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List of Abbreviations

CAPM	Capital Asset Pricing Model
CD	Certificate of Deposit
CDO	Collaterized Debt Obligation
CMO	Collaterized Mortgage Obligation
CPI	Consumer Price Index
E	Exchange rate
ECB	European Central Bank
EONIA	Euro OverNight Index Average, effective overnight rate in the interbank market
EU	European Union
Euribor	Euro Interbank Offered Rate, daily reference rate in the euro wholesale money market
EuroCOIN^{TM}	leading coincident indicator for the euro area business cycle; indicator provides an estimate of the monthly growth of euro area GDP[1]
FDI	Foreign Direct Investment
Fed	Federal Reserve, Central Bank of the United States
FIH	Financial Instability Hypothesis
GDP	Gross Domestic Product
G7	Group of Seven: France, Germany, Italy, Japan, United Kingdom, United States of America, Canada
i	interest rate
I	Investment
IM	Imports
IMF	International Monetary Fund
LIBOR	London Interbank Offered Rate
LTCM	Long Term Capital Management

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[1] Definition from www.cepr.org (Center for Economic Policy Research)

M	Monetary base
Moody´s	Moody´s Investors Services
NBER	National Bureau of Economic Research
NX	Exports
OECD	Organisation for Economic Co-operation and Development
ROA	Return On Assets
SEC	United States Security Exchange Commission
S&L crisis	Savings and Loan crisis
S&P	Standard and Poor´s
S&P 500	value weighted index of 500 large cap stocks actively traded in the United States; maintained by Standard and Poor´s
T-bill	United States Treasury bill
UK	United Kingdom
US	United States
USD	United States Dollar
VaR	Value at Risk
Y	Output

INTRODUCTION

The current financial crisis first appeared on the US housing market and quickly spread to other local and global market segments.

Three broad factors, which I will discuss with respect to transmission mechanisms, have reinforced one another in a way that caused the financial market turmoil. Analyzing former crises, the reasons are not so unknown to market participants and policy makers. The abundance of *liquidity* in the financial system, the growth of the interwoven and *complex financial system* lead by financial innovation, the reduction in total reserve holdings of financial firms, and the actions taken by central banks resulted in an extensive build-up of leverage and *global financial imbalances*. The current crisis raises fundamental questions about the role of the banking industry, central banks and regulators, the US macroeconomic conditions, and the links between countries and global activity.

Since journalists, politicians and other opinion leaders have given various interpretations of the causes leading to this complex and critical situation- often in search of a scapegoat- I want to point out the multiple dimensions of this crisis in order to create a basis for broader discussion on a possible remedy.

In the first chapter I discuss risk and risk perception, which I perceive to be most fundamental in explaining the current crisis. Our environment is too complex to use linear models for any investment decision we take. Feedback mechanisms are partly responsible for why markets are prevented from becoming efficient as modern portfolio theory would require. Returns are not normally distributed, but show fat tails. I point out the measurement problems with mathematical models that are employed by financial market players on a wide-scale. The chapter also discusses the conflict of interest that rating agencies face.

The second chapter analyses transmission mechanisms of monetary policy with respect to its validity in this crisis. In my structure I follow the classification by Mishkin (2007). The credit channel as a monetary transmission is discussed in detail, while also introducing the cost

channel. In order to point out the relative differences of bank- versus market- based financial systems I study a paper by Kaufmann and Valderrama (2007).

The first two chapters provide the conceptual ideas of factors that have contributed to the immense debt creation and are further expounded upon in the remaining chapters. The section Financial Innovation describes how credit could have been made available easier before the crisis and how risk could be spread on a global scale. The chapter Global Imbalances further scrutinizes the "global savings glut" as stressed by Alan Greenspan (2005).

Central banks around the world contributed to the developments that led to the crisis. The risk of deleveraging lies within the scope of global monetary policy risks. In my thesis I focus on Greenspan´s insurance policy, known as the Greenspan Put, and the role fiscal budgets play with regard to international capital flows. Emerging economies as well as OECD countries and their currency management heavily contributed to the developments on financial markets.

As a conclusion, I comment on the repercussions I expect the crises to have on the US, Europe and Asia and try to give an economic outlook on a development, of which the severity still remains to be seen. Various reasons are put forward as to why the US has become the "world banker". Deep mistrust on financial markets will pull money away from developing countries and investors will continue putting their money in the safe haven of US Treasury bills. Drawing from my analysis I do not see the US suffering as much as its lenders may.

My analysis ends with November 1st 2008.

I. RISK PERCEPTION

MISPRICING OF RISK

In the run- up of the financial turmoil, one essential issue was the mispricing of risk. In an interwoven complex market environment, statistical assumptions underlying the mathematical models for predicting future returns and volatility failed to hold true in reality.

Advances in financial know- how and technology permitted unbundling and re-bundling of risky payoffs of ordinary financial products. Illiquid assets such as loans were made liquid and parts of them could be sold off to the market. Not only hedge funds, but also those investors usually considered as risk averse, followed the market trend by investing in some of the numerous derivative products. Borio (2007) points out that financial innovation made it possible to separate various risk segments. Exchange rate risk or interest rate risk now can be separated from the traditional loan or security through derivative products. Swaps are used to hedge against these risk parameters. As the growth of credit default swaps and collateralised debt obligations shows, credit derivatives also gained in significance.

The mathematics underlying the pricing of these products often follows an independent identical distribution (iid), which approaches a normal distribution. In reality, the random variables in derivative pricing do not follow a linear function.

I.1. ASSUMPTIONS OF RISK TRADING MODELS

I.1.1) Normal distribution

Quantitative trading strategies work with mathematical models that have, as an underlying assumption, a normal probability distribution. For returns to follow a normal distribution, one must have a set of independently distributed returns with no extremes. In static systems this assumption is frequently valid, but not so in a dynamic system.

The assumption of a normal distribution results from the central limit theorem. The central limit theorem states that under certain conditions, such as being *independent* and *identically* distributed with finite variance, every variable that can be modelled as a sum of a large number of small random variables is approximately normally distributed. The assumption that many small, independent effects *additively* contribute to each observation, theoretically justifies the use of a model with normal distribution.

In fact, random variables in finance are not additive, but rather multiplicative. Variables influence each other. Thus, the effect on the outcome is a combined contribution. The appropriate probabilistic model may then be a log-normal distribution, i.e. a normal distribution of the logarithms of the respective variables. In finance one uses the logarithm of the variable of interest to determine the return path of a security. Indirectly observed *returns* as opposed to values are thus observed to determine the distribution.

If it seems implausible that a large number of small effects act *additively and independently*, the assumption of normality is not justified. If there is a single external influence (Fed policy) which has a large effect on the variable under consideration, the assumption of normality is not justified. The very crucial assumption to match a normal distribution is the required independence of the variables.

I.1.2) Independent variables and correlation

The observation that variables are neither correlated, nor normally distributed does not imply independence. Only if the random variables are *jointly normally distributed* would this feature be valid. Then the variables follow a multivariate normal distribution. If the random variables are uncorrelated, their covariance should be zero. They are independent variables.

Variables can have a normal distribution and can be uncorrelated if one looks at them separately. But if their joint distribution is not normally distributed, they need not be independent. Independent statistics are always uncorrelated, but the inverse is not true. Quantitative trading strategies implicitly assumed probabilistic independence between events that turned out to be correlated. When modelling a social system that changes over time, the

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assumption of independence might not hold true. Variables that were uncorrelated in the past need not be uncorrelated in the future.

The inaccuracy of the mathematical models that banks and bank regulators had been using had also been an issue in 1998 during the crisis of Long Term Capital Management as a consequence of the Russian crisis and high risk aversion on capital markets. The measure employed to determine a bank's capital need is VaR (Value at Risk). Edwards (1999) states that the applied mathematics leading to the crisis of LTCM was inadequate to fully capture the reserve requirement. He focuses on the implications for regulators and what can be learned from a crisis. He argues that relying on risk models to estimate exposures and capital requirements needs to be scrutinized.

During periods of financial distress price volatilities explode which implies probability distributions with greater variances. Furthermore asset prices, previously thought to be uncorrelated, become highly correlated. This is because of the interdependence of variables contributing to the return of financial assets in certain periods of the business cycle. When holding exotic instruments such as collateral debt obligations, the investor takes a position in a tranche. CDOs are split into tranches of notes to account for the different exposures to credit default. Following the priority rule of payments senior notes are paid before mezzanine notes, which are paid before equity notes. The pricing of CDO tranches reflect investors' expectation of the correlation of defaults in the underlying portfolio. According to Gibson (2004), the correlation risk of the various tranches can be characterised as business cycle risk. In recessions the correlation of the tranches increases. The tranches have defined risk and reward characteristics. The quality of the investment thus depends on the quality of the model assumptions that define the corresponding risk and return. The price of a tranche is sensitive to default correlation. If default is likely, losses are more likely to wipe out the equity and mezzanine tranche. The senior tranche thus gets more vulnerable too and its value decreases.

Prices are hence extremely sensitive to estimation errors of the higher moments of the probability distribution. Derivative pricing is particularly sensitive to the distribution of pay-off.

In statistical model-fitting, an indicator of quality of fit is looking at the errors deviating from the model prediction, the residuals. If normality is assumed residuals should be independent and normally distributed. Any deviation from normality needs to be explained. Normality is the only observation that need not be explained. However, if the original data are not normally distributed, then the residuals will also not be normally distributed. This fact is usually ignored in practice, which means that looking at residuals is not an appropriate indicator for testing the model-fit.

I.2. MODERN PORTFOLIO THEORY AND FAT TAILS

Modern portfolio theory in asset pricing builds on the efficient market hypothesis (EHM), put forward by Fama (1965). According to EHM investors´ reactions to information follows a *random walk,* i.e. today's price it the best forecast for tomorrow's price. The variation of prices is a random value following the Gaussian distribution. Price changes are independent of one another and occur as a result of unexpected information, which is by definition, random. Investors can act exuberant or fearful, but on average they are right and the average price is a function of the intrinsic value of an asset.

But stock market returns do not follow a normal distribution as suggested by capital market theory. Return distributions show high kurtosis. The tails of the density function are fatter and the mean is higher than predicted by a normal distribution. Mandelbrot (1960) argued that stock price volatility is too great to justify a bell shaped curve. The hyperbolic decline in the tails of the empirical distribution appears to be one of the most elementary and pervasive stylized facts for financial markets.

I tested the distribution of the S&P 500 to see whether the assumption of normal distributed returns holds. To test the null hypothesis that the return data from the American S&P 500 stock index follows a normal distribution I used the Jarque Bera test. I worked with daily data

from January 1970 to September 23rd 2008[2]. The statistic program R is the tool I employed to get my results. Based on the sample kurtosis and sample skew deviations from normality can be identified. A normal distribution has a skew of zero and kurtosis three. Excess kurtosis is zero. In the data sample of the S&P 500 the kurtosis takes on the value of 22.19, which is a positive number that describes a leptokurtic distribution of data. Characteristic for a leptokurtic distribution, sometimes also termed super Gaussian distribution, is the more acute peak around the mean and the fat tails.

The statistic program calculates a p- value lower than the significance level of 0.99. Thus, the null hypothesis can be overthrown. The data is not normally distributed. Figure 1 depicts my findings graphically.
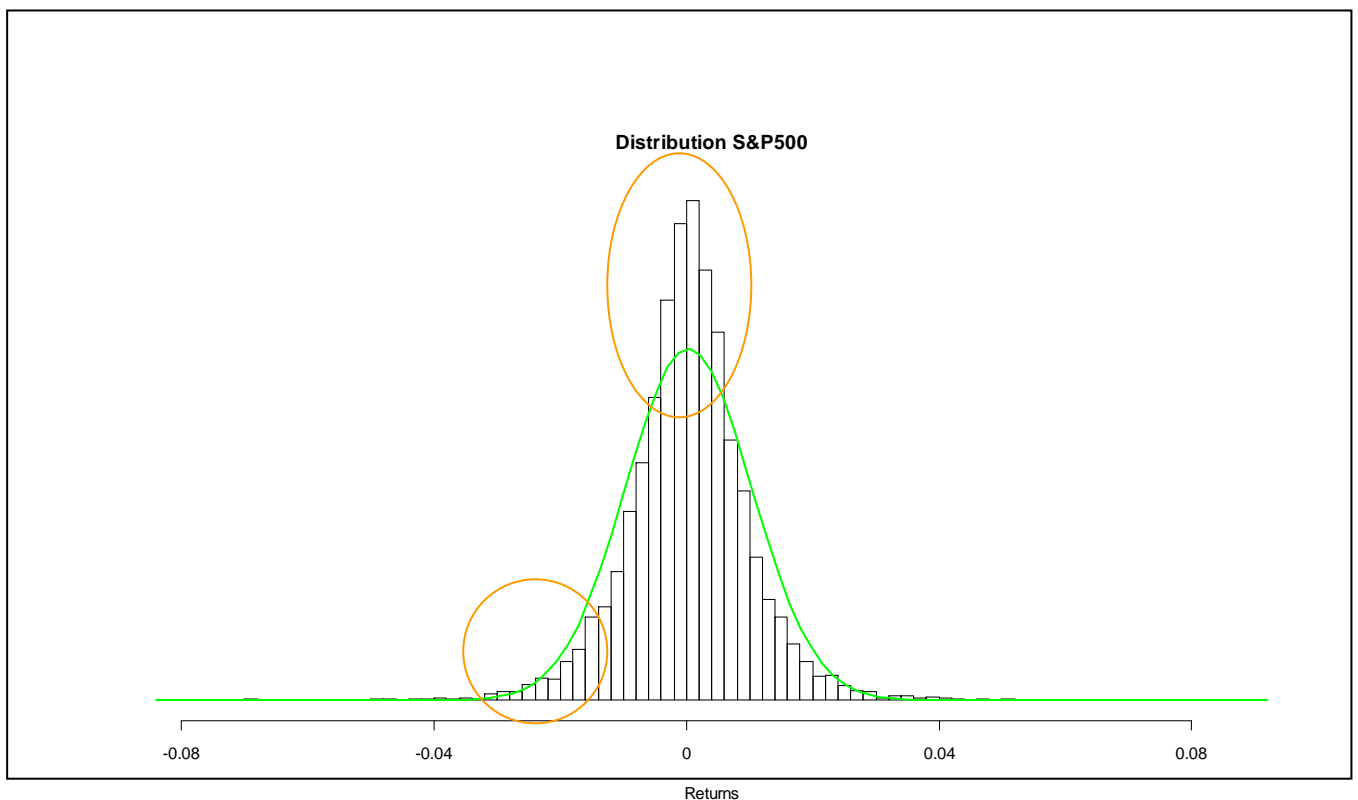
Figure 1: Distribution of the S&P 500 stock market index

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[2] Data from yahoo.finance, September 23rd, 2008.

I.2.1) Market efficiency and investor rationality

Modern portfolio theory rests on the key assumptions of market efficiency and investor rationality. But it can be doubted that the assumptions of rational, well informed and homogenous investors would remain valid for various time windows.

Rational investors can assess and optimize their risk- return outcome following the logic of the linear relationship of risk and return in the Capital Asset Pricing Model, CAPM. Behavioural finance and the current crisis show that the copy cat problem and herd behaviour are salient features of real markets and do not support a linear cause and effect logic.

Not all investors are well informed about risk and return prospects. Behavioural assumptions on investor and managerial behaviour rather than rationality assumptions are more likely to explain decision making in finance. Decision rules are set in response to market conditions. Information is taken from the market environment and combined with personal views. This approach is also used in the asset allocation model of Black and Litterman (1992). Evidence from IPOs and mergers shows, that herd mentality and rules of thumb determine decisions which are similar among market participants (Loughran, Ritter and Rydqvist, 1994).

I.2.2) The Black Swan and Fat Tails

Taleb (2007) uses the black swan metaphor to help popularize the fat-tail idea. The Black Swan reference points to the scientific work of Karl Popper on induction. The black swan is an outlier event that has extreme impact and that humans seek to explain after the fact. Humans like to generalize about a system based on properties of a limited sample. The problem of induction should make us sensitive to which methodology serves us better, falsification or verification. Seeing lots of white swans doesn't prove the theory that all swans are white (verification), but seeing one black swan does disprove it (falsification).

On financial markets we observe inductive behaviour. When an asset price is goes up, the natural assumption is it will continue to do so. In this self- reinforcing process profitability and rising asset prices verify each other. The process feeds on risk appetite and market

liquidity. Higher prices reduce short- term volatility and improve liquidity. Within the financial system there are positive feedback mechanisms that generate pro-cyclicality.

Indeed, prosperity can breed an unhealthy sense of security. And even if the financial players are aware of under pricing risk (Borio, 2007), competition forces them to "keep dancing as long as the music plays"[3]. For financial institutions leaving the market seems more costly than staying. Short horizons are crucial in assessing this problem. Mean- reversion, the tendency of a stochastic process to return to the average value, only holds true for longer horizons (Frankel and Froot, 1990). In the same token, the other self- reinforcing process is that the availability of external finance increases asset prices and output. This is known as the financial accelerator mechanism (Bernanke, Gertler, Gilchrist, 1996). This mechanism combines the importance of a borrower's net worth for being able to receive funding and the fact that external finance is more expensive than internal funds due to the principal- agent problem. An upward trend on borrower's balance sheet increases investments.

Financial liberalisation facilitates access to markets and credit and increases external funding, which builds on perceptions of risk and wealth. Borio and Shim (2007) state, that we have shifted form a cash- flow constrained, to an asset backed global economy. An asset backed economy tends to be pro-cyclical, and even more so building up booms.

Borio and Crockett (2000) observe that the financial markets behave differently from other markets. In other markets, price mechanisms will regulate supply and demand and equilibrate the market. This is not necessarily the case in financial markets as with feedback mechanisms in place "greater supply of funding liquidity generates additional demand for itself" (Borio, 2007). Feedback mechanisms have already been discussed by Shleifer and Vishny (1997) in a model showing the limits of arbitrage.

The authors state that most arbitrage trades intended to detect market inefficiencies are risky and require capital. Arbitrage trades in the real world are conducted by relatively few, but highly specified professional investors. Fundamental to such arbitrage trading is that in order

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[3] Charles Prince, Citigroup´s CEO in an interview with the Financial Times on July 9th 2007.

to operate in the capital intensive arbitrage markets, fund managers step into an agency relationship with investors, such as banks, endowments and wealthy individuals. Arbitrageurs use their highly specified knowledge in order to achieve market efficiency. Since investors lack the profound understanding of the arbitrage market, they allocate money based on past returns of the arbitrageurs, i.e., they base their manager selection on past returns.

So, if the mispricing that the arbitrageurs bet against worsens, investors usually withdraw their resources or the risk-averse arbitrageurs voluntarily abandon their original strategy and liquidate their positions in extreme circumstances. Shleifer and Vishny´s results of a performance based arbitrage model indicate that arbitrageurs have the weakest stabilizing effect when prices strongly diverge from fundamentals, since noise traders who push prices away from fundamentals provoke capital outflow of the funds under management. The current situation proves what the authors´ had already identified 1997. In both extreme cases, in an exuberant upwards trend and in a fearful downwards trend, the feedback mechanism constrains arbitrageurs in revealing the assets´ fair value. In "extreme circumstances" when funds are limited and external capital is not easily forthcoming the market is prevented from becoming efficient.

