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This thesis is dedicated to Natalie.

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1. Introduction

During the summer of 2007 problems with U.S. subprime mortgages became public and subprime lenders in the U.S. went into bankruptcy. Financial institutions all over the world announced write downs of assets because they had invested in securities that were related to U.S. subprime mortgage loans. The fact that nobody knew who was affected created a situation of uncertainty and stock markets fell worldwide. Central banks had to pump billions of dollars in the markets to provide liquidity. The threatening danger of a recession in the U.S. and the bits and pieces of published losses without knowing the full extent forced stock markets to stay highly volatile in the second half of the year 2007 and reacting sensitive to news.

In my thesis I want to analyze the U.S. subprime mortgage crises, how it became a worldwide financial crisis and what have to be changed in regulations in order to prevent such developments in the future.

In the first section, I start with a characterization of the U.S. market for subprime residential mortgage loans and how subprime mortgages are sold on the secondary market. Then I discuss the roots of the U.S. subprime mortgage crises followed by market developments. I take a particular look at the impact on Austria and the ATX. In a correlation analysis I examine if the correlation coefficients between the ATX and other major European and American stock indices changed significantly before August 2007 and afterwards. In the last section I discuss future prospects and required changes of regulations of the U.S. subprime lending industry, the U.S. economy and the banking industry. I finish my thesis with a world economic outlook.

2. The U.S. Market for Subprime Residential Mortgages and Mortgage-related Securities

Lax et al (2004) defined subprime lending as a controversial segment of the United States (U.S.) mortgage market which is the largest debt market in the world.

2.1 Subprime Mortgages

According to Fabozzi (2002) a mortgage is a loan that is secured by the collateral of some specified real estate property. The borrower is obliged to make a predetermined series of payments. The mortgage gives the lender the right to foreclose on the loan and seize the property if the borrower fails to make these contracted payments in order to ensure that the debt is paid off. If an individual for example wants to fund a home purchase, he can apply for a loan from a mortgage originator. The mortgage originator performs a credit evaluation to decide whether the loan will be provided or not. The two most important factors to evaluate are the payment-to-income (PTI) ratio and the loan-to-value (LTV) ratio. The first one is the ratio of monthly payments to monthly income and represents a measure of the applicant's ability to make the monthly payments. The second is the ratio of the amount of the loan to the market value of the property and indicates the protection the lender has in case the applicant defaults on monthly payments and the lender must repossess and sell the property.

There exist traditional standard underwriting guidelines of the three Government Sponsored Enterprises (GSEs), namely are The Government National Mortgage Association (Ginnie Mae), the Federal National Mortgage Association (Fannie Mae), and the Federal Home Loan Mortgage Corporation (Freddie Mac). These guidelines require full documentation of income, employment and deposits, and 28% mortgage payment to monthly income, 36% total debt to monthly income and 80% loan to value as a maximum.

Additionally the applicant's credit history is measured by the FICO score. The FICO scoring system was developed by Fair Isaacs & Company and is used by lenders in the home equity, home mortgage, credit card and auto market. The FICO score is based on the applicant's previous credit history, length of credit history, current level of indebtedness, number of new credit inquiries and the type of credit available. Standard underwriting guidelines require a FICO score that is greater than 660. If a mortgage loan meets this underwriting standards mentioned before it is called a conforming loan and consequently if it fails the underwriting standards it is referred to as a nonconforming loan.

Borrowers who do satisfy the underwriting standards are referred to as *A credit borrowers* or *prime borrowers* and those who fail as *B and C borrowers* or *subprime borrowers*.

Johnson, Levy and Temkin (2002) group the products offered in the subprime market in three different groups:

- *Home purchase* and *refinance* mortgages targeted to borrowers with poor credit histories. The larger shares of these loans (80%) are refinance mortgages. Most time borrowers refinance mortgages for an amount greater than the unpaid principal on the original mortgage, thereby taking "cash out" of the transaction.
- *Alt A* mortgages that are originated to borrowers who can't document all of the relevant underwriting information when they apply for a loan. The purpose is again either to purchase a home or to refinance an existing mortgage. The FICO scores of these borrowers are comparable to those in the prime market.
- *High loan-to-value* (LTV) mortgages, which are originated to borrowers with relatively good credit scores but with LTV ratios that sometimes exceed 150%.

There is different information about on the contribution on each of these three types of loan to the total subprime market. Johnson, Levy and Temkin (2002) stated in their article that credit-impaired lending is about 75% of all subprime loans originated.

2.2 Development of the U.S. Subprime Mortgage Market

Consequently subprime lenders originate subprime mortgage loans to borrowers who do not qualify for loans based on standard underwriting guidelines, because they are perceived to have high credit risk. In some cases a mortgage broker acts between the subprime mortgage lender and the borrower.

Johnson, Levy and Temkin (2002) state that subprime lending is a different type of business compared to prime lending. In their interviews subprime lenders explained that originating loans to borrowers with low credit scores requires a personalized and manual underwriting process. Only with that a subprime lender can set appropriate prices for borrowers who are more creditworthy than their low credit scores might suggest. So the challenge is to judge and price risks accurately according to other standards used in the prime market in order to serve costumers who would otherwise not get access to a loan.

All mortgage borrowers are expected to earn sufficient income to make their payment obligations. Prime mortgage borrowers must document this ability with pay stubs, tax records and other financial documents. Canner, Laderman, and Passmore (1999) explain that the *low doc* or *no doc* segment of the subprime mortgage market serves borrowers who can not or do not want to provide this documentation.

What do the typical subprime borrowers look like and where in the U.S. do we find a high concentration of originated subprime mortgages? Subprime borrowers often have a weak credit history or other characteristics which are associated with a high probability of default. Lax, Manti and Raca (2004) analyzed the economic efficiency and found out that subprime borrowers are disproportionately part of a minority and lower income

group, less well educated, less financially sophisticated and less likely to search for the best interest rate when applying for a mortgage. Therefore subprime borrowers are more often riskier compared to their prime counterparts and pay higher rates and fees for their mortgages. Courchane, Surette and Zorn (2004) confirmed these findings with their analysis. They stated that subprime borrowers are less likely to be informed about the mortgage process and are less likely to search for the best mortgage rates. These circumstances make them possibly more vulnerable to mortgage outcomes, which are unfavourable. Further they showed persistence to the subprime market segment because borrowers are more likely to take out a subprime loan if their previous mortgage came from the subprime market segment. Additionally the analyses of the survey responses they made could show that borrowers with subprime mortgages are significantly dissatisfied with their mortgage outcome.

According to The Canner, Laderman and Passmore (1999) the proportion of minority and lower income borrowers is much higher in the subprime market than in the prime market. Scheessele (1998) documented that in the year 1998 African Americans and Hispanics accounted for less than 8% of conventional home purchase mortgages in the prime market whereas their fraction was nearly 20% in the subprime market. The same could be observed for refinance mortgages where 6% of all prime refinance mortgages but nearly 17% of all subprime refinancing mortgages were taken out by these minorities.

These racial disparities are not solely due to income. Immergluck and Wiles (1999) showed in a multivariate analysis of subprime lending activity that the proportion of loans originated by subprime lenders in a given census tract was most affected by the tract's racial composition, irrespective of income.

How did the U.S. market for subprime mortgage loans develop? After changes in legislation in the early 1980s lenders could originate mortgages with prices and features that were previously forbidden. Mansfield (2000) explained that the Depository Institutions Deregulation and Monetary Control Act (DIDMCA) adopted in 1980 deregulated loan rates through the pre-emption of state interest rate caps for first lien

loans on a borrower's house and through not setting an alternative rate cap and set a framework for higher interest rates.

The Alternative Mortgage Transaction Parity Act (AMTPA), adopted in 1982, preempted state laws that restricted a number of alternative mortgage features. The aim was an increase of loan products that reduced the up-front costs to borrowers in order to make homeownership more affordable. Lenders were allowed to originate mortgages with features such as variable interest rates, balloon payments and negative amortization.

In the following period the demand for home equity loans increased, but it is unclear whether lenders created a market for home equity loans or whether these laws made it easier to react on the increasing demand for such loans. Rising home values during the 1980s increased the amount of homeowner equity in the U.S. Additionally the Tax Reform Act of 1986 created another incentive because it contained a passage that prohibited taxpayers to deduct interest on consumer loans while it allowed them to deduct interest paid on mortgage loans secured by their principal residence and one additional home.

Mansfield (2000) stated that an increased number of homeowners used their home equity to retire other forms of credit because home equity mortgages were an alternative to unsecured consumer debt. In the year 1988 35% of home equity loans were used to repay other debt compared to 45% of such loans used to pay for home improvements. In 1994 these fractions changed respectively to 68% and 38%¹.

The growth in the 1990s was driven by the increased demand for home mortgage equity and technological developments like computerized loan application and automated underwriting systems, which made it easier for brokers and lenders to originate subprime mortgages. Brokers and mortgage companies started to originate a larger number of subprime mortgages in 1994 in order to maintain profits and utilize existing

¹ Because some loans were used for more than one purpose these numbers do not add to 100%.

capacity after prime loan volumes declined because the Federal Reserve increased interest rates.

As the growth of subprime market lending continued consumer groups and government regulators were concerned that some lenders in the subprime market took advantage of borrowers by engaging in questionable marketing techniques and fraudulent business practices. Such borrowers were accused of practicing predatory lending. According to the U.S. Department of Housing and Urban Development (HUD) predatory lending involves practices in which lenders, brokers or home improvement contractors have been engaged in deception or fraud. The borrower is manipulated through aggressive sales tactics or lenders take unfair advantage of the borrower's lack of understanding about loan terms. Additionally loan terms are used that are abusive or make the borrower more vulnerable to abusive practices. Bunce and Fishbein (2000) explained that the HUD identified four frequent predatory practices: loan flipping, charging borrowers excessive fees and packing them into the loan amount, lending without taking into account the borrower's ability to repay and finally outright fraud and abuse.

A mortgage broker is a salesman who wants to maximize his net income. This means that a broker does not always act in the interest of the borrower providing him the cheapest mortgage. Moreover, the opposite is the case since lenders sometimes pay brokers premiums if they sell loans with interest rates above the minimum acceptable rate for the loan (yield-spread premiums) or loans with heavy prepayment penalties. Renuart (2004) argued that because a broker bears little or no risk in case of a default of a borrower, there are no economic incentives to originate loans that are affordable for borrowers in the long run.

Such abusive and predatory lending increased since brokers and mortgage companies were only weakly regulated. A large extent of subprime loans was made by companies that specialized in mortgage lending. According to Gramlich (2007), 50% of subprime loans were made by independent mortgage companies that were state-chartered but not much subject to federal supervision and 30% were made by subsidiaries of banks and thrifts that were less lightly supervised than their parent company. These independent

mortgage companies and bank subsidiaries were not deposit-taking institutions and therefore not subject to regulations that govern federal or state banks. Because they are state-chartered, they are subject to state law. The Home Owners' Equity Protection Act (HOEPA) and the Community Reinvestment Act monitor these entities less closely. In some states there have been tries to apply federal predatory lending advisories to all lenders or to regulate brokers and lenders, but states have fewer resources for oversight than the federal government.

Regulatory agencies increased their oversight of the subprime lending market and as a result the Federal Reserve, the Federal Deposit Insurance Corporation (FDIC), the Office of the Comptroller of the Currency and the Office of Thrift Supervision started to set policies like capital standards that would affect more subprime lenders. Additionally guidelines that provided recommendations for the banks, from managing the risks of subprime lending to selling the mortgages, were published.

The expansion of subprime mortgage lending in the period 2001 to 2006 came primary through a well defined channel of financial intermediaries. The players in this channel were brokers, mortgage companies and firms, which securitized these mortgages and sold them on to the capital markets. All of the financial intermediaries mentioned before were interested in an increase in the supply of loans. One outcome was a significant increase in the rate of homeownership that rose from 64% to 69% in the years from 1994 to 2005 as data from the Bureau of the Census, U.S. Department of Commerce show².

Alan Greenspan, the Federal Reserve chairman, remarked on April 8, 2005 that advances in technology had changed mortgage lending: *"Where once more-marginal applicants would simply have been denied credit, lenders are now able to quite efficiently judge the risk posed by individual applicants and to price that risk appropriately."*³

² Data from the Bureau of the Census U.S. Department of Commerce. Available at <http://www.danter.com/statistics/homeown.htm> (visited January 14, 2008).

³ See *Remarks by Chairman Alan Greenspan at the Federal Reserve System's Fourth Annual Community Affairs Research Conference*, Washington, D.C., April 8, 2005. Available at

2.3. Mortgage-related Securities

In this section I examine how subprime mortgages are securitized and sold on the secondary market. I start with the characteristics of simple asset-backed securities (ABSs) and mortgage-backed securities (MBSs) before I move on to structured products like collateralized debt obligation (CDO).

Asset-backed securities (ABSs) and mortgage-backed securities (MBSs) are securities entitled to the cash flows from a specified pool of assets. Subprime mortgage loans are often sold on the secondary market where they are pooled and become the underlying assets for MBSs. Consequently a MBS is a type of bond or note collateralized by the interest and principal payments of a set of mortgage loans.

According to Hayre (2001) ABSs and MBSs constitute the largest sector of the U.S. bond market. While the term MBSs is used to refer to securities backed by residential home mortgage loans, ABSs are securities collateralized by other types of loans like consumer or car loans but also by home equity loans (HELs) or by manufactured housing loans (MHs). The total volume of outstanding MBSs has increased from about \$100 billion in the year 1980 to \$3000 billion in the year 2000.

The cash flows produced by the assets can be distributed to investors either by a simple pass-through security which comprises the bulk of ABSs or MBSs or by allocating them according to specific rules and creating a structured securities such as collateralized debt obligations (CDOs) or collateralized mortgage obligations (CMOs)⁴.

<http://www.federalreserve.gov/BoardDocs/speeches/2005/20050408/default.htm> (visited February 20, 2008).

⁴ Since a collateralized mortgage obligations (CMO) is a particular type of a collateralized debt obligation (CDO) I will use the general term CDO in the rest of this thesis but focus on those backed by residential home mortgage loans.

The three housing finance agencies Ginnie Mae, Fannie Mae and Freddie Mac enforced the development of the secondary mortgage market in the U.S. These agencies were created by the U.S. government in order to facilitate the flow of mortgage capital by buying mortgage loans for cash from lenders or issuing an MBS in exchange for pools of mortgage loans. MBS issued by one of the three agencies can be referred to as agency MBS.

Banks, life insurance companies, pension funds and foreign investors are the main investors in agency MBSs. The reasons why these institutional investors invest in agency MBSs are higher returns compared to U.S. treasuries or corporate bonds and liquidity. Also because of the close ties of the three agencies to the U.S. government, MBSs are perceived to have minimal credit risk.

Fabozzi (2002) defines nonagency MBS as mortgage-backed securities that are not issued by government sponsored entities. Instead nonagency MBSs are issued by private entities and their collateral consists of nonconforming loans like subprime mortgage loans. Nonagency MBSs can also be grouped in nonagency pass-through securities and nonagency CDOs that are described later. The most important difference is that nonagency MBSs have default risk since there is no explicit or implicit governmental guarantee of cashflows.

Banks and thrifts sell their mortgages primarily to government sponsored enterprises (GSEs) such as Freddie Mac and Fannie Mae whereas independent companies primarily sell to other financial market outlets⁵.

But since subprime MBSs often get a low credit score they can not become part of a portfolio of many professionally managed funds. This problem is solved by slicing the MBS/ABS into tranches and creating new structured finance instruments like collateralized debt obligations (CDOs).

⁵ See Schumer C. and Maloney C.: *The Subprime Lending Crisis: The Economic Impact on Wealth, Property Values and Tax Revenues, and How We Got Here*, Report and Recommendations by the Majority Staff of the Joint Economic Committee, October 2007, available at <http://jec.senate.gov/Documents/Reports/10.25.07OctoberSubprimeReport.pdf> (visited December 10, 2007).

Fender and Mitchell (2005) defined structured finance instruments through three distinct characteristics:

- Pooling of assets which either are cash-based or synthetically created.
- De-linking of the credit risk of the collateral asset pool from the credit risk of the originator. For this purpose the assets are transferred to a standalone special purpose vehicle (SPV).
- Tranching of liabilities which are backed by the asset pool.

