming from the repackaged loans are being distributed. This is happening according to the so called waterfall principle – first are paid all fees, taxes, premiums to the asset manager. And then the cash flow flows into each tranches, according to the principle the best rated the first paid.

Before the payments shift from one type tranche to the another, so called coverage tests are run, in order to assure the deal is performing within guidelines. They are designed to protect noteholders against a deterioration of the existing portfolio (Goodman, Fabozzi, 2002).

⁶⁵ Sometimes also the super-senior tranche is used, this tranche includes AAA rated loans.

⁶⁶ The single-tranche CDO consist only of one tranche, the issuer does not buy the whole portfolio of loans, but only those corresponding with the tranche rating.

Picture 3: Interest Cash Flow „Waterfall“



Two coverage tests are run:

Overcollateralization test – this test compares the par value of collateral portfolio with the par value of the tranche for which the test is run and with all tranches over this tranche (with better ratings).⁶⁸

⁶⁷⁵ Interest coverage ratio =
$$\frac{\text{scheduled interest due on underlying collateral portfolio}}{\text{scheduled interest to the tranche the ratios is computed} + \text{scheduled interest for all tranches senior to it}}$$

The ratio is compared to the tranche’s interest coverage trigger. Once the ratio is greater than or equal to the interest coverage trigger, the test is passed. (Source: Goodman Laurie S., Fabozzi Frank J.: Collateralized Debt Obligations – structures & analysis, John Wiley & Sons, 2002, New Jersey)
Source: Goodman Laurie S., Fabozzi Frank J.: Collateralized Debt Obligations – structures & analysis

Interest coverage test – this test compares the scheduled interest due on underlying collateral portfolio with the scheduled interest for the tranche for which the test is run and with all tranches over this tranche.⁶⁹

Equity tranche is the most risky one, on the other hand, bearing the highest return – the equity investor obtains all excess payments. Several factors drive the returns from the investment, including the excess spread⁷⁰, the credit losses, the value of the call option⁷¹ and the performance of the manager (Das, 2006). However on the contrary, in case of any payment difficulties from the borrower's side, equity tranche investors are the first ones to lose their earnings (this is called the first loss). Notes, belonging into this tranche, often bear no rating.

Mezzanine tranche is the second riskiest tranche. The return is divided according to following factors: credit losses, performance manager, CDO structure, level of the coupon. Mezzanine investors lose their money in case, when the default problems are of that size, it outflows the equity tranche's capacity (so called second loss). However, unlike the equity investors, the mezzanine ones do not dispose of an option – because of this some enhancements were introduced, in order to protect these investors too.

CDOs serve for postponing credit risk. A bunch of loans, mortgages is repackaged into tranches, that are further offered to investors. In other words, a bank takes a group of loans, mortgages etc. for sale, cash flows from these parcels into tranches, according to liquidity and then offers these tranches to investors to invest into.

For issuers CDOs bear following advantages: the amount of regulated capital needed to be held because of loans will be reduced, since the loans are sold, the sold loans also go off bank's balance sheet; banks gain a quite feasible way of getting funds –

⁶⁸ Overcollateralization ratio =
$$\frac{\text{principal value of collateral portfolio}}{\text{principal for the tranche the ratio is computed} + \text{principal for all tranches senior to it}}$$

This ratio is then compared with the tranche's minimum required ratio (this is specified in the each CDO's guideline). If the ratio is greater than or equal to the minimum required ratio, the test is passed. (Goodman, 2002)

⁶⁹

⁷⁰ Excess spread over the term of transaction.

⁷¹ Equity investors often receive a call option, in order to end investment in case of a disadvantageous development – the option however can be used only after a non-callable period.

repackaged loans are sold and banks have money for granting new ones; credit risk is transferred to investors and banks do not have to care about borrowers' solvency (Das, 2006).

For investors, CDOs offer advantages such as: access to portfolios of loans (or of another collaterals), highly diversified and classified according to their risk; opportunity to invest into instruments that would otherwise not be opened to public investors;

The less risky tranches (typically the senior ones) are rated by rating agencies. Via this, they may reach larger pool of investors, including those required by regulation to invest only into high-quality assets (such as pension funds or insurance companies). Rating agencies evaluates many factors and at the same time runs various tests. Factors to be evaluated include credibility of every single borrower and what happens if he defaults, how does it affects cash flows; market risk; legal risk; expected default rates; how the whole structure is going to "behave" if the default rates increases etc.

In general, two approaches can be distinguished:

the rating agency separates the underlying asset and the market risk element and evaluates them separately (this is an approach, that thinks of the whole transaction from the issuer point of view)

expected loss approach – the probability of default and with that connected loss are evaluated. This approach is preferred by the rating agencies – it more correctly portrays the investment credit profile (Das, 2004).

Many assets can be used as the underlying asset: loans, bonds, mortgages (both residential and commercial), various backed securities (asset backed securities, mortgage backed securities, etc.), CDOs itself.

Three basic CDO structures are: collateralized loan obligation (CLO), credit linked note CLO and synthetic securitisation.

CLO is a classical structure. A bank (the seller) has a portfolio of loan, which she wants to sell – in order to raise some funding or to get rid of some portion of credit risk. The

portfolio is then sold to an issuer who transforms the portfolio into tranches and offers them to investors. The issuer pays the seller the total amount of the sold loans, and receives all payments from borrowers so far made.

The issuer can become the new owner of the loan portfolio (usually by means of a special purpose vehicle), however in some countries this can be problematic, because an approval from the borrowers is required (which can be very complicated, if we take into account, that the portfolio may consist of hundreds of loans), therefore it happens that all the cash flows from the loans are being postponed to the issuer, but the seller remains the actual owner of the portfolio.

Credit Linked Note is very similar to the simple CLO one, the main difference is that this time is being operated with credit linked notes

The issuer buys credit linked notes from a selling bank. At the same time, offers its own ones, divided into tranches, to investors. The loans remains on the selling bank's balance sheet, the issuer owns just the notes. In case of prepayment of one of the loans from the side of the borrower, or in case of maturity of some of those loans, the issuer purchases another notes. Often if the new notes do not match the previous ones, the investor is repaid and new notes are issued.

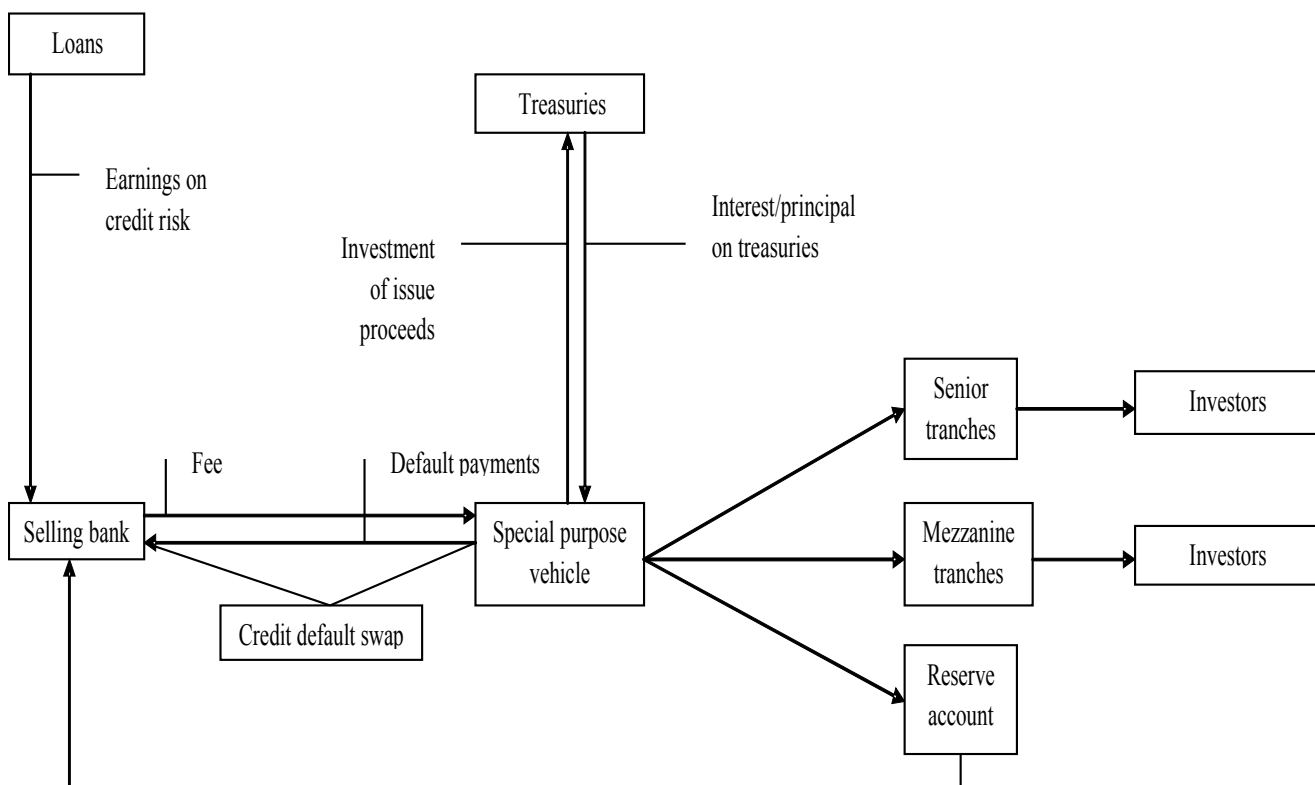
Synthetic Securitisation structure incorporates the credit default swap. The issuer hedges his risk by selling credit protection on the reference side of the portfolio in the form of single-name credit default swap⁷² (Gibson, 2004). It was used for the first time in 1997 - Swiss Bank Corp.⁷³ and JP Morgan⁷⁴ were the first one to use them. Picture 5 shows this structure's scheme.

⁷² The credit default swap: one party pays a regular fee, the other one is obliged to pay in the case of the first party's loan's default.