As observed in the LTCM crisis in 1998 the copy cat problem reduces diversity of market participants and thus fuels pro-cyclicality. By copying LTCM´s trading strategy a vulnerable banking and financial system was created (Edwards, 1999). Risk management had not incorporated the herd behaviour. "Observational independence" underlying the risk management models is not given if the market follows the same strategies.

The economic mechanism here is straightforward. Since everyone is applying very similar strategies, in a falling market traders have a hard time selling. LeBaron (2001) states that according to a Walrasian setup, prices drop by a large magnitude to clear the market. Hence, population homogeneity translates into a reduction in market liquidity (Keynes, 1936, p.173).

I.2.3) Complex adaptive systems

Drawing on findings in the fields of biology and physics researchers at the Santa Fe Institute in New Mexico articulated a phenomenon called complex adaptive systems. Financial markets can be referred to as a complex system adapting to its environment. *Complex* means a large number of participants. *Adaptive* is the feature describing decision rules resulting from interaction among market participants. Paraphrasing Mauboussin (2007), in a competitive environment various decision rules compete with one another. The most effective one will survive and be adapted by others. In a *system*, the sum is greater than its parts, which is explained by the interaction and adaptation of rules within the system. In a complex system investors´ behaviour is not determined by rationality, but rather by social and psychological factors.

I.2.4) Wisdom of crowds

A colloquial way of describing the market as a complex system is introducing behavioural finance and the phrase "wisdom of crowds". In an interview 2004, William Sharpe declares himself as a fan of behavioural finance. Even though "these sort of almost silly models in which everyone knows everything and everybody is perfectly rationale", traditional asset pricing models can be good in terms of prices, risk and return. "The basic argument [of the wisdom of crowds idea] is that if we have enough people even though they may be ill-informed and irrational coming to the market, it is entirely possible the prices of assets, thereby true risks and returns, are what you get if they were all rational and well informed" (Sharpe, 2004).

Sharpe (2004) refers to the book by James Surowiecki, an American journalist who first published a book on the phenomenon of wisdom of crowds. Work dealing with this phenomenon shows that when certain conditions are met - diversity, aggregation, and incentives - markets tend to be efficient. Conversely, when one or more of these conditions are violated, markets become inefficient. Then the price is no longer an unbiased reflection of the value of an asset.

Statistical properties of price movements in financial modelling are not valid in reality. Mechanisms that make movements diverge from the "normal form" stem from the fact that efficient markets are constrained when these three necessary conditions are not fulfilled.

Diversity is the condition most likely to be violated. Diversity means cognitive diversity, which summarizes diversity in how people make their decisions. Social diversity is the term used in organisational structuring to achieve this form of diversity. But to be precise, social diversity does not necessarily mean cognitive diversity. If investors apply the same strategy, this condition is not met.

The condition of **Aggregation** demands that information is correctly aggregated, i.e., different viewpoints have to be aggregated to one shared opinion. Stock exchanges take the role of aggregating information.

Incentives as a condition to make optimal decisions, to make the market efficient, refer to the rewards investors can expect when making the right decisions. Corporate finance has created vast literature on incentive based compensation and its implementation. The problem to be overcome is the problem of short term horizons for assessing risk (Borio, Shim; 2007). When the time horizon is short, it is easier to expect the current situation to continue. In a market that is confirming strategies, that generated profits, incentives appear to respond to short time horizons rather than aiming at long term performance. Relying on market prices and not being able to identify the deterioration of repayment prospects - if at some longer horizon adverse events occur - result in pro-cyclicality.

I.3. RATING AGENCIES

Rating agencies have come under criticism for rating the complex products that are made - among other factors- responsible for the widespread defaults on US subprime mortgages and the ensuing credit market crisis. The agencies had already been involved from 2001 to 2002 for not having spotted signs of problems at Enron and WorldCom, the US utility and telecoms giants that went bankrupt after the publication of fraudulent accounts.

In July 2007, the US Security and Exchange Commission (SEC), reported its findings on the practices of the three rating agencies Fitch Ratings, Ltd. ("Fitch"), Moody's Investor Services, Inc. ("Moody's") and Standard & Poor's Ratings Services ("S&P"). The tenor of the report makes clear that the SEC thinks that the ratings shortcomings enabled the increase in mortgage securitizations that contributed to the subprime meltdown. The issuance of a credit rating for each tranche of the collaterised debt obligations and mortgage-backed securities is an essential component in the creation and sale of subprime instruments. The issuer of the product seeks to get a rating; he arranges the deal, which gives him the description of "arranger".

Tranching allows for creating an AAA (S&P) or AAA (Moody´s) -rated asset out of a subprime collateral because each tranche is assigned a particular risk profile. The first dollar of income goes to the securities in the tranche with the highest rating, while the first dollar of loss is assigned to those with the lowest rating.

Working themselves through internal communication documents, exchanged within the rating agencies, the SEC staff identified some reasons for the inability of ratings to predict unsound developments.

First, the substantial increase in the number and complexity of deals with collaterised debt obligations and mortgage backed securities proved not to be well understood by the agencies and suffered due to a lack of staff. Besides the difficulty of coping with the volume of the deals that needed rating, limitations on the availability of data increased the shortcomings of the ratings. Historic data, used in the quantitative models, were based on periods of rising house prices, thus not fully capturing an adequate distribution.

Second, there is no legal requirement that information which agencies receive from the arrangers needs to be verified in the form of due diligence. Information about the quality of the assets underlying the structured products is second- hand and its quality is not guaranteed.

Third, the documentation of the rating process was found to be incomplete. Agencies did not always follow their internal procedures. Moreover, the quality of surveillance after the issuance revealed some leakages. This leads to the fourth point, the conflict of interest.

"The issuer pays"- conflict exists in all asset classes that receive ratings. With structured products this conflict may be exacerbated for the following reasons: Since the "arranger" of the rating is often "the primary designer of the deal" (SEC Report, 2007), he also has the flexibility to adjust the deal structure to obtain the desired credit rating. The analyst conducts an analysis of the pool of assets underlying the product. In a further step he develops predictions about the future path of the security applying quantitative expected loss models as well as qualitative factors. The outcome of stress tests, with different grades measuring the severity of defaults, determines the rating. Another key element in the rating is the test of capital structure against the requirement for a particular rating. The analysts reveal to the arranger whether the capital structure supports the desired rating. By doing so, the rating agency gives a recommendation on capital structure.

The analysts were also allowed to engage in fee discussions, which may increase the conflict of interest. The concentration in the underwriting business is high. According to the SEC, 80% of the deals in number and dollar volume are conducted by twelve underwriting firms. Agencies seek to keep the business relationship upright, since it is its vital source of income streams.

II. TRANSMISSON MECHANISMS

The monetary transmission mechanisms describe the process through which monetary policy decisions affect the economy in general and the price level in particular (ECB). The transmission mechanism is characterised by long, variable and uncertain time lags. Thus it is difficult to predict the precise effect of monetary policy actions on the economy and price level.

Since the 1980s, under the chairmanship of Paul Volcker and Alan Greenspan at the Federal Reserve, monetary policy was more and more thought to have the means to stabilise output and keep inflation low. Against the background of budget deficits in the era of John F. Kennedy and Lyndon B. Johnson and the difficulty to make tax and spending decisions in a timely fashion (Mishkin, 1995) fiscal policy has lost its lustre in the 60s. Monetary policy has become a recognized tool for macroeconomic policymaking.

To successfully apply the tools of monetary policy it is required to understand the transmission mechanisms through which monetary policy affects the real economy. Standard literature discusses the mechanisms in the setting of interest rate, exchange rate and other asset price effects, as well as the credit channel. In my theoretical outline I will follow the transmission mechanism outlined by Mishkin (2001).

II.1. INTEREST RATE CHANNEL

The interest rate channel is the key monetary transmission channel in Keynesian economics. This mechanism can be shown in a schematic diagram:

$M\uparrow \rightarrow i_{nom}\downarrow \rightarrow I\uparrow \rightarrow Y\uparrow$

An increase in the money supply ($M\uparrow$) translates to lower nominal interest rates ($i_{nom}\downarrow$) and higher investment ($I\uparrow$). An increase in aggregate demand increases output ($Y\uparrow$). This mechanism applies equally to business and consumer spending.

Keynes argued that the solution to depression was to stimulate the economy ("inducement to invest") by reducing interest rates and increasing government spending in infrastructure. In his approach, monetary easing via the interest rate as a policy instrument should start a cascade of events that stimulate economic activity further and multiple the effect of the initial stimulus (Blinder, 2002).

II.1.1) Demand for money

Keynesian theory has as a starting point, the focus on the demand side for money. A change in supply can alter expectations and thus change demand.

In Keynesian economics non- neutrality of money is assumed. That is, any change in money supply does have effects on consumption, employment and growth. The underlying argument is that prices and wages are sticky and do not adjust to an unexpected change in the money supply. In the short run the rigidity of consumption and wages thus changes the real money supply. In the long run the change in money supply should be offset by the adjustment process of prices. In periods of downturns in the economy the short run is extended. The reactions to the monetary stimuli are slower. Instead of investing, risk aversion forces market participants to holding cash. This behaviour prevents prices from rising.

Quantity Theory of Money

Keynes contributed to the theory of money demand and responded to Irving Fisher's classical quantity theory of money. According to Fisher, velocity of money captures the link between total spending and total quantity of money. Velocity of money is a measure of how often per year an average unit of money is spent. Fisher states that velocity depends on institutions and technology and thus is fairly constant in the short run. A change in money supply changes prices, but leaves velocity stable. Money demand is proportional to nominal spending. In Fisher's identity interest rates have no influence on money demand. Empirical data shows that velocity cannot be treated as constant. In recessions, velocity decreases. Keynes (1936) abandoned the idea of constant velocity.

In the Liquidity Preference Theory he postulates three motives for holding money:

- The transactions motive assumes that money is a medium of exchange to conduct every day's transactions. Just as in the classical theory, transaction demand is proportional to income.
- The precautionary motive says that money is a cushion against unexpected needs. Precautionary demand is also proportional to income and sensitive to interest rates. Agents face a trade off between the benefits of holding money (transactions, precaution) and the costs (interest rate) of doing so.Changes in interest rates alter the optimal level of transaction and p recautionary demand.
- Money is a store of wealth. This speculative motive for holding money depends on income (or wealth), but also on actual and expected interest rates.

For Keynes, interest rates determine the opportunity cost of holding money in a world with two assets, money and bonds. As risk aversion increases, demand for money rises. People want to hold more money. Lower interest rates should keep agents from behaving that way and increase velocity.

II.1.2) Counterarguments to the interest channel as a transmission mechanism

A key monetarist objection to the Keynesian paradigm is that its focus of monetary policy actions is only on one relative asset price, namely the interest rate. Instead, monetarists are of the opinion that it is vital to look at how monetary policy affects a wide universe of relative asset prices and real wealth, especially in markets for equities and real estate. The IS- LM model and later the Mundell- Flemming model, which relate money supply and the interest rate to aggregate income and output, is too narrow to capture monetary policy's influence. Monetary stimuli change actual and anticipated prices of a variety of domestic and foreign assets (Meltzer, 1995).

Both Keynesians and monetarists explain how monetary policy affects asset prices. In the Keynesian view, contractionary policy increases the incentive to hold more bonds than equity.

Consequently, the price of equity drops. Monetarists argue that a change in the money supply changes the marginal utility of holding money relative to other assets and consumption. Monetary contraction leaves the public with less money than it wants to hold. In order to compensate for that, money holders attempt to adjust prices to restore equilibrium. This is done by reducing spending and consumption. The stock market is one place, where spending is reduced. A decrease in demand lowers equity prices.

Meltzer (1995) argues that the transmission mechanism of monetary policy begins on asset markets. Information and transaction costs are lower with asset prices than costs associated with the adjustment in production, change in consumption and investment in durables. The adjustment in asset prices is particularly strong when uncertainty about the persistence of the stimulus exists. Asset prices react both to permanent as well as to transitory effects. Lower interest rates in a recession might not translate into higher business spending.

Currently, we experience extremely low interest rates in the US. As the figures show, it was the household sector that drew cheap credit due to this circumstance. Investment from the business sector in the US did not so much react to low interest rates. Low interest rates affected demand for global products.

Would lower interest rates, to counteract the current turmoil, induce business spending and prevent the economy from cooling down? The answer is no. Firms will consider whether their investment can be employed in the future with a financially weak household sector, which is not able to borrow in the near future as it did in the recent past. Against the background of extremely low savings rates in the US, additional spending on durable goods and housing is not easily feasible. Most banks are unwilling to lend given the unsound development and economic prospects. The degree of prevailing risk aversion in the market can be captured by looking at the spread of the interbank rate to the policy rate and the long- term – short-term bond spread.

Figure 2 shows the Ted spread, the difference between the three- month Libor and the three-month Treasury bill yield. The dramatic widening of the spread is due to the immense fall in the three- month Treasury bill rate, which yielded 0.022 percent on 15 October 2008. Since investors seek to flee to secure financial products, the yield of Treasury bills has been falling.

The return they generate is negative if inflation is considered. Figure 3 depicts the spread between the 30 year (the green line), the 10 year (the blue line) and the 2 year Treasury bill, which has widened more than 250 basis points after the bankruptcy filing of the investment bank Lehman Brothers in September 2008.

Figure 2: Ted spread: Spread between 3- month LIBOR and 3- month Treasury yield from October 2006 to October 2008; Source: Thomson Datastream
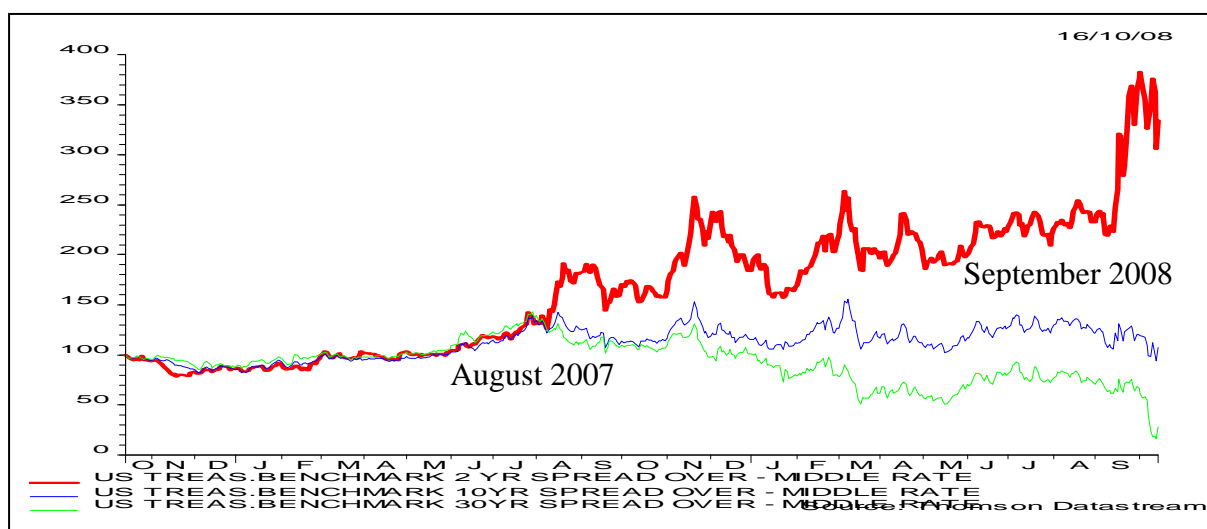
Figure 3: Spread of US Treasury bills over the middle rate with distinct times to maturity; Source: Thomson Datastream

Wide spreads between the term funding rates (of which many bank loans are priced off of) and the policy rates, reduce the efficiency of policy rate adjustments when needed (Noyer, 2008, Bank of France). The critical point is to examine how far the policy rate influences the market rate.

Taylor (1995) claims that during cyclical fluctuations the many short term interest rates in place are all highly correlated, and that research focuses on the Federal Funds rate, as a short-term private market rate (Brayton, Marquez; 1990). Currently, we do not observe a high correlation between the policy rate and other short term rates. The central bank can control the Federal Funds rate, but it cannot control the Fed Prime Rate or LIBOR rate. I calculated the correlation of the Libor rate with the federal funds target rate for the period from 2006 to 2008 and got a negative correlation of 0.32 between the two rates, which underpins the criticism of explaining the interest rate channel of monetary policy, especially in a critical market environment.

As the spreads of the central bank target rates and the interbank rate show, the central bank cannot control for the pass through of the interest rate to the real economy. The spreads are the result of high risk aversion on the markets. According to the European Central Bank (ECB) the sub-prime mortgage crisis spilled over to the euro area money market on the 9th of August 2007 as indicated by the spread between the three – month Euribor and the Eonia swap rate. Figure 4 shows the widening spread of the three- month Euribor and the Eurepo rate as money market tensions increased on European markets. Eurepo is the rate at which one prime bank offers funds in euro to another prime bank. The data plotted ranges from October 2006 to October 2008.
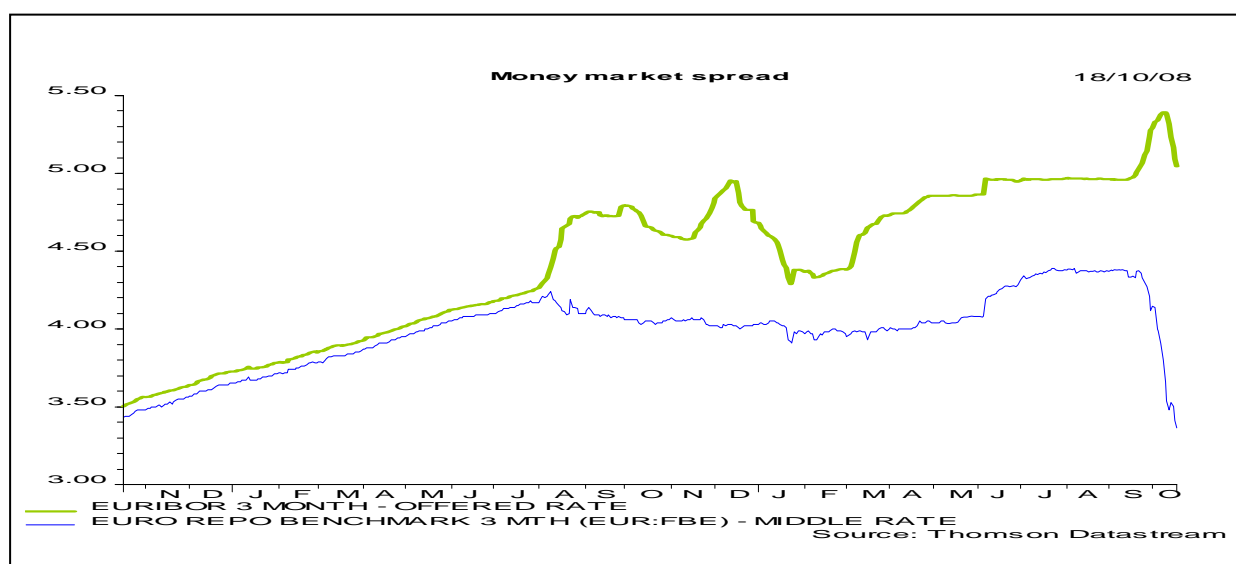
Figure 4: European Money Market Spread between three- month Euribor and ranging from 2006 to 2008, Source: Thomson Datastream

Bernanke and Gertler (1995) argue that the interest rate channel is incomplete in its reasoning. The authors discuss some empirical responses to monetary policy shocks to explain their starting points. First, typically monetary policy only has *transitory* effects on the interest rate, but the decline in the price level and real GDP following monetary tightening is more *sustained.* Second, final demand falls relatively quickly after the monetary policy shock. Production is second to fall, with a lag in time. Business investment follows the downward path.