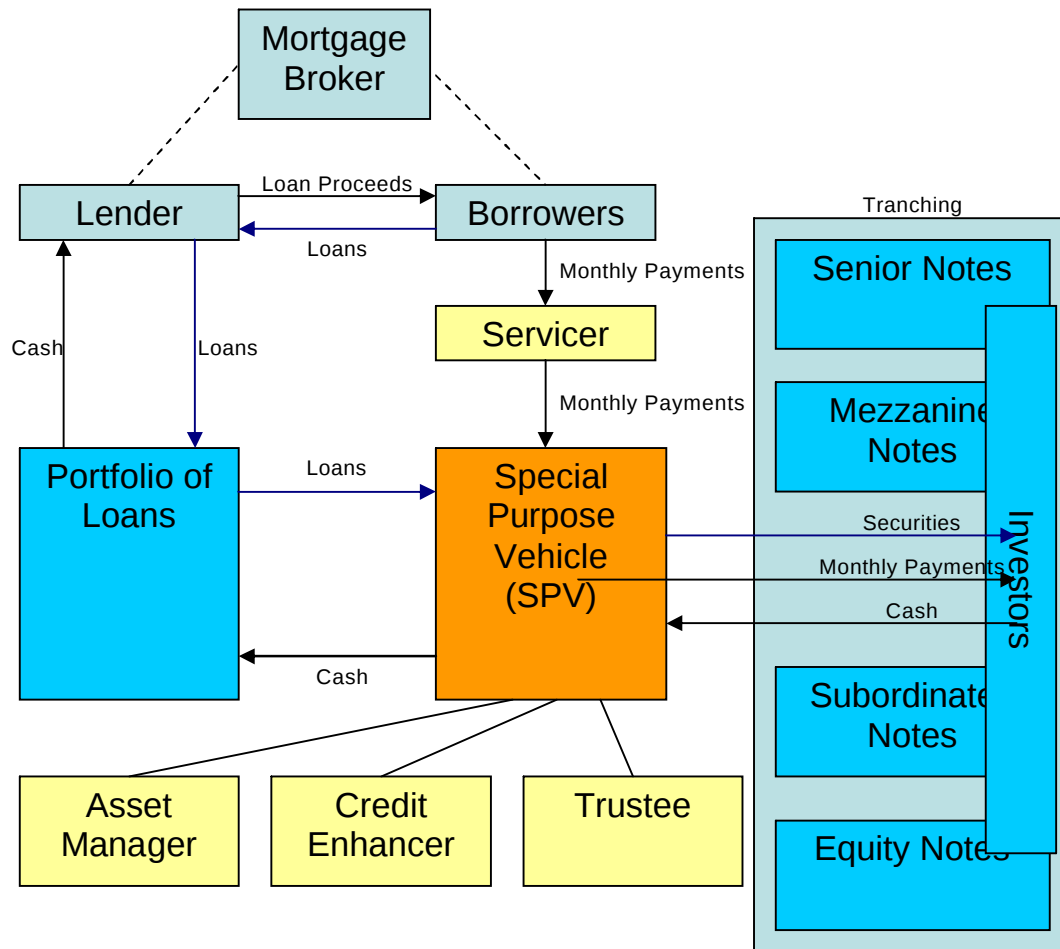
The first two steps are also used in classical pass-through securitisations but the tranching of liabilities is the key element in structured finance products.

A cash flow CDO is a structured finance product that securitizes a pool of debt assets into different classes of notes or bonds from the cash flows generated by such assets⁶. In general, the underlying assets can be corporate bonds, bank loans, emerging market sovereign debt, credit derivatives, ABSs, MBSs or other structured finance securities.

Fabozzi (2002) explained that it is uncommon that nonconforming mortgage loans are securitized as a pass-through security like a MBS to become the underlying asset of a MBS CDO. Instead in the subprime market mortgage loans that have not been securitized as pass-through become underlying assets of a CDO directly.

⁶ See *The Barclays Capital Guide to Cash Flow Collateralized Debt Obligations*, available at http://pages.stern.nyu.edu/~igiddy/ABS/barclays_cdoguide.pdf (visited November 25, 2007).

Figure 1: Subprime Mortgage Loans in a CDO Transaction



How subprime mortgage loans become the underlying assets of a CDO can be seen in Figure 1. A mortgage lender originates subprime mortgage loans directly or via a mortgage broker to borrowers. Afterwards the originator sells a portfolio of loans and other debt obligations to a created special purpose vehicle (SPV) that is a legal entity. The cash received is used by the mortgage lender to fund fresh mortgages for new borrowers. The debt obligation pool is classified into several tranches with different risk exposure: senior tranches (rated AAA), mezzanine tranches (AA to BB), subordinated tranches (below BB) and equity or junior tranches, which are unrated and the most risky. The SPV refinance the purchase by issuing tradable securities like notes or bonds backed by a pool of assets of one tranche. This process is called subordination and divides credit risk among these tranches. The most senior tranches have the first claim on the cash-flows the SPV receive. In case of losses of the underlying assets they are

first applied to equity tranches. After an equity tranche is exhausted losses will impair the next senior tranche. The goal is to create highly demanded investment-grade notes or bonds (senior tranches) with relatively low risk.

The asset manager receives a predetermined fee from the SPV and manages the SPV's portfolio of assets. The trustee enters into a trustee agreement with the SPV. The role of the trustee includes fiduciary responsibilities like ensuring compliance with the CDO's requirements or that collateral quality and coverage test are met. While the task of the asset manager is advising and directing trades, the trustee carries them out.

The servicer collects the interest and principal payments of the mortgage loans that are passed along to the SPV and handles delinquencies and foreclosures. Typically there exist a master servicer and subservicer. Whether or not the investor is affected by a homeowner's delinquency depends on whether the servicer is required to make advances. A back-up servicer is only used if the master servicer can not advance. If delinquency payments have been made or the property has been foreclosed the servicer recovers advances. The servicer can be legally obligated to advance, his advance can be limited but can also be voluntary. Due to their critical role rating agencies look carefully at the quality of the servicer when assessing the credit risk of the nonagency MBS.

The CDO's transaction can be categorized as a balance sheet or as an arbitrage transaction depending on the motivation of the originator. The motivation of a balance sheet transaction is to remove debt instruments from the balance sheet. Typically financial institutions use this type of transaction in order to reduce their capital requirements. In an arbitrage transaction the originator earns the spread between the yield received on the assets in the underlying pool and the payments made to the various tranches in the structure.

According to Kiff and Mills (2007) the major parts (80%) of a typical transaction are the AAA-rated *Class A* tranches. They serve a broad investor base of high-grade investors. Most of the remaining 20% of a typical mortgage securitization structure is comprised of so-called *Class M* or *mezzanine* tranches. The rest of *below-mezzanine*

tranches are usually either sold to hedge funds and investment banks or retained by the originator.

Why can a pooling and tranching of liabilities create value although these processes are costly? According to Ashcraft (2005) the answer is related to the presence of imperfections in financial markets. Originating institutions might have more information about the potential cash flows from an asset pool than outside investors. In this case it may be better to issue a senior tranche that is at least partially secured against default and comparable to debt to lesser informed investors and a junior or equity tranche that is purchased by more informed investors or kept by the originating institution. Also because of the segmented financial markets, some investors demand highly rated instruments. Therefore it is attractive for financial institutions to create new assets with desirable characteristics for a particular investor class.

Fabozzi (2002) explained that almost all nonagency securities are credit enhanced, either internal or external, in order to protect higher-rated tranches of shortfalls in cash flows. External credit enhancements are third-party guarantees that provide first loss protection against losses up to a specific level like 10%. The most common forms of external credit enhancements are corporate guarantees, letters of credit, pool insurances and bond insurances. With a letter of credit a fee is paid to a financial institution to provide a specific cash amount to compensate a cash shortfall of the cash-flows. Pool insurance policies cover losses resulting from defaults and foreclosures but not losses resulting from bankruptcy, fraud arising in the origination process, or special hazards. Bond insurance is not used as primary protection but to support other forms of credit enhancement. Investors realize a shortfall in the cash-flows in case of a default if the resulting net losses exceed the guarantee level. Reserve funds, over-collateralization, and senior/subordinated structures are the most common forms of internal credit enhancements. Reserve funds are deposits of cash generated from issuance proceeds and are typically invested in money market instruments. In the concept of over-collateralization the outstanding mortgage loans are worth more than the par value of the outstanding securities. This excess is used to compensate shortfalls in cash-flows.

An excess spread, which is the pool yield minus servicing fee, coupon interest and losses, is used in order to absorb losses.

Rating agencies determine the level of credit enhancement. For example Standard & Poor's (S&P) begins with a prime pool that consists of at least 300 geographically diversified, fixed-rate, first lien mortgage loans that have 30 years maturity, full documentation and 80% loan-to-value ratio. For this prime pool S&P has statistics by rating for foreclosure frequency and loss severity. The product of these two indicators is the base case loss coverage. Finally, for every deviation from the prime pool criteria an adjustment has to be made.

The subprime mortgage lender has an interest in selling the whole MBS off quickly because it raises cash that can be used to fund fresh subprime mortgage loans. In the CDO market it is easy for the investment bank to sell the senior tranches that are high investment-grade bond to investors. But what happens to the mezzanine and the equity tranches, which insiders sometimes call *toxic waste*⁷?

The investment bank might create a hedge fund that buys the equity tranches. In case of an increase in house prices that prevents borrowers from defaulting the value of the CDO equity increases as well. These hedge funds are often highly leveraged using the CDOs as collateral to get bank loans, which are invested in more CDOs of the investment bank.

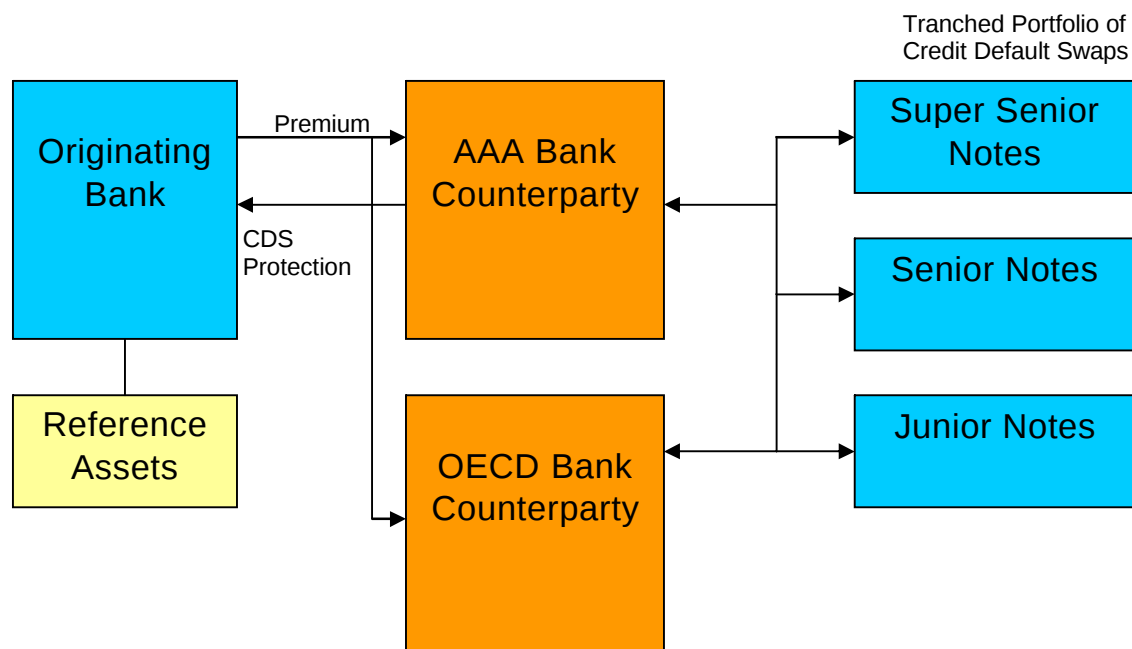
An alternative possibility is that the investment bank keeps the highly risky mezzanine and equity tranches but insures itself by entering a credit default swap (CDS). Another financial institution receives the insurance premium paid by the investment bank for underwriting the risk of default of the underlying subprime mortgages. Since the insurance payments can be seen by the underwriting institution as a stream of income payments, these CDS streams can be once again aggregated to a pool and trached into different risk profiles that are called synthetic CDOs.

⁷ See Tustain P.: *Investment Landfill: How professionals dump their toxic waste on you*, July 2, 2007, available at: http://goldnews.bullionvault.com/files/Investment_Landfill.pdf (visited December 3, 2007).

Gibson (2004) defined synthetic CDOs as an outgrowth developed of cash flow CDOs. Unlike traditional cash flow CDOs, which have a reference portfolio made up of cash assets such as corporate bonds or loans, the reference portfolio of a synthetic CDO is made up of credit default swaps. Anson et al (2004) explained that in a cash flow CDO deal there is a transfer of ownership or true sale of the underlying assets to a legal entity whereas in a synthetic securitization structure only the credit risk of the assets is transferred from the originator to the investors. Therefore a synthetic CDO is classified as a credit derivative where the investors are credit protection sellers and the originator is the credit protection buyer. Much of the risk transfer that occurs in the credit derivatives market is in the form of synthetic CDOs.

In general, a synthetic securitization has advantages over traditional cash flow structures like lower transaction costs because there is no necessity to set up an SPV or the banking relationships with clients can be maintained because loans stay on the balance sheet of the originating institution. A disadvantage of a synthetic CDO structure can be the need for an OECD bank to act as the swap counterparty to meet capital relief requirements like Figure 2 shows.

Figure 2: Synthetic CDO Structure



Source: Anson et al (2004)

What are the potential risks investors have to take if they invest in subprime-related securities?

To analyse the return of a CDO backed by a pool of loans, potential investors have to consider three key factors which are:

- Default probabilities of individual loans and cumulative default rates
- Default correlations
- Recovery rates in case of default

These factors are usually provided by analysts like rating agencies. Returns on CDO tranches can be simulated by viewing number and time of defaults up to maturity as well as the recovery rates as random variables that are modelled with a stochastic process.

The main indicator of the default risk embedded in debt instruments is the rating which is provided by the credit-rating agency. This is based on expected loss or probability of default. Fender and Mitchell (2005) argued that the complexity of structured finance product increased the role of rating agencies as *delegated monitors* of debt instruments. Ammer and Clinton (2004) suggested that the reliance on ratings as credit information seems to be higher in structured finance than in traditional bond markets and they found that ABS downgrades have a stronger impact on prices than downgrades for corporate bonds have. Since structured finance ratings have become one of the fastest-growing business segments and a principle source of revenue, potential conflicts of interest based on issuer-paid fees might arise.

According to Anson et al (2004) the risks of investors who invest in synthetic CDOs are mainly the credit risk of the reference assets and the legal issues associated with the definition of credit events. The primary measure of the credit risk of the reference assets is the credit rating of the assets, taken together with any credit enhancements, as well as their historical ratings performance. In general, the risk taken by investors in a synthetic CDO deals is higher than in a cash CDO deal because the hurdle for a credit event may

be lower than that for outright default. Therefore the probability of losses for a synthetic note of a specific rating may be higher than for a conventional note of the same rating. To a smaller extent, there exists also the counterparty credit risk associated with the credit default swap that transfers the credit risk to the CDO structure.

Hayre (2001) stated that servicing risk addresses the concerns that the servicer will survive the full life of the securitization, the financial stability of the servicer and the servicing intensity of the collateral.

3. The 2007 Crisis in the Financial Markets

The turmoil on the global financial markets in summer of 2007 was triggered by the crisis in the U.S. market for subprime residential mortgages. First, I focus on recent developments on the U.S. subprime lending market and then I analyze how losses of mortgage-related securities caused panic in financial markets.

3.1. U.S. Subprime Market Crisis

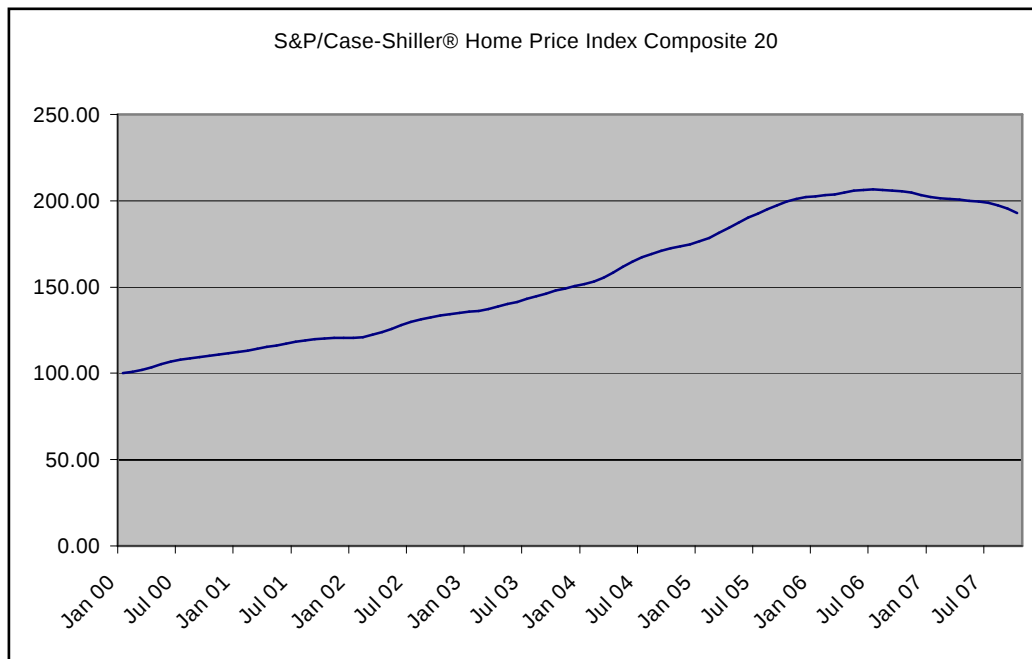
In December 2006 and the beginning of the year 2007 several U.S. subprime lenders filed for bankruptcy. Later that year we saw a meltdown of the U.S. subprime mortgage market. What went wrong and what were the roots of the 2007 U.S. subprime market crisis? In this section I take a close look at the factors that have contributed to the hazardous developments in the subprime lending market.

Despite borrower friendly underwriting criteria I examined in the previous section, favorable conditions on the residential housing market also contributed to the expansion of the subprime mortgage market.