⁷³ Swiss Bank Corp. used this structure in the transaction named „Glacier Finance Ltd.“ for the first time.

⁷⁴ JP Morgan used the synthetic structure in the transaction named „BISTRO“ for the first time.

Picture 4: Synthetic securitisation scheme



Source: Das Satyajit: Structured Products Volume 2: Equity; Commodity; Credit & New Markets

The special purpose vehicle (SPV) issues notes, divided into tranches - the raised money uses for purchasing treasuries. At the same time, it enters into a credit default swap contract with the selling bank.⁷⁵ The fee and the coupon payments are used for paying out the investors (at maturity, also the principals goes to investors). There is also a reserve account, for the case of default. This money are paid down at the SPV by the bank and are refundable, when no default occurs. In case of a default, first the reserve account is spent and then the funds from investors – as usually, first are used tranches with lower ratings.

⁷⁵ This time, the bank sells nothing, it offers just the credit default swap contract.

The number and structure of underlying loans is stable and unchangeable – a matured or defaulted loan cannot be substituted by another one, as in the case of CLO.

Synthetic CDO tranches can be divided into two groups – funded and unfunded:

Funded tranches: investors pay the notional value of the tranche at the beginning of the contract. During the existence of the contract, the investor receives LIBOR increased by a spread (the size of the spread is set according to the riskiness of the certain tranche). In case of any default, the invested amount is decreased accordingly.

Unfunded tranches: investors enter a kind of a swap contract, they receive spread payments and pay in case of a default occurs (of course, he pays after all subordinated tranches' investors have already paid).⁷⁶

This synthetic securitisation has become increasingly popular in recent years, therefore various modifications have appeared over time – variations for European (more regulated) market⁷⁷, for other types of underlying asset (residential and commercial mortgage backed securities, lower solvent companies loans, CDO tranches, derivatives etc.), variation without the SPV or single-tranche CDO.

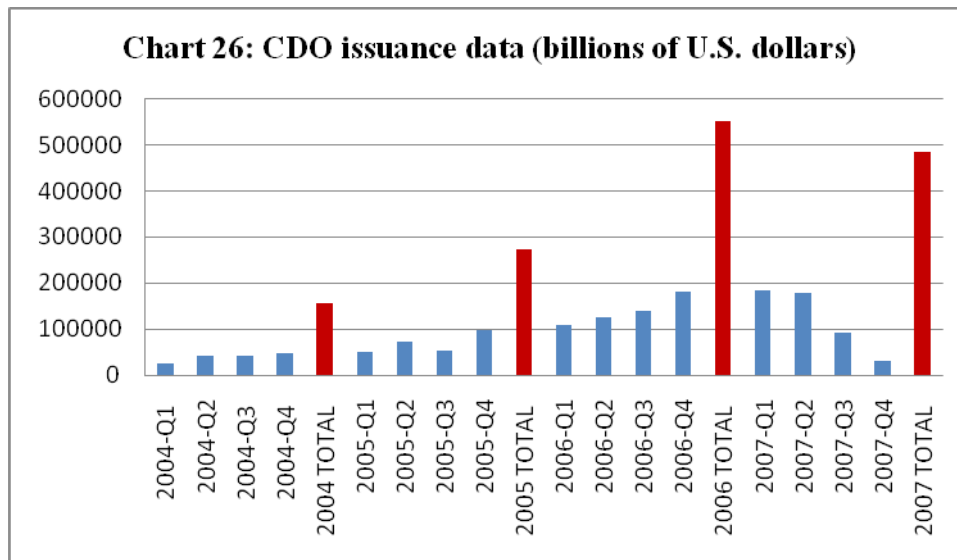
The first synthetic structures used were of balance sheet type (between years 1997 and 1999), but since then the arbitrage type is prevailing. (Gibson, 2004)

4.4 The market development prior the crisis.

In the hunt for yield, investors focused also on CDOs. The CDOs market was growing at a massive pace, over the past years. This huge evolution suddenly stopped in the mid 2007, when the collapse of the CDO market started. Chart 26 illustrates the situation - the market grew by 350% just in two years, between 2004 and 2006.

⁷⁶ There is a certain risk connected with the unfunded type – it is being relied on investors' future ability to meet their obligations, therefore a new credit risk has been created by that.

⁷⁷ In the „classical“ case, the whole portfolio is the subject of the swap deal with a SPV; in this modification only the worse rated loans enter the swap deal with SPV, the best rated are subject of their own swap deal – but this time with a more stable institution (f.e. OECD).



Source: sifma.org

Thanks to CDOs and the whole securitization process (and also thanks to the overall flood of liquidity), market players stopped caring about the risk – some securities were even issued at negative risk premium⁷⁸. Given this fact, it may no longer be prudent to assume credit default swap contracts will be liquid when the adjustment comes – traders may be unable to escape from positions where losses are ballooning, because nobody will be willing to deal (Plender, 2007).

The vast majority of issued CDOs (always more than 50% every year issued CDOs) of had as an underlying asset another structured products (CDO, CDS, ABS, and others) – this is one of the reasons why the credit crunch in 2007 withdrew the liquidity from the market that much – it was because one mortgage (or any other type of loans used as a collateral) was due to various repackaging used much more often, than just once. Thanks to this - a so called contagion effect was created, that in result caused all markets to be hit by the sudden lack of liquidity at the same time – which happened in August 2007 (see next Chapter 5).

⁷⁸ The risk premium is lower than the one offered by government treasuries.

Chapter 5: The evolution of the 2007 credit crisis

This chapter aims to give an overview of what happened during the year 2007. The focus will be primarily on American financial markets, as this is the primary spot, where basically all has started, when needed – also situation on another markets will be mentioned.

The crisis started in the middle of 2007 and changed the market for structured products significantly. The highlights of the crisis will be reviewed.

The forecasts for USA for 2007 were not as optimistic as in previous years. The economy was about to slow down (but rather a low-growth pause was expected than a recession). The slowing housing market was considered as the biggest thread – cooling of the whole real-estate sector was anticipated, as well as decline in consumption (followed by decline in equity prices or rise in gasoline prices, see IMF, 2006).

Later estimates mentioned also the danger of subprime-mortgage sector – which was seen as the weakest link of the housing market, in result able to affect financial markets and credit availability. (IMF, 2007) The duration and ultimate extent of the housing market correction is difficult to foresee and may prove to be greater than projected (OECD, 2007). Mortgage lenders and major credit defaults are amongst the main factors to watch for in 2007 (Authers, 2007).

Some of the forecasts were brave enough to talk about a possibility of a financial distress among mortgage lenders (Münchau, 2007). Some discussed the wide-spread usage of various types of credit derivatives and the decline of risk aversion over the recent period of time and were predicting that risk aversion will stage a comeback at some point in 2007 (Plender, 2007).

Some authors went even further and talked about markets' mispricing of credits, possibly on a large scale, that would lead to an inevitable correction. In the worst scenario if a truly big macroeconomic shock occurred, the process of risk transfer might cease its benign role, and exacerbate contagion instead (Tett, 2007).

Above mentioned opinions and theories were at the beginning of 2007 often regarded as highly speculative. However later the year proved that also the most speculative and improbable theories might turn out to be the correct.

5.1 February correction

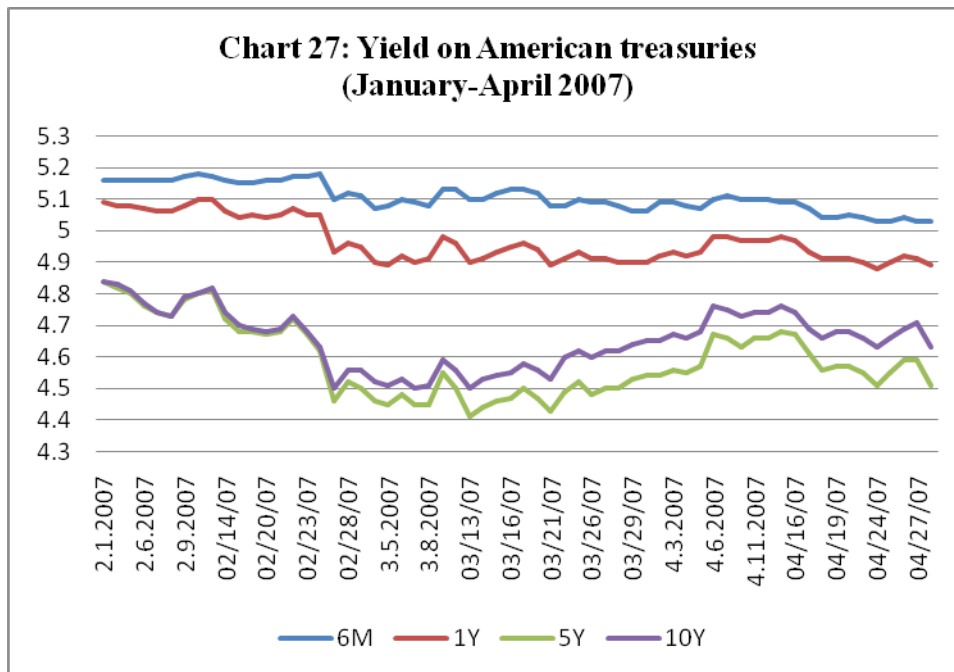
The market experienced three big corrections before the actual crisis: February 2006, May/June 2006 and February(/March) 2007 (see also Chapter 2). Each correction was expected to be the turning point in the development and yet the prices recovered soon again. I concentrate on the February 2007 correction, as it was a certain signal: the market volatility did not return to its previous lows and investment banks' shares were among the hardest hit.

At the end of February (27 Feb), stock markets fell sharply. The correction was said to be almost inevitable as the prices had not dropped by more than 2% for almost 5 decades (Economist, 2007). The grey Tuesday, as is this correction named, started in China – where shares fell by 9% and then subsequently moved to other markets. This is the first time a sell-off was started in China.