The sharpest and earliest decline in spending is observed with housing. Next come consumer goods and spending in production. In the short run inventory stock piles rise before ultimately declining as a result of reduced production due to falling demand. Business investment is last to fall in demand. Inventory disinvestment accounts for the largest portion of a declining output.

Bearing in mind the stylized facts, the authors identify three puzzles not explained by the interest channel.

- One is in regards to the *magnitude of the policy effect*. Even though interest changes may be small, the real economy may be strongly affected. Empirical studies did not find reasonable effects of increased cost of capital on spending. "Accelerator" variables (Bernanke, Gertler, Gilchrist; 1996), such as lagged output, sales or cash flow do have an impact on spending.

- The second puzzle relates to the issue of *timing*. Some components of spending, such as consumer durables and business investment, react relatively late. Bernanke and Gertler find that these sectors show reaction only after 3 to 4 months after the interest rate change.

- The third puzzle is why an overnight rate, such as the federal fund rate, has so much impact on spending on long lived assets, such as housing and production expenditure. Investment in those assets should be primarily responsive to real long- term interest rates.

Criticism of the interest rate channel goes beyond the failure to explain whether short term or long term interest rates determine investment and consumption. Neglecting the adjustment of asset stocks to new investment and capital accumulation, the role of intermediaries is a further

aspect critics point out as a shortcoming of the IS- LM model (Meltzer, 1995). Money supply is considered to be that of the monetary base or proportional to it.

Not satisfied with the neoclassical cost of capital approach Bernanke and Gertler (1995) find explanations for the puzzles of magnitude, timing and composition by extending the discussion to the credit channel. Bernanke and Blinder (1993) show, that the federal funds rate affects bank activity in respect to the loan supply. In his studies on the Great Depression, Bernanke (1983) uses data on the supply of loans and finds that the credit situation is able to explain the persistence of low GDP growth as well as the severity of the financial crisis.

II.2. CREDIT CHANNEL

Bernanke and Gertler emphasize that the term credit channel is not a free standing, distinct alternative to the traditional transmission channels, but rather captures "a set of factors that amplify and propagate conventional interest rate effects".

II.2.1) External finance premium and asymmetric information

Basic to explaining the transmission process of the credit channel is the external finance premium. This premium constitutes the difference between an internal funding rate and an external one. It reflects the "deadweight cost" associated with asymmetric information.

The difference between the opportunity cost of retained earnings and the cost of external finance is also referred to as the "lemons´ premium". Akerlof (1970) explains the problem of adverse selection via a used car market, where the seller has better information than the buyer. The buyer of a car simply does not know which cars are the lemons and which ones are the peaches. Given that buyers cannot tell the quality of the car, all cars will sell at the same price. Since the buyer wants to get compensated for the risk of purchasing a lemon, the price of all cars is reduced. Non lemon car sellers will be inclined not to sell at the price under value and will leave the market.

To apply this information problem to credit markets, the bank can be referred to as the `buyer´, and the borrowers as the `sellers´. Whenever there are informational frictions a risk premium has to be paid to cover the expected costs of evaluating and monitoring the lender, as well as expected costs of collecting the interest payments. An increase in the interest rate also increases the external finance premium. This premium alters the borrower's net worth and cash flow.

Taking the agency problems in imperfect financial markets as a starting point, two basic channels of transmission arise in a credit market, the bank lending channel and the balance sheet channel.

II.2.2) Balance sheet channel

Studies in the field of corporate finance show that equity disciplines the management to act in the shareholders´ best interest. An optimal portion of equity ownership reduces the principal-agent problem (Jensen and Meckling, 1976).

The same problem prevails in credit finance. The customer's net worth plays a crucial role in assessing the creditworthiness of the lender. A greater share of self financing or being able to offer collateral to guarantee the liabilities reduces the agency problem. The greater the borrower's net worth, the lower the external finance premium and the easier to access credit. In the real world the requirement of financial ratios, such as the equity ratio and down payments or collateral provisions should help reduce the problem. There are direct and indirect effects that can weaken a borrower's balance sheet:

Outstanding short-term- or floating- debt directly weakens the borrower's financial position. Reliance on short term debt and working capital deteriorates cash flows in a situation of tighter credit conditions. Consequently, asset prices drop. The classical Discounted Cash Flow method shows that the equity position is overvalued and that it will drop to its fair value.

Monetary tightening also has indirect effects on cash flow. It reduces spending by customers due to the restricted access to credit and/or increased cost of borrowing. Firms as well as households tend to smooth "cyclical variations" by borrowing to overcome financing gaps

(Bernanke, Gertler; 1995). The gaps arise from a discrepancy of fixed costs versus revenues or income, respectively.

If income decreases because of decreasing demand by customers the financing gap widens, since fixed costs still need to be paid. This development increases debt and reduces creditworthiness. The external financing premium, and with it, interest expenses for its floating debt rate rises. Bernanke and Gertler find evidence for the link of monetary policy to the financial position of borrowers. They plot the coverage ratio and the mortgage burden along with the Federal Funds rate and find an obvious co-movement of the ratio with the interest rate. The coverage ratio is a measure for a firm's financial health and creditworthiness. The "mortgage burden" (Boldin, 1994), the ratio of mortgage payments to income is the respective measure for households.

I want to show the relation found by Bernanke and Gertler for the more recent period of 2000 to 2008. However, the analysis I conducted with data from the data download program of the Federal Reserve does not show such an obvious co-movement of the funds rate and the mortgage ratio. (See figure 5.)
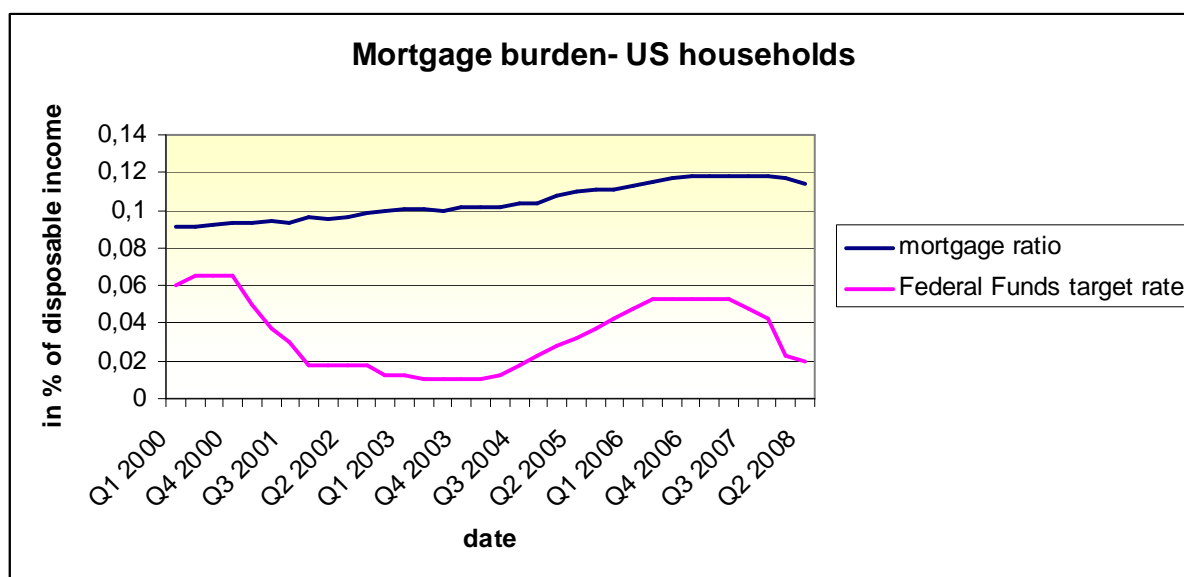
Figure 5: "Mortgage ratio", data source: Federal Reserve

As can be seen from the spread of the interbank market rate against the policy rate, banks´ willingness to lend to the financial sector is extremely low. Banks´ balance sheets deteriorated

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at the same time as household balance sheets did. The subprime mortgage crisis is a banking crisis. From the perspective of monetary transmission mechanisms, a banking crisis makes supporting an economic upturn through monetary actions extremely difficult.

II.2.3) Bank lending channel

Schematically, the monetary effect of the bank lending channel is as follows:

M ↓ → bank deposits ↓ → bank loans ↓ → I↓ → Y↓

The bank lending channel analyses the effect of monetary policy on the supply of loans by depository institutions. Banks play an important role in monitoring and evaluating borrowers. They are the best informed creditors thanks to their screening tools. The model of the bank lending channel by Bernanke and Blinder (1988) argues that central bank open market sales drain reserves and hence bank deposits. Lower deposits reduce banks´ possibility to fund loans. Similarly, higher reserve requirements also reduce loan supply. So, if money supply is expanded, bank deposits take the same direction. This process results in more bank loans, which boosts investment. The opposite is true as well.

Bank credit is especially important for small firms. Due to asymmetric information, small firms rely heavily on banks for funding, whereas large firm have access to credit through the stock and bond markets. This is, however, not so clear in a serious financial market downturn with cash hoarding: Required stock and bond market returns might become prohibitive. Banks have specialized in reducing the informational problems in credit markets. Modern financial markets most likely have diminished the importance of the traditional bank lending channel, but still relationship banking is an important source for funding. The bank lending channel thus transmits monetary policy with respect to bank dependent types of borrowers.

II.2.3.1) The cost channel

The cost channel is the transmission mechanism that works through the supply side or cost side effects of monetary policy. It completes the view of a market, where supply meets demand, by adding the supply side to the scope of the transmission mechanisms. The cost channel is part of the broad credit channel and focuses on the pass through of monetary policy through borrowing costs. The interest rate channel and the exchange rate channel represent the aggregate demand channel. The cost channel focuses on the supply side of products and services. Central banks can directly influence marginal costs of firms by setting a policy rate.

Borrowers´ balance sheets and the economic environment determine the supply of funds. These two factors do matter, not only for the intermediation decisions of banks, but also for those of markets. Chowdhury et al. (2005) show empirically that there are cross- country differences in the strength of the cost channel to the pass- through of monetary policy. Kaufmann and Scharler (2006) analyse whether the differences in financial systems across countries impact the effectiveness of the cost and credit channel, respectively.

II.2.3.1.1) Bank based versus market based lending regimes

Allen and Gale (2000) analyse financial systems. They distinguish bank- based and market based financial systems. A financial system´s most important characteristic is how it aligns savings and investment.

Bank based system

In a bank based system, savings are transformed into firm investments by using banks as intermediaries. Bank based systems prevail in Germany, France and Japan. In a bank based financial system retail interest rates should have greater influence on the economy than in a market based system, since the pass through from policy interest rates to retail interest rates is a more direct one than to corporate bonds (Kaufmann, Scharler; 2006). The yield of a bond is determined indirectly by the market.

The opposite is true if banks hold close ties to their customers. They are then willing to charge lower rates relative to the higher market rates during periods of monetary tightening (Berger, Udell; 1992). Consequently, as put forward by Ehrmann et al. (2003), the bank lending channel might not show that much reaction to monetary policy, simply because house banks smooth liquidity shocks/ lending rates. De Bondt (2005) finds evidence that retail interest rates in the euro area are sticky in the short run, but almost completely adjust to policy rates in the long run. The banking sector increases them less frequently or in smaller steps. In the short run only 50 percent of policy interest rates in the euro area are passed through as opposed to 70 percent in the US.

Mayer (1988, 1990) finds that bank finance is an important source of finance in all countries. Consistent with the Pecking Order Theory (Myers, 1984), firms prefer to fund themselves with the least risky finance first. This is internal finance. Bank finance comes second. Cechetti (2001) reports that 50 percent of all forms of finance in the euro area are bank loans. In the US this figure accounts for 20 percent. According to Mishkin (2007, p.257), commercial banks´ share of total financial intermediary assets, at the end of 2005, was 30 percent.

Market based system

In a market based financial system markets account for the transfer of savings to firm investment. A market based system is faced with informational problems. The agency problem manifests itself in the problems of adverse selection and moral hazard.

Given these informational problems, high risk aversion and uncertainty lead to credit rationing by banks in periods of economic downturn. Markets as well as banks show this risk-averse behaviour. In the presence of high risk aversion, lower policy interest rates from the central bank just increase the spread between the policy rate and the interbank rate and prevent the pass through to investment, which is risky by definition.

II.2.3.1.2.) Cross country differences and the cost channel

In a paper published in March 2006, Kaufmann und Scharler compare the financial systems of the euro area and the United States to explain the role of the cost channel and how it affects output and prices.

Borrowing costs enter the cost function of a firm and influence production plans and prices. On an aggregate level the cost of working capital influences output as well as inflation given that labour has to be paid prior to production. In the presence of a cost channel, monetary contraction results in higher borrowing costs. From a supply side as costs increase aggregate supply falls. From the view point of the interest rate channel, as prices increase demand shrinks. Households are inclined to postpone consumption due to higher prices, which decreases demand. Both consequences amplify the real effects of monetary policy on the economy.

The authors find that the quantitative impact of the cost channel on output is rather limited. "The dynamics of the inflation rate" (Kaufmann, Scharler; 2006) are to some extent affected by the cost channel, but the response to output appears to be primarily related to aggregate demand. Borrowing costs do play a role in economic output as a reaction to lending rates by altering supply. As for inflation the adverse supply shock due to increased costs does not show a significant effect because decreased demand partly offsets this effect.

The authors conclude that the prevailing financial systems across countries do not react differently to the supply shock in the setting of the cost channel. In any financial system, the persistence of lending rates, which is a characteristic of the very financial system, does not explain effects on output. Differences in the financial systems do not appear to be heterogeneous enough to show quantifiable cross-country results of the borrowing cost transmission mechanism.

Borrowing costs do not have different effects in a bank based system compared to a market based system. That the financial system is an undistinguishable feature in the cost channel might stem from the observation that increased costs are smoothed in a bank based system. Persistent interest rates in the bank based system compensate for the high degree of bank dependence.

In periods of economic prosperity a high degree of bank dependence is not so favourable for the euro area, while a limited interest rate pass- through as a result of relationship banking in periods of economic downturn acts in favour of the euro area. In good economic periods external finance via financial markets is easier to get and more widespread in the US market based banking system. Interest smoothing renders the lending rate less volatile. In favourable times this reduction in risk results in the observation that bank based lending does not pass on lower interest rates.

The implication for the euro area is that the bank lending channel might not be a powerful channel of monetary policy despite the background of the house bank principle. Output is affected by aggregate demand, and not so much by the more narrow distinction of borrowing costs. Aggregate demand depends on the opportunity cost of saving and investing money. Borrowing costs enter the payoff function of saving and investment as only one part of the aggregate demand function.

The authors limit the analysis of the cost channel of credit markets for loans to non- financial corporations. The present situation of financial crisis is characterised by a credit crunch within the financial sector. Thus, implications from the findings need further evidence from transmission among financial institutions.

II.2.3.1.3) Cross country differences and the credit channel

In a paper dated September 2007 Valderrama and Kaufmann (2007) address the issue of the transmission of monetary policy, with focussing on the credit channel. They analyse how credit aggregates and asset prices reinforce each other and affect output. They estimate a model to assess whether there are differences in the transmission mechanism of asset prices and loans between a bank based and a market based economy.

The intuition behind their research is summarized by three working hypothesis.

- The first hypothesis provides the theoretical models for the *reinforcement of credit aggregates and asset prices*. Among others, Kiyotaki and Moore (1997) show that in the

presence of asymmetric information, equity plays a key role as it is used as collateral for lending. Lending influences investment. Investment affects asset prices.

An improvement in the borrower's net worth, which serves as a collateral for loans, increases their creditworthiness and hence their investment prospects. Responding to improved investment prospects, asset prices rise. These mutual reinforcing effects may lead to the build up of financial imbalances and bubbles. Credits may go beyond what the real economy can absorb. Financial imbalances may fuel a boom and are responsible for the bust. Literature (Borio and Lowe, 2002) argues that unsound economic conditions will show up on financial markets first and materialize in inflation with a substantial delay. The authors analyse whether the cost channel allows for this observation in the data of the US and the euro area.

- The second hypothesis is the observation of *asymmetric dynamics*. The theoretical model underlying it is the one developed by Kiyotaki and Moore (1997), which relates credit to business cycles and asset prices. Asymmetric dynamics imply that reactions to monetary shocks vary across the business cycle. Kiyotaki and Moore suggest that asset prices and credit aggregates should be modelled in a non linear way since it is observed that the effects of monetary shocks are more profound during recessions. The difference in monetary transmission throughout the business cycle is reflected in the credit cycle. During economic downturns increased default rates and changes in bank lending as well as changed standards or monetary contraction cause credit cycles.

Bernanke and Blinder (1988) assess the asymmetric effects on output that occur at different levels of economic activity due to the interest rate elasticity of loan supply; a method Kaufmann and Valderrama take on.

- The third hypothesis relates to the reinforcing effect of asset prices and bank lending with respect to the *relative importance of equity financing* in the US and the euro area. The effects of the cost channel are assumed to be stronger in countries with a market based financial system, in which external financing plays an important role, as opposed to countries with a bank based financial system. In the latter credit is mainly provided by banks.
To analyse the impact of the credit channel Kaufmann and Valderrama specify more precisely the lending conditions. They distinguish between demand and supply driven lending regimes.

II.2.3.1.4) Demand driven versus supply driven financial regimes

Bernanke and Blinder (1988) provided a framework in which monetary shocks have asymmetric effects on output depending on the interest rate elasticity of loan supply. The interest rate elasticity of loan supply depends on the level of economic activity and thus, supply depends on the stage of the business cycle the economy is in. With this in mind, Kaufmann and Valderrama distinguish periods in which lending is driven by supply and periods in which lending is driven by demand.

Periods of demand driven supply are characterised by a situation in which the interest elasticity of supply for loans is greater than the elasticity of loan demand. In this case, banks try to maximize their profit function. According to Kashyap and Stein (1993), loan supply is a function of money supply and the rate differential of loans and bonds is the difference in the interest rates for loans and commercial paper (bonds). The interest rate is determined by the prevailing risk aversion on the markets. If banks are able to charge higher rates on loans, they have an incentive to increase the supply of loans.

This logic is reversed when the economic situation changes and the risk associated with an additional outstanding loan cannot be compensated for by higher interest rates. Banks offering loans are concerned with the rate they get on the loan and its riskiness. Similarly, the rate charged may affect the riskiness of the borrowers. Stiglitz and Weiss (1981) explain this phenomenon of credit rationing with the asymmetric information problem of external finance. (See discussion on credit rationing, p.38.)