1997 saw the beginning of a period of rapid house price appreciation that helped to increase volumes of subprime lending as well as poor underwriting quality and predatory tactics. Between 2000 and 2006 real home prices almost doubled according to the S&P/Case-Shiller® Home Price Index⁸. The development of the index can be seen graphically in Figure 3.

⁸ The S&P/Case-Shiller® Home Price Indices measures the residential housing market, tracking changes in the value of the residential real estate market in 20 metropolitan regions across the United States. Data available at <http://www.homeprice.standardandpoors.com> (visited December 10, 2007).

Figure 3: S&P/Case-Shiller® Home Price Index from 2000 to 2007



Source: <http://www.homeprice.standardandpoors.com>

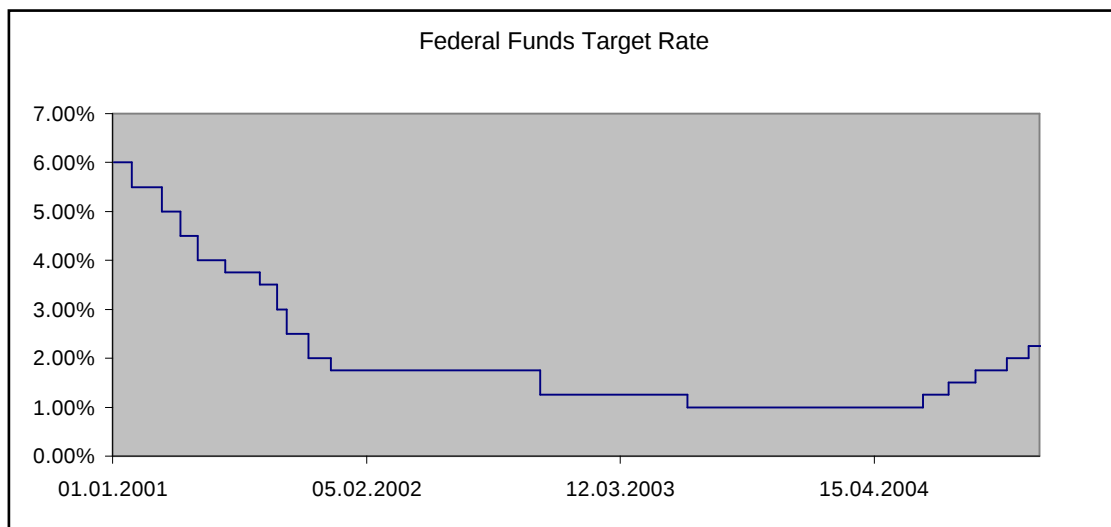
If the house value of a struggling borrower has appreciated, he could solve his financial problems temporarily by refinancing the mortgage. Cash could be withdrawn from the increased equity of the house and the new mortgage that was higher can be held for a while. Another option would be the sale of the house and the repayment of the loan principal. Appreciating house prices give borrowers an equity cushion. But in a period when equity was not created by house price appreciation, borrower's financial shortcoming could no longer be hidden and default rate rose.

The option to sell or refinance reduced payment delinquencies that are the forerunner of default and foreclosure. Doms, Furlong and Krainer (2007) documented a strong negative correlation between delinquency rates and cumulative house price appreciation across metropolitan areas during 2006. This research also stated that house price appreciation significantly improved the performance of subprime loans.

Additionally, Krinsman (2007) explained, interest rates were low in the period from 2002 to 2005 and delinquency rates on subprime mortgage loans were at historically

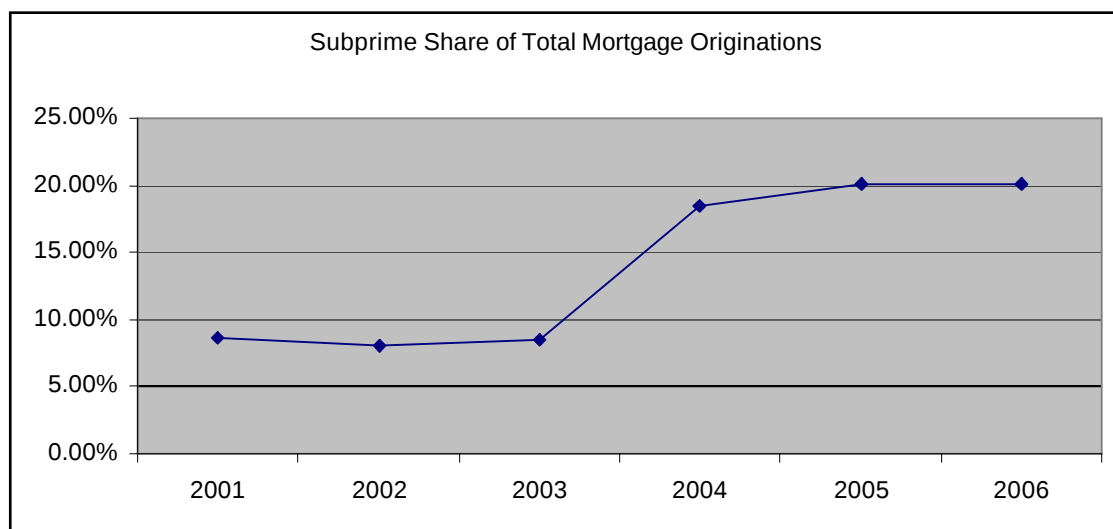
low levels in the years 2004 and 2005. Due to these market conditions there were only moderate or low losses on defaulted nonconforming loans. The good performance of subprime loans might have masked potential problems in the subprime market and made it easier to convince investors that very few subprime loans would experience defaults or foreclosures. During the refinancing boom in the years 2002 and 2003 borrowing demand increased because interest rates fell. Mortgage lenders expanded their business and new lenders were attracted and entered the market.

Figure 4: Federal Funds Target Rate from 2001 to 2004



The primary objective of some lenders was to increase the origination volume due to the fact that incentive structures were tied to the number of subprime loans closed. After origination subprime loans could generate profits through whole loans sales or funding through securitization. Krinsman (2007) concluded that the growth in the subprime lending business might have resulted in tremendous overcapacity. While the amount of total U.S. mortgage originations increased from \$2215 billion in the year 2001 to \$2980 billion in the year 2006, subprime mortgage originations increased from \$190 billions to \$600 billions in the same time¹¹. Figure 5 shows that the subprime share of total mortgage originations increased from about 8% in 2001 to 20% in 2006.

Figure 5: Subprime Share of Total Mortgage Originations from 2001 to 2006



Source: Inside Mortgage Finance

In the year 2006 things changed. The rise in interest rates from 2006 on and the slowdown on the U.S. housing market increased competition among mortgage lenders because the number of subprime borrowers that were qualified for a mortgage loan declined.

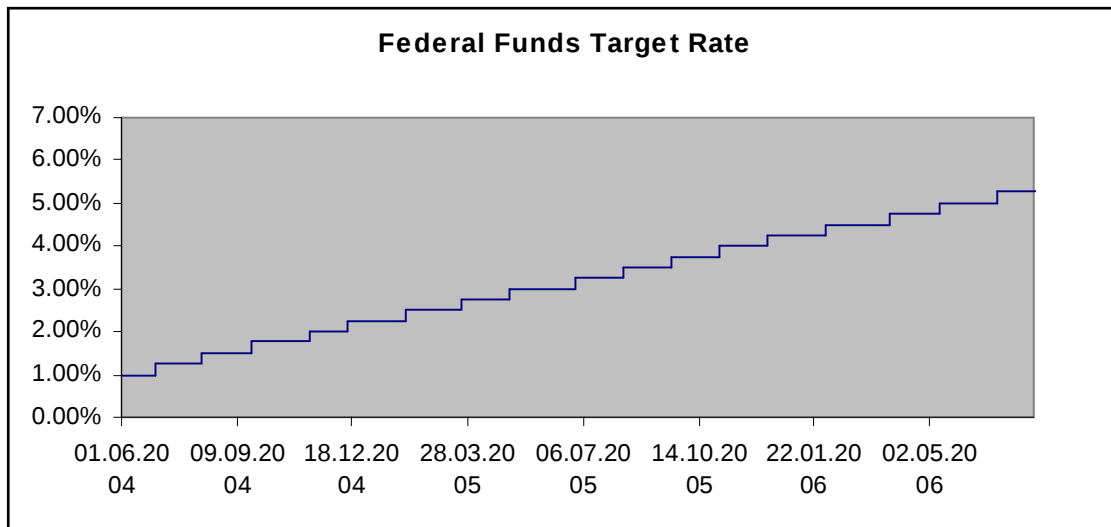
¹¹ Data from Inside Mortgage Finance: *The 2007 Mortgage Market Statistical Annual, Top Subprime Mortgage Market Players & Key Data*, available at: <http://www.imfpubs.com> (visited December 20, 2007).

At the same time demand of institutional investors for subprime MBSs and ABSs with high yields was still strong. The pressure on subprime lenders to maintain origination volume and to meet the demand for subprime mortgage-related securities weakened the underwriting standards and borrowers were approved who otherwise might not have qualified for subprime loans. For this purpose underwriting standards have been relaxed and a typical subprime borrower could obtain a loan with little or no down-payment and by providing little or no documented proof of income or assets.

Borrowers were expected to make at least a 20% down-payment on the purchase price of their home in order to finance the remaining amount, otherwise lenders required private mortgage insurances. In the years 2006 and 2007, in addition to a first mortgage for 80% of the total purchase price, a second mortgage or “piggyback” loan for the remaining 20% was made to the borrower in the form of a home equity loan or a home equity line of credit. Those piggyback loans typically had higher interest rates and were originated by different lenders. With a product that was called 80/20 loan the borrower did not have to make a down-payment and could finance the total purchase price of his home. Krinsman (2007) found out that in recent years subprime first mortgage loans made with piggyback loans accounted for almost 50% in states that had the greatest home price increases.

Additionally loans with a maturity beyond 30 years and so-called 2/28 and 3/27 hybrid adjustable rate mortgages (ARMs) were originated. Those ARMs were largely sold to financially vulnerable borrowers without consideration for their ability to afford them. A typical 2/28 hybrid ARM has a fixed *teaser* interest rate during the initial two year period. After that period the rate is reset every six months based on an interest rate benchmark for example the London Interbank Bid Offered Rate (LIBOR). Because the LIBOR was rising since summer 2003 the resets caused payments increased by at least 30%, to an amount that many borrowers could no longer afford. In the same period the U.S. Federal Reserve tightened the monetary policy. Figure 6 shows that the federal funds target rate has been increased from 1% in June, 2004 to 5.25% in July 2006.

Figure 6: Federal Funds Target Rate from June 2004 to July 2006



Source: Federal Reserve¹²

As a consequence delinquency and foreclosure rates for subprime ARMs have risen sharply. In a period of house price appreciation subprime borrowers could sell or refinance their homes to pay off their loans before they were reset to unaffordable rates. But in 2006 house prices began to decline indicating a housing market contraction. The decade of continuous house price appreciation appeared to end and the financial unsteadiness of the millions of borrowers would no longer be disguised.

The situation could be described as a bursting of a housing price bubble. A bubble can be referred to as a period of strong demand when prices are high only because market participants believe that prices will be high tomorrow and the price level deviates from the equilibrium level consistent with market fundamentals. The existence of a bubble in housing markets is controversial due to transaction and carrying costs associated with owning a house¹³.

Shiller (2007) stated that the boom in U.S. home prices since the late 1990s could be seen as a classical speculative bubble driven largely by extravagant expectations for

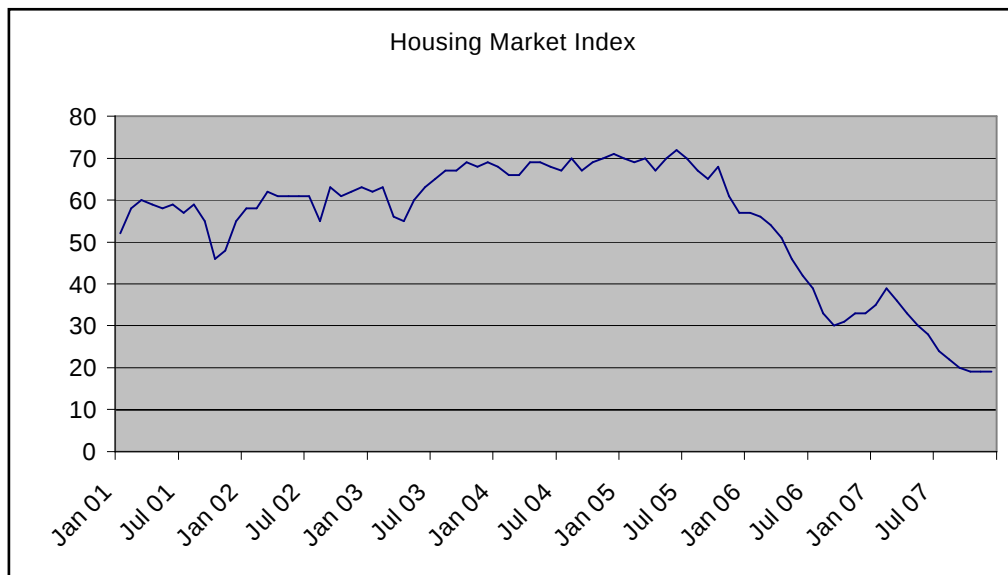
¹² Available at: <http://www.federalreserve.gov/fomc/fundsrate.htm>

¹³ See e.g. Definition at Investopedia, available at: http://www.investopedia.com/terms/h/housing_bubble.asp (visited January 9, 2008).

future price increases and that the situation might result in substantial declines in real home prices.

However if a housing price bubble does exist, shifts in expectations will have a dramatic impact on house price levels. Figure 7 shows the historic low of the Housing Market Index (HMI)¹⁴ from October to December 2007 that could be an evidence of a change in expectation about housing prices. The Housing Market Index is based on monthly surveys of a panel of homebuilders.

Figure 7: Housing Market Index from 2001 to 2007



Source: The National Association of Home Builders

As a result, in 2006 almost 75% of nonagency securitized subprime mortgage originations were ARMs and in most cases 2/28 and 3/27 hybrid loans. Further the rate of serious delinquencies for ARMs rose sharply towards the end of 2006 and on March 13, 2007 the Mortgage Bankers Association reported that almost 13% of subprime

¹⁴ The National Association of Home Builders produces the Housing Market Index (HMI), a weighted, seasonally adjusted statistic derived from ratings for present single-family sales, single-family sales in the next six months and buyer's traffic. A rating of 50 indicates that the number of positive or good responses received from the builders is about the same as the number of negative or poor responses. Ratings higher than 50 indicate more positive or good responses. Data available at: <http://www.nahb.org/generic.aspx?sectionID=134&genericContentID=530> (visited January 9, 2008).

borrowers were delinquent on their payments by 60 days or more. The foreclosure rate for subprime ARMs increased from 1.50% in the fourth quarter of 2004 to 3.23% in the first quarter of 2007¹⁵.

3.2. Securitization Boom

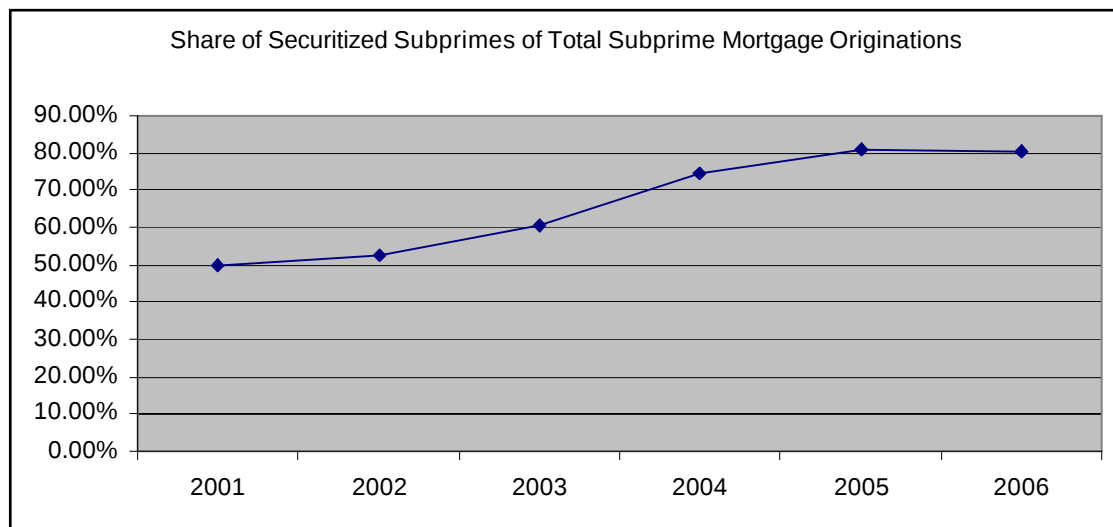
In recent years there has been a boom in securitization. In this section I analyze what factors drove the demand for subprime-related securities and the rise of the global CDO market. Then I also discuss controversial issues of the boom in securitization.

Despite the increase of subprime mortgage originations after the year 2001 the demand for subprime-related securities increased as well. Figure 8 shows the share of securitized subprime mortgage originations of total subprime mortgage originations from in the period from 2001 to 2006¹⁶.