Thanks to the correction, more than 3-month gains were evaporated – the Dow Jones index lost almost 5% of its value between 26 Feb 2007 and 05 March 2007. But as we can see in less than two month, the index was back at its levels as before the correction.

Worries about US mortgage lending and the housing market, mixed economic data and a appreciating yen that put the global carry trade in doubt are the most often arguments explaining why this correction happened (Barker, 2007).

The anxiety from the financial market condition is also a reason, why the investment banks' were amongst the hardest hit (f.e.: Merrill Lynch down by 7.%, JP Morgan by 6.4%. Citigroup by 6.5%. Lehman Brothers by 8.6%. Bear Stearns by 8.6%). As the stock markets fell, investors were moving to safer havens – the market for American treasuries (see Chart 27).



Source: finance.yahoo.com

Under the pressure of high demand, the yield of government bonds fell. That is nothing exceptional.⁷⁹ However, the short-term yields did not return to its previous heights, as one would expect, when the stock market did return into its previous roots. That could suggest that investors' faith into the stock market stability did not recover in full – this is also supported by the volatility index (see Chapter 2), that did not return into its lows, either.

A completely opposite movement happened on the side of long-term bonds. Their yields regained the losses caused by the correction, and what is more – later that year grew to such heights, that it “violated” the long-term trend of generally declining long-term yields – and also the conundrum disappeared for while.⁸⁰ The reason for this development were huge fire-sales of bonds.

At the time of the correction there were growing worries about the market liquidity, about its evaporating. Because it has already happened in the subprime mortgage sector – and evaporating liquidity in one part of the credit market has a habit of

⁷⁹ Except the fact, that short-term bonds' yields were higher than long-term ones.

⁸⁰ Here, we are talking about the period until the beginning of August, when thanks to the credit crunch, the yield curve has returned to its „standard“ proportions.

spreading, as creditors take a close look at their lending standards and re-price risk (Beales, 2007).

The yen/dollar market⁸¹ was one of those, where liquidity disappeared in the time of correction – as yen gained more than 4% of its value to dollar.⁸² As a result investors were closing their yen positions. The unwinding of yen loans probably accelerated the market declines (Hayashi, 2007). The danger of carry trades is that it is widely used by hedge funds, which are heavily leveraged. While many will have insured the currency risk in carry positions with credit derivatives, they may have been forced to sell equities in the more liquid developed world equity markets to cover loss-making positions in emerging markets and in wildly volatile credit markets (Plender, 2007). Luckily, the yen market has calmed down, as the correction ended and so the carry trade returned, as well.

5.2 March-August development

Calm before a storm – this is how this period could be described. Equity markets seemed to have forgotten the February correction and quickly regained its lost positions. However problems arising from subprime mortgage market and CDOs market were slowly coming to surface, but there was still more or less enough liquidity, its desiccation was still about to come.

The main events of this period were Bear Stearns hedge funds problems, Treasury bonds fire sales, downgrading of subprime-related asset backed securities and problems of a German bank IKB.

Two of Bear Stearns' hedge funds (the Bear Stearns High-Grade Structured Credit Fund and the Bear Stearns High-Grade Structured Credit Enhanced Leveraged Fund) got into trouble – after losing around 25% of its value. This was because of their overexposure to the subprime mortgage market. Investors demanded their money back. As a result the money withdrawal was blocked by the funds' managers. Finally at the end of June – one

⁸¹ The cornerstone of carry trade market.

⁸² From 26.02.2007 to 05.03.2007

of the funds were bailed-out, as \$3.2 billions were pumped in,⁸³ in order to prevent further losses.

Some authors question the rescue operation as wise decision. The hedge funds' managers should have been sophisticated enough and foreseen the coming risks and problems. At the same time, the funds' investors were warned about how risky investing into such instruments is – this rescue helped a lot of banks and investors who did not deserve it (Gapper, 2007).

As a reaction to the problems of the funds, a fire sale of CDOs seized from the funds was put up – thus they created a market for CDOs – as CDOs are usually not frequently traded and rather held until maturity. To everyone's surprise, only a small fraction out of the securities worth \$850 million was sold. Partially this was because of growing investor's aversion to CDOs backed by subprime market. However the failure of the fire sale left everyone with questions about the rightness of CDOs' valuations. The problem with the valuations is that history shows that large-scale structural dislocations – such as a serious mispricing of assets – are rarely corrected in an orderly manner (Scholtes et al., 2007).⁸⁴

Treasury bond market went through a huge selling-off wave (see Chart 27). The American long-term Treasury bond yields unexpectedly broke the long-term trend of sinking yield.⁸⁵ Because the macroeconomic situation was stable, the only possible explanation of that was that the market was facing a sell-off of bonds (The Economist, 2007). The selling was of such an intension, that the yield curve, being inverted for months, shaped back into its “classical” form.⁸⁶ The best single explanation may be that the bond market suddenly recognised it had grown too complacent about risk. The danger is that just as the bond market suddenly snapped out of years of complacency

⁸³ Interestingly, it was decided, to help the fund investing into less risky assets.

⁸⁴ In the same article is mentioned a confession of a US policymaker: „If every CDO manager was forced to mark to market their subprime holdings, it would be – well, I can't think of a strong word to describe what it would be.“

⁸⁵ This trend is visible since 1990.

⁸⁶ But after the sell-off period was over, the yield curve turned again into the inverted shape. However not for long – the liquidity crisis arriving in August definitely ended the conundrum period.

without a specific trigger, so the holders of many riskier assets may yet do the same thing (Mackenzie, et al., 2007).

Rating agencies were rerating (or practically downgrading) mortgage backed securities – and subsequently also CDOs were affected. The downgrading is nothing unusual, but this time, thanks to the worsening conditions in the subprime mortgage segment, the downgrading had become massive - at the beginning of July, Standard & Poor's warned of downgrading about \$12 billion in subprime mortgage-backed securities, Moody's were about to downgrade about \$5 billion of these securities (Financial times, 2007). As the ratings have set the tone for how the instruments are assessed, the downgrading have meant that the financial markets more or less lost confidence in anything that might contain subprime loans (Nyberg, 2007).

The downgrading continued since then: at the end of February 2008 it was estimated, that since 2005 more than 70% of mortgage backed securities originally rated as B, BB or BBB lost its rating (by 1, 2 or even 3 categories), those originally rated as A were in almost 60% downgraded. Original AA changed its rating in less than 10% of cases and for the AAA rated is the percentage negligible (IMF, 2008).

At the beginning of August (2 Aug), the so far to the banking mainstream unknown German bank IKB Deutsche Industriebank published its expected losses (€ 1 billion), because of its investing branch's⁸⁷ overexposure to subprime market segment. Later (7 Aug) it further announced that 96% of its portfolio consisted of AAA or AA securities and the rest were A-rated securities.⁸⁸ The investment branch was bailed out by capital provided by state-owned KfW Bankengruppe and by other private banks.⁸⁹

It was the first bank announcing problems arising from mortgage-backed securities.⁹⁰ This announcement is widely considered as the factor pulling the trigger of subsequent credit crunch and liquidity crisis.

⁸⁷ The investment company was named Rhineland Funding.

⁸⁸ Further was announced, that the Bank will consolidate \$2.4 billions from Rhineland Funding's assets on its balance sheet.

⁸⁹ KfW Bankengruppe provided €8.1 billions, other banks: €6.5billions. Financing via Commercial Papers turned out to be ineffective.

⁹⁰ Although already in February, HSBC Bank announced having some problems due to unfavourable development of the subprime mortgage segment.

5.3 The August crisis

The lifeguards had been scanning the horizon for an oil-price shock, a bankrupt buyout or a terrorist attack. But when the big wave struck it surprised them by coming from inside the financial system and threatening to swamp an unlikely shore – the money markets where banks lend to each other to help cover their daily operations (The Economist, 2007).

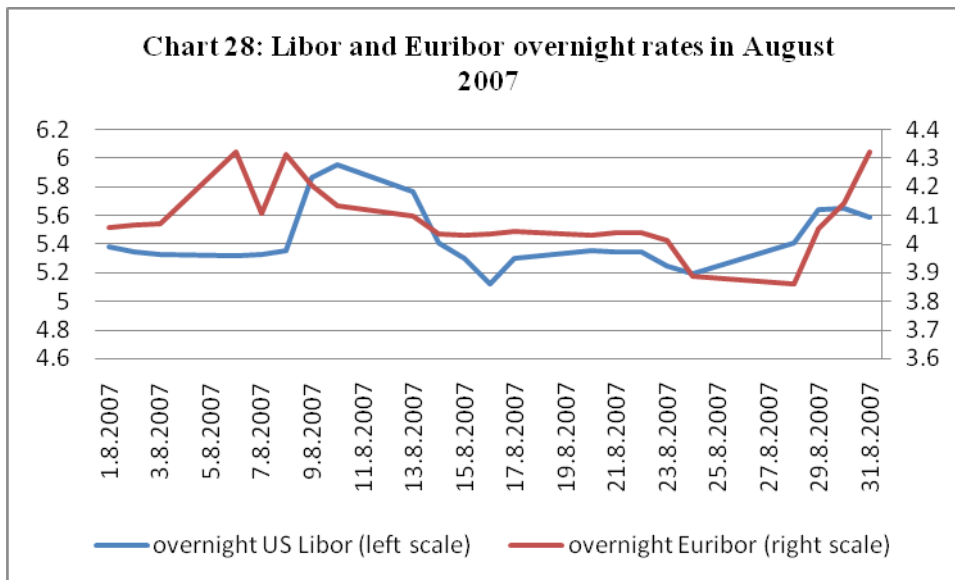
The situation worsened a lot. Bank suddenly realized that securities in their or their investment bank's portfolios (namely those backed by subprime mortgages and namely CDOs) were not rated properly, turned out to be illiquid (see the not successful attempt to sell securities of those two Bear Stearns' hedge funds and what is more – worthless.