Under circumstances where economic prospects deteriorate and induce a rise in interest rates, the interest elasticity of the supply of loans decreases. If it falls under the elasticity of loan demand, the model by Kaufmann and Valderrama classifies the lending regime as supply driven. Above a certain threshold of the interest rate, resulting from credit rationing, the loan supply curve becomes inelastic (nearly vertical). Hence, the actual amount of loans is determined by the supply side. When lending is supply driven it does not react to spending and an interest shock sends loan supply into the opposite direction of the rate movement (Valderrama, Kaufmann, 2004).

It is the other way round in a demand driven lending regime. In a demand driven system an increase in the Fed funds rate is expected to be followed by a decrease of bank loans because of the money multiplier. This is not necessarily true if demand is still up and cannot be satisfied by the bank loans supplied. Thus, creditors search for other ways of finance. It can be expected that non-bank sources of credit, such as commercial paper issuances, increase. In order to substitute bank finance with other sources of finance, firms must not be restricted by their ability to access the markets of non- bank finance. As long as the banks´ are not constrained by credit risk limits and reserve requirements they try to maximize their profit function by offering more loans. By doing so they compete with firms issuing bonds (Kayshap, Stein; 1993). This gives banks an incentive to increase their supply of loans even if the interest rate rises. The lending decision thus is left to the demand side. Interest rate shocks affect the lending and spending decision by households and firms.

In order to characterise periods in which asset prices and credit aggregates reinforced each other the authors use financial time series from 1980 to 2004. They work with Vector Auto-regression to estimate a model to define the economic state of the financial system, named "regimes", from the data. The regimes are characterised by relating posterior state probabilities to variables in the system. With generalized impulse responses the authors try to identify whether a pattern can be found that relates the variables to the economic and credit regime (market based versus bank based financial system, demand driven loan supply versus supply driven loan supply).

The model estimated uses five variables, namely GDP, CPI, equity prices (S&P 500 for the US and a DataStream Index for the Euro area), lending to the private sector and a 3 month interest rate.

The findings

With the method of generalised impulse responses to describe the dynamics of the data set, Kaufmann and Valderama find evidence for the two regimes, regime 1 and regime 2, which correspond to a pattern of variables that characterises the state of the economy.

Further, they analyse whether a pattern is found that allows for identifying a relation of the variables to credit supply and/or the economic foundation. The authors find that the US, as well as the euro area, experience a demand- driven, as well as a supply- driven regime during the sample period.

Findings for the Euro area

The Center of Economic Policy Research defines a recession as "a prolonged period of declining growth in the cyclical component of GDP (as measured by the movements in the EuroCOIN)"[4]. For the euro area the authors detect a regime which correlates with the business cycle. In regime 1, loans respond to an interest shock negatively. This allows them to be characterised as a supply-driven regime. It is observed to prevail at the end of recession periods.

The supply driven regime roughly corresponds to periods of strong economic recovery. Loan growth is very low in regime 1. This finding is consistent with the problem of adverse selection, where banks are reluctant to give out loans to not so well-known customers in periods of high uncertainty. In contrast to the US, corporate lending rates by European banks are highly persistent. Liquidity shocks are absorbed to a greater extent in the euro zone as European banks smooth retail interest rates (Ehrmann et al.; 2003). Lending is reduced as interest rates are raised.

The analysis does not show any significant response by loans to asset price shocks and vice versa. Loans do not affect asset prices significantly. Amplifying effects of asset prices and loans on output in the supply driven system are not observed either. The authors conclude that financing constraints do not impede economic recovery. In the supply driven system asset prices and loans do not reinforce each other and thus do not cause pro-cyclicality.

In regime 2 the variables indicate a healthy state of the economy. Here, regime 2 is characterized by having demand as the driving force. Banks are willing to meet the demand for loans; interest rate shocks are insignificant for loans. In the demand driven regime loans

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[4] The EuroCOIN is a cross section time series data.

react positively to an output shock. They conduct an active strategy, adjusting the interest rate to demand by customers and supply from the central bank. In their financial business decisions they compete against bond issuance as an alternative to bank loans.

During demand driven periods, asset prices and loans have a pro-cyclical effect on output. A positive asset price shock and a positive loan shock materialize in higher output. At the same time, rising asset prices and an increase in loans has an impact on inflation and thus also on the price of money, the interest rate. If interest rates go down banks do not lower their lending standards, however they do so if interest rates rise above a threshold value. Rising interest rates trigger the switch to a supply driven lending regime. The mechanism and the behaviour of banks contribute to pre-emptively restrain the build up of financial imbalances due to pro-cyclicality in early periods of recovery and do not impede economic recovery (Kaufmann, Valerrama, 2007). Consistent with earlier findings on the cost channel, borrowing costs do not affect output significantly.

Findings for the United States

In the US, during recoveries after the Asian crisis and the crisis of Long Term Capital Management (LTCM), as well as after 9/11, regimes are also characterised by working with the posterior state probabilities of the model's variables. The authors compare the variables to the states of the National Bureau of Economic Research (NBER) business cycle and characterise a regime of economic recovery as regime 1. The regime is not as obviously related to the business cycle as it was with the data for the euro area. Relating the characteristics to a credit and economic regime, they do not find evidence for supply driven lending in regime 1. In regime 1, interest rates are observed to rise, and so are asset prices and output. Inflation and lending did not rise. Good economic prospects and low inflation expectations correspond to a situation where financial imbalances may build up if asset prices reinforce loans. While in regime 1 there is no reinforcement process observed, regime 2 reveals pro-cyclicality.

In regime 2, characterised by a pattern of variables that indicates a sound economic state, the authors find a positive response of loans to an asset price shock in the short run. Loans respond positively to interest rates. This characterises the demand driven regime. In the

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demand driven regime asset price changes have an effect on lending and vice versa. Monetary policy thus improves investment prospects, which manifest themselves in raising asset prices. In the data sample GDP rises as well. Shocks in asset prices and loans do not translate into higher prices, neither do interest rates rise. This observation can be applied to developments in the current financial crisis.

Inflation was low and stable in past years. Asset prices were steadily increasing and there was no end in sight for the favourable economic outlook. But financial imbalances have built up. They were not reflected in rising consumer prices, but in asset prices.

In the US market based system the authors find evidence for a demand driven regime, which experienced stronger pro-cyclicality than it did in the euro area. Credit aggregates showed stronger reaction to asset prices and vice versa. The cost channel of monetary policy reveals itself to be more powerful in terms of effects on asset prices and loans in the US. The effect on output shows only marginal differences between the observed countries.

While in the bank based regime unsound financial development showed up in rising prices, this was not necessarily true for the market based system. The authors conclude that as a policy advice for the euro area, credit growth can be looked at to indicate future inflation and liquidity.

Summarising Cross Country Differences and the Credit Channel

Asymmetric dynamics do appear differently in a bank and a market based system. During recessions credit aggregates in a market based credit environment react stronger to interest rate changes than in a bank based system, where retail interest rates are smoothed. A bank based system is stronger in counteracting the build up of financial imbalances.

In a financing environment with a high degree of bank dependence lending behaviour reacts to the investment prospects. In a market based system lending behaviour is highly linked to asset prices and supports pro-cyclicality. The market based system does not have the

automatic switching mechanism that changes the lending behaviour from demand to supply driven.

For both, the euro area and the US, lending standards and borrowing costs do not impact output significantly in periods of unsound economic conditions. In a stable environment the credit channel becomes more powerful if lending is demand driven. Then, loans and asset prices have positive effects on output.

II.2.3.2) Criticism of the bank lending channel

Meltzer (1995) criticises the bank lending channel by pointing to the question from which side the change in bank loans granted comes. The bank lending channel propagates the view that the shift in a cyclical change of bank loans is induced by the banks´ willingness to lend. An alternative view is to look at the change in bank loans from the demand side. Small firms, the type of borrowers most reliant on bank loans, find their businesses most vulnerable in economic downturns. Dietsch (2003) finds that credit rationing is only relevant for very small firms having unfavourable credit status. Retail interest smoothing may benefit them, but at the same time they are the first to be squeezed out of the market.

Meltzer's criticism addresses the issue of whether a fall in bank reserves explains the more than proportional drop in bank loans.

The crucial assumption behind the bank lending channel is that banks do not have access to any other form of funding loans. In reality, this assumption does not hold true anymore. Meltzer (1995) adds that alternative lenders, such as finance companies, credit card debt and venture capitalists may substitute bank lending to some extent. Excess demand for funding should be met by these alternative sources. Certificates of deposit (CD) and equity issues are a vital source of funds for banks. But still, bank demand for deposits and managed liabilities is not perfectly elastic (Bernanke, Gertler; 1995).

Given the existence of other sources of financing for a bank to be able to offer loans, Meltzer argues that not a fall in bank reserves is responsible for the decline in bank loans, but a fall in

asset prices explains the downward path of bank loans. There is no need to put forward a separate explanation of bank lending to explain a change in output resulting from monetary policy. Not bank loans affect output, but economic prospects reflected in asset prices do. If the bank lending channel as a separate channel of monetary transmission were valid, evidence from the Great Depression and the credit crunch in the late 1990s should have indicated that. In fact, not only bank loans decreased, but also open market commercial paper and bankers´ acceptances, which served as supplements and substitutes for bank loans (Meltzer, 1995).

The discussion of the bank lending channel can be expanded to the consideration of interest rate smoothing and credit rationing.

II.4) Interest rate smoothing

Berger and Udell (1992) analysed more than a million individual loans in the US over the period 1977 to 1988 and found some evidence on commitment lending.

They find evidence that loans issued under commitment show stickiness in the interest rate charged. Sticky loan prices can be explained by "implicit interest rate insurance" banks may offer to "risk-averse repeat borrowers". If banks hold close ties to their customers they are willing to charge lower rates relative to the higher market rates during periods of monetary tightening. Banks are later compensated for their behaviour when market rates drop to lower levels (Fried, Howitt; 1980). Consequently, Berger and Udell, as well as Ehrmann et al. (2003) put forward that the bank lending channel might not show that much reaction to monetary policy, because house banks react to liquidity shocks by smoothing lending rates.

When there is relationship banking, interest smoothing partly counteracts the loan supply shock induced by lower reserves. But at the same time credit rationing reduces the supply of loans by shrinking the pool of borrowers they would lend to.

II.5) Credit rationing

In periods of economic downturn high risk aversion and uncertainty leads to credit rationing. One could explain that it is also a mismatch of supply and demand. When demand exceeds supply, banks ration the credit they give. When asymmetric information is high, banks limit their supply of loan even though they would have enough funds to lend out. Instead of raising the interest rate, they change "non- pecuniary terms of the loan contract" (Meltzer, 1995). Rationing means, that loan applicants either get a smaller loan at the quoted rate than desired or they are denied a loan, as the bank cannot tell whether the applicant is able to meet the payments or not. A change in the interest rate does not alter the banks´ behaviour.

Stiglitz and Weiss (1981) explain why banks choose to ration credit instead of simply letting the price balance demand and supply. Banks are concerned about the interest rate they get on the loans and the risk of not getting paid back. Credit rationing is a reaction to the problem of adverse selection. There is a link between higher interest rates and the threat to banks´ profitability. The higher the interest rates, the higher the average default risks.

Clemenz (1986) gives four reasons for why the default risk increases with the interest rate charged. At higher interest, riskier projects are offered and less honest customers apply. Knowing that their payoff function is unlimited at the positive end and limited in the downside, borrowers may turn out to be less able entrepreneurs or put less effort into the management of their investment.

This is the classical problem of risk shifting (Jensen, Meckling; 1976). With an amount of debt outstanding that exceeds the critical disciplining value, equity holders are tempted to take on riskier projects because they know that their payback is limited by the cash flows that accrue.

II.3. EXCHANGE RATE CHANNEL

In a globalised world monetary policy operates through exchange rates as well. Exchange rates affect trade and capital flows. The exchange rate is the price of one country's currency in terms of another country's currency. The principles that govern the behaviour of other financial asset prices, also explain the behaviour of exchange rates (Obstfeld, 2006). Holding wealth in the form of an asset is transferring purchasing power from the present to the future. The exchange rate thus reflects the expectation of the future level of the rate.

Martin, Schuknecht and Vansteenkiste (2007) distinguish between the trade channel and the international financial channel.

II.3.1) The trade channel

In a closed economy with floating exchange rates, interest rates drop if expansionary monetary policy is conducted. The currency devalues and stimulates net exports. The schematic is

$$M\uparrow \rightarrow i\downarrow \rightarrow E\downarrow \rightarrow NX\uparrow \rightarrow Y\uparrow$$

This is exactly what happened in the current crisis. The Fed lowered interest rates and - until recently - the US dollar experienced a massive depreciation. The drop in interest rates communicated that the economy was in trouble. At the same time the depreciation benefits the export sector (Feldstein, 2008) as goods become relatively cheap.

Interestingly, foreign investors have been financing the US current account deficit despite the fact of decreasing interest rates and heavy losses they made on US capital stocks. An analysis of this paradox is elaborated in the chapter *Global Imbalances*.

Theory states that capital flows to places where returns are expected to be highest. If the interest rate is raised, capital flows into the country. The US experience does not follow the theoretical argumentation. Recently, despite falling interest rates, capital poured into the US as investors are expecting to profit from the competitiveness of the US economy. Under a *floating* exchange rate regime, capital inflows lead to exchange rate appreciation. This raises prices. The result is a loss of competitiveness and, possibly, a deterioration of the current account balance.

Mundell (1962) explains capital mobility with the relationship between short term interest rates and the exchange rate. The interest parity condition states, that the interest rate differential between any two countries determines the exchange rate of these countries. By lowering the domestic interest rate dollars become less attractive relative to deposits denominated in foreign currencies. This conclusion requires that expected rates of return are the same and neglects differences in risk premiums. At the same time as the dollar value dropped and prices were beneficial for exports, the low exchange rate translated into higher prices for raw materials, most importantly oil.

Oil exporters have their currencies pegged to the USD. In order to keep the purchasing power of raw material suppliers constant, prices of raw materials were raised. This fuels inflation all over the world. This development highlights the importance of the exchange rate channel as a transmission mechanism. As I will discuss more thoroughly in the chapter *Global imbalances*, the exchange rate is an asset price on financial markets that must not be ignored. It further raises the discussion about the responsibility the United States, as the issuer of a reserve currency, has for the rest of the world.

II.4. OTHER ASSET PRICE CHANNELS

II.4.1) Tobin´s q

Tobin (1969) defines q as the market value of "installed capital" (which is the firm's market value) divided by the replacement cost of capital. The transmission mechanism, which argues with Tobin´s q, affects economic activity through the valuation of equities. If the market value of a firm is high relative to the replacement costs of a new plant and equipment at the prevailing cost of capital, companies can issue new equity relatively cheap. They get more for their new shares than the costs of buying new plant and equipment. If Tobin's q is high, firms have an incentive to undertake investments because the financing cost is relatively low. If financing costs rise, Tobin's q falls. Decreasing investment transmits to the real economy.

$M \downarrow \rightarrow P_{equity} \downarrow \rightarrow$ Tobin's $q \downarrow \rightarrow I \downarrow \rightarrow Y\downarrow$

Corporate finance literature has vastly extended this reasoning by further considerations on signalling firms´ prospects (Myers, Majluf; 1984).

II.4.2) Wealth channel

An alternative channel that operates through equity prices is the wealth channel.

$M \downarrow \rightarrow P_{equity} \downarrow \rightarrow$ wealth $\downarrow \rightarrow$ consumption $\downarrow \rightarrow Y\downarrow$

Modigliani´s (1971) life cycle model states that consumption spending is determined by the "lifetime resources of consumers". The "lifetime resources" are made up of human capital, real capital and financial wealth. Common stocks are a key component of financial wealth. A decreasing stock price decreases financial wealth and consumption falls.

III. FINANCIAL INNOVATION

III.1 FINANCIAL INSTABILITY HYPOTHESIS

Minsky (1992) proposed a hypothesis on financial instability. The FIH (financial instability hypothesis) links financial market fragility to speculative investment bubbles endogenous to capital markets. The theoretical argument underlying the FIH starts with the characterization of a capitalist economy which has expanding capital assets and a complex financial system.

Investment is motivated by the expectation of future profits. Under prosperous conditions, the stream of cash flows is sufficient to cover contractual debt obligations as they come due, also allowing for safety margins. Minsky (1968) argues that the economic process does not follow a "savings - investment" thinking, but rather a sequence that runs from investment demand to financing these investments, resulting in income and finally savings. The need to finance investment induces "portfolio transformation", designed to finance accelerating investment activity. Minsky argues that in times of prosperity a speculative euphoria develops. When corporate cash flow raises beyond what is needed to service the debt, investors take on riskier projects until eventually debt outstanding exceeds the credit that borrowers can pay off from the revenues they earn. Eventually, lenders call in the loans and asset values become vulnerable to collapse. The hypothesis analyses the debt impact on the behaviour of the economic system in the normal life cycle of an economy. Minsky defines three distinctive income- debt relations for economic units, which are hedge, speculative and Ponzi financing.

Hedge financing refers to a form of financing where all contractual obligations can be serviced by cash flows. Speculative financing means that the economic unit can meet its payment commitments on its "income account". That is they can issue new debt and roll it over in order to meet their obligations stemming from maturing debt.

A Ponzi scheme usually offers abnormally high short-term returns in order to entice new investors. The Ponzi scheme advertises high returns by paying off some investors. But this system requires a constantly increasing flow of money from investors in order to keep the

scheme going. The system is doomed to collapse because the money received by the promoter offers no earnings. The basement of this business idea simply is to borrow credit to promote fresh investment.

"[I]f hedge financing dominates then the economy may well be in an equilibrium seeking and containing system. In contrast, the greater the weight of speculative and Ponzi finance the greater the likelihood of deviations from the equilibrium" (Minsky, 1992). Walras and Smith perceive the economy as an "equilibrium seeking and sustaining system".

Without relying on external shocks to generate business cycles, the capitalist economy tends to engage in speculative and Ponzi finance after "good times" since banking is a profit-seeking innovative activity creating bubbles that are not sustainable with the underlying real cash flows. As a result of such speculative borrowing bubbles, moral hazard and adverse selection induce banks and lenders to tighten credit availability, even to companies that can afford loans. This in turn causes the economy to contract. For Minsky, financial complexity and the greater involvement of governmental institutions and business firms enable the system to limit the downside vulnerability to profits, as well as produce an upside potential in the form of inflation.

Thus, following the logic put forward by Minsky, financial innovation contributes to an expanding economy that allows for risk shifting and enables participants to turn illiquid assets into liquid instruments. The system is prone to implode one day.

III.2. NEW CONFIGURATION OF PLAYERS

Borio (2007) analyses change and constancy in the financial system and points out that the configuration of the players in the financial system has changed. He highlights three dimensions. The distinction among different types of financial intermediaries has been blurred. There is a tendency for greater consolidation among the different business segments. Borio uses the terms "atomisation of risk" (Knight, 2007) and "marketisation of finance" to describe the developments in the financial industry.