¹⁵ See Schumer C. and Maloney C.: *The Subprime Lending Crisis: The Economic Impact on Wealth, Property Values and Tax Revenues, and How We Got Here*, Report and Recommendations by the Majority Staff of the Joint Economic Committee, October 2007, available at <http://jec.senate.gov/Documents/Reports/10.25.07OctoberSubprimeReport.pdf> (visited January 9, 2008).

¹⁶ Data from Inside Mortgage Finance: *The 2007 Mortgage Market Statistical Annual, Top Subprime Mortgage Market Players & Key Data*, available at: <http://www.imfpubs.com> (visited December 20, 2007).

Figure 8: Share of Securitized Subprimes of Total Mortgage Originations from 2001 to 2006



Source: Inside Mortgage Finance

Whereas in the year 2001 half of the \$190 billion of subprime mortgage originations were securitized in mortgage-backed securities, the share increased to 80% of the \$600 billion of subprime mortgage originations in 2006.

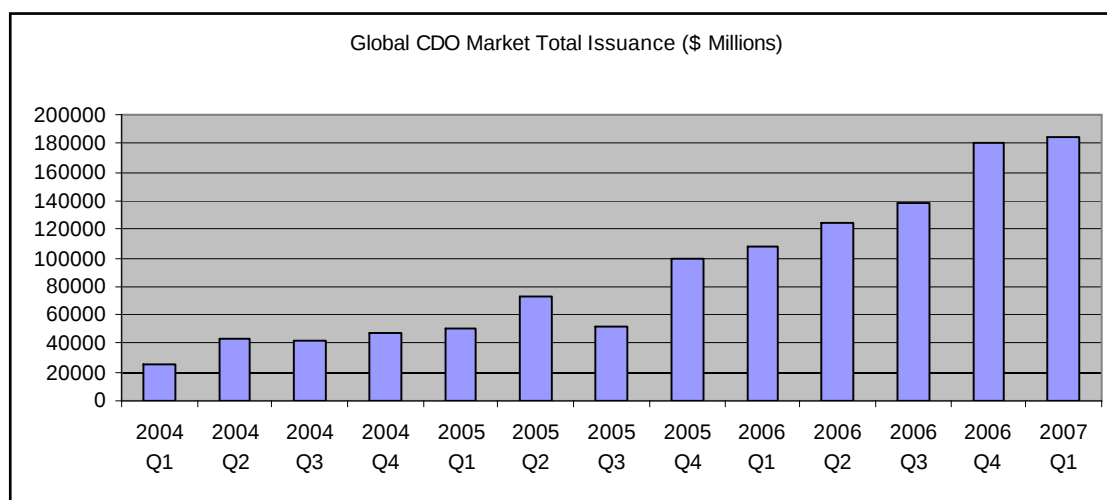
After 2001 not only interest rates declined, also spreads on corporate bonds continued to fall. From September 2001 to August 2005 the spreads on high-yield corporate bonds decreased by one fifth from 1653 basis points to 341 basis points¹⁷. Investment-grade corporate bonds had an average spread of 44 basis points in August 2005 which was about one third of the observed spread in October 2002. Spreads on CDO tranches were significantly higher than for corporate bonds with the same rating, so demand for asset-backed securities has been created by investors. Higher spreads can be explained by the greater complexity of structured finance products or with the fact that returns on CDO tranches are more volatile than returns on corporate bonds of the same rating documented by Perraudin and Van Landschoot (2004).

¹⁷ See *Financial Stability Review*, Deutsche Bundesbank, November 2005, Page 135-144, available at: <http://www.bundesbank.de/download/volkswirtschaft/finanzstabilitaetsberichte/200511.corporatebond.pdf> (visited January 15, 2008).

But the good performance of subprime-related securities and the decline of spreads in that period might have led to a situation, in which investors underestimated the potential risks of such investments. Higher spreads and good ratings of CDO tranches also attracted many European banks. According to the Bank for International Settlements, the credit-related derivatives rose by 568% from 2001 to 2004. That growth was almost 5 times higher than the overall growth in over-the-counter derivatives¹⁸, but in this period risks have become increasingly under-priced.

Data from the Securities Industry and Financial Markets Association (SIFMA) show in Figure 9 the development of global CDO issuances from the year 2004 to the beginning of the year 2007. The total CDO issuance amounted \$24.98 billion in the first quarter of 2004 and increased by 640% in three years to \$184.76 billion in the first quarter of 2007.

Figure 9: Global CDO Market Total Issuance from 2004 to 2006



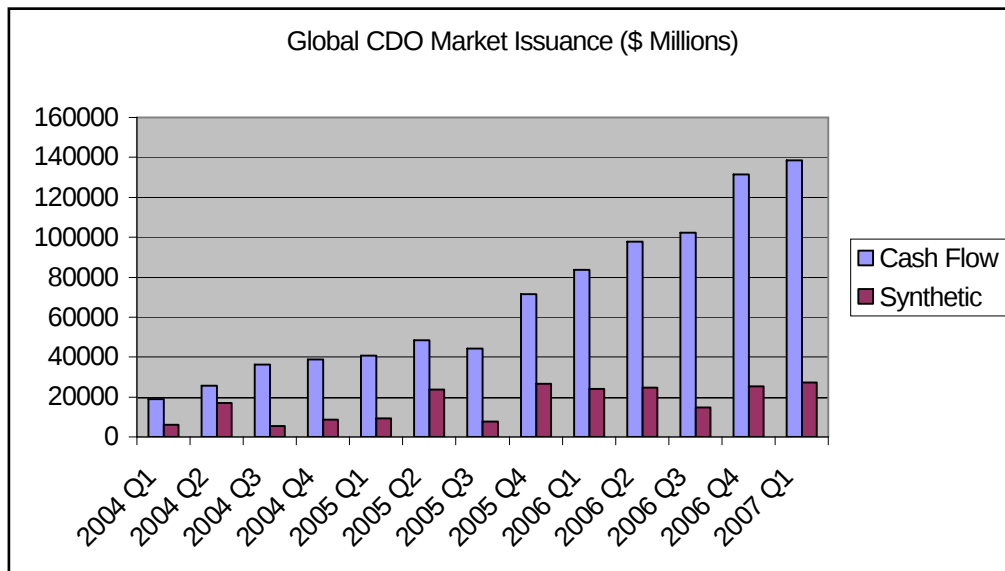
Source: Securities Industry and Financial Markets Association

The Data set consists of all kind of CDO issues mainly based on ABS but also on leveraged loans, corporate bonds and other categories. In Figure 10 shows that global issuance of CDOs generated by cash flow streams account for a significantly larger part

¹⁸ See Fornari F.: *BIS Quarterly Review*, Bank for International Settlements, June 2005, Page 41, available at: http://www.bis.org/publ/qtrpdf/r_qt0506.pdf (visited January 18, 2008).

than synthetically founded CDO that use credit default swaps (CDS) to replicate cash flows rather than buying cash assets.

Figure 10: Global CDO Market Issuance by Motivation



Source: Securities Industry and Financial Markets Association

According to Auerback (2007) excess capital of foreign investors in Asia and Central Europe denominated in U.S. dollars further increased the strong demand for investment-grade U.S. debt. This excess capital pool derived either from petrodollars or from a massive trade surplus with the U.S. He stated that U.S. insurance companies and pension funds stopped buying subprime mezzanine CDOs that are 10-20 times levered special purpose vehicles consisting of only the BBB and BBB- tranches of subprime mortgage loans in late 2003. As a result issuers repacked a series of BBB tranches with a cascading cash waterfall and sold the senior tranches to investors in Asia and Central Europe. There had been orders from overseas investors to buy any U.S. debt-related investment rated AAA and the credit rating agencies provided the most senior tranche this rating.

Despite the demand created by investors, Basel II also had an effect on securitization activities of financial institutions because it created a new framework for how they had

to measure and allocate capital against credit risk¹⁹. Under Basel II banks faced strong pressure to minimize their exposure to non-investment grade rated assets caused by the regulatory capital that banks had to hold against these positions. By selling risky assets to special purpose vehicles and creating CDO tranches, banks were able to remove them from their balance sheet and reduce their regulatory capital. Fitch Ratings reported that banks could face lower capital charges by investing in securitization structures with high ratings rather than by holding a comparable pool of unsecuritized assets directly. This was particularly true for mortgage-backed securities (MBSs) and credit card asset-backed securities (ABSs). The Basel II regulatory framework increased the securitization activities of financial institutions and how they structure their securitization deals.

The goal of securitization is to diversify risk by pooling diversified and uncorrelated assets and structuring this portfolio in several tranches with different risk exposure. CDOs are sold all over the world ensuring that risk is not concentrated in one region or among a particular group of investors. In the case of subprime mortgage loans, securitization offered riskier borrowers access to more credit than before because originators and intermediaries did not have to take credit, interest-rate and liquidity risk on their own books. Instead they could transfer those risks on to who look for longer-term, higher-yielding assets²⁰.

But what are the critical issues of this business model? Because CDO tranches are sold in private placements it is difficult to get the present values or information about the underlying portfolio. There is absolutely a lack of transparency. Pricing of CDO tranches can be done with complex models but model-implied credit spreads often are smaller than the observed market spreads. This underestimation of market spreads by the model is a restatement of the “credit spread puzzle” by Amato and Remolona (2003).

¹⁹ See Hansen M.: *Basel II: The ‘Bottom-line’ Impact on Securitization Markets*, Risk Center, September 14, 2007, available at: <http://www.riskcenter.com/story.php?id=11459> (visited February 13, 2008).

²⁰ See Wolf M.: *Securitisation: Life after Death*, Financial Times, October 2, 2007, available at: http://www.ft.com/cms/s/0/8dd50650-70fc-11dc-98fc-0000779fd2ac.html?nclink_check=1 (visited February 20, 2008).

In CDO transactions, the monitoring and servicing of the underlying loans is task of the holder of the equity tranche because he will experience the first losses and has an incentive to keep a high level of quality of the loan portfolio. As long as the mortgage originator keeps the equity tranches, uninformed investors who hold a senior tranche can be sure that the originator maintains the loan portfolio quality. Krahnen (2007) stated that since equity tranches are sold off in CDO transactions, the market value of all outstanding tranches decreases because without knowing who is holding the equity tranche, investors have to be concerned about the mortgage market and about borrower monitoring²¹. But since investors were not able or not willing to do that the market collapsed.

One has to keep in mind that a CDO transaction transfers but does not eliminate credit risk. Through diversification risk is reduced but in the case of subprime mortgage loans problems arose when CDO deals pooled similar assets, in this case MBSs or portfolios of subprime mortgage loans that are not uncorrelated.

Credit-rating agencies have played a significant role in the development of the market for structured finance products. They provide ratings for structured finance securities and assess the quality of the underlying assets. Investors rely on ratings provided by Standard & Poor's, Moody's and Fitch which are currently the internationally recognized credit-rating agencies²². But there are potential conflicts of interest since these credit-rating agencies are paid by the issuers of the securities. Additionally credit-rating agencies advise issuers of the structured finance securities on how to design structures that receive the best rating possible. High ratings are in the interest of the issuers and the assistance of the rating agencies to obtain them is of course remunerated.

Bloomberg reported in July 2007 that 95% of the securities in the CDO receive investment-grade ratings and that these ratings gave no hint of what was in the debt package or that it might collapse although it was loaded with risky debt like subprime

²¹ See Krahnen J.: *Securitisation Crisis claims Causalities*, The Banker, October 1, 2007, available at: http://www.thebanker.com/news/fullstory.php/aid/5249/Securitisation_crisis_claims_casualties.html? (visited February 12, 2008).

²² See Buiter W.: *Basel II: back to the drawing board?* Financial Times, September 21, 2007, available at: <http://blogs.ft.com/maverecon/2007/09/basel-ii-back-t.html/> (visited February 15, 2008).

mortgage loans²³. The three largest credit rating agencies earned more money from evaluating structured finance products including CDOs and ABSs in 2005 and 2006 than from rating anything else. The fees for rating CDO tranches are as much as three times higher than for rating bonds. Lund (2007) points out that the credit-rating agencies have a strong financial interest in the development of the market for structured products because it is a major source of income.

Rating agencies defend themselves by arguing that no investor should rely only on a credit rating or an opinion when making his investment decision.

3.3. Credit Crunch

By the end of 2006 the credit quality deterioration of subprime mortgage borrowers became visible for investment banks, which reduced their purchase of nonconforming loans for CDO from lenders.

On March 13, 2007 *The Wall Street Journal* posted that a number of banks led by HSBC were trying to force small mortgage lenders to buy back some of the same loans the banks eagerly bought in 2005 and 2006, by enforcing what the industry calls repurchase agreements²⁴. Due to the fact that subprime mortgage lenders were often thinly capitalized and dependent on their cash-flows more than 25 of them filed for bankruptcy during the first half of the year 2007. In almost every case, the subprime mortgage lender was a specialty finance lender and was not an institution with federally insured deposits. The repurchase agreements mentioned before became worthless in case of bankruptcy.

²³ See Tomlinson R. and Evans D.: The Ratings Charade, Bloomberg, July 26, 2007, available at: <http://www.bloomberg.com/news/marketsmag/ratings.html> (visited January 22, 2008).

²⁴ See Mollenkamp C. and Smith J.: *Banks Go on Subprime Offensive*, The Wall Street Journal, March 13, 2007, available at: <http://online.wsj.com/article/SB117369890345734007.html?mod=mostpop> (visited January 9, 2008).

During the spring and summer of 2007 delinquency and default rates of subprime mortgages were higher than expected and investors had to re-evaluate their mortgage-related securities. On June 23, 2007 Bear Stearns, one of the largest investment banks and security trading firms, announced to lend \$3.2 billion to one of its two troubled hedge funds, which are heavily invested in subprime MBSs, in order to stave off the risk of a collapse of the fund.²⁵ On July 10, 2007 Moody's and Standard & Poor's investor service announce a wave of downgrades on MBSs, an indicator that they might have misjudged the risk of these securities²⁶. One week later Bear Stearns explained that the two hedge funds, the Bear Stearns High-Grade Structured Credit Fund and the Bear Stearns High-Grade Structured Credit Enhanced Leveraged Fund, have lost almost all their value as the MBSs downturn went global.²⁷

Historically, U.S. mortgages have generally been perceived as among the most rock-solid of investments, so these investments have been bought by investors from all over the world, especially from Europe. On July 30, 2007 it became known that the German IKB Deutsche Industriebank was in trouble because its subprime assets were declining in value. To calm down the local panic the German government stepped in with a bailout package on August 2 but the damage to credibility was already done. Reports by funds that their subprime exposure was minimal had no effects on investors who began pulling their money out of any investment that might be linked in any way to U.S. subprime mortgage loans.

Around August 7, 2007 new stories built panic and investors didn't differentiate between subprime and prime mortgage loans any more and fears had spread to higher risk products in general. The uncertainty among credit market participants about the risk exposure to subprime mortgage CDOs or MBSs rose. Auerback (2007) explained that while risk could to some extent be priced by financial market participants, uncertainty simply could not. Now it became evident how difficult the task of evaluating the risks of structured financial products was and that there was only minimal pricing

²⁵ See *Year-End Timeline – Second Quarter*, The Wall Street Journal, January 2, 2008, available at: <http://online.wsj.com/article/SB119879374267153845.html> (visited January 3, 2008).

²⁶ See *Year-End Timeline – Third Quarter*, The Wall Street Journal, January 2, 2008, available at: <http://online.wsj.com/article/SB119884951243255571.html> January 3, 2008

²⁷ For more Details see Timeline in the Appendix

transparency. This true uncertainty caused a panic in credit markets and market participants stopped buying private debt instruments, also those which were not related to subprime mortgages, or demanded higher interest rate risk premiums. As a result the entire commercial paper market stopped functioning. Risk premiums, which had been trending down in recent years, rose sharply²⁸ relative to riskless U.S. Treasury securities. Analysts compared the situation with a minefield, no one knew where the mines were planted and that they were trying to stumble through it²⁹. Therefore a local quality problem in the U.S. subprime mortgage market triggered a near-shutdown of the commercial paper and the interbank lending market on August 9, 2007 and the days afterwards. The increasing desire for financial risk came to an abrupt end.

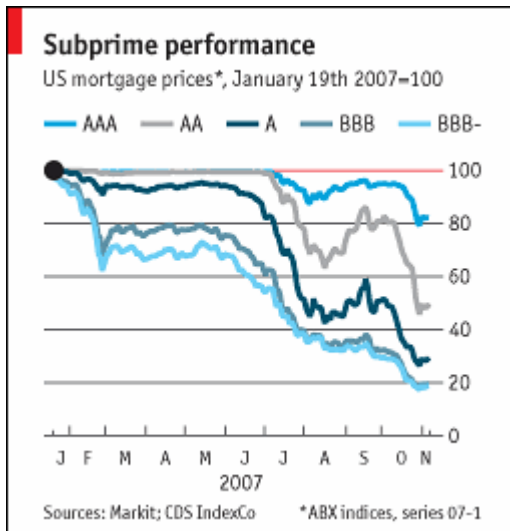
In the first two weeks of August 2007, the Federal Reserve, the European Central Bank, the Bank of Japan, and other central banks pumped tens of billions of short-term liquidity into the banking system in order to stem the panic that had to do with unpriceable uncertainty rather than measurable risk. The Federal Reserve cut the discount rate, which is the interest rate charged on a bank when it borrows funds, and the federal funds rate that banks charge other banks on interest loans. Also the European Central Bank and other central banks cut the interest rate charged on borrowing banks. All of these actions have been taken to prevent the crisis affecting other financial markets.