It also came to the surface, that conduits and special purpose vehicles were not as independent from the issuing investment banks as always thought, since someone had to pump in them some liquidity – and because the credit market broke down, stopped offering any liquidity, the “mother” (investment) bank was left to do it, in order to prevent them from bankruptcy.

Uncertainty regarding overall losses and exposure has raised market and liquidity risks, with potentially broader implications for financial institutions (IMF, 2007). These implications have become obvious later: the inability to raise funds.

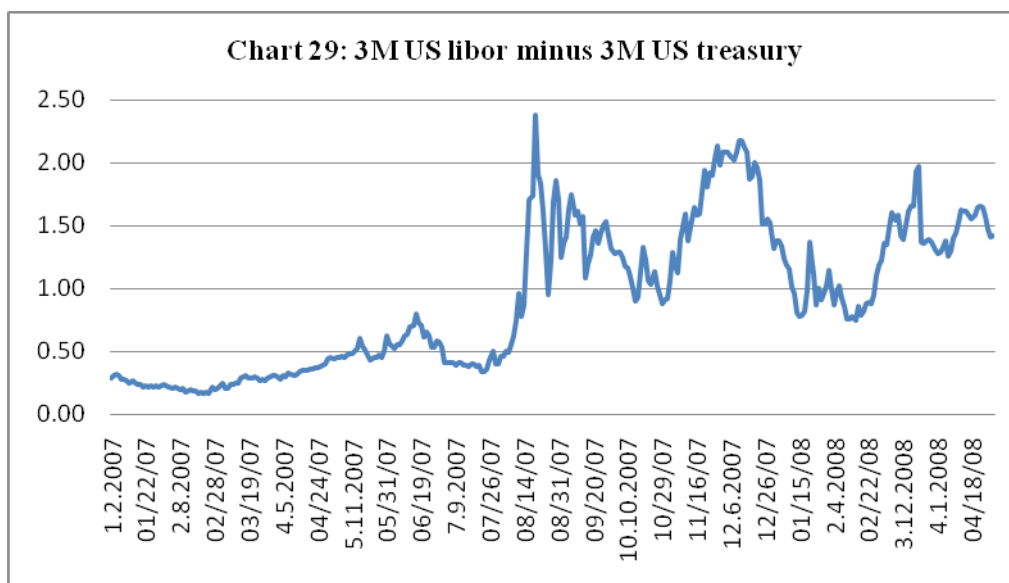
The response of the market to the IKB announcement was immediate increase of overnight interbank (LIBOR and EURIBOR) rates⁹¹ (see Chart 28).

⁹¹ First in Europe, a day later also in USA.



Source: econstats.com

Another indicator for this is the TED spread ⁹² (see Chart 29).



Source: econstats.com

There was also another cause: BNP Paribas suspended withdrawals from some of their hedge funds hit by the investment into CDOs. Normally, these rates are closely aligned with the expected interest rates set by the central bank. This time, they were almost one

⁹² The Ted spread measures the difference between the 3-month LIBOR rates and 3-month Treasury bills.

percentage point higher. Banks did not want to lend their money. Lenders who cannot distinguish good borrowers from bad become less willing to lend to anyone (The Economist, 2007).

The increase in interbank rates reflected a mix of liquidity and counterparty credit risks, in proportions that have proved hard to disentangle (Borio, et al., 2008). Central banks⁹³ responded to this by pumping liquidity into the market. ECB released €156 billions in repo-operations on 9 Aug. and 10 Aug, Fed \$62 billions in the same days. Also other central banks (Japan, Canada, Australia) followed this decision to provide more liquidity to the market. The only major central bank that acted differently was Bank of England, which did not decide to provide some liquidity until September (19 Sep).⁹⁴ These interventions were successful, as the interbank rates – although only in the very short-term segment of the yield curve - decreased.

Since August, there were another two periods when the situation in the credit market escalated⁹⁵ - in December 2007 and in March 2008. Every time central banks had to intervene in order to get the market little bit moving. Since January 2008, they accept (while doing repo trading) structured products as a collateral, in order to try to revive the market.

During late 2007 and early 2008, another problematic banks and hedge funds emerged (mainly in the USA). In Germany, besides IKB, were also problems with some of the partly state-owned Landesbanks – West Landesbank and Sachsen Landesbank. Number of large institutions announced significant losses. In the UK, Lloyds, HSBC. In Canada Coventree, in the US Goldman & Sachs' hedge funds and some Citigroup .

All of these, as already indicated above, have mainly problems with conduits, structured investment vehicles (SIVs) and SIV-lites, and their problems with time mismatch of funds and investments. These traditionally borrow short-term funds (f.e. asset-backed commercial papers) and invest them into highly rated, high-yielding instruments (f.e. mortgage backed securities, CDOs). However – as the credit market collapsed (no one

⁹³ Federal Reserve (FED) and European Central Bank (ECB)

⁹⁴ And yet none of the banks applied for the bid-auction when it was at last settled.

⁹⁵ Periods when the overall not good situation got even worse.

was willing to lend to anybody – mainly not them investing into CDOs, that turned out to be worthless), so the sponsoring banks had to provide further liquidity. And given the closed credit market – banks were forced to sell their best assets⁹⁶.

What is more – those who already invested into hedge funds (primary brokers) issued margin calls⁹⁷ (they were worried about the funds' overexposure to the subprime market, and thus possible losses). This also resulted in fire sale of highly liquid assets and put stock markets into a tailspin.

Banks and hedge funds were trying to solve the situation by closing their positions – however as the market for CDOs was not liquid at all, this proved to be impossible, so they had to start writing off huge losses and reprise all those various asset-backed securities they were holding in their portfolios.

There was another factor causing the situation for them to be this difficult – they simply did not think that something like that could happen, because their quantitative models did not predicted any such problems. According their models (and it turned out they were all using very similar models) the probability of anything like this to happen was almost zero.

Many also believed that with the introduction of credit derivatives, a new period arrived, that thanks to the credit derivatives and the principle of risk sharing, future market bias and corrections will be softened and their impact will not be that huge. The truth is, exactly the opposite happened. Because of the very long period without any severe market fall and with risk premiums pushed to the very bottom, market players just got used to it and adjusted their expectations accordingly, returns were more correlated.

This has changed as the stock markets began to fall. Similar risk management techniques, common investors, and similar positions may have exacerbated the situation – losses were magnified as many market participants tried to exit similar positions simultaneously (IMF, 2007).

⁹⁶ These are high liquid and can be easily sold.

⁹⁷ Hedge funds were asked to increase their collateral against the risk of default.

5.4 Selected banks in problems and banks' losses estimations

Northern Rock is one of the two biggest victims⁹⁸ of the current crisis. Only a year ago, this British mortgage lender was praised as the best financial borrower in 2006. Currently it has been nationalised (22 Feb 08), in order to be saved from going bankrupt – after a unsuccessful attempts to find a strategic investor.

The bank special in raising its funds from the wholesale market, rather than from retail customers – that turned out to be deadly, together with a too big market share (19% of the net new-lending market in the first half of 2007) gained too quickly (at the end of 2006 just 7%⁹⁹), once the wholesale market broke down. The bank's business model was built on an assumption that it could always securitize its mortgages (Giles et al., 2008). When then suddenly the market for mortgage-backed securities collapsed, they were simply out of the money. The bad situation of the bank caused a first Britain's bank run in more than 100 years.

The situation has stabilised after the bank was nationalised and a new manager was installed. The bank finally ended with a loss of £167.6 millions (2006: £626.7 millions profit). The acting of Bank of England as a lender of last resort and as a bank regulator has been widely criticized in the case of Northern Rock, as being slow, not flexible, and by that worsening the situation even more (Giles et al., 2008; The Economist, 2007).

Bear Stearns was the other bank facing a lot of problems during this time. This one is however of a bigger importance, since as a big global investment bank influences the world market and its bankruptcy could have far-reaching implications.

The main problem of Bear Stearns was that it held too many mortgage-backed securities, structured products and other nasties, that all are hard to value (The Economist, 2008). And one cannot expect they would be worth much.

Finally, the bank was bailed-out by JP Morgan and Fed – where JP Morgan provided the much needed liquidity and Fed bears the risk, which means the end of Bear Stearns' 85-year run as an independent investment bank (Landon jr., 2008). This was taken as a

⁹⁸ Together with Bear Stearns

⁹⁹ Source: The Economist, 2007

positive signal to the market that helped to regain the confidence, that Fed is willing to help financial institutions, even without any retail depositors. The boost of confidence has helped banks to repair their balance sheets by raising large sums from both shareholders and the bond markets – maybe financial Armageddon had been avoided (The Economist, 2008).

Of course, also other banks suffered huge losses. The IMF estimates, that in general, all market participants suffered losses of \$950 billions¹⁰⁰ – banks alone lost \$500 billions.

Table 5 calculates the overall losses:¹⁰¹

Table 5: estimated losses since the beginning of the crisis
(billions of USD)

| Reason for a loss | Loss |
|-------------------|------|
| Conduits/SIVs | 35 |
| ABS CDOs | 135 |
| ABS | 35 |
| Subprime loans | 50 |

Source: IMF

Another estimate, made by OECD and based on a default model basis talks about \$422 billions of losses arising from subprime mortgages (OECD, 2008). However, given the illiquidity of the credit markets, it is very hard to get correct valuation of the CDOs. Thus, the estimates are rather preliminary.