Competing for investors´ savings, financial institutions expanded their asset management volume in order to remain in the market. This transition for traditional intermediaries, such as banks, is a step away from an "originate and distribute"- strategy towards a strategy relying on market incentives. This process is termed "disintermediation". Relationship lending was thus transferred to the markets. At the same time banks gave up their informational advantage built on relationship. Both, commercial and investment banking, as well as banking and insurance extended their competences.

Redrado (2007) points out, that improvements in information technologies facilitated quality assessment of the securities offered on capital markets. Statistical methods to assess credit risk made banks loose part of their comparative advantage by reducing information and transaction costs for non-bank financial intermediaries. Growing counterparty risk is due to this growing "symbiosis between markets and intermediaries" (Borio, 2007).

Intermediaries and markets are highly complementary in their task of providing a functioning financial system. Intermediaries, such as banks, have become increasingly reliant on markets guaranteeing their operational businesses. The market provides them the necessary tools for their risk management, namely hedging possibilities. In return markets benefit from the market making service of the intermediaries as well as their liquidity funding.

"The same capital base can ultimately support operation of both markets and intermediaries" (Borio, 2007). The drawback of this development is that counterparty risk increased simultaneously. The most recent happenings show that the very investors in many cases were institutional investors, covering a wide range from investment banks to pension funds.

III.2.1) Banks as providers of liquidity

Traditionally, banks borrowed short-term and lent long-term. They borrowed liquid and lent illiquid.

On the liability side of a banks' balance sheet there are deposits, which are withdraw able on demand. Loans to businesses and households were the major entry on the asset side. Typically

banks held those loans until maturity. This classical balance sheet structure, referred to as the 'originate and hold' model, is inherently vulnerable to bank runs by deposit holders. The bank adds value by transforming maturities and creating liquidity (Niehans, 1987). The liquidity preference theory (Hicks, 1935) states that investors prefer the less risky short term fixed income instruments to long term investments. Borrowers do have the need for longer term finance. Banks´ function is to transform the maturities of investments to match demand and supply. Banks´ deposits were the key part of the source of funding for households and non-financial corporations, because banks played the central role in the clearing and settlement of large-scale transactions and of securities.

Financial innovation now made it possible to deviate from this "originate and hold" concept to a new strategy which allows for an increase in the allocation of funds. Advances in modes of securitisation created products, such as mortgage backed securities. These new products brought with them a new configuration of players on financial markets and simultaneously changed the information content of prices and the perception of risk. Financial innovation seeks to make better use of cash or capital reserves by lowering cash holding, working with higher leverage and holding lower equity capital buffers, which constitutes a changed environment for monetary policy. However, it also increased potential risk in the case of a credit market downturn.

III.3. SECURITIZATION

"Most financial innovations in over-the-counter derivatives involve new ways to disperse risk. …[O]ur constantly changing financial environment supplies a steady stream of new opportunities for innovation to address market imperfections.…[R]egulation is not only unnecessary in these markets, it is potentially damaging, because regulation presupposes disclosure and forced disclosure of proprietary information can undercut innovations in financial markets just as it would in real estate markets."

Alan Greenspan (2004) before the Society of Business Economists, London

Definition of Securitization

Securitization is the process of converting nonmarketable credit instruments into publicly traded securities. Mortgage-backed securities are an example of a securitized credit instrument. The basic idea of securitisation is to turn illiquid portfolios into liquid assets. Lenders get the possibility to move interest risk off their balance sheets, and move it on as a liquid asset to investors. 'Originate and distribute' became a new attractive model for banks. For their servicing function they are paid a fee.

In the 1938, the private corporation Fannie Mae, the Federal National Mortgage Association, and Ginnie Mae (Government National Mortgage Association) were founded. These associations service a secondary market for mortgages insured by the Federal Housing Administration. They buy mortgages from banks, package them to mortgage based securities and resell them to investors. In the 1970s another mortgage corporation joined the stage Freddie Mac, the Federal Home Loan Mortgage Corporation. These listed associations are backed by the government and smoothed the rates for mortgage loans across the USA. They started with securitizing residential mortgages. Before the Great Depression in the 1930s, home mortgages were often short- term, non- amortizing loans with a balloon payment due when the loan matured. During the Great Depression households were to a large extent not able to repay their loans or get them refinanced. Unemployment resulted in a sharp increase of delinquent mortgages. The 1968 Charter Act responded to this situation by allowing banks to create mortgage backed securities. The intent was to allow banks to give out more long term loans. This could be achieved by enabling banks to sell off mortgages, thus freeing up funds to lend to more homeowners.

Equivalent to mortgage backed securities in the U.S., German and Austrian banks have long been emitting "Pfandbriefe", a vital source of bond finance on the private debt market.

Asset securitisation involves the creation of debt securities. The interest and principle payments of these debt securities are serviced with an income generating pool of assets. By pooling these cash flow generating assets, the cash flow streams can be used to finance the payments on the "new" debt instrument. The originator of the debt instrument assumes a regular stream of payments of the underlying asset to service the debt.

Financial institutions and businesses of all kinds use securitization to immediately realize the value of a cash-producing asset. In the process of securitisation the originator passes through the interest and principle payments of the underlying assets to investors on the stock market. The originator (the bank or institution) thus receives the payment stream of the assets as a lump sum rather than spread out over time.

Securitisation involves the creation of a special purpose vehicle. This vehicle, which might be a trust or a company, finances the purchase of the assets in the pool by the issue of bonds. The bonds in return are secured by those assets. This procedure allows the originator to get the loans off the balance sheet. Moving an asset off the balance sheet, while simultaneously increasing income, has a positive effect on ROA (return on assets), a measure indicating how efficient management is using its assets to generate earnings), and demonstrates to investors a more efficient use of capital. Banks realize a unique advantage from securitization. Removing loans from their balance sheet can lower regulatory capital requirements, or the amount and type of capital banks must hold given the size of their loan portfolio (Cowan, 2003). Duffie (2007) notes, that the total risk to be borne remains with the financial system as a whole, but it allows banks to diversify their risk and hold less of it on their balance sheets. The advantage of the credit risk transfer is, that it enables banks to transfer risk out of the banking system to institutions that "are not as critical as banks for the provision of liquidity" (Duffie, 2007). In effect, however, the reserve ratio of the financial system is reduced.

The ability to pass through loan payments was a great innovation on credit markets. Before securitisation, selling and buying of loans were transactions on a relatively illiquid market. For home mortgage lenders holding an illiquid loan portfolio is unattractive, since lenders have to bear the exposure to higher interest rates which might exceed their interest income. This risk exposure turned out to be disastrous in the Savings and Loan Crisis of the 1980s.

 "The fundamental goal of all securitization transactions is to isolate the financial assets supporting payments on the backed securities. Isolation ensures that payments associated with the securities are derived solely from the segregated pool of assets and not from the originator of the assets." (Cowan, 2003) Investment banks are the intermediaries between the originator of the asset pool and the investor. They bear the risk of buying the newly created bonds and having them in their portfolio until they sell them on to investors.

Private institutions, especially banks, immediately took advantage of these techniques to liquefy their illiquid loans.

Benefits of Securitisation

The existence of a secondary market for mortgages enables financial institutions to set free fresh capital through the sale of loans. This capital can be re- deployed in form of new loans. This strategy lowers borrowing costs for households and firms applying for credit. Securitized bonds were considered less risky than corporate debt instruments, since securitized bonds had as an underlying security, a pool of assets. However, the implicit assumption was that those assets, e.g. residential housing, would never fall in the value and *were* therefore risky.

Geographic dispersion is another advantageous effect of securitisation. Traditionally, banks borrowed in those areas where they got deposits. With the creation of Freddie Mac all regions could be serviced at an equal lending rate. Estrella (2002) analyses the development of securitised debt on European markets and finds that this form of financial innovation was increased with the configuration of players at the time of the introduction of the euro as a currency.

As Cowan (2003) points out, another benefit of the innovation was said to be the contribution to market efficiency, since a wider range of investors was supposed to be able to demand the appropriate risk premium. An increase in market completeness would support long- term growth prospects. The separation of risk and its shifting is of importance as well. Financial institutions can shift their credit risk on to investors and reduce theirs, thus being less vulnerable to systemic risk.

Problems with Securitisation

The problems associated with securitisation are most likely to be generally associated with the creation of off-balance sheet vehicles:

Securitisation increased the opportunities for risk trading and shifting. On the one hand securitisation made it possible to hedge risk better. But on the other hand it also permitted investors to seek out and take on additional risk (hedging, open positions). The new risk-trading opportunities are enhanced through the creation of innovative instruments or institutions. Since these instruments have become too complicated to be able to trace them back to what the underlying assets are, the risk inherent to it is hard to estimate. Indeed the number of subprime mortgages increased.

From the viewpoint of asymmetric information the 'originate and distribute' model destroys information compared to the 'originate and hold' model. The incentive for collecting sufficient information gets lost at the level of the originator of the assets when loans become securities. Knowing that the loan will be sliced and sold off to another institution the loan officer's incentive for information gathering is reduced. The loan officer as the agent of the lending bank works for a vehicle that is not shown on the originator's balance sheet after the securitisation. The incentive of monitoring the borrower and his risk taking and eventually exit the lending relationship in a timely manner is lessened (Duffie, 2007). Reputation considerations will eventually mitigate this problem, but will not eliminate it.

Moreover, investors do not have the possibility to access the information the loan originator had. Thus, arguing that efficiency is improved by the investor's decision to buy, hold or sell the asset or mortgage backed security is hard to believe since information cannot be transmitted effectively to investors. The chain of parties involved in the deal before the bond having reached the investors has become longer than in the past. In the end, neither the buyer nor the seller will know what assets are backing the security traded.

The complexity of instruments makes it hard to measure the value of an instrument and its exposure to risk. Taking banks and the special purpose vehicles together, the proportion of reserve assets to total lending has decreased. Lending has altogether become riskier.

III.3.1*) Collateral Debt Obligations*

Starting with this rather simple approach of making loans liquid through securitisation, financial innovation and technological advances brought about the creation of increasingly complex instruments.

In the 1980s, mortgage-backed securities known as collateralized mortgage obligations (CMOs) were created. Typically, the underlying collateral for a CMO is either a pool of mortgages or a mortgage pass-through security. CMOs are created by carving up the cash flow from the underlying asset into various categories, or tranches, with different maturity or risk characteristics. Investors can then purchase the obligation that best suits their appetite for risk and/or duration.

III.4. FINANCIAL INNOVATION AND MONETARY POLICY

III.4.1) Marketisation of finance

Financial innovation has created new uncertainties in the transmission channels of monetary policy. It may have weakened some channels and strengthened some others. At least in normal times, financial innovation significantly weakens the bank-lending channel. Securitisation gives firms broader access to capital markets and, as such, makes them less dependent on bank funding. Similarly, banks may be more able to issue debt securities and less dependent on the constraint of funding themselves with secured deposits. At the same time, however, securitisation strengthens the "direct" transmission channel through which interest rates operate, since a great number of financial intermediaries are more dependent on liquidity and on its price.

Altunbas, Gambacorta and Marqués (2007) show that securitisation is positively linked to bank lending. The bank lending channel as a transmission mechanism of monetary policy has decreased due to the emergence of securitisation. But in any case, the supply of loans is not completely insulated by the effects of securitisation.

III.4.2) Procylicality

Financial innovation – to the extent that it makes it easier to take risks and encourages the "search for yield" – may have increased the impact of monetary policy because, in such an environment, risk premiums are highly pro-cyclical and move in tandem with interest rates. This same pro-cyclicality of "risk taking" can lead to busts when investors risk appetite changes.

III.4.3) Financial Innovation and the Balance sheet channel

Securitisation facilitated access to residential mortgage by easing credit constraints since credit risk could be separated and sold off. Demand for housing increased and so did the prices on the housing market. Rising home equity serves as collateral for further lending and thus finances consumer spending. The collateral in place reduces the information problems as collateral, that can be valued and recycled, can decrease the lender's losses in case the borrower defaults.

The question is to what extent housing wealth translates to the real economy and to what extent it alters the aggregate demand for money, which is the crucial figure the central bank has to control in order to manage the stated aims of price stability and employment. And moreover how should central banks react to house price appreciation? Should it burst the bubble or simply react to it bursting?

When bubbles burst, e.g. house prices fall, they threaten financial stability and increase the demand for liquidity. This affects the central bank's target variables, such as price stability and output by destroying wealth.

First, the argument that the central bank should burst bubbles would imply that it knows when there is a bubble. It would require perfect information to be able to determine at what stage of the business cycle an economy is. It would also require that the central bank has an informational advantage over private markets (Greenspan, 2002). By bursting a bubble at the wrong moment a lot of value could be destroyed.

Mishkin (2007) emphasises that uncertainty about the effect of interest rates on bubbles is too great to be able to deflate a bubble without doing much harm. This argument is in line with Greenspan´s view of addressing a bubble's consequences rather than the bubble itself. In addition, very few analysts before late 2007 expected house prices actually to fall.

Mishkin (2007) also points out that uncertainty around how house prices affect consumer spending is quite high. Dyman, Elmendorf and Sichel (2005) argue that advances in mortgage finance allow consumers to smooth their consumption by borrowing on their home equity. The authors show that consumption in the US was less sensitive to income shocks since the mid- 1980s when innovations in housing finance evaporated. Mishkin (2007) summarises that the reaction of consumption to income has been reduced through financial innovation, but emphasizes that this weaker link between consumption and income, does not imply a smoothing of consumption to interest- rates in general. In the case of strongly deteriorating income expectations, financial innovation cannot prevent consumption from decreasing. Hodges (2007) provides data for the decreasing debt productivity of US credits by stressing that the credit to GNP ratio has risen from 1.86 percent in 1957 to 4.60 percent in 2006. This means $4.60 of debt for each dollar of national income. Thus, US credit expansion in the past few years was matched by a declining growth in GNP. A huge portion of US debt is owed to foreigners.

This means that the interest channel, although it might affect incomes, does not transmit to consumption when mortgages are easily available. Consequently, in countries with developed mortgage markets, consumer spending shows higher correlation with house prices than what can be observed in countries with less developed mortgage markets (Calza, Monacelli, Stracca; 2007). The US has a developed mortgage market, whereas in Italy, for example, the legal environment is not so favourable for the mortgage market due to lengthy and expensive procedures to repossess collateral.

The interest channel is of importance if mortgage interest payments are variable. The amount of residential mortgages thus is sensitive to changes in short term interest rates. Concerning securitisation, Estrella (2002) finds that a higher level of securitisation causes the market for residential mortgages to be more closely linked to capital markets. His findings show that liquidty and credit volume effects cause the response of mortgage interest rates to changes in

policy rates. Thus the liquidity (cost channel) and credit channel have a strong influence on the transmission of monetary policy when securitisation is in place.

The effect of securitisation, namely greater loan supply is linked to the business cycle. A bank's risk profile and its liquidity demand significantly impacts the supply of loans. The riskiness of the loan portfolio decreases the bank's capacity to lend. Mishkin concludes from these studies (Estrella, 2002) that securitisation has the potential to strengthen the interest rate channel. But as I will discuss in the chapter on transmission mechanisms, the criticism to the interest channel in general is that policy interest rates are not always transmitted to the real economy if liquidity on market is scarce and risk is high.

IV. GLOBAL IMBALANCES

The balance of payments measures both payments to and receipts from foreigners. Transactions resulting in wealth transfers between countries enter the current account. The current account measures a country's net exports of goods and services relative to its net imports. Besides the trade component changes in foreign indebtedness, which measure the size and direction of international capital flows, are the second component that are part of the balance of payments. In an economy without foreign investment, the current account equals income minus spending, which is saving. In an open economy the economy can either save by building up its capital stock or by acquiring foreign wealth. The US is currently experiencing an excess of imports over exports as well as a high degree of foreign credit, which translates into an excess of investment over saving.

The US current account deficit currently accounts for US$699 billion, equivalent to about 4.7% of GDP. The US soaks up about 80% of the combined current account surpluses of Germany, Japan, China and all other surplus countries of the world[5]. In absolute terms, Germany ($272bn) and Japan ($206bn) together account for a much larger share of global surpluses than China ($372bn) does. Relative to GDP, China's current account surplus accounts for 8.5%, compared to 3.9% and 6.5% for Japan and Germany, respectively. For Saudi Arabia this number is 33.1%. Brazil and India have current account deficits of 1.6% and 2.9% of GDP, respectively.

The current situation results from heavy US debt borrowing paired with heavy equity lending (Obstfeld, Rogoff; 2005). The US has had the remarkable ability to pay a lower rate of interest than asset earnings yielded. In the longer run, the prevailing financial imbalances did not serve the US, and does collateral damage also to the rest of the world. With "borrowed liquidity from debt creation" (Moneyweek) on hand, the US consumed more than would

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[5] Data from *The Economist*, October 11th; Q2 2008.

match up with the means it actually had. In the remainder of this section I will discuss possible reasons for the process of international leveraging.

IV.1. LOW GLOBAL INTEREST RATES

The Greenspan Put, as well as an investment environment of low global interest rates, contributed to a booming period on the back of financial balances. Kindleberger (1965) speaks of the US as the "world banker". The "world banker" is taking short term deposits in the form of US Treasury bills and foreign reserves and invests long term in foreign equity. Figure 6 depicts foreign holdings of US Treasury bills. Japan ranks first, followed by China.
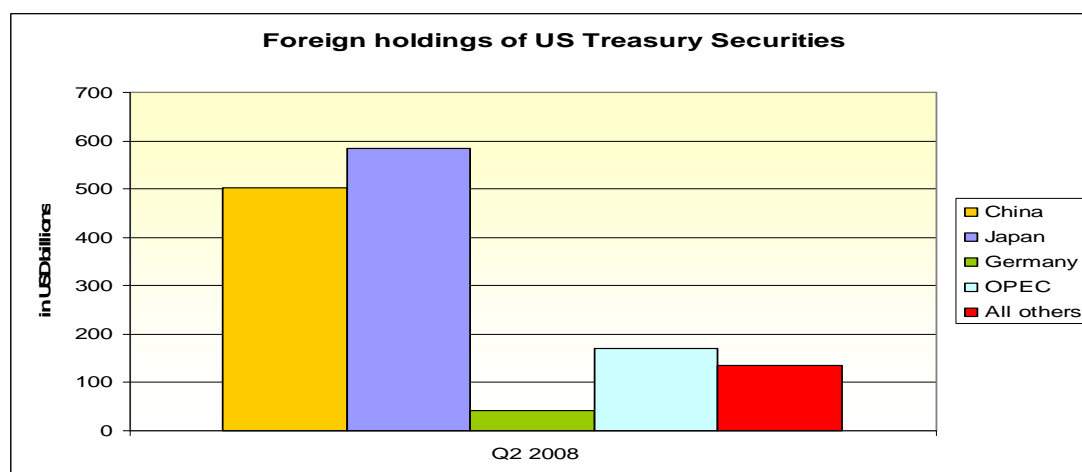
Figure 6: Foreign holdings of US Treasury Securities

The United States possesses the comparative advantage of being able to generate financial assets that others want to hold (Frankel, 2006). Advantageous for the US is that the rest of the world relies on the assumption that the dollar remains the reserve currency and will be the destination of the "flight to quality" in crises around the world (see Figure 2, Ted spread). Especially in the period 2001-2007, low global interest rates enabled investors to borrow cheaply. Since 1982, using cheap external finance, the US financed its growing current account deficit.