While lower rated subprime CDO tranches were in trouble since the beginning of the year 2007 also AAA-rated tranches started to fall in value in August. Since it is difficult to find an indicator of CDO tranches market prices the Markit ABX family of indices could be a performance measure. The performance of the 2007 ABX indices for different ratings from January to November of the year 2007 can be seen in Figure 11. AAA-rated papers lost almost 20% of their value and credit-rating agencies started to downgrade them. The fear of downgrades led to a wave of sales, because many institutional investors are allowed to hold only AAA-rated securities.

²⁸ See King A.: *The Subprime Crash*, OCREgister.com, August 26, 2007, available at: http://www.cato.org/pub_display.php?pub_id=8669 (visited February 20, 2008).

²⁹ See Auerback M.: *Risk vs Uncertainty: The Cause of the Current Financial Crisis*, Japan Policy Research Institute, Occasional Paper No. 37, October 2007, available at: <http://www.jpri.org/publications/occasionalpapers/op37.html> (visited February 22, 2008).

Figure 11: Performance of Subprime-related Securities



Source: Markit

In the last week of August the German government had to rescue another savings bank with exposure to structured credit markets, the Sachsen LB with a €17.3bn (\$23.3bn) bail-out. The Sachsen LB supported and managed a special investment fund, an asset-backed commercial paper conduit that borrowed in the short-term commercial paper market and invested on longer-term asset-backed instruments. Problems arose when commercial paper investors refused to finance the conduit and Sachsen LB was unable to provide the credit it had pledged.

In September 2007 RealtyTrac Inc. reported that U.S. home foreclosure filings surged to 243000 in August 2007. This means that foreclosure filings increased by 115 % from August 2006 and by 36% from July 2007. It was also the highest number of foreclosure filings since RealtyTrac began tracking monthly filings. The foreclosure filing rate in the U.S. was one in every 510 homes at that time. The Office of Federal Housing Enterprise Oversight (OFHEO), the regulator of Fannie Mae and Freddie Mac, agreed

to relax restrictions on the investment holdings of mortgage finance companies. This enabled Fannie Mae and Freddie Mac to buy \$20 billion more in subprime mortgages.³⁰

Also in Europe things were getting worse for some financial institutions. On September 15, 2007 the shares of United Kingdom lender Northern Rock PLC fell 31% after it disclosed that it was forced to turn to emergency funding from the Bank of England. Customers withdrew more than \$2 billion accelerating the fall of shares. On October 1, 2007 the Swiss bank UBS said that it had to write down \$3.41 billion in fixed-income assets, including securities tied to subprime mortgages³¹.

On October 18, 2007 Standard & Poor's cut the credit ratings on \$23.35 billion of securities backed by pools of home loans that were offered to borrowers during the first half of the year. The downgrades even hit securities rated AAA. At the beginning of November U.S. bank Citigroup announced that despite a \$5.9 billion write-down reported in early October it has to take an additional \$8 billion to \$11 billion write-down related to subprime mortgages. Two days later Citigroup bailed out seven affiliated structured-investment vehicles and brought \$49 billion in assets onto its balance sheet. One month later Swiss UBS announced that it has to take new \$10 billion write-downs related to U.S. subprime mortgages and it may record a full-year loss in 2007. The announcement made the group the biggest victim of the crisis to date among European banks³². UBS also announced it has solicited a cash infusion of \$11.5 billion from GIC, Singapore's sovereign wealth fund, and an unknown Middle Eastern investor.

Accumulated subprime write-downs of major financial institutions until the end of March 2008 are listed in Table 1.

³⁰ See Schumer C.: *The Subprime Mortgage Market Timeline*, Joint Economic Committee, January 2008, available at: <http://jec.senate.gov/Documents/Reports/01%2023%2008%20subprime%20timeline.pdf> (visited February, 2008).

³¹ See *Year-End Timeline – Fourth Quarter*, The Wall Street Journal, January 2, 2008, available at: <http://online.wsj.com/article/SB119885527558455711.html?mod=JR-Year-End-Review-2007> (visited January 4, 2008).

³² See Hurst A.: *UBS writes down \$10 bln, Singapore injects capital*, Reuters, December 10, 2008, available at: <http://www.reuters.com/article/ousiv/idUSL1049891520071210?sp=true> (visited January 8, 2008).

Table 1: Losses caused by Subprime Loans or Subprime-related Securities

Financial Institution	\$billions
UBS	37.4
Merril Lynch	22.1
Citigroup	21.1
HSBC	17.2
Morgan Stanley	9.4
Deutsche Bank	7.1
Bank of America	5.3
Bear Stearns	3.2
JP Morgan Chase	3.2
BayernLB	3.2
Barcleys	2.6
IKB	2.6
Royal Bank of Scotland	2.6
Credit Suisse	2

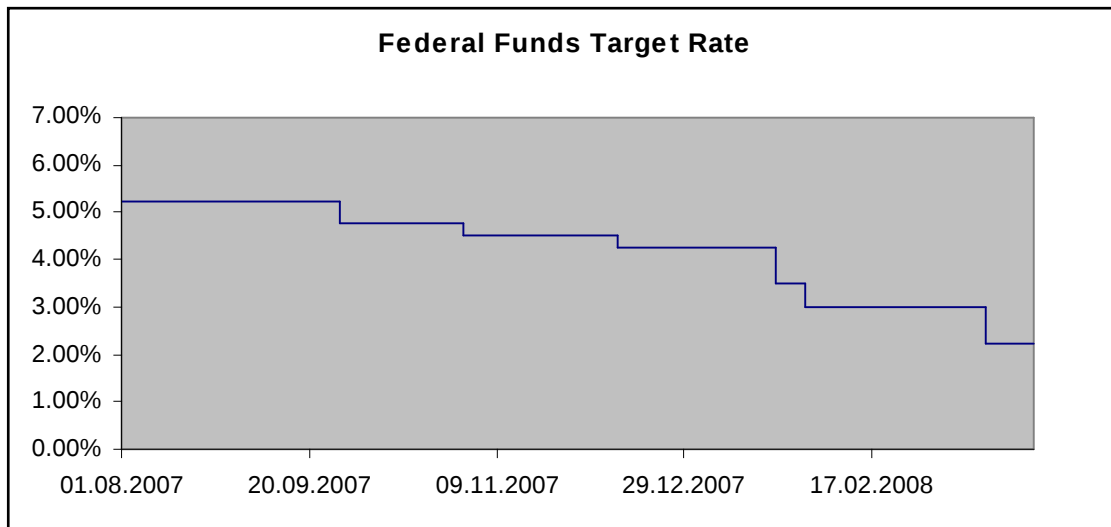
Source: BBC News³³

It can be seen that although the crisis caused by American homeowners many European banks are among the biggest victims, on top the Swiss UBS.

To help struggling homeowners and markets the Federal Reserve started a series of reductions of their intended federal funds rate that is summarized in Figure 12. But the troubles in the credit markets affected equity prices in stock exchanges around the world. Unknown losses on bank balance sheets caused a steep sell-off in global equity markets. The performance of major stock indices can be seen in the next section.

³³ See *UBS doubles subprime writedowns*, BBC News, April 1, 2008, available at: <http://news.bbc.co.uk/2/hi/business/7323809.stm> (visited April 6, 2008).

Figure 12: Federal Funds Target Rate from August 2007 to March 2008



Source: Federal Reserve³⁴

After stock markets all over suffered huge losses on Monday January 21, 2008 the Federal Reserve responded on January 22, 2008 with a three-quarter percentage-point cut in the target for the federal-funds rate to 3.5%³⁵. This cut was the biggest trim in 20 years. But fears of a recession in the U.S. were mounting. The announcement stopped the free fall of the stock markets, but they remained highly volatile the days after. On Wednesday January 30, 2008 the Federal Reserve lowered the target for short-term interest rates by a half percentage-point to 3%.

Bond insurers came under pressure too. They guarantee repayment of interest on a variety of debt securities in case of default in return for a premium. In the past decade they moved from insuring municipal bonds to structured finance products. The *New York Times* reported on January 24, 2008 that the two largest U.S. bond insurance companies, Ambac Financial Group and MBIA, have guaranteed buyers against losses

³⁴ Available at: <http://www.federalreserve.gov/fomc/fundsrate.htm>

³⁵ See Ip G.: *Fed Rate Cuts Halts Market Fee Fall, But Recession Fears Are Mounting*, The Wall Street Journal, January 23, 2008, available at: http://online.wsj.com/article/SB120100837976106391.html?mod=economy_lead_story_lsc (visited January 23, 2008).

on more than \$1 trillion of bonds³⁶. Insurance regulators and major banks met and discussed ways to help insurers by injecting fresh capital. Fitch Ratings downgraded Ambac from AAA to AA level reflecting the significant uncertainty with respect to the company's business model and strategy³⁷. Without its AAA credit rating the Ambac might be unable to write top-ranked bond insurance, which makes up 74% of its revenue. The downgrade further raised doubt on the ratings of municipal and structured debt guaranteed by Ambac and accounted for almost \$556 billion.

Investors turned their back on complex debt structures. According to the Securities Industry and Financial Markets Association (SIFMA) global CDO issues dropped from the peak of \$184.8 billion in the first quarter by 83% to \$29.9 billion in the fourth quarter of the year 2007, which can be seen in Figure 13. *Reuters* reported that business analysts describe CDOs as the dinosaurs of the subprime crisis and that the business model of repacking residential mortgage-backed securities in CDOs has vanished³⁸.

³⁶ See Bajaj V. and Anderson J.: *Next on the Worry List: Shaky Insurers of Bonds*, The New York Times, January 24, 2008, available at:

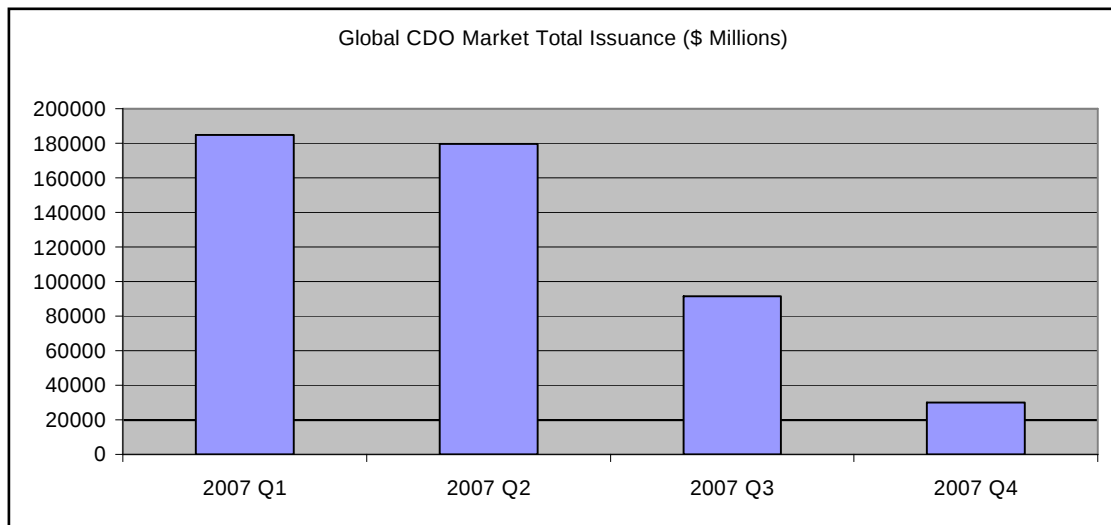
http://www.nytimes.com/2008/01/24/business/24bonds.html?_r=1&oref=slogin (visited March 12, 2008).

³⁷ See Richard C.: *Ambac's Insurance Unit Cut to AA from AAA by Fitch Ratings*, Bloomberg, January 19, 2008, available at:

<http://www.bloomberg.com/apps/news?pid=20601087&sid=asLtTQyLRQQs&refer=home> (visited March 12, 2008).

³⁸ See Baird J. and Webb Q.: *Cash CDO Issuance drops 83 pct in Q4 –SIFMA*, Reuters, February 1, 2007, available at: <http://www.reuters.com/article/newIssuesNews/idUSL0153153620080201> (visited February 15, 2008).

Figure 13: Global CDO Market Total Issuance in 2007



Source: Securities Industry and Financial Markets Association

Hedge funds were also hit by problems with subprime-related securities, because they hold more than 45% of all CDO assets, according to the International Monetary Fund³⁹. Over the past few years, hedge funds, which are lightly regulated investment partnerships for wealthy and institutional investors, have become important vehicles to develop wealth. The world-wide total assets that were managed by hedge funds increased from \$490 billion in the year 2000 to \$1.9 trillion by summer 2007⁴⁰. They often had a marvellous track record of beating the market with highly complex trades. But as the credit crunch hit financial markets this opacity hurt hedge funds since investors who hear news about financial institutions were afraid of bad trading bets and pulled their money out. Additionally, the fact that hedge funds are often highly leveraged put pressure on their returns because banks cut their lending or made it more expensive to borrow. The *Wall Street Journal* reported on February 23, 2008 that in the year 2007 the shares of Fortress Investment Group LLC, a U.S. asset management firm who manages hedge funds, declined by 50%. Further Citigroup announced a bailout of an in-house hedge-fund group that lost on speculative bets and in January 2008 alone

³⁹ See *Credit markets: CDOh no!* The Economist, November 8, 2007, available at: http://www.economist.com/finance/displaystory.cfm?story_id=10113339 (visited February 26, 2008).

⁴⁰ See Zuckerman G.: *Hedge Funds Feel New Heat*, The Wall Street Journal, February 23, 2008, available at: <http://online.wsj.com/article/SB120373510155387833.html> (visited February 26, 2008).

so-called *quantitative* hedge fell 6% as a group, according to data-tracker Hedge Fund Research Inc.

4. Impact on Austria

Unlike German or Swiss banks, Austrian banks stated that they have no exposure to U.S. subprime-related securities. They claimed that because of their growth opportunities in Central and Eastern Europe there was no money left to invest elsewhere.

The biggest bank in Austria, the Erste Bank der oesterreichischen Sparkassen AG had to write down €20 million in the third quarter⁴¹. In December 2007 the magazine *Format* published that the Austrian federal railways Österreichische Bundesbahnen had to write down up to €60 million on subprime-related securities that year. They had sold a portfolio of accounts receivables worth €612.9 million in a credit default swap transaction and had bought a portfolio of 200 ABSs and CDOs in order to diversify risks in 2005⁴².

The Central Bank of Austria stated in March, 2008 that losses related to the international financial crisis of all Austrian banks account €1 billion. Because of increased profits, this amount should not cause any problems. In 2007 banks in Austria had to write down €325 million losses of subprime-related securities⁴³.

4.1. Rise and Fall of the Austrian Traded Index (ATX)

But what was the impact on the Vienna Stock Exchange? To understand this situation, a long term view has to be taken into consideration. The Austrian Traded Index (ATX) was published in 1991 for the first time and became the first leading index of the

⁴¹ See *Erste Bank: Mit leichten Kratzern aus der Kreditkrise*, DiePresse.com, October 30, 2007, available at: <http://diepresse.com/home/wirtschaft/boerse/340084/index.do> (visited January 17, 2008).

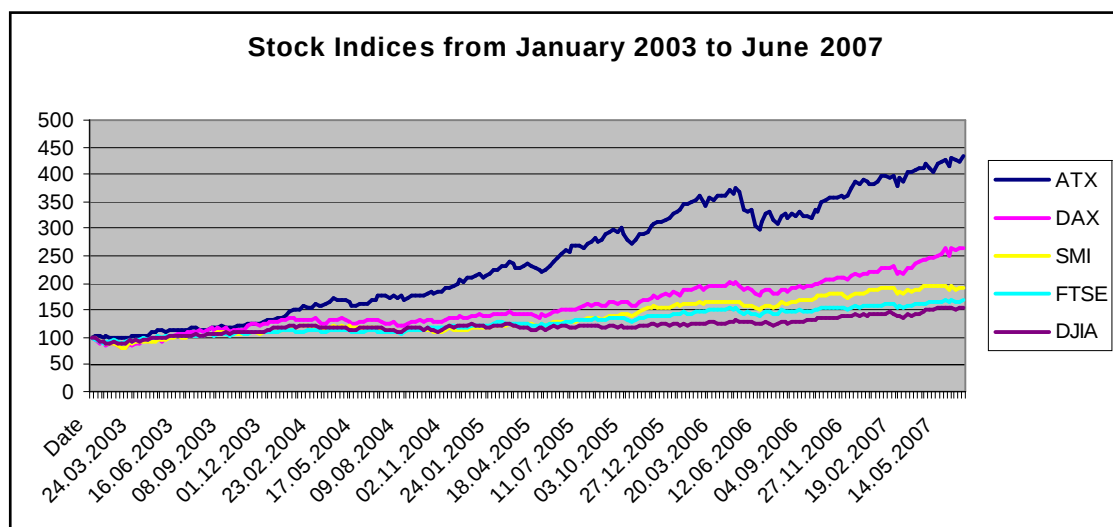
⁴² See *US-Hypothekenkrise holt ÖBB ein*, Kurier, December 3, 2007, available at: <http://www.kurier.at/nachrichten/wirtschaft/125693.php> (visited January 17, 2008).

⁴³ See *Krise belastet Österreichs Banken mit einer Milliarde*, Der Standard, March 28, 2008, available at: <http://derstandard.at/?url=/?id=3281709> (visited March 29, 2008).