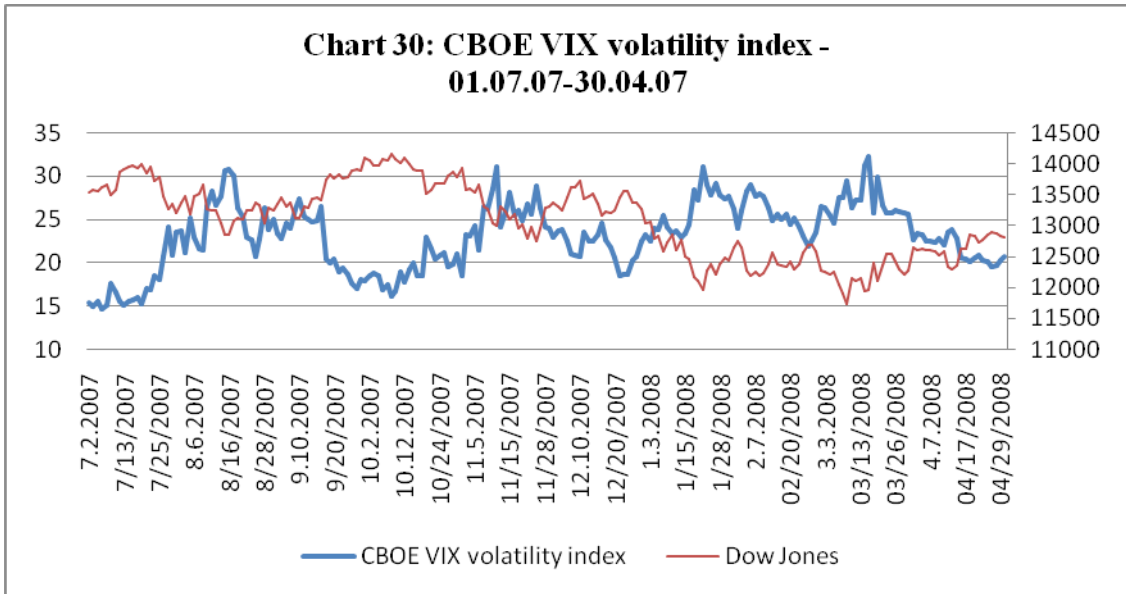
5.5 Financial markets development during the crisis

Stock market went through a very wild period since August. There has been a number of sell-offs, the first one came on 9 Aug as a reaction to German bank's problems. The Dow Jones index fell between 8 Aug 07 and 30Apr 08 by 6.13%, the lowest point was achieved on 10 March 07 and the highest point on 9 Oct 07. (see Chart 30 together with the volatility index)

¹⁰⁰ This was taken as from the beginning of the crisis to the end of March 2008.

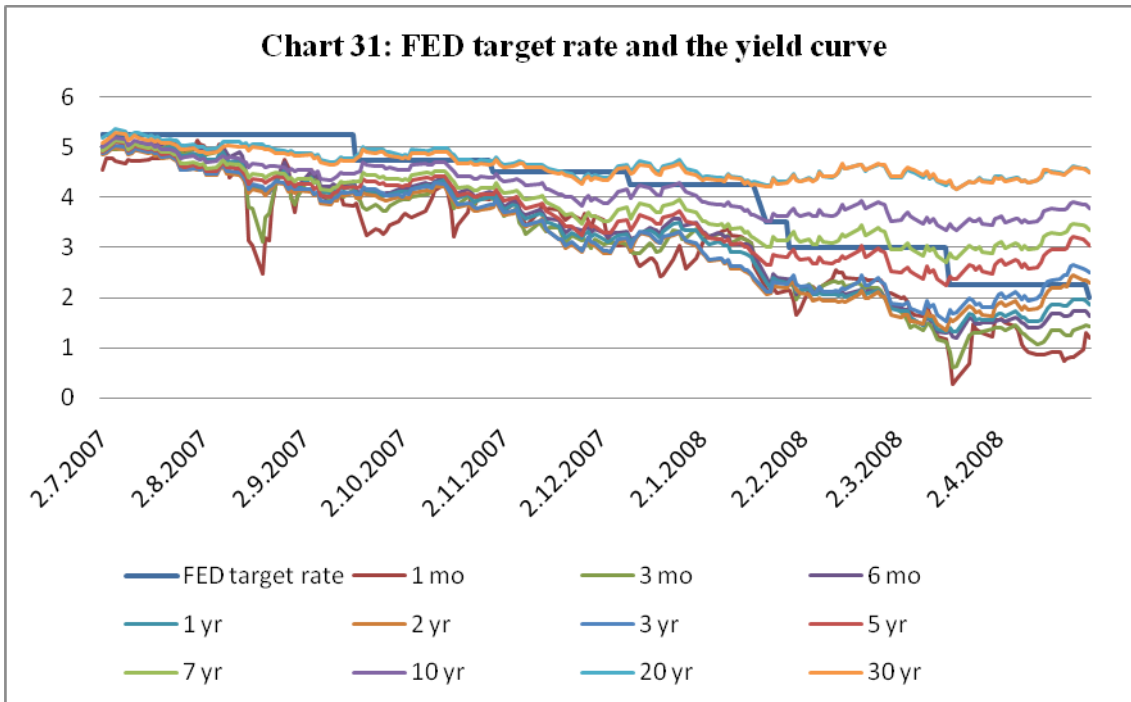
¹⁰¹ This contains banks from USA, Europe, as well as Asia.

As already mentioned, the market falls are a result of banks searching for liquidity and thus selling their most liquid assets, retail traders, who are subjected to some psychological issues, and certainly also in general overpriced shares (see Chapter 2).



Source: finance.yahoo.com

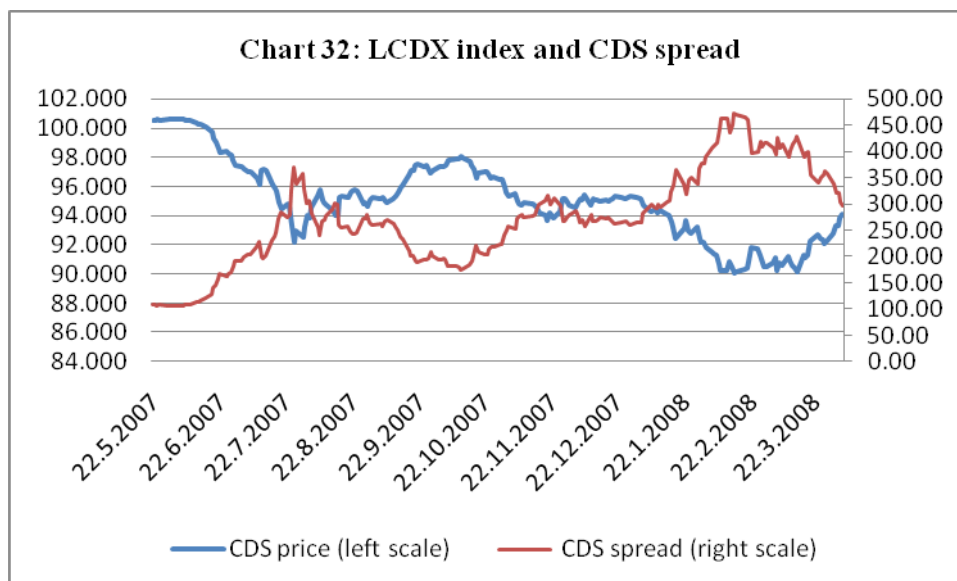
Because stock markets proved to be extremely volatile and falling, investors turned to the market of government's treasuries (see Chart 31). The extreme demand pushed the bonds' prices up and therefore the yields fell.



Source: econstats.com, treas.gov

From the start of the crisis in early August to September 2007, when the rates were cut for the first time (18 Sep), the entire yield curve lied below the FED target rate - this was a very unhealthy and dangerous period (Connolly, 2007). Since then, a policy of easing rates has been applied – short-term rates were pushed down and the yield curve has become steep again. The healthy risk aversion has returned to the market – short-term bonds yield less than the long-term ones.

The market for structured products (CDO, CDS) suffered hard hits and it certainly is going to take years in order to restore the market faith in these products again. In chart 32 we can see that CDS prices suffered huge losses. However, the market seems to be improving in recent times. For the huge decline in newly issued CDOs, see chart YY.



5.6 Central banks' reactions and the current situation

The interventions of central banks were a subject of a certain discussion. The question was whether the banks should intervene at all¹⁰² - having in mind that the market for credit derivatives is a market, where mostly only professional banking players occurs – there is thus no evident need for consumer protection that would justify the intervention of the authorities (Nyberg, 2007).

The central banks were accused of not understanding fully the essence of the crisis – the crisis is widely considered as a liquidity one, but it is more widely an insolvency one (Roubini, 2008) and a capital one (Connolly, 2007) – of using inappropriate models (Connolly, 2007) – and of using wrong reasoning when explaining the rate cuts and describing the whole macroeconomic situation (Todd, 2008).

In general, central banks were facing four major challenges: to find an appropriate policy, given the serious market disturbances, to restore standard conditions in the interbank market, to find a policy corresponding with the potential macroeconomic threats caused by the turmoil (Borio et al., 2008). The following Table 6 illustrates

¹⁰² By this is mainly considered the pumping of liquidity into the interbank market.

which steps were undertaken by which major central bank in order to keep the situation stable.

Table 6: Policies applied during the turmoil

| | ECB | BoE | FED |
|---|-----|-----|-----|
| Exceptional fine-tuning (frequency, conditions) | X | X | X |
| Exceptional long-term open market operations | X | X | X |
| Change in the standing lending facility | | | X |
| Broadening of eligible collateral | | X | X |
| Change in banks' reserve requirements/target balances | | X | |
| Broadening of counterparties | | X | X |

Source: (Borio, et al., 2008)

However what is dangerous about all this actions taken by central bank is the problem of moral hazard. Market players now see that central banks are willing to encourage a wide range of rescuing procedures in order to maintain stability. This might prompt investors to take even bigger risks in future, with potentially catastrophic consequences (Giles, et al., 2008).

Currently (beginning May 2008) the situation seems calmer and improving. Stock markets seems to have stabilized, the corporate credit spreads have come down sharply, bankers talk about having put the worst behind them, central banks' rates may have reached the bottom, Bear Stearns has been rescued (The Economist, 2008).

But there are also some bad news: the housing market is getting worse, little demand for high-yield debt, the securitization business is ruined and it is going to take some time to restore it, there are still lots of price anomalies, cost of funds are not sinking, counterparty risk is still present (Tett, et al., 2008). Central banks and international institutions do not agree on the extent of the impact of the crisis on the real economy, but they do agree that the impact will be visible. The economic development in the US has already started to show signs of recessions, a question remains about possible contagion effects on Europe and other countries.