Over the last 15 years, interest rates have declined to levels not seen since the 1970s. Real interest rates of almost all classes of long term bonds have been low (Bank of Canada; 2007). Corporate bonds have yielded lower risk premia after the stock market crash in 2001. Emerging markets´ high yield bonds also paid a relative low risk premium compared to historical price earnings ratios (Ahrend, 2006). This indicates falling risk premia relative to equity. Since the start of the financial market crisis this situation has reversed completely. Risk premia have risen dramatically.

The world interest rate – defined as the common component of interest rates of the G7 in a paper by Desroches and Francis (2007) – had been reflected in a decrease in real interest rates to levels slightly above two percent after 2001. For periods that are not highly inflationary this number constitutes a historic low. The costs of arranging a relationship between the creditor and the debtor, as well as the uncertainty about the future interest rate would limit the interest rate from falling below the lower boundary of about 2 to 2.5 percent (Keynes, 1936, p. 183). Financial integration of capital markets has led global national interest rates to move in common.

The determinants of the interest rate are demand and supply for funds. A low interest rate thus can be explained by identifying sources of a change in savings and /or investment. The debate centres on whether low savings or a low level of investment contributed more to the situation of low global interest rates.

IV.1.1) Investments

Investment demand by G7 countries has reached a low level (Rajan, 2006). Various developments contribute to excess investment capacity of the major developed countries. Desroches and Francis (2007) adopt a longer term perspective to explain the falling real interest rates over the past 15 years. They find a significant relationship between investment demand and growth in the labour force. A declining labour force in industrialized countries thus is reflected in a weaker global investment demand. Demographics in Europe, Japan, Canada and the US would match this link between low interest rates and a decrease in

investment demand. At the same time the major industrial countries face high capital-to-labour ratios, which diminish the expected return on the investment.

While investment demand in the developed world decreases, emerging markets demand is rising. Growth in productivity and industrial production are found to be factors to which investment demand reacts positively. Paradoxically, many market players financially invest in the US. Desroches and Francis argue that Tobin's q (market value relative to replacement costs) plays an important role and associate stock market returns with higher investment demand.

Risk aversion in the aftermath of the stock market crash in March 2000 was high and reduced equity investment. Nonetheless, investors were searching for yield. Demand for corporate bonds and emerging market sovereign debt vehicles increased, narrowed spreads and contributed to low interest rates. Moreover, more risk averse institutional investors shifted their portfolio composition towards bonds.

Emerging markets have large growth opportunities, but not so much the ability to locally generate the store of value instruments (Frankel, 2006). They demand saving instruments from developed capital markets and their investment requires funding from foreign markets. The US, in particular, took over the role of an intermediary aligning the demand for investment with the funding supply. As a consequence of its unique role in international economics the US could benefit from positive investment performance of foreign assets, while at the same time profiting from low costs to finance its foreign equity holdings. Coupled with an expanding foreign leverage, US residents enjoyed this rate of return advantage (Obstfeld, Rogoff; 2005). Substantial capital gains were made due to the appreciation of foreign currencies relative to the US dollar and the return on foreign direct investment (FDI) and equity (Frankel, 2006). Lane and Milesi-Feretti (2005) provide data for those valuation effects.

Figure 7 shows the proportion of US FDI in the rest of the world in billions of dollars. The European Union ranks first in terms of receiving direct investment from the US. This outward direct investment is complemented by inward investment from the rest of the world. Figure 8 depicts this reversal of investment flows by showing the inflow of Chinese wealth to US T-bills.
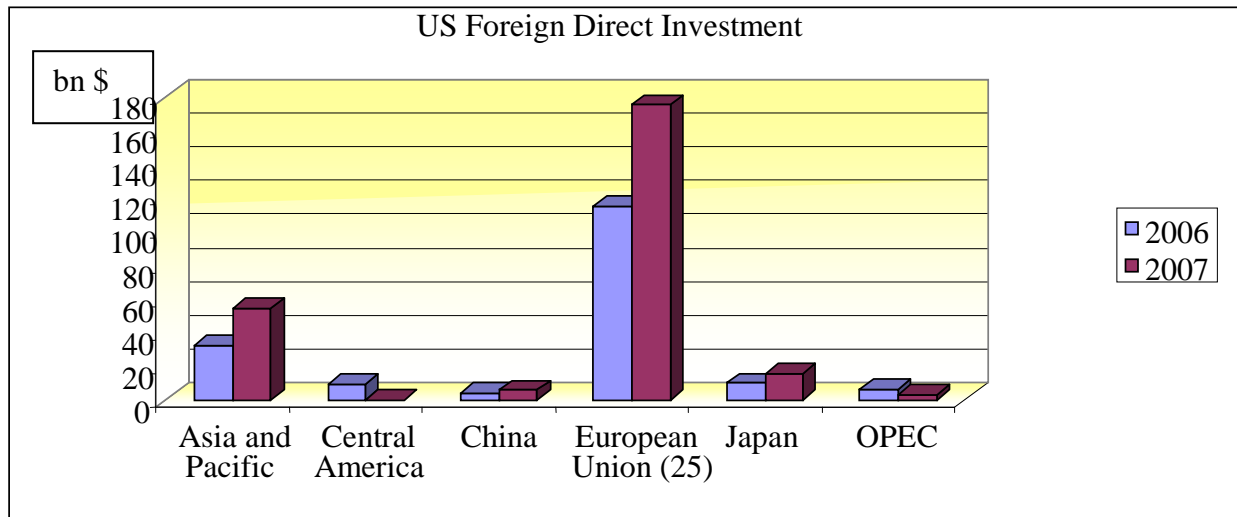
Figure 7: US Foreign Direct Investment, data source: Thomson Datastream
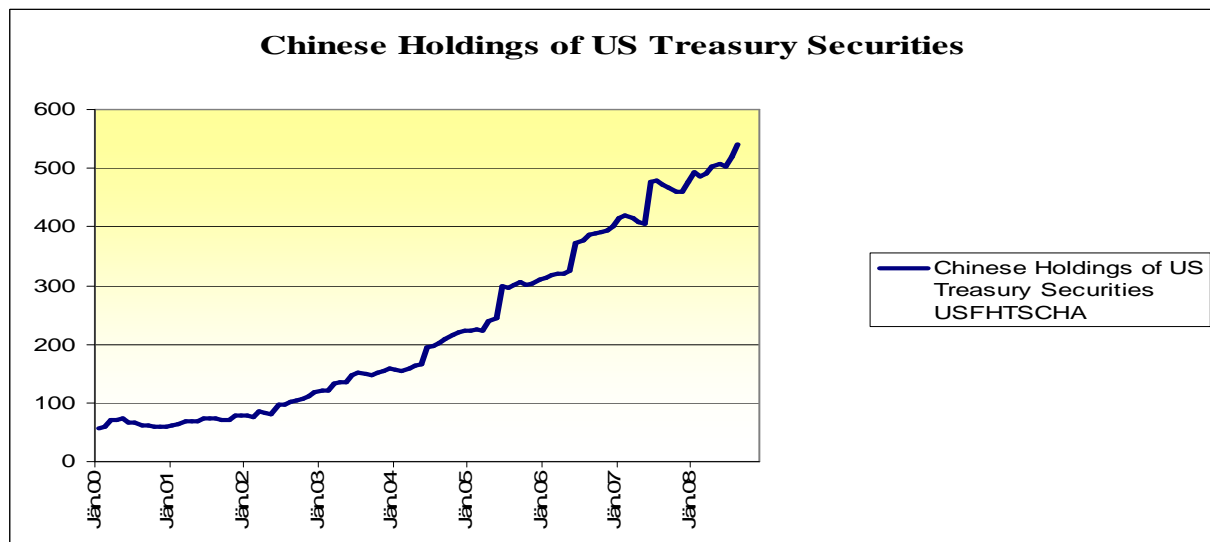
Figure 8: Chinese holdings of US Treasury Securities from 2000 till 2008 in billions of US dollars, Source: Thomson Datastream

IV.1.2) Savings

Bernanke (2005) speaks of the forces of a "global savings glut" that help explain the current account deficit in the US and the low interest rates. In this version, the rest of the world wanted to keep their savings in US dollars. The low interest US government bond yields can be traced back to portfolio shifts and the fiscal-monetary policy mix of the countries involved.

IV.2. THE GREENSPAN PUT

A put option is used as insurance by investors against a drop in the price of a security below a certain threshold. In financial markets, the belief that the Federal Reserve is going to intervene in favour of Wall Street if stocks or bonds threaten to fall significantly is called the Greenspan Put.

Alan Greenspan was chairman of the US Federal Reserve (Fed) from 1987 to 2006. Greenspan conducted monetary policy under President Ronald Reagan, George H.W. Bush, Bill Clinton, and George W. Bush. Beginning with Paul Volcker, the Fed in the 80s focused on keeping inflation in check and managed to do so.

Greenspan forcefully stood behind the perception that asset prices determine GDP. Aware of the meaningful contribution of monetary policy "to the impressive performance" of the US American economy (Greenspan, 2004) his monetary policy added not only to the booms but also to the bust the economy is currently experiencing.

Greenspan rejected rigid frameworks and "simple linear functions" (Greenspan, 2004). He was aware of the incomplete knowledge about complex linkages in the economy, which central bankers face. In his point of view, precisely specified models that try to quantify risk and uncertainty are not able to capture the full set of parameters that influence the economy. He tended to more flexible and adaptable monetary policy, which brought him the reputation of a practitioner.

His management style adapted elements of risk management, knowing that the structure of parameters used is constantly changing, which is highlighted by Bernanke (2004) saying that "[t]he channels of monetary policy, consequently, are changing in tandem".

Greenspan´s "insurance policy" (Blinder, Reis; 2004) went into action in 1998 during the events of the Russian crisis and the collapse of Long Term Capital Management (LTCM). The Fed organised a rescue of LTCM, a large US hedge fund. LTCM was perceived to be "too big to fail" since a failure of the hedge fund was feared to have the potential to disrupt financial markets. Many Wall Street and foreign banking firms had a stake in LTCM and were concerned about a widespread impact on counterparties. The bailout of LTCM sent a

positive signal to the stock market. Critics argue that this "too big to fail" doctrine induces moral hazard. Fisher (1999) points out that both managers and investors are subject to excessive risk taking due to the implicit guarantee of the lender of last resort.

A central bank's task is to avoid panic on the markets and keep prices stable and unemployment low. The difficulty of accomplishing this task is to make the right judgements about the state of institutions. The critical point is to determine "the line between solvency and liquidity" (Fisher, 1999). A lender of last resort can reduce panic on the market if it is skilled enough to determine whether a particular institution is suffering from temporary illiquidity or would be insolvent in normal times. If a crisis is well managed, the number of bankruptcies is likely to be small. If a crisis is badly managed, general illiquidity and insolvency may result.

Greenspan justified his reaction of easing of monetary policy in the event of LTCM with the concern about "the low probability risk that the default might trigger events that would severely disrupt domestic and international financial markets" (Greenspan, 2004). Greenspan´s opinion on operating under a risk management paradigm implied that at times it would be required to take actions that guarded against possible, if improbable, outcomes that could have severe adverse effects on the economy. Suspicious about the models employed, he argues that models that are designed to meet specific policy objectives could in practice prove to be unsuitable and cause severe adverse outcomes (Greenspan, 2004).

With this reasoning Greenspan also defended his policy of low interest rates after 2001, pointing out that the US experienced an "exceptionally mild recession, even milder than a decade ago" (Greenspan, 2004) in the aftermath of the savings and loan crisis.

Critics of Greenspan put forward that the Fed was providing psychological insurance by cutting the interest rate in support of the stock market. Fed policy did not allow a substantial devaluation and thus encouraged excessive risk taking.

Governor Donald Kohn (2004), vice chairman of the board of governors at the Federal Reserve, explains the Fed´s reaction to the bursting bubble in 2000 with the problem of falling asset prices. Falling asset prices deteriorate the stability of the financial markets and constrain loan possibilities and spending. In order to stop the flight of liquidity that could disrupt

financial markets and economic activity, confidence building policy actions are taken. These include a decrease in interest rates to lower the probability of the high impact event of an asset price correction.

IV.2.1) Falling Risk Premia

Miller, Weller, Zhang (2001) study to what extent the market changes the risk premium on the US stock market in response to Fed policy. They assume that if investors observe "asymmetric policy interventions," they will believe that the central bank puts a floor under falling market prices. This is because the Fed (then under Greenspan) is a strong advocate of not bursting the bubbles, but reacting to their consequences. The Fed therefore tries to stabilize the market by building confidence (Kohn, 2004). The central bank's reaction acts as a put option insuring against downside risk. In the theory of Miller, Weller and Zhang, the put is available without cost, but the insurance is priced into the stock market in the form of higher prices. Higher stock prices and low risk premia mean that the cost of equity has decreased. Using the framework of Tobin's q, equity can buy relatively more than when security prices are down. Bernanke (2004) explains the decline in the cost of equity by the decrease in economic volatility.

My calculations of the volatility using the model of the equally weighted moving average (EWMA volatility) underline this fact. For the period 2003 to mid-2007, when the crisis reached broad capital markets, volatility was less than one percent for daily data (See Figure 8). Such low risk reduces the premia.
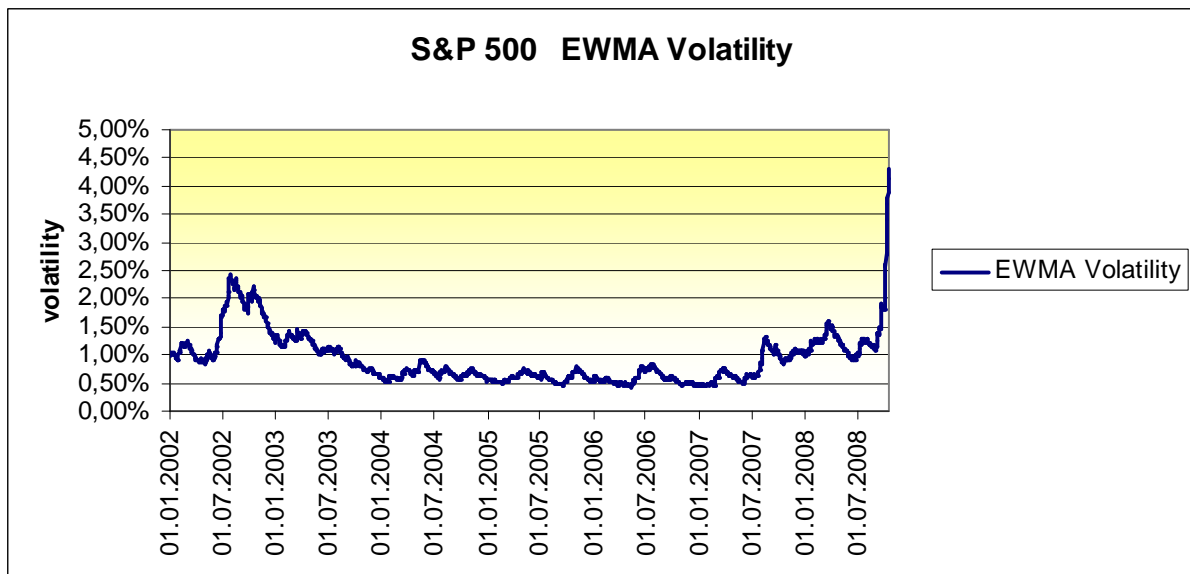
Figure 9: EWMA volatility of stock market index S&P 500; Data source: Thomson Datastream

McKinnon and Pill (1996) show that financial innovation together with an implicit deposit insurance, has the ability to fuel lending and exacerbate boom-bust cycles. Greenspan is criticised for focussing on wealth effects and consequently for conducting a policy that combats market declines. He advocates that prices of stocks, bonds, and real estate as well as the exchange rate support the Fed in achieving its objective of price stability for consumer goods, which should increase macroeconomic stability and growth in general. Liquidity gives investors confidence that their assets can be sold at any time. Investors perceive this as a safeguard. On the liquidity paradox, Keynes (1936) wrote that the individual investor's belief of being able to exit the market at will "calms his nerves and makes him much more willing to run a risk". This creates the problem of moral hazard. Excessive risk taking because of perceived safety takes place when the potential loss is so great that the "insurer" (the central bank) is not able to provide enough liquidity to calm the market. High risk aversion forces the market players to leave the market and abandon investment, resulting in illiquidity.

Coming to the Trinity Problem of Mundell (2000a), during the Greenspan era the external balance was not an objective for monetary policy considerations. Until 2007, the US developed an economic environment of low unemployment and low inflation, as well as a stable exchange rate towards its main trading partners. The latter is not an achievement of US monetary policy, but rather the fact of quasi dollar pegs in Asian and oil exporting countries until 2006. The US had established a stable environment, while the current account deficit widened dramatically.

Greenspan (2004) once pointed out that his task is to conduct monetary policy with a sole focus on the US. His responsibility for domestic policy goals only understated the risk of a growing current account deficit. Unsound developments on domestic markets could easily spread risk aversion and induce a reversal of capital inflows. Liquidity then becomes scarce and, as asset prices drop, the "vicious cycle" (Kaminsky, Reinhart; 1999) of wealth effects continues to deteriorate output.

While the external balance deteriorated, the internal balance was sound. In its open economy, the US increased liquidity on the market, helping asset prices without affecting inflation or consumer prices. Stock market prices inflated, whereas the consumer price index did not overshoot the inflation target.

IV.2.3) Flattening of the Philips Curve

In the 1960s, economists pursued the idea of a permanent inflation-unemployment trade-off. The inverse relation of unemployment and inflation no longer matches reality. Iakova (2007) calls this development the "flattening of the Phillips curve".

The Philips curve describes the rate of unemployment and inflation as an inverse relationship. Usually, if an economy is overworking its resources, inflation rises since production and labour costs increase. The output gap, which constitutes the difference between the actual and the efficient (or potential) output, is a way to measure aggregate demand over aggregate

supply as an indicator of expected inflation and unemployment. The efficient output is the level where the economy works at full employment.

Iakova analyses inflation in the UK and argues that globalisation is responsible for the flattening of the Phillips curve. She puts forward three reasons for abandoning the Philips curve, namely increased competition, labour mobility (and the shifting of production abroad at a high cost) and increased trade and investment flows. In an open economy, a change in domestic demand can easily be satisfied through an increase in imports and a shift of production abroad. Demand pressure does not show up in higher prices for manufactured goods, but is still a reliable indicator for service price inflation. Consequently, domestic inflation may become less sensitive to a positive domestic output gap and more sensitive to global tensions on production capacities (Noyer, 2008). Heightened competition from a globalised world was thwarting producers' ability to pass through cost increases in the past few years. Developed countries imported cheap manufactured goods. The drop in import prices allowed real consumption wages to increase while real production wages remained unaffected. This has lowered the inflation rate at any given level of employment. In addition to the benefits of low inflation, competition on product and labour markets was a further feature of globalisation.