Vienna Stock Exchange containing of the 20 largest and most actively-traded stocks on the exchange⁴⁴. After years of ups and downs the ATX started its rally and rose from 1150 index points in January 2003 to the all-time high of almost 5000 index points in June 2007. In this period the ATX had a double-digit annual growth rates that were 34.7% in the year 2003, 41.9% in 2004, 42.1% in 2005 and 15.9% in 2006⁴⁵.

Figure 14 shows the relative performance of the ATX compared with other major stock indices like the Deutscher Aktien Index (DAX) that is Germany's blue-chip stock market index of the 30 major stock companies traded on the Frankfurt Stock Exchange; the Swiss Market Index (SMI) which is Switzerland's blue-chip stock market index consisting of the 20 largest and most liquid stock listed on the Swiss Exchange; the FTSE 100 which is the stock market index of the 100 largest stocks listed on the London Stock Exchange and the Dow Jones Industrial Average (DJIA) which consists of the 30 largest stock companies of the United States.

Figure 14: Stock Indices from January 2003 to June 2007



Source: finance.yahoo.com

⁴⁴ See *History of Wiener Börse*, available at:

<http://en.wienerborse.at/static/cms/sites/wbag/media/en/pdf/about/history.pdf> (visited January 19, 2008).

⁴⁵ Annual log-Returns

From January 2003 to June 2007 the ATX clearly outperformed the other four stock market indices.

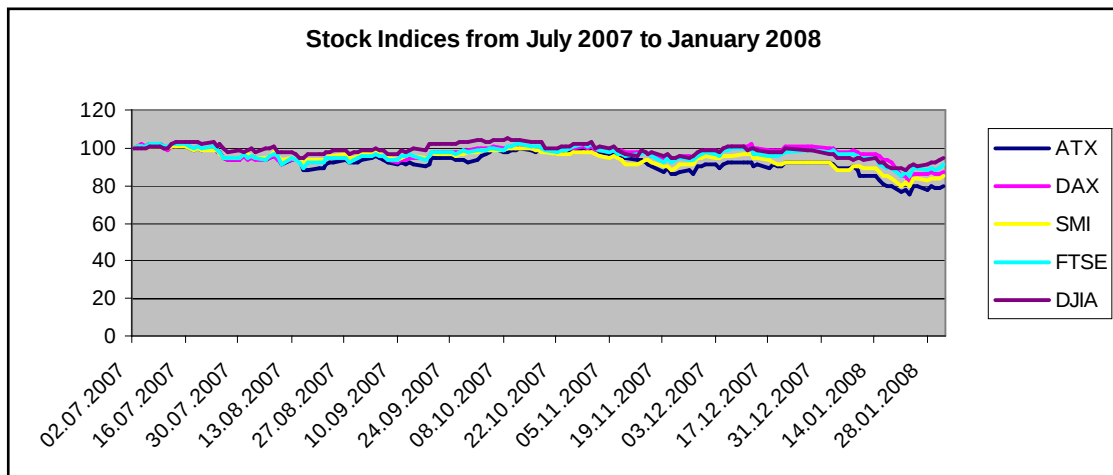
The driver of this incredible performance was what in German is called *Ost Fantasie*. The European Union enlargement story offered Austrian companies new markets beyond the eastern border. More than two thirds of the companies listed on the Vienna Stock Exchange have business connections with the economic area between Prague, Budapest and Zagreb⁴⁶. Banks and insurance companies in particular are heavily invested in Eastern Europe but also the OMV, Austria's largest oil-producing and refining company has important activities in Eastern and Central European countries.

As growth opportunities were becoming fewer in global equity markets, investors were searching for alternative markets and looked east. Due to the fact that stocks were more liquid and less volatile in general than those on Eastern Europe stock exchanges, the Austrian equity market was an ideal entry point. If global equity markets were expected to gain between 5% and 10% in one year the return on the Austrian market was expected to be between 10% and 15% because of the pickup of exposure to Eastern and Central Europe.

But the panic on financial markets and the resulting sale hit the Vienna Stock Exchange very hard. The following chart shows graphically the relative performance of the ATX compared with the DAX, SMI, FTSE and DJIA in the time from July 2, 2007 to February 1, 2008.

⁴⁶ See Wall B.: *Austria booming amid EU enlargement*, International Herald Tribune, May 10, 2005, available at: <http://www.ihf.com/articles/2005/05/09/business/gfcolumn.php?page=1> (visited February 7, 2008).

Figure 15: Stock Indices from July 2007 to January 2008



Source: finance.yahoo.com

The ATX fell in the period from July 9, 2007 to January 23, 2008 by 30%. In the same time the DAX declined by 22%, the SMI by 23%, the FTSE by 18% and the DJIA by 10%.

Why was the sell off on Austria's equity market as a result of the financial crisis much larger than on stock exchanges the U.S. although U.S. subprime mortgages triggered stock markets turmoil and Austrian banks claimed that they did not suffer large subprime-related securities losses?

The Austrian stock market could not escape global developments. After problems on the U.S. subprime mortgage market became known, share prices of financial institutions all over the world dropped since investors did not know who was affected by losses caused by subprime-related securities. The ATX had a high exposure on the banking sector since the Erste Bank der österreichischen Sparkassen AG and the Raiffeisen International Bank Holding AG made up 26% of the index⁴⁷.

Further Voestalpine AG (8.6% of the ATX), an international steel company; Wienerberger, the world's largest producer of bricks (4.5% of the ATX) and

⁴⁷ <http://www.indices.cc/cgi-bin/indizes.pl?index=ATX&lang=5> February 7, 2008

STRABAG SE (3.8% of the ATX), a European construction company would be affected by an economic downturn caused by rising fears of a recession in the U.S. because they highly depend on the business cycle.

4.2. Correlation Analysis of the ATX

In this section I take a look at the co-movements of the ATX and four equity market indices, Germany's DAX, Switzerland's SMI, the U.K.'s FTSE and the American Dow Jones Industrial Average.

The benefits from an international diversification of an investor's portfolio depend on low correlations among international equity markets (Levy and Sarnat 1970). But in difficult times after stock crashes, financial crisis or global market corrections these correlations change. Arshanapalli and Doukas (1993) stated that the degree of international co-movements among stock price indices has increased substantially after the international equity market crash in October 1987. Meric and Meric (1997) confirmed these findings in their long-term analysis and concluded that co-movements of U.S. and European equity markets had become closer after the crash, reducing portfolio diversification benefits.

Whether or not the U.S. subprime crises caused an international financial crisis or a market correction, I analyse if the correlation of the ATX with international equity markets changed from the first half of the year 2007 to the second half of the year 2007.

Table 2: Correlation Matrix of Equity Market Indices from 1.1.2007 to 31.7.2007

	<i>ATX</i>	<i>DAX</i>	<i>SMI</i>	<i>FTSE</i>	<i>DJIA</i>
<i>ATX</i>	1	0.7755	0.7737	0.7694	0.3856
<i>DAX</i>	0.7755	1	0.8776	0.8952	0.5189
<i>SMI</i>	0.7737	0.8776	1	0.8558	0.4604
<i>FTSE</i>	0.7694	0.8952	0.8558	1	0.5100
<i>DJIA</i>	0.3856	0.5189	0.4604	0.5100	1

Table 3: Correlation Matrix of Equity Market Indices from 1.8.2007 to 31.12.2007

	<i>ATX</i>	<i>DAX</i>	<i>SMI</i>	<i>FTSE</i>	<i>DJIA</i>
<i>ATX</i>	1	0.7884	0.8027	0.8516	0.2859
<i>DAX</i>	0.7884	1	0.8013	0.8611	0.3433
<i>SMI</i>	0.8027	0.8013	1	0.8677	0.4083
<i>FTSE</i>	0.8516	0.8611	0.8677	1	0.4442
<i>DJIA</i>	0.2859	0.3433	0.4083	0.4442	1

The correlation matrices Table 2 and Table 3 show the correlation coefficients of the equity market indices in the period from 1.8.2007 to 31.12.2007 and from 1.8.2007 to 31.12.2007 respectively.

Table 4: Correlation Coefficients of the ATX with other Equity Market Indices

Equity Market Index	1.1.2007 - 31.7.2007	1.8.2007 - 31.12.2007	Change
<i>DAX</i>	0.775454341	0.788432474	1.67%
<i>SMI</i>	0.773746738	0.802662013	3.74%
<i>FTSE</i>	0.769413488	0.851638555	10.69%
<i>DJIA</i>	0.385620072	0.285876177	-25.87%

The changes from the first to the second half of the year 2007 are summarized in Table 4. It can be seen that the correlation coefficients between the Austrian equity market and other European equity markets increased in the second half of the year 2007 whereas the correlation between the ATX and the DJIA decreased⁴⁸.

Table 5: Correlation Coefficients of the DJIA with European Equity Market Indices

Equity Market Index	1.1.2007 - 31.6.2007	1.8.2007 - 31.12.2007	Change
<i>ATX</i>	0.3856	0.2859	-25.87%
<i>DAX</i>	0.5189	0.3433	-33.85%
<i>SMI</i>	0.4604	0.4083	-11.32%
<i>FTSE</i>	0.5100	0.4442	-12.90%

⁴⁸ Correlation Coefficients calculated on the basis of daily log-returns. Data from <http://finance.yahoo.com>.

Table 5 shows that all correlation coefficients of the DJIA with the four analyzed European equity market indices decreased significantly in the second half of the year 2007. In case of the U.S. equity market there is no increase of co-movements with international equity markets like it has been documented for the October 1987 crash. I observed that the DJIA declined less in the period from July 2007 to January 2008 than the other European equity market indices, so the impact of the credit crunch on stock markets was higher in Europe than in the U.S. even though market turmoil was caused by U.S. subprime mortgages.

4.3. Austrian Economic Outlook

The Austrian economy grew by 3.4% in the year 2007 but in 2008 GDP growth will decelerate to 2.4% according to the December 2007 estimates of the Institute for Advanced Studies (IHS) or 2.2% according to the Austrian Institute of Economic Research (Wifo)⁴⁹. In March 2008 both institutes corrected their predictions to 2.1% GDP growth for the year 2008⁵⁰. The Austrian economy will slow down but the growth rate will be still above the average rate of 2% in the Eurozone. Karl Aiginger, president of the Austrian Institute of Economic Research believes that the U.S. economy is not as important for Austria as it was before. He sees growth potential in India, China and other emerging markets. But the prospects for Austria's most important export market, Germany, are pessimistic. The Halle Institute for Economic Research (IWH) adjusted its prediction for 2008 GDP growth to 1.7% from 2.5% in the first half of the year 2007. For the economists, this is only an interruption of the economic expansion that was ongoing for three years. They believe that after the shocks on financial markets disappear, expansion will continue in the second half of the year 2008 and 2009.

⁴⁹ See *Wirtschaftswachstum: Der Konjunkturmangel trübt sich ein*, Die Presse, December 20, 2007, available at: <http://diepresse.com/home/wirtschaft/economist/350180/index.do> (visited March 19, 2008).

⁵⁰ See *Finanzkrise und Preisexplosion bremsen Wirtschaft ein*, Der Standard, March 28, 2008, available at: <http://derstandard.at/> (visited March 28, 2008).

The unemployment rate in Austria won't decrease any longer due to the economic prospective but will remain at 4.3% in the following year⁵¹. A real problem will be headline inflation. The institutes predict that the rate of inflation will be above 3% in the first half of the year 2008. The rate of inflation will fall in the second half but for the whole year 2008 we won't see the rate under 2.6% (Wifo) or 2.4% (IHS). The main drivers of inflation are high energy, commodity and food prices. Prices of nearly all commodities increased during 2007 and crude oil prices hit all-time-highs in autumn 2007 and again in the beginning 2008 with a price over \$100 per barrel. Inflation and uncertainty about future economic developments caused by the volatility on financial markets will reduce private consumption and will lead to a relative low contribution of private consumption to GDP growth⁵².

For Austrian small and medium enterprises, it will be tough to raise funds in the foreseeable future. The U.S. subprime crisis caused a crisis on financial markets and the uncertainty led to a repricing of risks. The number of initial public offerings on the Vienna Stock Exchange during the year 2008 will be smaller compared with previous years and some were already cancelled because it is probably not the best idea to sell new shares when markets are volatile and fragile. And since banks need to fill up their equity because of write downs and have to re-evaluate and re-price their assets bank loans getting more expensive. Additionally because spreads on banks to refinance themselves and liquidity premiums remain high, corporate credit spreads will do the same. The credit crunch will affect businesses that need to finance large projects, real estate acquisitions or takeovers as well as venture capital and private equity corporations because they depend heavily on bank loans. To qualify for bank loans businesses have to optimize their balance sheets, increase their creditworthiness and accept that they have to pay a higher price. Banks may also break up with clients that

⁵¹ Unemployment rate calculated by Eurostat definition. The Austrian calculation is higher.

⁵² See *Österreich: Wirtschaftswachstum 2007 leicht gebremst*, Die Presse, February 14, 2007, available at: <http://diepresse.com/home/wirtschaft/economist/362907/index.do?from=simarchiv> (visited March 19, 2007).

have bad credit histories. Higher credit spreads indicate a higher probability of default; therefore market participants believe that the year 2008 will be turbulent⁵³.

⁵³ See *Unternehmensfinanzierung im Schatten der Subprime-Krise. Pressegespräch zum "Industrie aktuell"-Industrieforum 1/2008*, FinanzNachrichten.de, March 13, 2008, available at: <http://www.finanznachrichten.de/nachrichten-2008-03/artikel-10336677.asp> (visited March 19, 2008).

5. Future Prospects

What are the future prospects of the U.S. market for residential subprime mortgages, the U.S. economy and the banking industry after the international financial crisis? Do these market developments have an impact on the world economy?

5.1. Subprime Lending

Kriensman (2007) stated that the interest rates for an estimated 882000 subprime ARMs originated during and after 2004 will reset in 2008 to higher payment rates causing the volume of subprime delinquencies and defaults to rise substantially and therefore put downward pressure on the house prices. Beside outstanding hybrid subprime mortgage loans there are many other subprime borrowers who are also at high risk of default. The resets on subprime ARMs in the near future will cause higher monthly payments that strain or exceed many borrowers' budget. The volume of credit available will be reduced by tighter lending standards and the slumping U.S. housing market will affect the ability to refinance of subprime borrowers with little home equity. Though prices of new homes will remain low the next months only borrowers with excellent credit scores, employment histories and substantial equity can take an advantage from these developments.

Foreclosures could have a significant impact in a community, in which the foreclosed property is located. A concentration of home foreclosures in a neighborhood hurts property values in several ways like a reduction of sales for businesses or reduced rental income for landlords. Additionally like Apgar, Duda and Gorey (2005) documented homes left vacant by foreclosure lower the desirability of the neighborhood because there is often an increase in crime associated with vacant houses. Immergluck and Smith (2006) found that conventional foreclosures have a statistically and economically significant effect on nearby property values.

In August 2007, the President of the U.S.A. George Bush announced a private sector plan to combat the rising wave of home foreclosures and to help struggling American homeowners. The president and his Administration assembled a private-sector group called the HOPE NOW Alliance. On December 6, 2007 representatives of HOPE NOW presented a plan under which up to 1.2 million U.S. homeowners could be eligible for assistance⁵⁴. The HOPE NOW plan was designed to help subprime borrowers who can at least afford the current, starter rate of their hybrid adjustable rate mortgage, but who will be unable to make higher payments once the interest rates go up. The members of the HOPE NOW Alliance have agreed on a set of new industry-wide standards to help struggling borrowers in either refinancing an existing loan into a new private mortgage or freezing their current interest rates for five years. Additionally the ability of the Federal Housing Administration (FHA) was expanded to offer refinancing to homeowners who have good credit histories but cannot afford their current payments. By the end of 2008, the FHA expected to have helped more than 300000 families. The FHA also started to charge insurance premiums based on the individual risk of each loan, using traditional underwriting standards. With this risk-based pricing the FHA is able to help even more low-to-moderate income families who otherwise have no access to prime-rate financing.

On March 4, 2008 Federal Reserve Chairman Ben Bernanke said in a speech to the Independent Community Bankers of America that the current focuses on reducing the monthly payments of U.S. homeowners by modifying their mortgage rates does not solve the underlying problem⁵⁵. The dilemma is the increasing number of American homes that are worth less than their mortgage. With this negative equity a struggling borrower has less ability and less financial incentive to remain in his home. By the end of 2006, 7% of all mortgage borrowers had a negative equity. Economists from Goldman Sachs Group Inc. and Morgan Stanley estimated that this proportion will rise up to 21% if home prices fall 15% as they are expected to. Mr. Bernanke suggested that principal reductions that restore some equity for the homeowner might be relatively

⁵⁴ See *Bush's Outline for Homeowner Aid*, The Wall Street Journal, December 6, 2007, available at: <http://online.wsj.com/article/SB119697097999116122.html> (visited March 6, 2008).

⁵⁵ See Ip G.: *Bernanke's Call: Aid Homeowners*, The Wall Street Journal, March 5, 2008, available at: <http://online.wsj.com/article/SB120463882742910281.html> (March 6, 2008).

more effective to avoid delinquency and foreclosure. He also proposed that the FHA should be given more power to insure troubled mortgages.