Certainly, the current run of good feelings could easily be disrupted by a countless number of shocks, including worse-than-expected economic numbers, ever higher oil prices or, perhaps most important, a large default that comes completely out of left field (Tett et al., 2008).

Chapter 6: Assessment of the 2007 credit crisis

In this chapter, I review the main causes of the crisis – it turns out the features typical for the period prior the crisis are one of its causes. Also I discuss possible signals. It is clear no-one can predict the future, but there were surely some sign, that something is going on. And finally, I discuss possible implication of the crisis, what impact can it have on the financial market.

6.1 Causes of the crisis

A number of factors stand behind the development in financial markets that resulted into the crisis we are currently facing. Here, the low interest rates, massive lending by mortgage lenders, securitisation, flood of liquidity, SPV investments and rating agencies are discussed.

Low interest rates

The central banks kept their target rates low, and so influenced also market interest rates. Thanks to this, loans and mortgages became more available. The credit bubble was created by G-10 central banks. (Conolly, 2007)

Had not had the interest rates be so low, the mortgages would not have been accessible to anyone and so housing prices would not have risen.

Also as the rates were later increased, so did the mortgage rates (although they do not fully depend on interest rates, but also on long-term bonds' yields) and so the interest that had to be paid were higher substantially (sometimes even by more than 100%). The problems in housing credit markets owe a great deal already to the Fed's mistake in keeping monetary policy too easy for too long (WSJ, 2007).

Mortgage lenders

The low and then high interest rates are of course not to be blamed for everything that has happened. Mortgage companies also bear a certain part of the guilt, that in the hunt for higher yields were willing to lend money to anyone, who just asked, without any further and proper recognition whether he will also be able to repay the loan.

Also lenders “invented” various new types of mortgages, that in a reverse look makes one wonder, how it is possible that borrowers were willing to accept such disadvantageous conditions. These inconvenient loans were based on a principle (their forms were changing, but the principle always remained the same), that the customer paid a very low interest in the beginning, but this was then offset by (much) higher interest in later periods.

All this seemed not to be a problem, when house prices were rising – if one got into troubles with repaying, he simply sold the house and because prices were higher, he earned enough money for repaying the loan with all interests. These tricky loans turned out to be a serious problem when the prices started to stagnate and then later also decline and fall in the latest periods. Borrowers did not have enough money for repaying the remaining amounts and so the number of defaults increased substantially.

The interesting fact is, that behind many of recent crises in developed countries stands the factor of massive lending. The thrift crisis in the USA in the 1980s, the Sweden crisis at the beginning of the 1990s and the parallel real estate bubbles were caused by the market liberalisation and thus opening of new possibilities for the banks or lending entities to earn additional money. This time it was not the market liberalisation causing the massive willingness of lenders to grant loans, but the introduction of new products (structured products), enabling the massive development of securitisation.

Securitisation

There can be no doubt, that all this would not have such a global impact, had not the securitisation (especially in the very sophisticated form) existed. The mortgage market (but not only the mortgage market – the loan market in general) would not have grown at such a fierce pace, if the mortgage companies had had not the certainty of a possibility of selling loans on the secondary market, and thus obtaining (or getting back) funds that could have been used for granting additional loans.

The securitisation is the key feature of the originate-to-distribute model that was highly used in the loans market in the recent years. Loans were packed into asset-backed securities, these were further repackaged into various credit derivatives – mainly CDOs.

So one group of loans served as an underlying for more than just one structured product (so in result one defaulted mortgage affected more than just one product). These structured became so complicated and unclear, that it was in the end almost impossible to say what is connected with what.

This is the fact that was so crucial in the end. No-one could see into those complicated structures, nor banks – thus no-one knew when additional liquidity will be needed to be added instead of those suddenly worthless credit derivatives.

The originate-to-distribute model broke down at a number of key points: underwriting process (complicated structures), credit rating (see later in this chapter), and investor due diligence (the risk aversion was small, investors did not investigate, what they were investing in) (Bernanke, 2008).

Liquidity surplus

The liquidity surplus was also one of the main factors – it helped to inflate stock prices, house prices, pushed down bond yields, helped to boost market for credit derivatives and affected risk aversion.

Also because the rather “traditional” ways of investing were used to their very edge (the yields were pushed down maximally), new ways of investing were created or those which had already existed but had not been used at a massive scale, started to be very popular – this is the case of securitisation and thus mainly the growing popularity of various backed securities and structured products. Partly also because of the liquidity flood, the risk aversion was reduced (this was partly also because the favourable economic situation).

The disadvantages of such a big portion of liquidity were the same as the advantages: using the structured products at a large scale and low risk aversion. The problem is, that those various backed securities and CDOs had never been through a crisis or any turmoil before, so there was no experience of what might have been going on in such times.

Of course, it is not bad that these instruments were tested by a crisis, the problem is that their usage was at such a large scale, that their collapse spread as a contagion to sides of financial markets where no-one would had expected it. Ironically, it had been widely expected, that the products will lower the shock of a crisis, actually. It was believed, that their usage will lead to risk transferring, that the banks by selling their loans will get rid of the possible credit and default risk. Instead: the risk was not avoided, it was shared or maybe even multiplied. As the problems appeared, the risks flowed back to the banks, as toxic assets were returned to their balance-sheets (Economist, 2008)

Factors that contributed much to deepening and extension of the crisis are: special purpose vehicles and misunderstanding of rating principles.

Special purpose vehicles (SPVs), conduits, SPV-lites

The SPVs were another factor that played a substantial role in the recent development. They already came were once focused by the press and public, in connection with the Enron and Worldcome affairs. At that time their problem was different, their abusive usage, for the purpose of making private benefits to companies' managers.

This time their problem was completely different. The time-mismatch of their assets and liabilities was a cause of far-reaching problems. As already mentioned (see chapter 5) the problem of SPVs was that they hold as their long-term assets various types of the new financial products – backed securities, CDOs, etc. The bad thing was that they were bounded with the problematic subprime mortgages. And as the panic came to the market they became short of liquidity, the mother banks had to pump its own liquidity into them, and thus stopped being willing to lend to other banks.

Rating agencies

Rating agencies played also a substantial role in the process of the crisis. It was them who started the downgrading of the structured products in the first half of 2007 and by that surely contributed much to the nervousness on the market. They were blamed for not being able to evaluate the structures properly already in the beginning, and causing the whole crisis by their downgrading later on. This implication is however wrong, the rating agencies do not evaluate the product, they are just computing the probability of

its default and surely the probability must have been changing at that time, as many subprime mortgages were being reset.

Also as the market for structured products was rocketing, the number of products to be evaluated was growing. However the number of rating agencies was not, one could thus come to the idea, that the rating could not have been done properly, with such an enormous quantity to be rated. And the agencies might not have been experienced enough, as the markets for this products are not very old and so there is not enough experiences with them.

What might be controversial is the role of rating agencies in the whole process of creating the structures. They were advising how to best form a security or a tranche in order to get a certain rating, which type of loans to involve and which one not. Also there is the thing of a possible cross of interests, in that way, that it is the issuing company, who is paying for the rating, so doubts can occur, that the one who is paying can actually also dictate how the final result should look like.

6.2 Possible signals of the upcoming crisis

There can always be found some signals, of that something was going to happen, or at least that something not very usual was happening. Here, the development of key indices before the crisis is discussed and assessed as possible signals of future problems.

Volatility index

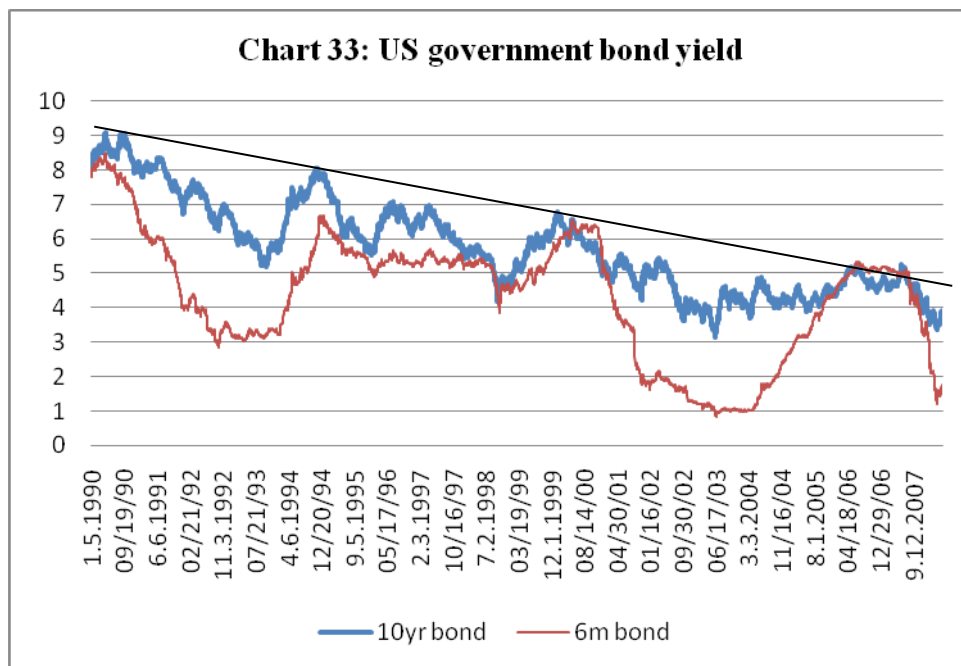
After the February 2007 correction the volatility index did not return to as low levels as it was before (this was unusual in the context of the last decade's development), what is more, the index rose in the second quarter of 2007 – the market was expecting the volatility to rise in the near future. This was clearly a sign of a certain disquiet arriving to the market – subprime market was starting to have trouble, default rates started to rise, etc. Although shares soon caught up the loss from the February 2007 correction, but thanks to the appreciating yen, the carry trade suffered losses and also someone was selling American long-term treasuries, this was a sign that the situation was not fully calm again.