Expansionary policy after the stock market crash in 2000 and 2001 added to the effect of already low interest rates compared to the past. The Fed´s decision to support growth kept interest rates below what is now considered the natural rate of interest. In 2001 the concern was more that the US economy would experience deflation. According to the definition of "the neutral rate of interest" the goal of price stability was achieved by mid- 2003.

The neutral rate of interest is defined as the rate at which the demand for physical loan capital coincides with the supply of savings expressed in physical magnitudes (Wicksell, 1965). Once the neutral rate is reached, equilibrium is attained. In this equilibrium framework the balance of supply (savings) and demand (loans) keeps prices stable.

The Fed constantly increased the money supply. As Figure 10 shows, policy rates were kept low until 2006. The loose monetary policy in the past years served as spending stimulus and is said to have worsened the current account deficit. Saving rates of US households dropped

to negative and near negative levels. The US stock market experienced an upward trend through 2001, with risk premia falling below historic levels.
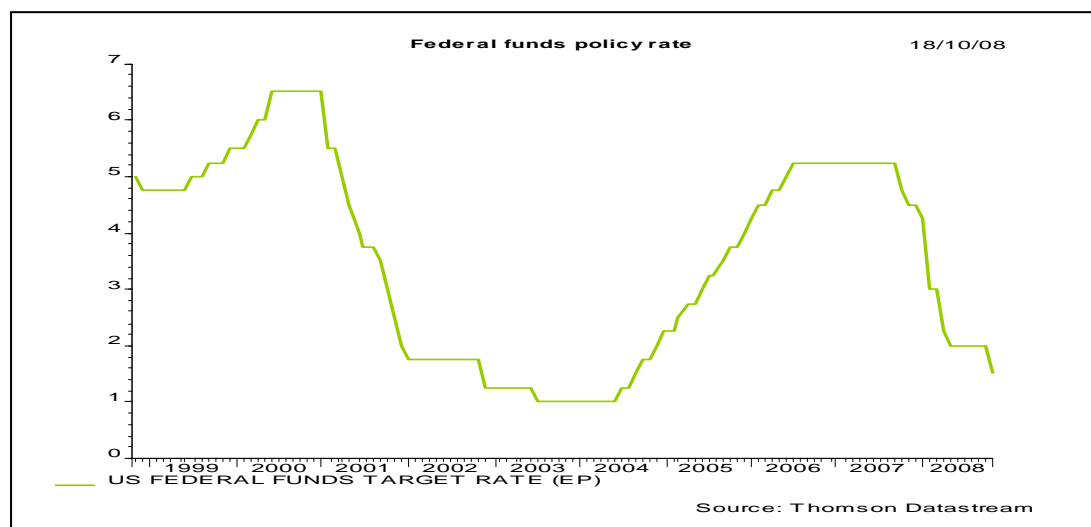
Figure 10: Federal Funds Target Rate from 1999 to 2008

The US fostered growth knowing that asset prices would affect output. The problem of the commitment to wealth effects is that if domestic investment is not matched with domestic savings, a current account imbalance occurs.

IV.3. PORTFOLIO SHIFTS

IV.3.1) "War chest of reserves"

Painful economic crises induced emerging economies to increase their savings rate in order to reduce their vulnerability to opportunistic capital flows. Mexico in 1994, East Asia from 1997-98, Russia in 1998, Brazil in 1999 and Argentina in 2002 were highly dependent on foreign capital lending prior to the financial crisis. Precautionary reserve accumulation in the wake of these crises turned developing countries form borrowers to lenders on a large scale on international capital markets. Export-led growth in Korea, Thailand and China vastly contributed to the accumulation of dollar reserves.

In the view of Deutsche Bank, advanced by Dooley and Garber, Chinese authorities needed to maintain a de facto dollar peg to preserve the economy's competitiveness on the export

market. But since 2006, the Chinese currency has appreciated against the dollar. Tyers and Bain (2008) argue that the appreciation results from illegal capital inflows and is not intentional on the part of Chinese authorities. For China, maintaining growth in industrial employment necessitates a competitive exchange rate. Chinese authorities consider staying on the growth path to be crucial for political stability. This fact was also termed "Bretton Woods II," with China taking the role of Europe in the 1960s. Concerns about the potential deterioration in the trade sector (which is the main sector emerging countries rely on) induced the authorities to absorb the inflow of foreign currency by accumulating reserves. As long as Asian central banks continue to tolerate an appreciation of their currencies against the US dollar, China's demand for US bonds is a way to abandon its interest inelasticity relative to US interest rates. Ahrend (2006) argues that the official capital flows into US bonds from the Chinese government further encourages private inflows, since investors rely on the Chinese central bank to ensure a strong US dollar and low interest rates, which is a favourable environment for bond prices. But, will this Chinese policy be sustainable and remain in the interest of China?

Capital losses in dollar terms amounted to about 100 US dollar per Chinese inhabitant. According to Streißler (2008), calculations for the period of 2007 to 2008 show that if the amount of losses is broken down by inhabitants, every single Chinese would suffer a loss of 100$ per annum. In October 2008, Chinese reserves hit a high of 1.9 trillion US dollars[6]. In the past 10 months, from January to October 2008, alone, the renminbi appreciated by 8.54 percent[6] against the US dollar. Even if one takes into account that not all reserves are held in US dollars the loss due to appreciation is quite high.

Limited access to credit and a strong concern over aging in a system without an adequate safety net increased private savings of household and firms in emerging markets. But the large majority of low US interest rates does not stem from the supply side of funds through high foreign savings, but is due to the demand for fund from the reserve build up by Asian countries.

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[6] Data from The Economist Intelligence Unit, October 30th 2008

IV.3.2) Saving industrialised countries

Age structure is a variable affecting the savings behaviour of individuals. The demographics of the G7 show an increasing share of individuals approaching retirement. The elderly-dependency ratio, a measure of those aged over 65 relative to the population aged 15 to 64, has grown steadily. Following the life cycle model of savings (Modigiliani, 1970), people tend to dissave during their retirement. Empirics on the theory of reduced savings in the late stage of life are mixed (Poterba, 2004) and unclear in terms of their effects on the ´savings glut´ (Desroches, Francis; 2007). Nevertheless, household saving in the OECD countries has decreased, with the US savings volume decreasing further from its already low levels. While the household component of private sector saving went down, the *corporate savings rate* rose. Lusardi et al. (2001) conducted a study on the relationship of personal and corporate savings rates for the period of 1988 to 2000. They find that 3.5 percentage points of the decline in the US personal savings could be traced back to the rise in the stock market value in real terms over the same period. Households shift their savings to capital markets, directly or indirectly as shareholders (directly) or participants in pension funds (indirectly). Since households can be regarded as the ultimate business owners (De Serres and Pelgrin, 2003), the impact on personal savings seems plausible. Increasing prices for residential housing is the other crucial aspect of wealth effects in the household sector. Graph 11 depicts the percentage change of house prices in ten major US cities. From 2006 through 2008, house prices experienced a decline of 25 percent.
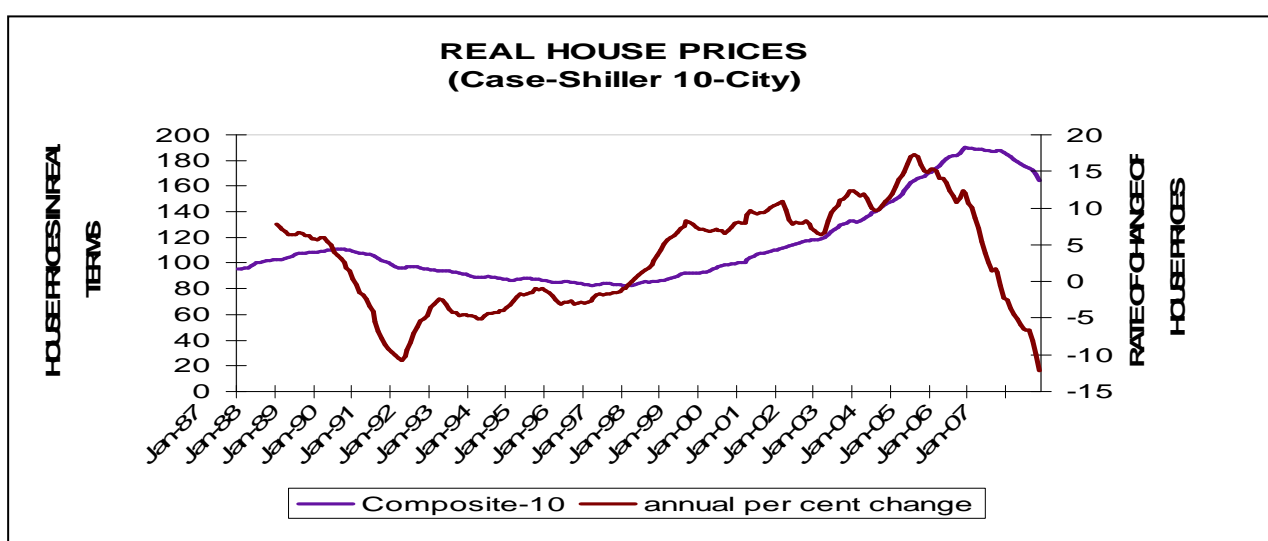

Figure 11: Case-Shiller House Price Index, source: Wolf (2008)

With respect to the OECD countries, particularly Germany, Japan and the US, the global "savings glut" translates into corporate savings and thus into a decreased demand for investment. A dearth of investment opportunities explains the excess of desired savings over realised investment.

Rajan (2006) describes the problem as an "investment restraint" rather than a "savings glut". He argues that one reason for low corporate investment is related to the prevailing competitiveness on the market. Financial slack is held to operate flexibly in a competitive environment. An increasingly fierce market for corporate control might be another reason why firms tend to hold cash instead of investing. Investment by US businesses in equipment and structure has been low (Bernanke, 2005). Much of the capital inflow into the US has shown up in construction of houses. House price increases stimulated consumption. Since imports were relatively cheap, a substantial share of consumption went to imported goods. In the long run, productivity was thus hindered since it is more likely to be driven by non-residential investment (Bernanke, 2005). Bernanke favours a development of "large and healthy export industries" to the non-traded goods sector, to which construction and housing belongs. Exports would counteract the current account imbalance that is associated with costs of adjustment.

IV.3.3) Oil exporters

A surge in oil prices beginning in 2004 induced oil exporting countries to also invest in US dollars. Despite having fixed or managed exchange rates towards the dollar, central bank dollar reserves do not account for much of the current account surplus. But official institutions, such as stabilisation funds and official investment banks recycle their petro-dollars on the capital market (Ahrend, Catte, Price; 2006).

The accumulation of dollars benefits the reserve currency in the form of seigniorage associated with the issuance of money. The process of accumulating and the usage of dollar reserves in countries outside of the US can be seen as Dollarization. The same mechanism is true for "Euroization". Dollarization and Euroization means the expansion of the use and holding of the dollar and the euro, respectively, outside the issuing country. When adopting a

currency the "dollarised" or "euroized" country must sell goods and services to the issuing country, and in exchange is paid in the foreign currency. Seigniorage revenue is the value of goods and services the issuing country receives against its additional money creation. For the US the most important good received is oil. The seniorage for the old European countries is due to the extension of product and service markets.

IV.4. MONETARY- FISCAL POLICY MIX

Nobel laureate Mundell (2000a) emphasises that monetary factors are crucial determinants for the real economy. *Free capital mobility, a fixed exchange rate and an independent monetary policy* are factors that determine the appropriate mix of fiscal and monetary policy.

The appropriate fiscal and monetary policy mix is aimed to keep an economy's internal and external balance. Keynes (1923) distinguished internal and external stability. Internal stability refers to the stability of prices, whereas external stability means stability in exchange rates and an equilibrated balance of payments. Keynes stated that priority should be given to internal stability, without forgetting about the external factor. The Trinity problem formulated by Mundell states that it is not possible to incorporate all three factors. Thus countries are always facing a trade-off, having to choose only two of the factors.

In an open economy (of flexible exchange rates) in which capital can move without restrictions, the effect on output comes to a large extent through the exchange rate rather than through a stimulation or restriction on domestic demand. A permanently tighter monetary policy would raise interest rates and induce foreigners to invest domestically, since investors are always looking for an optimal risk-return relationship. The investment inflow has positive effects on the unemployment rate (internal balance), but acts inflationary as an increase in costs of labour increases prices (external balance).

The currency would appreciate, harming the export sector and deteriorating the trade balance. From 2000 to the present, investment inflow to the US resulted in a booming credit industry and stimulated the nontradables sector. An environment of high liquidity kept the exchange

rate high since funds poured into US financial institutions. The large bulk of the current account imbalances was borne by foreign borrowing.

IV.4.1) The optimal policy mix under Bretton Woods

Since the beginning of the Bretton Woods System in 1944, through its transition to floating rates in 1973 and even until today, the United States has chosen different policy mixes of the three elements. But at no time the US did give up its ability to run an independent domestic monetary policy.

Under the Bretton Woods regime, the industrial nations chose domestic autonomy and fixed exchange rates against the US dollar by ruling out free capital mobility. The US dollar took on the role of reserve currency. The price of the dollar was held fixed to gold at $35 an ounce from 1934 to 1973. The architecture of Bretton Woods would have required that its most powerful member, the US, would not pursue exclusively domestic goals, but rather would adopt policies geared to increase the welfare of the world economy as a whole (Krugman, Obstfeld; 2006). The collapse of the gold exchange standard in 1973 enabled the US to liberalize capital movements without sacrificing its domestic policy priorities and without committing to a fixed exchange rate (Broz, 1998).

In the period up to 1973, monetary policy in the US worked through transmission mechanisms typical for closed economies. In a traditional closed economy, monetary policy operates through interest rates and affects interest-sensitive expenditures to achieve an internal balance (asset prices). A decrease in money supply translates into lower prices, which influences the trade and external balance in a positive way.

In the 1960s under Bretton Woods Mundell (2000a) suggested a policy mix of lowering taxes to spur employment and tight monetary policy to protect the balance of payments in order to treat a situation of "sluggish growth and subpar employment". With this policy mix the US achieved rapid growth and stability.

Would Mundell´s policy suggestion for achieving external and internal balance still lead to the desired outcome in a world of full capital mobility?

IV.4.2) Mundell revisited 2008

Using the trilemma framework, the US after Bretton Woods chose free capital flows and conducted an independent monetary policy. Mundell´s policy mix in such a setting makes the achievement of the goal of internal and external balance more complex.

In monetary terms, the US acted as if it still were a closed economy, pursuing domestic goals without considering effects on the rest of the world. The problem with this behaviour ultimately has become quite clear. By remaining a reserve currency for a range of emerging markets, the United States exported its monetary policy to many emerging countries relying on the fixed exchange rate. In order to keep the rate of exchange fixed, emerging markets piled up dollar reserves, which benefited from asset price growth in the US through allowing a greater supply of credit.

As the bubble burst, assets which were high in value before the crisis lost their ability to stand as collateral. Now dollar holdings of foreigners exceed the level that can be backed by US assets. The US thus no longer is able to maintain the value of the dollar, as it had not been able to maintain gold convertibility at the end of Bretton Woods. Not being able to maintain the dollar value means a depreciation of the dollar. While dollar depreciation may benefit US exports (Feldstein, 2008), it hurts those trading partners holding vast dollar reserves.

This is a situation Mundell already identified when discussing the right policy mix in order to correct the balance of payments deficit in the 1960s. Depreciation of the dollar reserves means shrinking the reserves by deflating the debt outstanding as the currency loses real value.

IV.*4.3) The United States as external adjuster*

Bernanke (1983) in his studies on the Great Depression noticed that those countries that devalued or allowed for depreciation of their currencies experienced rapid recoveries after an economic downturn; "the effect of this credit squeeze on aggregate demand helped convert the severe [...] downturn of 1929-1930 into a protracted depression" (Bernanke, 1983).

Martin, Schuknecht and Vansteenkiste (2007) analyse the role of the exchange rate for adjustment in boom and bust. The authors observe industrialised countries in the period from the mid 1980s to the early 1990s in order to detect patterns of exchange rate adjustments on a cross-country basis. The authors distinguish external versus internal adjusters. External adjusters are defined to experience a real effective exchange rate depreciation/ devaluation in the bust, whereas countries that did not have their countries depreciated/ devaluated are referred to as internal adjusters.

The asset price cycle is the conceptual basis for identifying channels that explain emergence and evolution of boom and bust episodes in their analysis. Credit, trade, fiscal policy and international capital flows are the factors analysed in hindsight of the exchange rate adjustment process. The authors look at a number of stock and flow variables to gather insight on how these factors transmit to the real economy.

Their findings reveal that, in booms, external adjusters tend to experience more overheated demand, increases in prices and credit as well as a loss of competitiveness, measured in the growth of unit labour costs, and deterioration in the balance sheets compared to internal adjusters. In busts, the downturns external adjusters experience are deep, but not as protracted as with internal adjusters. External adjusters have their imbalances unwound faster, since the depreciation in the currency affects the reversal of capital inflows. In a world of free capital flows this affects not only the current account, but affects asset prices and, through the credit channel, demand and output as well.

Fiscal and external imbalances indicate that a country's currency is more likely to respond to busts with depreciation/devaluation because internal adjustment is not feasible from a cost perspective. The adjustment strategy is thus to some extent endogenously determined because large imbalances increase the cost of internal adjustment.

Internal adjusters need to correct imbalances via domestic price adjustments in wages or the trade sector. External adjusters experience a credit squeeze and decreasing output. Internal adjusters experience an increase in real wages due to appreciation relative to other currencies. This harms the export sector. Revenue from the tradable sector declines, contracting the economy.

Following the pattern of features, the authors find that the US fits in the group of external adjusters in a period of bust. Growth in asset prices and output, the fiscal and current account deficit and high unit labour costs are all factors pointing at external adjustment. Indeed, the world wide bust we are currently experiencing resulted in a depreciation of the dollar, partly due to the positive real interest rate differential.