Federal banking regulators have tightened guidance on non-traditional and hybrid adjustable rate mortgage lending in August 2007. But one problem is that because of the fragmented nature of U.S. financial regulation, observance and enforcement of such standards is not uniform. Regulators can enforce compliance by their regulated institutions. Since non-bank lenders and mortgage loan brokers are regulated at the state level, such initiatives rely on consistent state-level enactment and enforcement too⁵⁶. The whole oversight framework on subprime mortgage lending might need to be reconsidered. Another challenging task within the U.S. regulatory and legal framework is to improve effective consumer protection against fraud and predatory lending in the originate-to-securitize financial model in the future.

5.2. U.S. Economy

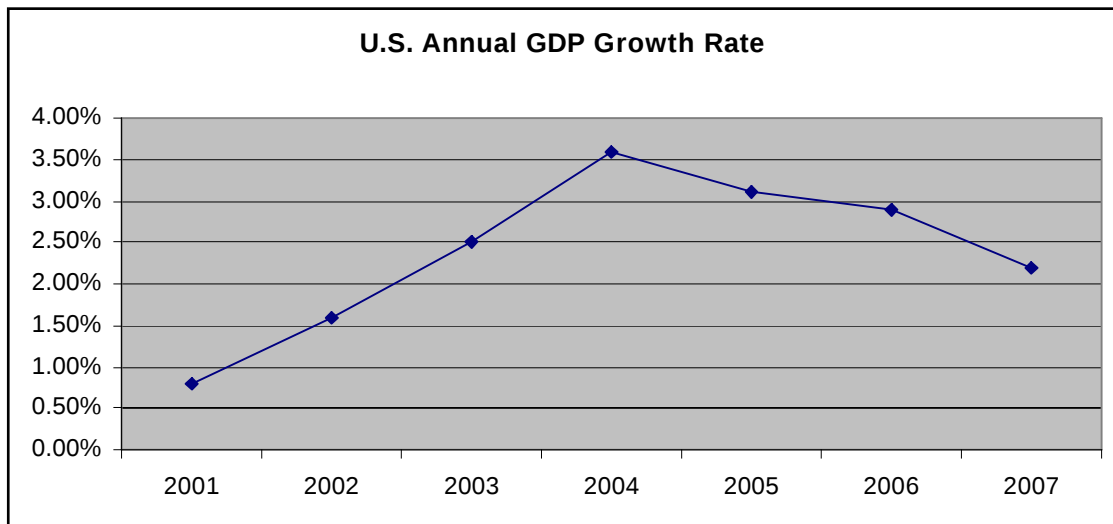
A large decline of the U.S. house prices reduces growth and employment because it reflects a decline in demand for new housing and therefore construction activity will decline as well, pushing smaller builders out of business. The whole U.S. building industry, which makes up 15% of the U.S. economy, expects to cut output by one half and that about one million workers will lose their jobs⁵⁷. A lower level of household wealth either caused by struggling homeowners or by rising unemployment lead to lower consumption, all other things being equal. But Mishkin (2007) argues that these effects occur with significant time lags.

⁵⁶ See Kiff J. and Mills P.: *Lessons from Subprime Turbulence*, IMF Survey Magazine, International Monetary Fund, August 23, 2007, available at: <http://www.imf.org/external/pubs/ft/survey/so/2007/RES0823A.htm> (visited March 18, 2008).

⁵⁷ See *The US sub-prime crisis in graphics*, BBC News, November 21, 2007, available at: <http://news.bbc.co.uk/2/hi/business/7073131.stm> (visited March 5, 2008).

According to the U.S. Department of Commerce, the U.S. economy grew with an annual rate of 0.6% in the fourth quarter of the year 2007⁵⁸.

Figure 16: U.S. Annual Growth Rate from 2001 to 2007



Source: Bureau of Economic Analysis

Figure 16 shows that during the year 2007 the U.S. economy expanded at an inflation adjusted rate of 2.2%, which is the lowest gross domestic product (GDP) growth rate in the past five years. The credit crunch further increases the U.S. economic downturn because banks and other lenders are cutting back on how much credit they will make available. They have tightened standards for loans since the wholesale bond market dried up and because their own balance sheets were affected by the crisis. Additionally rising losses forced banks to reduce lending to businesses, which weakens the economy's prospects. There would be no effect if capital markets were perfect because instead of borrowing from banks, those who need funds could issue securities. But in the real world a drop in bank lending affects overall access to finance. This is particularly true with this crisis since there has also been a sharp drop in securitisation⁵⁹.

⁵⁸ See *Gross Domestic Product: Fourth Quarter 2007*, Bureau of Economic Analysis, February 28, 2008, available at: <http://www.bea.gov/newsreleases/national/gdp/gdpnewsrelease.htm> (visited March 5, 2008).

⁵⁹ See *The credit crisis: Crunch Numbers*, The Economist, March 6, 2008, available at: http://www.economist.com/finance/displaystory.cfm?story_id=10809394 (visited March 8, 2008).

Greenlaw et. al (2008) tried to estimate mortgage-related losses with three different methods. Although each method involved some assumptions all three approaches yielded similar results that the losses were likely to be around \$400 billion. They also estimated in their paper a drop in lending of \$910 billion that would drag down the GDP growth by 1.3 percentage points over the year 2008.

Nobody can tell how long the slowdown of the U.S. economy, which is consumer driven, will last. Falling housing wealth and a weaker job market will decrease the spending of U.S. households and put pressure on the growth rate the next months.

Although the U.S.A. have become less central to global growth in the year 2007, it is still a big importer. Therefore a hard landing of the U.S. economy will affect the rest of the rich world⁶⁰.

5.3. Banking Industry

The subprime mortgage crisis caused huge losses in the U.S. and European banking industry. Although banks announced losses up to \$60 billion by November 21, 2007 because subprime-related securities have fallen in value, the losses could be much bigger. CDO tranches are typically originated by special purpose vehicles (SPV), which are not owned by banks but banks might be forced to cover any bad debt that they accrue.

Uncertainty about losses forced banks to reduce the amount of money they lend each other because they feared not receiving the funds back. The result was a sudden reduction in the availability of loans and other types of credit from banks and financial markets and an increase in the cost of obtaining a loan which can be referred to as a

⁶⁰ See *The global economy: The turning point*, The Economist, September 20, 2007, available at: http://www.economist.com/finance/displaystory.cfm?story_id=9831159 (visited March 9, 2008).

credit crunch⁶¹. Although central banks increased the supply of money the situation did not improve.

If the credit crunch deepens and broadens further it will become a serious threat for banks or brokers. Liquidity problems and a lack of confidence that increases counterparty risk can quickly turn into a solvency crisis⁶². This is especially true for U.S. investment banks that rely pretty much on short-term lending and do not have access to the Fed's discount window because they are not depository institutions.

Market participants may also have to reconsider ratings provided by credit-rating agencies in the future. But this means that regulatory frameworks like Basel II need to be adjusted too. Pillar 1 of the proposed Basel II framework defines the minimum capital requirements for financial institutions. Using the standard approach to calculate those requirements they rely on ratings from credit-rating agencies. Under the internal rating-based approach, methods have to be developed for marking to model illiquid instruments that are not traded. But provided ratings on complex structured products and models used by banks are not trusted anymore.

Investors have placed excessive trust in ratings on structured debt instruments provided by the credit rating agencies. Since the rating technology for corporate risk is fundamentally different from the one used for structured credit the results that are the rating should not have been put on the same scale because that implies similar potential losses⁶³. To avoid confusion among investors in the future, ratings for the different types of obligations should be clearly distinguished.

Regulators in advanced economies will have to discuss reforms to rebuild counterparty confidence and to ease liquidity strains in order to address the current turmoil on the financial markets. One issue will be to improve transparency of exposures to complex

⁶¹ Definition was taken from TeachMeFinance.com, available at: http://www.teachmefinance.com/Financial_Terms/credit_crunch.html (visited March 12, 2008).

⁶² See *Bear Stearns: Stripped Bear*, The Economist, March 14, 2008, available at: http://www.economist.com/finance/displaystory.cfm?story_id=10870166 (visited March 16, 2008).

⁶³ See Kiff J. and Mills P.: *Lessons from Subprime Turbulence*, IMF Survey Magazine, International Monetary Fund, August 23, 2007, available at: <http://www.imf.org/external/pubs/ft/survey/so/2007/RES0823A.htm> (visited March 18, 2008).

assets and valuations of these exposures. These actions are critical to reduce the uncertainty about potential losses across financial institutions and for restoring the confidence of investors. Systematically important financial institutions should be encouraged to rebuild capital cushions in order to improve their capacity to support the role as financial intermediaries. This can be happen by inviting new equity investment and by cutting dividends. Central banks will have to continue to provide liquidity needed to assure the functioning of the markets. But they should be aware of taking on credit risk themselves or sending confusing messages about the stance of monetary policy. Finally supervisors need to do more to ensure that off-balance sheet exposure of banks are properly accounted for and that banks do a better job in managing the risks posed by these off-balance sheet liabilities. Critical is also that supervisors and credit-rating agencies take greater care in assuring that underwriting standards are maintained⁶⁴.

It will be important to observe how banking systems and credit creation in developed as well as in emerging markets will manage the recent crisis that was one of the largest financial shocks since World War II.

5.4. World Economic Outlook

Economists at the International Monetary Fund estimate that in response to the continuing financial turbulence, global economic expansion will decelerate from 4.9% in the year 2007 to 4.1% in the year 2008⁶⁵. Growth will slow down in the U.S.A., Western Europe and Japan. Despite the slowing growth in exports, emerging markets and developing countries will continue to expand strongly. The ongoing troubles on financial markets will reduce domestic demand in advanced economies, which has spill-

⁶⁴ See Portugal M.: *Navigating the Financial Storm: The Financial Market Crisis and the Global Economic Outlook – Lessons and Policy Changes*, Annual Meeting of Institute for International Finance, March 7, 2008, available at: <http://www.imf.org/external/np/speeches/2008/030708.htm> (visited March 21, 2008).

⁶⁵ See *World Economic Outlook Update: Financial turbulence clouds growth prospects*, International Monetary Fund, January 29, 2008, available at: <http://www.imf.org/external/pubs/ft/weo/2008/update/01/index.htm> (visited March 20, 2008).

over effects on emerging markets and developing countries. Growth in countries that are heavily dependent on capital inflows could be particularly affected but the strong momentum of domestic demand in some markets provides upside potential like in China and India.

The remaining risks for the global economy in 2008 are rising losses from the U.S. subprime mortgage crisis and that the credit crunch takes hold in advanced countries. A greater than projected decline in U.S. domestic demand caused by interactions of adverse financial events or corrections in the housing market and on household balance sheets would have spill-over effects on other developed countries. Countries with substantial exposure to structured financial products linked to U.S. subprime mortgages are at greater risk. Emerging markets and developing countries that rely on short-term cross-border borrowing from developed countries to finance large current account deficits will also remain at a higher risk.

6. Conclusion

The current credit crisis shows how globalisation has been taken place in the financial world and how linked international markets are. In this multi-polar and integrated world, economic problems will become more international than they have been before. Everything started with mortgages originated to borrowers with shaky credit histories to finance their dream of an own home. Then when the housing boom ended and things went wrong a meltdown in the U.S. market for subprime mortgage loans triggered a global financial crisis. European banks and U.S. investment banks had to write down billions of dollars and some of them were bailed out. So the turmoil in the relatively small market for U.S. subprime residential mortgages spread quickly across the Atlantic and inflicted damage on other financial markets and institutions. The fallout cut back liquidity in the interbank lending money market that is the heart of the financial system. And even worse, fears of a recession in the U.S.A. could trigger a global slowdown.

Through the concept of securitization mortgage brokers were able to focus on pushing the origination number only and investors were happy to invest in top-rated debt securities with significantly higher spreads than ordinary corporate bonds. The spread and distribution of credit risk all over the world was praised as the innovation of structured finance. We saw an incredible expansion of the market for credit derivatives and the market players involved like investment banks und credit-rating agencies could boost their profits. But a bundle of bad mortgage loans is not much better than a single bad mortgage and the challenge for investment bankers was to hide that fact. Therefore the originate-and-distribute business model of structured finance created some degree of moral hazard. On the other side it is the responsibility of the investors to evaluate carefully the investments they make. But it was already too late when investors realized that they put money into complex debt securities they did not understand. As a result the market for structured finance products dried up and the marvellous recent growth of the market came to an abrupt end.

So the integration of countries all over the world has been taking place can be seen not only in trade or climate change, but also in financial regulation. To deal with global challenges we need joint efforts. To keep pace with the financial innovation that has created complex financial assets, which can be traded internationally, regulatory and supervisory framework cooperation among countries will have to be strengthened. The lesson that has to be learned by investors is never to rely only on ratings when they determine their investment policy.

Alan Greenspan, the former chairman of the Federal Reserve explained: “*The current credit crisis will come to an end when the overhang of inventories of newly built homes is largely liquidated, and home price deflation comes to an end.*”⁶⁶ That will stabilize home values and is particularly important for those held as collateral for subprime-related securities. “*But after a period of protracted adjustment, the U.S. economy, and the world economy more generally, will be able to get back to business.*”

⁶⁶ See Greenspan A.: *The Roots of the Mortgage Crisis: Bubbles cannot be safely defused by monetary policy before the speculative fever breaks on its own*, The Wall Street Journal, December 12, 2007, available at: <http://opinionjournal.com/editorial/feature.html?id=110010981%3C/ref%3E> (visited March 5, 2008).

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Appendix

Timeline⁶⁷

2006:

December 28: Ownit Mortgage Solutions files for bankruptcy.

2007:

February 12: ResMae Mortgage files for bankruptcy.

February 20: Nova Star Financial reports a surprise loss.

March 2: Fremont General stops making subprime loans and puts its subprime business up for sale.

March 8: New Century Financial, the second largest subprime lender in 2006, stops making loans.

March 20: People's Choice files for bankruptcy.

March 27: At a Joint Economic Committee hearing, Ben Bernanke, Chairman of the Board of Governors of the Federal Reserve System, says housing market weakness "does not appear to have spilled over to a significant extent."

April 2: New Century Financial files for bankruptcy.

April 6: American Home Mortgage writes down the value of risky mortgages rated one step above subprime.

⁶⁷ Source if not explicitly mentioned: Schumer C.: *The Subprime Mortgage Market Timeline*, Joint Economic Committee, January 2008, available at: <http://jec.senate.gov/Documents/Reports/01%2023%2008%20subprime%20timeline.pdf> (visited February, 2008).

April 18: Freddie Mac announces plans to refinance up to \$20 billion of loans held by subprime borrowers who would be unable to afford their adjustable-rate mortgages at the reset rate.

April 24: The National Association of Realtors announces that sales of existing homes fell 8.4% in March from February, the sharpest month-to-month drop in 18 years.

May 17: At the Federal Reserve Bank of Chicago's Forty-Third Annual Conference on Bank Structure and Competition, Chairman Bernanke reiterates his March statement by saying the Fed does not foresee a broader economic impact from the growing number of mortgage defaults.

May 25: The National Association of Realtors reports that sales of existing homes fell by 2.6 percent in April to a seasonally adjusted annual rate of 5.99 million units, the slowest sales pace since June 2003. The number of unsold homes left on the market reached a record total of 4.2 million.

June 6: ZipRealty Inc., a national real-estate brokerage firm, announces that the number of homes listed for sale in 18 major U.S. metropolitan areas at the end of May was up 5.1% from April. This is a striking deviation from the general trend as tracked by the Credit Suisse Group, which says on a national basis, inventories of listed homes have typically been little changed in May during the past two decades.

June 23: Bear Stearns, one of the largest investment banks and security trading firms, announce to lend \$3.2 billion to one of its two troubled hedge funds, which are heavily invested in subprime MBSs, in order to stave off the risk of a collapse of the fund.⁶⁸

⁶⁸ See *Year-End Timeline – Second Quarter*, The Wall Street Journal, January 2, 2008, available at: <http://online.wsj.com/article/SB119879374267153845.html> (visited January 3, 2008).

July 10: Moody's and Standard & Poor's investor service announce a wave of downgrades on MBSs, an indicator that they might have misjudged the risk of these securities⁶⁹.

July 18: Bear Stearns Cos. explains that two hedge funds, the Bear Stearns High-Grade Structured Credit Fund and the Bear Stearns High-Grade Structured Credit Enhanced Leveraged Fund, have lost almost all their value as the MBSs downturn went global.

July 20: Despite that news the Dow Jones Industrial Average crosses the 14000 barrier for the first time.

In the following weeks stock indices all over the world started to decline and the Dow Jones Industrial Average dropped below 13000 points by August 15. Especially stocks of financial institutions suffered significant losses as a result of mortgage payment defaults and devaluations of MBSs. Also many European banks announced losses due to MBSs investments.

July 31: The shares of mortgage lender American Home Mortgage Investment Corporation plunge 89% after they have been halted the day before. The company explain that it is unable to finance its mortgages due to increasing margin calls from its lenders and demands for cash and collateral⁷⁰. The mortgage lender files for Chapter 11 bankruptcy protection on August 6⁷¹. In the first half of the year it was the 10th-largest mortgage lender of the U.S. with \$34.6 billion in loans. But unlike most other bankrupt lenders American Home Mortgage almost none of its home loans were to subprime borrowers.