Stock prices

The stock price enjoyed a period of an enormous growth, caused partially by the liquidity surplus, but partially also by the companies' good performance. On the other hand, they were still highly overpriced as assessed by the P/E ratio (see Chapter 2).

Bonds

The yield curve of American government bonds was inverted for a while – which is always a sign of upcoming problems – if the risk premium is higher for short-term investment tools than for the longer-term ones, this tells us something about the investors' faith of future development.



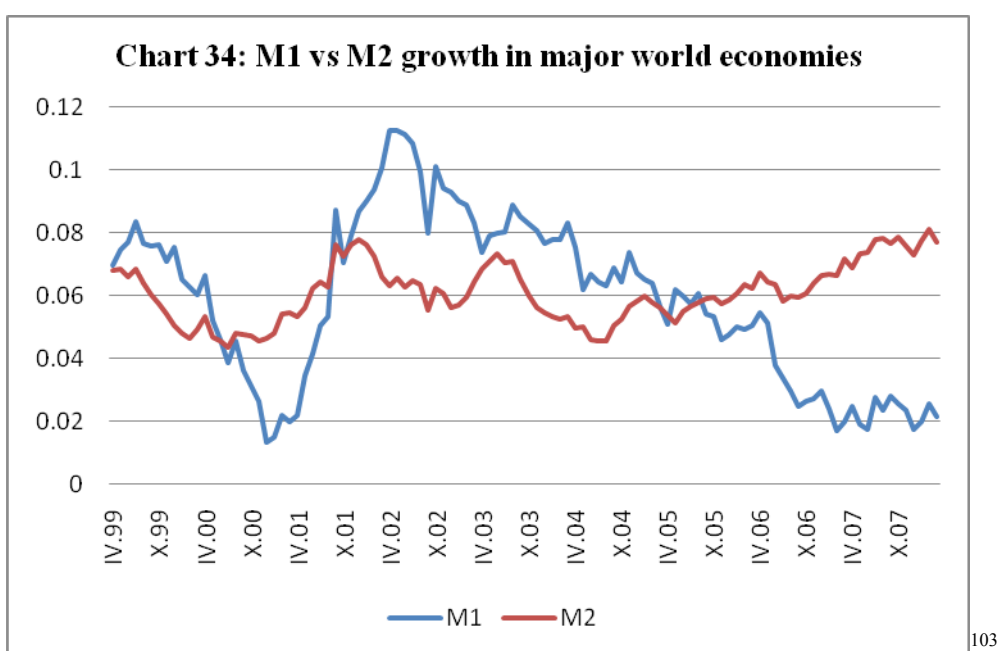
Source: finance.yahoo.com

Also, the 10-year government bond broke its long-term trend in the spring of 2007 (see chart 33). This trend lasted uninterrupted since the beginning of 1990's. Huge-sell offs were taking place. This could have been a clear sign of the future development – it is certain some hedge funds were starting to be short of liquidity already, so they were trying to get it on one of the world's most liquid market.

Money aggregates

As Chart 34 illustrates the monetary policy was tightened rapidly in 2006 and remains very tight since then (at least in comparison with previous decades). This was interpreted as a thread for the financial market and mainly for the global liquidity.

There were two scenarios about how the liquidity surplus will return to its “normal” levels. If the monetary policy continued its not loosened trend, then a sharp correction asset correction connected with risk re-pricing could have been expected. The second scenario counted with a softer return, however under the condition that the nominal global GDP growth would exceed the money growth (Becker, 2007).



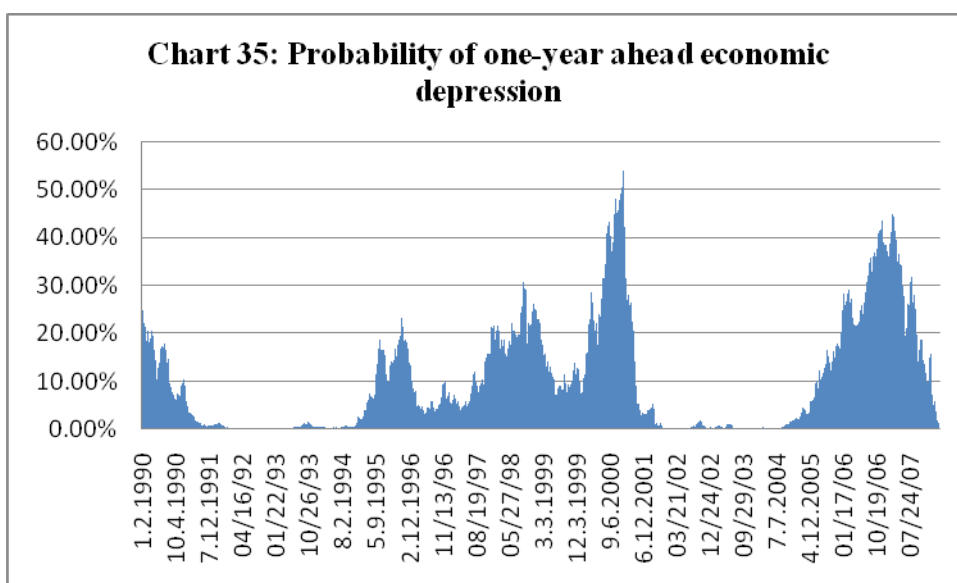
Source: Bank of England, Bank of Japan, ECB, FED

In the end both happened. The monetary growth did not exceed the GDP nominal growth and the monetary policy remained tight (the M1 growth fell from almost 6% at the beginning of 2006 to as low as 2% at its end).

Bonds spread

¹⁰³ The charts are computed as GDP-weighted year-on-year changes in M1 and M2 money aggregates of United Kingdom, USA, Eurozone and Japan

The spread is considered to be a very reliable indicator of one-year ahead possibility of economic depression (Estrella, Trubin, 2006).¹⁰⁴ Chart 35 shows the probabilities computed on the basis of yield spread. We can see, that the short stagnation after the dot-com bubble was predicted by the spread. The same case is the nowadays stagnation (beginning winter 2007).^{105,106} At the beginning of 2006 was the probability of depression 20% (in one-year ahead term), at the beginning of 2007 was the probability 27.5%.



Source: own computation based on the model described by Estrella, Trubin (2006)

Default rates

The growing default rates were also an indicator. In the time when home prices started to stagnate or even decline and therefore number of defaults started to rise, it must have been obvious that problems are about to come: 1.3 million of homes were in default in 2006 – a 42% growth in comparison with 2005. (Economist, 2007)

¹⁰⁴ The probit model: $Recessm_{t+12} = F(\alpha + \beta sprd_t)$, where $sprd_t$ is the spread for a given month t , α and β are constants (their values were estimated as: $\alpha = -0,6045$, $\beta = -0,7374$ on the basis of previous observations), $F(z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{x^2}{2}\right) dx$ and $Recessm_{t+12}$ is the probability of a recession occurring in the month $t + 12$ from the viewpoint of information available in month t .

¹⁰⁵ Having this in mind, it seems that the cause of all depressions (or at least of the probabilities of depressions) is a tight monetary policy. According to this model: if the monetary policy were loosened, the spread would not be narrow, and therefore the probability of a depression would be small.

¹⁰⁶ Inverted yield curve is then, thanks to this measure, taken as a sure signal of recession (if it lasts long enough). (Estrella, Trubin, 2006)

IMF prediction

The IMF published five factors predicting the credit cycle to change (IMF, 2006). These criteria are: changes in credit spreads in the corporate bond and credit derivative markets, changes in the difference between the number of credit upgrades and downgrades and the default rates, changes in credit standards used by commercial loan officers, changes in the volume of credit flowing to the corporate sector, changes in the quality of corporate balance sheets.

According to the IMF measures, already at the beginning of 2006 there were signs, that these figures were changing, and that the credit cycle would change.

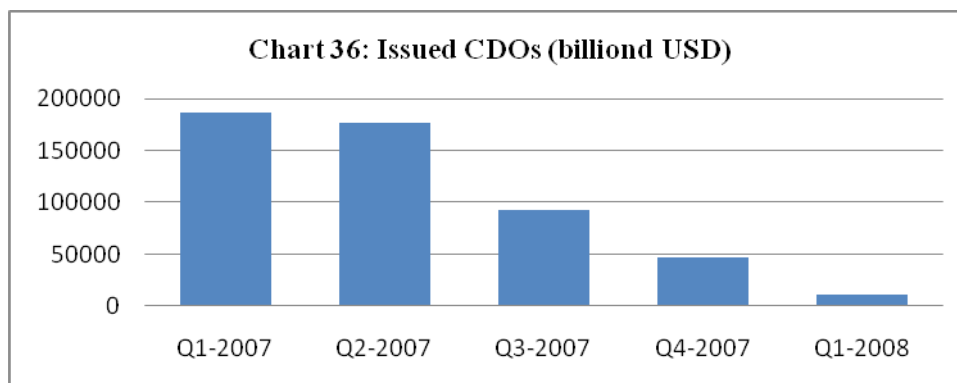
6.3 Consequences of the crisis

Although the crisis is not over yet, we can already see some consequences of the crisis for the financial markets, leaving aside the impact on the real economy.

The Great Moderation period is over, or at least seems to be interrupted.

The securitisation market has been ruined. The confidence in its main feature, the CDOs, evaporated (as the number of newly issued CDOs is only a fraction of the numbers before the crisis (see chart 36)). Some call for abolishing these instruments, as it has not proved itself to be able to survive a crisis.