⁶⁹ See *Year-End Timeline – Third Quarter*, The Wall Street Journal, January 2, 2008, available at: <http://online.wsj.com/article/SB119884951243255571.html> January 3, 2008

⁷⁰ See Bajaj V.: *Jittery Stock Market Drops as Mortgage Fallout Spreads*, The New York Times, August 1, 2007, available at: <http://www.nytimes.com/2007/08/01/business/01subprime.html> (visited January 6, 2008).

⁷¹ See *American Home Mortgage Seeks Chapter 11 Bankruptcy Protection*, The New York Times, August 7, 2007, available at: <http://www.nytimes.com/2007/08/07/business/07home.html> (visited January 6, 2008).

August 1: Two hedge funds managed by Bear Stearns that invested heavily in subprime mortgages declare bankruptcy. Investors in the funds file suit against Bear Stearns, alleging that the investment bank misled them about the extent of the funds' exposure.

August 7: German banks organize a bailout for IKB Deutsche Industriebank AG which was in trouble because of its investments in subprime residential mortgage CDOs⁷².

August 9: President Bush addressing the housing market crisis, saying, "The fundamentals of our economy are strong...I'm told there is enough liquidity in the system to enable markets to correct." Bush also said, "The conditions for the marketplace working through these issues are good. My hope is that the market, if it functions normally, will be able to yield a soft landing."

August 9: French bank BNP Paribas freeze three funds due to subprime-related losses.

August 9 and 10: European Central Bank and Federal Reserve intervene in markets by pumping billions of dollars of liquidity into the markets.

August 13: Goldman Sachs and a group of investors inject \$3 billion to bailout the Global Equity Opportunities hedge fund of Goldman-Sachs that lost about 28% of its market value in the week before.

August 16: Countrywide Financial, the nation's largest mortgage lender, draws down \$11.5 billion from its credit lines.

August 17: The Federal Reserve cut the discount rate from 6.25% to 5.75% and encouraged banks to borrow from its discount window by lengthening the term of such loans to as long as 30 days from the current one day.

August 31: President Bush holds a press conference to highlight the growing problems in the subprime mortgage market. He says the "government has a role to play" in the

⁷² See Joint Economic Committee Research Report, Number 110-11, available at: http://www.americansecuritization.com/uploadedFiles/JEC_Report.pdf (visited January 9, 2008).

growing crisis and calls upon the Federal Housing Administration to help subprime borrowers refinance into loans insured by the federal agency. The modest FHA program is expected to assist 60000 delinquent borrowers. President Bush announces an additional program expected to help another 20000 homeowners by reducing insurance premiums for those who pose less of a credit risk. Reaching out to Democrats, the President also expresses support for Michigan Senator Debbie Stabenow's Mortgage Relief Act, which will exempt homeowners from paying taxes on home loans forgiven after foreclosure.

August 31: At Federal Reserve meeting in Jackson Hole, Wyoming, Federal Reserve Chairman Ben Bernanke reassures investors on Wall Street by stating that the Fed will "act as needed" to contain the spreading mortgage crisis and discourage predatory lending practices.

September 15: The shares of United Kingdom lender Northern Rock PLC fall 31% after it disclosed that it is forced to turn to emergency funding from the Bank of England. Customers withdraw more than \$2 billion accelerating the fall of shares.

September 18: RealtyTrac Inc. announces that home foreclosure filings surged to 243,000 in August, up 115 percent from August 2006 and 36 percent from July, marking the highest number of foreclosure filings since RealtyTrac began tracking monthly filings. The foreclosure filing rate nationally is now one in every 510 homes.

September 19: The Federal Reserve cut the federal-funds rate that is the benchmark target rate for overnight lending between banks by half a percentage point to 4.75%.

September 19: The Office of Federal Housing Enterprise Oversight (OFHEO), the regulator of Fannie Mae and Freddie Mac, agrees to relax restrictions on the mortgage finance companies' investment holdings, enabling Fannie Mae and Freddie Mac to buy \$20 billion more in subprime mortgages.

September 25: According to the S&P/Case-Shiller's Home Prices Indices, which track housing prices in metropolitan areas, home prices continue to fall at an increasing rate. The 10-City Composite index shows an annual decline of 4.5 percent – the largest in 16 years.

September 27: Countrywide Financial Corporation post its first quarterly loss in 25 years on about \$1 billion in write-downs.

October 1: The Swiss bank UBS AG says it has to write down \$3.41 billion in fixed-income assets, including securities tied to subprime mortgages⁷³.

October 4: Analysts expect that the losses of Merrill Lynch & Co linked to risky subprime mortgages amount \$4 billion due to the fact that Merrill has been the number one underwriter of CDOs since 2004. Three weeks later Merrill explained that write-down on mortgage-related securities was about \$8.4 billion and larger than expected. The company's credit rating was downgraded and their CEO Stan O'Neal retired.

October 9: The U.S. Securities and Exchange Commission (SEC) announces its intention to review potential conflicts of interest in the credit rating agencies due to questionable practices associated with the ratings given to mortgage-backed securities that have contributed to the spreading housing crisis. SEC Chairman Christopher Cox says: "We have underway right now the beginnings of examinations that are focused on conflicts of interest, and books and records examinations, and whether the agencies are following their own procedures."

October 15: Citigroup acknowledges that its risk management models failed its customers and shareholders during this summer's credit crisis, leading to the company's 57 percent drop in third-quarter profit. Citigroup was forced to write off \$3.55 billion and set aside \$2.24 billion to cover anticipated losses stemming from failing mortgages and consumer loans.

⁷³ See *Year-End Timeline – Fourth Quarter*, The Wall Street Journal, January 2, 2008, available at: <http://online.wsj.com/article/SB119885527558455711.html?mod=JR-Year-End-Review-2007> (visited January 4, 2008).

October 15: Strongly urged to act by the Treasury Department, Citigroup, JPMorgan Chase, and Bank of America announce the creation of a new entity, called a Master Liquidity Enhancement Conduit, to raise \$200 billion in order to purchase securities that are otherwise likely to be dumped on the market and further depress the housing debt crisis.

October 16: The National Association of Home Builders reports that its housing market index, which tracks builders' perceptions of conditions and expectations for home sales over the next six months, dropped to 18, its lowest level since the inception of the index in 1985. The housing market index has declined for eight straight months. Builder confidence increased in the Midwest by two points, but the region still has the lowest overall rate in the nation.

October 17: The Commerce Department reports that U.S. home construction starts fell 10.2 percent last month to their lowest level in more than 14 years. Building permit activity, an indicator of future construction plans, declined 7.3 percent, the largest drop since January 1995.

October 18: Standard & Poor's cuts the credit ratings on \$23.35 billion of securities backed by pools of home loans that were offered to borrowers during the first half of the year. The downgrades even hit securities rated AAA, which is the highest of the 10 investment-grade ratings and the rating of government debt.

October 24: Merrill Lynch writes down \$7.9 billion due to exposure to collateralized debt obligations, complex debt instruments, and subprime mortgages. As a result, the firm takes a \$2.3 billion loss, the largest in the firm's history.

October 29: John Robbins, former chairman of the Mortgage Bankers Association, says approximately a half of million U.S. mortgage borrowers each year for the next few years risk foreclosure. He expects that 1 million borrowers will lose favour with their lenders each year and that 500000 of them will not be able to save their home loans.

October 30: Shareholders sue Merrill Lynch & Co for issuing false and misleading statements regarding its exposure to risk mortgage investments. The lawsuit seeks class-action status on behalf of purchasers of Merrill stock between February 26 and October 23, 2007.

October 31: In a nearly unanimous decision, the Federal Reserve Board lowers the federal funds rate by one-quarter percentage point to 4.50 percent.

November 1: The Federal Reserve cut to 4.5% and explain that the risks of weaker growth and higher inflation were roughly balanced.

November 4: On top of the \$5.9 billion write-down reported in early October, Citigroup says it will take an additional \$8 billion to \$11 billion write-down related to subprime mortgages. In a memo to employees announcing his resignation, C.E.O. Charles O. Prince III writes: "It is my judgment that the size of these charges makes stepping down the only honorable course for me." Mr. Prince leaves with \$105.2 million in cash and stock – in addition to the \$53.1 million in compensation he took home over the past four years.

November 11: Swiss UBS announces write-downs of \$10 billion, becoming one of the biggest casualties of the U.S. subprime-mortgage meltdown. Two days later Citigroup bailed out seven affiliated structured-investment vehicles and brought \$49 billion in assets onto its balance sheet.

November 12: The Federal Reserve cut interest rates by a quarter percentage point to 4.25%.

November 14: HSBC Holdings PLC, Europe's biggest bank, reports that it took a \$3.4 billion impairment charge at its U.S. consumer finance division, HSBC Finance Corp.

November 15: Barclays Group PLC takes a \$2.7 billion write-down for losses on securities linked to the U.S. subprime mortgage market collapse.

November 20: Morgan Stanley posts its first quarterly loss in 21 years of about \$3.59 billion and disclosed a \$9.4 billion write-down on its mortgage assets.

November 29: According to RealtyTrac, there were 222,451 foreclosure filings last month. It is a 94 percent increase from October 2006 and represents one foreclosure filing for every 555 households in the nation. The 2 percent increase from September 2007 indicates that the subprime crisis is only getting worse.

December 10: Swiss UBS announced that it has to take new \$10 billion write-downs related to U.S. subprime mortgages and it may record a full-year loss in 2007. The announcement makes the group the biggest victim of the crisis to date among European banks⁷⁴. UBS also announced it has solicited a cash infusion of \$11.5 Billion from GIC, Singapore's sovereign wealth fund, and an unknown Middle Eastern investor.

December 18: The U.S. Commerce Department reported that housing construction was down 3.7 percent for the month of November to a seasonally adjusted rate of 1.187 million units. This marked a 24.2 percent drop in new home construction in the 12 month period and the lowest level of home construction in more than 16 years.

December 19: Morgan Stanley announced it would be writing down an additional \$9.4 billion in losses on subprime-linked investments. The company also announced it would be selling a \$5 billion dollar stake to a foreign investment fund.

December 20: Reeling from the subprime mortgage crisis, investment bank Bear Stearns announced the first quarterly loss in the institution's eight-decade history. With this announcement from Bear Stearns, Wall Street's losses had reached a combined \$40 Billion from the subprime mortgage crisis.

⁷⁴ See Hurst A.: *UBS writes down \$10 bln, Singapore injects capital*, Reuters, December 10, 2008, available at: <http://www.reuters.com/article/ousiv/idUSL1049891520071210?sp=true> (visited January 8, 2008).

2008:

January 10: Countrywide Financial reported that late mortgage payments and foreclosures reached the highest level ever recorded this past December. The foreclosure rate on Countrywide's mortgages grew from just 0.7% a year ago to 1.44% last month. On the announcement of this news, shares in Countrywide dropped to their lowest price in over a decade.

January 11: Bank of America, the nation's second largest banking institution, announced that it would buy Countrywide Financial, the U.S.'s largest mortgage lender. This acquisition ended days of speculation that Countrywide, due to its role in the proliferation of subprime mortgages, would be forced to declare bankruptcy.

January 11: Merrill Lynch, the nation's third largest securities firm, announced it would need to write down more than double its initial projection related to subprime mortgage losses. Initial projections showed Merrill Lynch would lose around \$7 Billion; however, it now appears that number could reach \$15 Billion.

January 15: Citigroup the largest bank in the U.S. announced that its mortgage portfolio dropped in value by \$18.1 Billion. This news led Citigroup to its first quarterly loss in 16 years.

January 17: Lehman Brothers said it would no longer continue the practice of wholesale mortgage lending. As a pioneer in issuing mortgage backed securities, Lehman Brothers also announced it would cut 1,300 jobs. These job cuts come on top of 2,500 other jobs eliminated since June 2007.

Abstract English

In my thesis I first analyzed what caused the U.S. subprime mortgage market meltdown and why this triggered a global credit crunch. In recent years rising house prices, favourable market conditions and a well-defined channel of financial intermediaries drove the expansion of the U.S. subprime mortgage market. The result was that borrowers with shaky credit history who did not satisfy standard underwriting criteria obtained loans, which was praised as innovation. Subprime mortgage loans were packed into complex bundles of securities and sold to investors all around the world. Many of these mortgage-backed securities received AAA ratings from credit rating agencies that also supported and advised the originators. In 2006, thousands of homeowners became delinquent and defaulted on their mortgage payments when the housing bubble was bursting and interest rate reset to higher levels because they could only afford the initial teaser rate of their hybrid adjustable rate mortgages. Unknown exposure dried up the demand for mortgage-related securities. In August 2007, U.S. Investment banks and large European banks had to write down billions of dollars because of losses of subprime-related securities and some of them were bailed out. Fears and uncertainty caused a crisis of liquidity and confidence, a global credit crunch in financial markets and a sell off on equity markets.

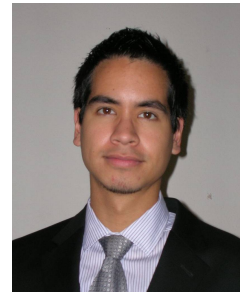
In the second part I looked for the direct impact of global market developments on Austria. In a performance analyses I showed that the sell off on the Austrian stock market was larger than on other European and American stock markets. I tried to find out, if the correlations of the Austrian Traded Index (ATX) with other stock market indices changed from the first to the second half of the year 2007 and I found out that the correlation coefficients between the ATX and European equity market indices increased slightly but the correlation between the ATX and the Dow Jones Industrial Average decreased.

Finally, I took a look on what consequences the credit crisis might has on the U.S. subprime lending industry, the U.S. economy and the banking industry and I gave a world economic outlook.

Abstract Deutsch

In meiner Arbeit untersuche ich zunächst die Ursachen der Krise am US-amerikanischen Hypothekenmarkt und wie diese Entwicklungen eine globale Kreditkrise zur Folge hatten. In den letzten Jahren waren steigende Immobilienpreise, niedrige Zinsen und ein gut organisiertes Netzwerk aus Finanzintermediären für die Expansion des US-amerikanischen Hypothekenmarktes für zweitklassige Hypotheken verantwortlich. Schuldner mit schlechter Bonität, die unter standardisierten Abschlussbedingungen abgelehnt wurden, konnten so einen Hypothekenkredit aufnehmen und sich ihren Traum vom Eigenheim verwirklichen. Die zweitklassigen Hypothekenkredite wurden dann in komplexe Wertpapiere gepackt und an Investoren aus aller Welt verkauft. Die Emittenten dieser, durch Hypothekenkredite besicherten Wertpapiere, wurden bei der Emission von Credit Rating Agencies beraten und unterstützt und viele Wertpapiere erhielten ein AAA Rating. Durch das Platzen der Immobilienblase und den steigenden Zinsen konnten tausende Schuldner ihre Kreditraten nicht mehr bezahlen und ihre Häuser wurden zwangsversteigert. Im August 2007 wurden Verluste von Amerikanischen und Europäischen Investment Banken in Milliardenhöhe bekannt, weil sie sich am U.S. Hypothekenmarkt verspekuliert oder in mit Hypotheken besicherte Wertpapiere investiert hatte. Die Unsicherheit führte zu Liquiditätsengpässen, Misstrauen zwischen den Banken, einer Kreditkrise und panischen Verkäufen auf Aktienmärkten. Um die Auswirkungen globaler Entwicklungen auf Österreich zu untersuchen führte ich ein Performancevergleich des Austrian Traded Index (ATX) mit anderen europäischen und amerikanischen Marktindizes durch. Daraus wurde ersichtlich, dass es heftigere Verkäufe am österreichischen Aktienmarkt gab, als an den anderen untersuchten Märkten. Ich zeigte auch, dass sich die Korrelationskoeffizienten des ATX mit europäischen Marktindizes vom ersten zum zweiten Halbjahr 2007 leicht erhöhten, der Korrelationskoeffizient des ATX mit dem Dow Jones Industrial Average sich aber verringerte. Zum Schluss analysierte ich noch die Auswirkungen auf das U.S. Hypothekengeschäft, die amerikanische Wirtschaft und die Finanzindustrie und gab einen Ausblick auf die Weltwirtschaft.

CV



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Staatsbürgerschaft: Österreich
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Schul Ausbildung

09/94 – 07/98 Bundesrealgymnasium Dornbirn Schoren
09/98 – 07/03 Höhere Technische Bundes – Lehranstalt Rankweil
Abteilung Elektronik, Schwerpunkt: Nachrichtentechnik und
Telekommunikation

Grundwehrdienst

10/03 – 06/04 Abgeleistet in der Schwarzenberg Kaserne in 5020-Wals,
Salzburg. Eingesetzt beim Tieffliegererfassungsradar

Studium

10/04 – 02/08 Internationale Betriebswirtschaft an der Universität Wien
Kernfachkombinationen: Banking und Corporate Finance
09/07 – 02/08 Erasmus Semester an der LUISS in Rom, Italien

Studienbegleitende Tätigkeiten

08/05 Zumtobel Staff GmbH in 6850-Dornbirn
07/06 VÖB DIREKT Versicherungsagentur GmbH in 1060-Wien
10/06 – 06/07 Studienassistent am Lehrstuhl für Finanzwirtschaft und
Banken der Universität Wien

Weitere Qualifikationen

Fremdsprachen: Englisch, verhandlungsfähig
Italienisch, fließend
Portugiesisch, Grundkenntnisse
EDV: MS Office
C, C++, Matlab

Hobbys

Fußball in einer Amateurm Mannschaft, Laufen und Skifahren