The CDOs turned out to be victims of their over-usage, of not proper understanding their principles and of low risk aversion. (Bernanke, 2008)



Once the faith in these products is restored (and it probably will, as it still represents a convenient tool for securitisation, their break-down was primarily caused by growing defaults not by any errors in those structures themselves and also the controversial rating principle seems to be changing as rating agencies announce to try to introduce a new model), the products will become much standardized or heavily regulated (in worse case scenario, as today's principles of regulation rather aggravate cycles than prevent them (Kay, 2008).). What is more, now there is this crisis experience that tells us, what the possible outcomes, in case of a next imaginary bubble, would be – that is something that we were missing before.

The American economy will suffer the most, the number of unemployed people has risen by more than 11% in comparison with the same period of last year, the retail sales has slowed down to the lowest growth since 2002 in recent month (2.03%), prices are growing at 4% y-o-y, the GDP growth is stagnating.¹⁰⁷ A wave of bankruptcies is expected. (Munchau, 2008)

House prices continue to fall, that is going the situation on the mortgage market even worse. The foreclosure rate is expected to be higher than in 2007, when 1.5 million U.S. homes experienced starting of foreclosure proceedings. (Bernanke, 2008)

Impact also on other countries is expected. IMF predicts that because of the greater role of banks in credit intermediation in many European economies than in United States means that the impact on European economies could be significant (IMF, 2008). On the other hand, the advantage of European countries is not having problem with defaulting mortgages, as the USA does. The economy is expected to grow by 1.3% to 2.1% (Trichet, 2008).

The impact of the crisis on emerging markets (including the Czech Republic) has been so far limited. Policy improvements have contributed to the resilience of many emerging markets in the face of the global turmoil (IMF, 2008). Unlike many previous crisis, the shock experienced in Western markets have not cascaded down through the

¹⁰⁷ Data source: econstats.com

global credit, foreign exchange and money markets, although we have seen some significant corrections in the equity markets (Ackermann, 2008).

This holds also for the Czech Republic, too. The macroeconomic situation has not been influenced by the credit crisis, the only possible problem could be the weak dollar, thus stronger euro and in result strong Czech currency (and possible problems for exporters). The linkages between the Czech and the US economy are not that binding, in order the USA to influence directly the Czech economy (Šimáček, 2007). Some signals suggest that the Czech mortgage market is slowing down a bit, but that might be mainly because the mortgage boom has slightly decelerated. Growing default rates are not likely to appear, as no large interest rate increase (as in the US) is expected. Also the banks appear not to have relaxed rules for lending, on the contrary: as a consequence of the turmoil that has also hit the foreign owners of the banks in the Czech Republic, they are now more careful in choosing whom to lend.

The real victims of the crisis appear to be the globally active banks. Their losses are estimated to be as high as \$500 billions (IMF, 2008). Many of them has to reduce their activity in the fields of investment (for example the Swiss UBS bank), many were forced to decrease the number of employees significantly (for example Merrill Lynch will fire 4000 employees). Moreover, the banks still do not trust each other, the counterparty risk still exist, the Libor spread is still larger than it was before the crisis (see Chart 29). Restoring the market confidence is yet crucial for resolving the crisis. (Heikensten, 1998; IMF, 2008)

Conclusion

The year 2007 was the year of the credit crisis, which was mainly a crisis of confidence and banks' unwillingness to lend money to each other and to some customers, too. This was triggered by the technique of securitization that became enormously popular in recent years.

Factors standing behind the crisis were mainly low interest rates leading to easily accessible credits and excessive lending of mortgage brokers. They faced a peculiar incentives to lend to anyone, because they immediately sold the loan on the secondary market, earned a fee and did not care about the loan anymore. The massive sales were able thanks to the process of securitisation that transformed the loans into CDOs and asset-backed securities and sold them in forms of tranches to investors willing to invest, thanks to the liquidity flood.

As the structured products were quite new, and used for the first time at such a scale, the behaviour of them during a crisis was unpredictable. In the end it affected credit markets, equity markets, bond markets, money markets and substantially disrupt the counterparty trust in interbank markets. Banks were not willing to lend to each other, both because of credit risk concerns and also out of the fear of being hit by a problem of not having sufficient liquidity themselves for their commitments related to SPVs and alike.

One of the lessons of the 2007 credit crisis is if risk aversion is low and investors do not investigate what tools they are investing in, risk may be heavily underpriced. Moreover, too much reliance on the rating agencies did not help as the technique of rating was often misunderstood. There were some signals of upcoming problems, mainly the default rate, however, as investors had not enough experience with these products and as the risk aversion was at very low levels, they did not pay enough attention to them. The final losses of financial institutions and the impact on the real economy and development of financial markets may be rather large and will have to be investigated in detail in the near future.

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Diploma Thesis Project

Diploma thesis project

Name: The 2007 Credit Crisis: anatomy, causes and consequences

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Consultant: PhDr. Adam Geršl PhD.

Introduction:

The year 2007 was meant to be a successful year again. Many expected the world economy to continue in its trend of growth. Investment banks were very optimistic in their future development. Stock prices should have continued in their continuous growth.¹⁰⁸ Market for credit derivatives should have doubled its size again.¹⁰⁹ But it did not happen.

Instead of this we witnessed the fact that financial markets are interconnected and correlated more than ever. That such a thing like stagnating or declining housing market in the USA could in the end result in stock prices falls all over the world and persisting lack of liquidity.

The connection between the American housing market and the huge price correction were the structured products, or collateralized debt obligations (CDOs), to be precise. This quite new products serve to postpone the default risk from banks offering mortgages to individuals wanting to bear the risk in exchange to compensating cash flows. CDOs improves non-bank investors' access to credit market. (Cousseran Olivier, Rahmouni Iméne, 2005) This works well under the condition of no huge defaults. Losses as a result of default are the major risk of the structure. (Das, 2006) Unluckily

¹⁰⁸ The S&P 500 was expected to grow for about 10% annually. – Tobias Levkovich, CitiBank Group (the actual grow was less than 5%)

¹⁰⁹ According to the development in recent years, when the volume doubled every year.

this is exactly what happened. A massive amount of defaults occurred and the CDOs moved from a profit-producing tool into a disaster-producing tool.

The disaster was a crisis that occurred in the year 2007. It started with already above mentioned crisis in the American housing markets and over the CDOs hit the stock markets, in the end. In my thesis I would like to analyze the crisis, its causes, developments, consequences. I would like also to analyze possible correlation that each stages of the crisis could have with the stock, possibly bond markets.

The future development remains uncertain. The housing prices in the USA are expected to continue declining and the decline should be more significant than what it has been so far. (Schumer Charles, Maloney Carolyn, 2007) The question is then, whether are the market players have already adapted to this new conditions, or whether we should expect another crisis.

Structure of the thesis:

The thesis will be divided into six parts.

The first part will consist of an brief overlook of market crises of the last decade. It will be described in brief, what the timing was, what their sources were, as well as whether they had any significant impact on the future development. It will be just a way of an introduction, in order to get an overview about the recent development on the global financial markets.

Questions to be answered: when did the crisis happen, what were their causes, what were their consequences?

The second part will be focused on credit derivatives and mainly on collateralized debt obligations. The mechanism of their functioning will be described, as well as the history. Another sub-topics: pricing, rating, market volume, types of underlyings, problems in the past. This chapter will serve as an introduction into the problematic of credit derivatives and should provide the reader with basic vocabulary and should introduce him basic problems, as well as

history of these products. Further a brief subchapter will be devoted to the credit derivatives crisis from the beginning of the century.

Questions to be answered: what principles are the CDOs based on, how are they priced, how are they rated, what was the purposes for the crisis of credit derivatives in the early 00's, what were its consequences?

The third part will be devoted to the American housing market. Its recent history and the present time, because this is the point where it all started, when the house prices started to stagnate. Further will be described the phenomenon of subprime mortgages, for the reason that this is the link between the housing market and the financial market crisis. This chapter will be an introductory one, again, this time into the problematic of housing markets, especially the American one. The reader will get an overview of recent problems and the price movements in the last decade, as well as an overview of recent American housing crises and of recent development in the mortgage market.

Questions to be answered: what was the recent development in the American housing market, what was the development in the field of mortgages, what was the default rate, were there any signals of the price decline?

The fourth part will be about the starting condition at the beginning of 2007 at financial markets. I would like to analyse, what the starting conditions were and what were the expectations about the 2007 development. The reader will get an overview of the situation at the beginning of 2007 on financial markets, about expectations and threats at that time.

Questions to be answered: were there any signals of the upcoming crisis, or was it all quite sudden and unexpected, what were the forecasts for the year 2007?

The fifth part will deal with the crisis itself, or better to say with all the actions that happened during the year. I would like to describe, what the milestones were and what were the reactions to them, what was the development during the year, how the crisis spread around the world, from the first hit subjects in the USA into the whole world. Another sub-topic of this chapter will be the description of how the crisis spread from the housing and CDOs market to the stock market all over the world and withdrew the liquidity, from which lack the markets have not fully recovered yet, how it is possible, that the results were as they were. This chapter will offer an analysis of actions that happened during the year, so that it would be clear from which to which point the problems were moving. It will be also shown how each stage of the crisis was

correlated with the stock prices movement and whether there were any signals of the future development (mainly of the down-swing in August).

Questions to be answered: what was the situation during the year, in which waves and from which sector into which was the crisis moving, was there any possible predictable correlation between the situation in various sector and the stock market, was the slight price fall in February a signal for the price fall in August, what were the reasons for such a massive price correction in the August, did the crisis end in the August and is it actually over yet?

The sixth part will discuss the consequences of the crisis. Some claim this all was just a beginning of problems we are about to face.¹¹⁰ So in this chapter should be discussed, whether the crisis ended or not, and sum up what problems remain to be solved.

Questions to be answered: Will this crisis have any further consequences, what was the real start of the crisis - was it just a result of mortgage banks' underestimating the situation or was it something different, is the crisis over?

Expected synopsis:

1. A brief overlook on last significant market crisis
2. Credit derivatives, CDOs
3. American housing market, subprime mortgage
4. Characteristics of the situation at the beginning of 2007
5. What happened during the year
6. Results and consequences of 2007 crisis

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