In September 2007 the Federal Reserve cut interest rates to 4.75 percent. At the same time the US dollar lost in value relative to the Euro. On January 1st 2008 the EUR/USD exchange rate was at 1.468. On April 1st 2008 it was at 1.528. On October 31th the EUR/USD exchange rate fell back to the level of 1.27. The US dollar increased in value. (See Graph 12.)
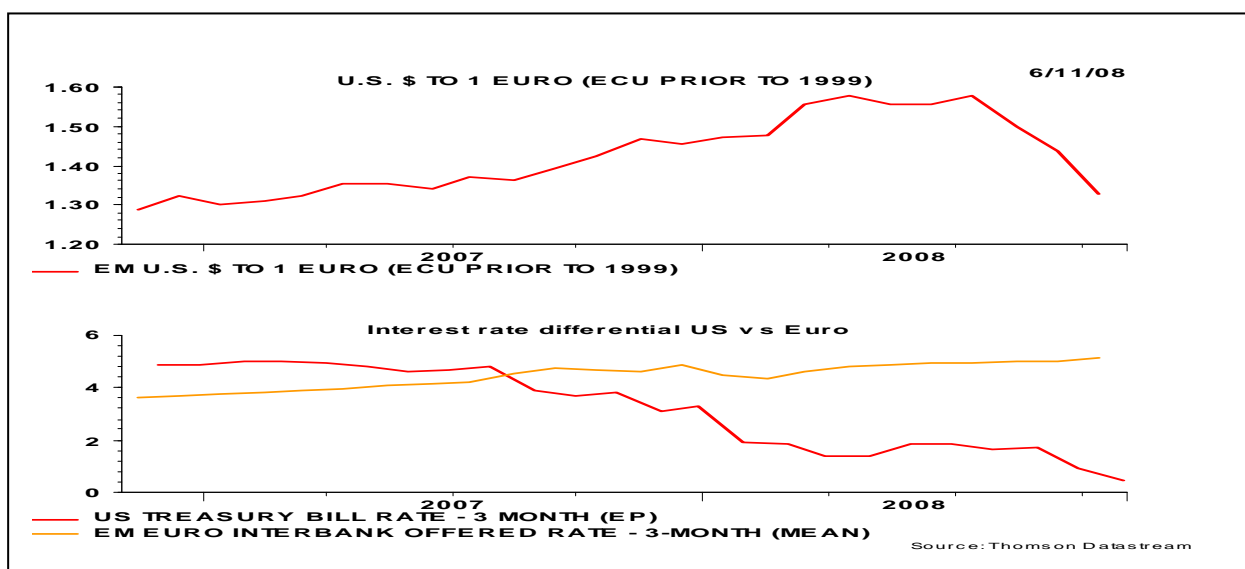

Figure 12: Interest rate differential 3- month Treasury bill with 3-month Euribor, source: Thomson Datastream

VI.5. TWIN DEFICITS

"[T]he growth of the US trade deficit in the 1980s primarily reflects the influence of several interrelated macroeconomic developments....Growth of US spending relative to production and income implied a deterioration in the national saving-investment balance, which, in turn, owed much to the persistence of a large Federal deficit..."

Council of Economic Advisers, Economic Report of the President (1988)

This statement from the year 1988 compromises an essential point in the discussion of the deficit in the present current account of 699 billion dollars. In the 1980s economists found that the current account deficit and the fiscal budget deficit were moving in the same direction and started a discourse on the "twin deficits".

During the Reagan era and beyond, the current account deteriorated slowly and steadily, and so did the budget deficit. Tax cuts did not result in an increase in savings, but led to further spending. Within 30 years the current account balance of the United States went down to a low of -6.5% of GDP in 2006 from approximately +/- 1% of GDP in the 1970s[7]. (See Figure 13.)
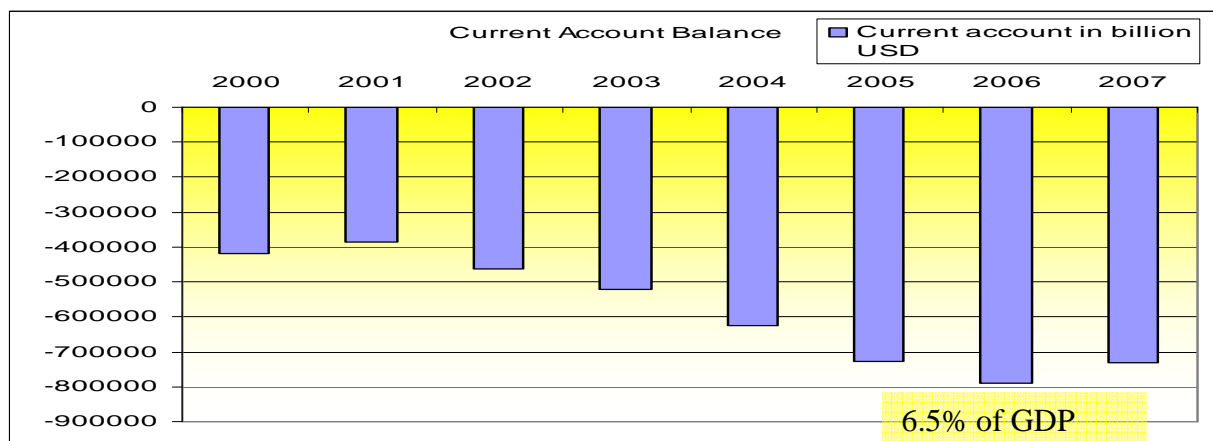

Figure 13: US Current account balance in millions of dollars; Source: Thomson Datastream

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[7] Data from The Economist

IV.5.1) War finance and the budget deficit

President Bush led wars in Iraq and Afghanistan, which became unpopular with the voters. Typically, unpopular wars are typically financed by printing new money: "Inflationary finance combines the political and economic advantages of borrowing with the immediate rewards of confiscatory taxation." (Trask, 2004)

Printing new money is essentially taxation using the back door, since the increase in money supply, unless hoarded, leads to depreciation and a loss in purchasing power. In a country with a stable current account, prices adjust faster than wages do; hence an increase in money supply acts as if wage earners were taxed. However, in any country with wage indexation, inflationary pressure does not act as a tax. In the later floating period Italian experience wages adjusted automatically to a cost- of- living index, such that an increase in money supply did not decrease wage earners´ purchasing power. Indexation reduces the output gains from monetary expansion. Officially the Bush administration communicated tax cuts, which decreased public saving. Simultaneously, the expansionary policy under Greenspan, who despite of his formally independent role as central bank president deliberately made clear his standpoint in favour of the war (Blinder, Reis; 2005), acted as a tax. Unless it is not hoarded, monetary expansion tends to reduce disposable income and enters the savings equation with a negative sign. Expenditures and tax cuts for the wars and the rebuilding of homeland security created a growing budget deficit and as it was financed through the issuance of new debt, and also created a growing current account deficit.

IV.5.2) Debt finance and the current account

Open market sales of government debt increase the monetary base and affect consumption. In an open economy with free capital mobility the printed money did not stay within the borders of the United States, but was accumulated by the rest of the world.

Beneficial economic prospects as well as increased household wealth on the back of foreign debt contributed to a low savings rate in the US. The personal saving rate in the US was temporarily negative and between 2005 up to the collapse of the American investment banks

remained near zero, with consumption still on the rise. Graph 14 depicts a steep hike of the personal savings rate as a percentage of disposable income in September 2008. The reasons for this spike are unclear; perhaps it is due to a one- time change in statistical definitions.
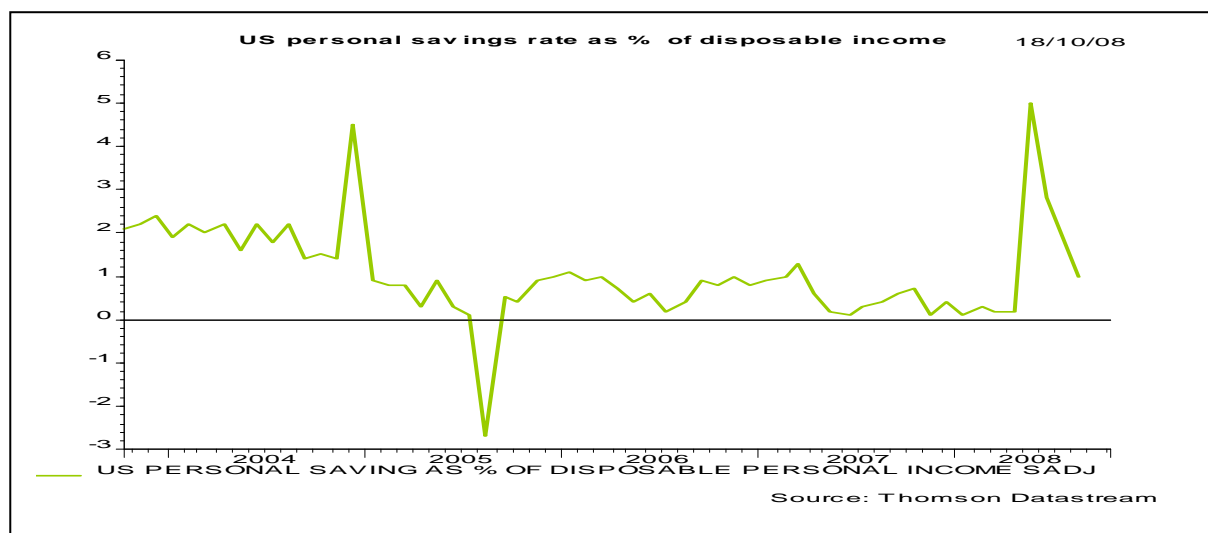
Figure 14: US personal savings as percent of disposable income from 2003-2008

Mann (2002) argues that, the lower the stream of interest payments demanded by foreign investors, the longer a country can run a current account deficit. She emphasizes that the exchange rate plays a key role in addressing the servicing of debt. As can been seen in the US financing position, debt in domestic currency is less vulnerable to exchange rate volatility. Consequently, it allows for low interest rates. As long as the economy manages to service its debt, the current account deficit can grow.

The US current account deficit has added substantially to financial market vulnerability. Beginning in the home mortgage market, neither home owners nor banks were able to service their debt. The leveraging mechanism multiplied the risk and damage of a reversal of capital flows. The US diminished savings rate is of great importance when considering economic stability since it leaves the economy vulnerable to "sudden stops" of capital inflows. Low savings rates exacerbate the situation in busts because the country has less means to address

the downturn. At present the sudden stop translated into a credit crunch and the "other twins" (Kaminsky, Reinhart, 1999) of a banking and currency crisis.

IV.5.3) The twins: Budget deficit and current account deficit

At the core of the theory of twin deficits lies the impact of fiscal policy on private saving. The fundamental accounting identity on investment and savings states that in a closed economy savings need to equal investment. Private savings tend to fall when fiscal policy loosens. In an open economy the above identity can be expanded to include the current account. Then, a shortfall of domestic savings while investment is maintained needs to be financed by external savings, which show up on the current account.

Historically, the Keynesian approach to fiscal policy and the "Ricardian equivalence" theory are the two prominent opposing views on the effects of fiscal expansion on the savings rate and the current account.

The Keynesian view argues in favour of the causal relationship between fiscal and current account deficits. An increase in fiscal spending either through tax cuts or the issuance of new debt results in a temporary increase of real disposable income. This changes private investment behaviour and increases consumption, while savings decrease. A savings shortfall results in a decrease in domestic investment as lower savings raise interest rates. Whether domestic investment is "crowded out" by the fiscal expansion depends on the country's degree of openness to financial flows. If a country can borrow from abroad investment can be held up. Purvis (1985) already noted that in the US federal deficits were accompanied by huge capital inflows in the 1980s. The credit granted by foreigners decreases the balance of payments.

The Ricardian view of tax cuts and government deficits explains why taxes should not alter the current account. Private savers neutralize the government's effort to lower public deficits by lowering private sector savings. Private savers anticipate the consequences of tax cuts in the longer run. Savers expect an increase in the budget deficit to be followed by higher taxes at a later point in time to pay off the government debt. A tax cut thus results in a higher

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savings rate and keeps the current account stable. Since financial policy is anticipated, the savings behaviour adjusts such that the current account is not affected by fiscal policy. In the Ricardian view debt finance does not affect the current account. The experience of Europe in the late 1990s, when European countries strove to meet the Maastricht criteria, supports the Ricardian theory.

In practice, Ricardian effects on saving are thought to explain no more than half of the change in European savings (Obstfeld, Krugmann; 2006). In the period of 1972-1983 the large fiscal deficits moved in tandem with the current account deficits (Figure 15). Then, financial expansion resulted in about 40 to 50 percent higher consumption. Bernheim (1987) finds in US time series data that fiscal policy has decreased its impact on national saving. Now, one dollar of tax cuts increases consumption by just 20-30 percent.
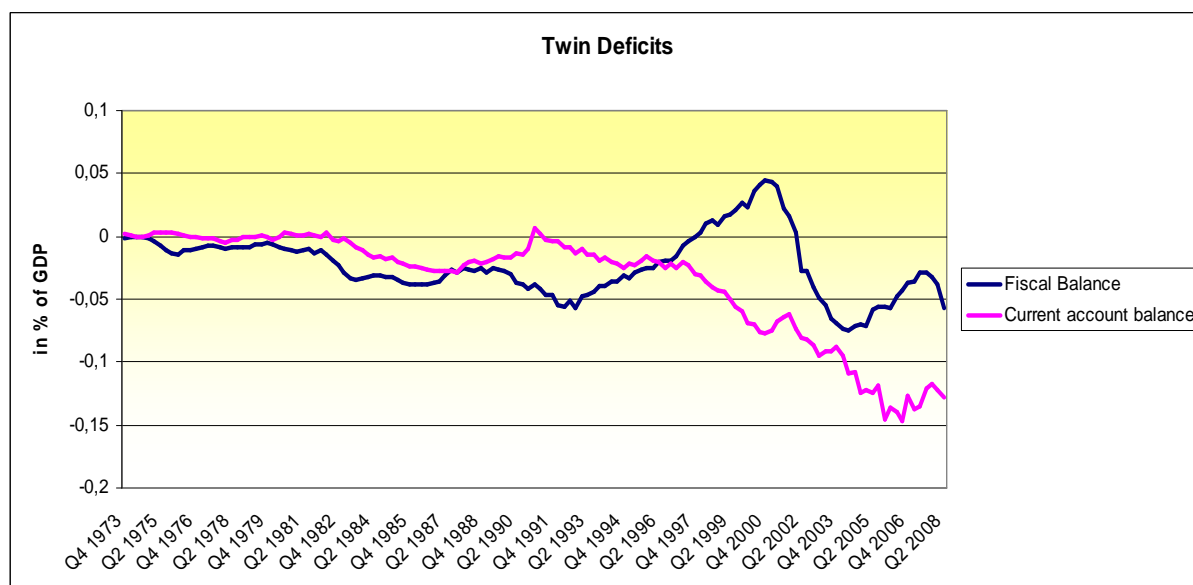
Figure 15: US Fiscal and Current account balance from 1973 to Q2 2008; Source: Thomson Datastream

This analysis would suggest that US data fit closer to the Ricardian view of national savings, namely that the private sectors cuts back on its investment and saves 70-80 percent. On a national level, a tax cut increases public debt. A tax cut of one dollar increases private saving by less, namely 70-80 percent. This investment gap needs to be borrowed from abroad. Bartolini and Lahiri (2006) present figures of the OECD countries showing that a one dollar increase in fiscal deficit is associated with a 33-37 per cent increase in national saving. The

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current account´s response is a decline of 30 per cent. Changes in national savings are thus approximately matched by foreign saving. This implies that investment is not curbed by an increase in domestic saving, but rather matched by an increase in the current account deficit to meet consumption demand, supporting the twin hypothesis.

IV.5.4) The declining impact of fiscal policy on private saving

As for the effect of fiscal policy on private sector consumption Bartolini and Lahiri (2006) point out several factors explaining its declining impact. First, financial innovation enabled private investors to access easy borrowing to spur consumption, decoupling investment decisions from a fiscal stimulus. Frankel (2006) points out that the budget and trade deficit would not move in the same direction unless there was a huge *exogenous* increase in investment. Second, "fiscal rules" to restore or keep a balanced budget deficit induce forward-looking behaviour by households taking a more Ricardian view. Third, a lengthening of working lifetimes in industrialised and emerging markets may lead workers to anticipate the future burden of a current tax cut.

Thus, fiscal incentives have lost importance in determining consumption and saving behaviour. The effectiveness of fiscal policy is determined by the interest rate sensitivity of international capital flows (Purvis, 1986). This is because fiscal policy alters income through the interest rate. Purvis states that as international capital flows react more strongly to the interest rate, fiscal policy becomes less effective in directing private savings.

Purvis's conclusion does not apply to the US experience. It is true that foreign investment is attracted by higher interest rates, which in return blurs the intended output of fiscal policy in order to control saving. But for the US, interest sensitivity need not be high to attract foreign capital. Despite falling interest rates, demand for US debt instruments form the rest of the world is persistent. Foreign capital has been used for US consumption. Capital from emerging economies flows into US financial assets decoupled from considerations on interest rate differentials. US authorities do not have the power to control saving by setting an interest rate. Interest sensitivity in the US is very low which explains the declining impact of fiscal policy. Consumption behaviour is hard to control since debt is easily available.

Enders and Lee (1990) state that the current account balance is related to government spending, but emphasize that the deficits are not twins. Government spending impacts the current account, but the means for financing it do not determine the balance of payments. The "twins" thus may rather be siblings (Frankel, 2006). "Ricardian equivalence" theory does not distinguish between tax collection and bond issuance for government spending (Purvis, 1985).

IV.5.5) The costs of government spending through fiscal and monetary policy

Government spending can be financed either by tax collection or bond issuance. Taxation is a source of directly diminishing citizens´ disposable income. With bond issuance the debtor can more deliberately choose to support government spending. A mismatch of domestic savings and investment, be it through public or private spending, thus still shows up in the current account if domestic debt is held by foreigners.

The costs of taxation and bond issuance may be borne by different players on the market. A domestic fiscal expansion appreciates the domestic currency and consequently shifts some of the expansionary effects on to the trading partners (Mundell, 1968). Monetary policy leads to a domestic currency depreciation, which stimulates the export sector and diverts demand away from the trading partner. Thus monetary expansion appears as beggar-thy-neighbour policy.

Devreux and Purvis (1984) developed a model addressing the benefits of fiscal expansion in the short run and its costs in the long run. In the short run, a tax cut increases real liquidity and creates room for output expansion. In the longer run, a rise in relative price of domestic goods compared to foreign goods decreases demand and the producer's real wage. According to the phenomenon of exchange rate overshooting (Dornbusch, 1976) the interest rate difference is adjusted through the exchange rate. Thus, a fiscal stimulus in an open economy will also reduce the economy's net foreign asset position over time. In order to service the debt of a long- run current account imbalance, the trade account needs to improve. The latter may require a drop in domestic income or depreciation of the exchange rate.

In the absence of Ricardian equivalence, the problem of debt finance arises when public debt replaces investment in productive capital. Taxation distorts agents´ incentives and reduces economic efficiency (Barro, 1979). Private sector savings decrease, which puts a "primary burden of debt" (Purvis, 1985) on to future generations. Perrson (1984) and Blanchard (1985) present models showing that tax cuts contribute to the welfare of the current generation at the expense of future generations.

V. ECONOMIC OUTLOOK

"A brave man would see catharsis in all this misery; a wise man would not be so hasty."

<div align="right">

The Economist, September 20th 2008

</div>

In the early 1980s the share of total American profits in the financial service industry took was 10%. Over the last twenty years this share has climbed up to 40% at its peak in 2007. I explain various factors that contributed to this growing bubble that is finally bursting. The macro- and micro-economic consequences that will ultimately result remain to be seen. As economic data show, the crisis has spilled over from the US to the rest of the world. How severe the economic downturn will be is unclear. In the remainder of this paper I analyse policy actions and present some scenarios of the future path for North America, Europe and Asia.

Consequences for the United States

In 2007 and early 2008 it seemed as if Bernanke´s monetary policy was successful in averting a more protracted economic downturn. Interest rates tumbled and so did the dollar relative to the euro and the yen. This benefited the export sector and eventually helped to decrease the deficit in the current account. Facing high inflation, Europe seemed to struggle more than the United States.

Another quarter year later the economic outlook for the US has deteriorated.

On Friday, 19th of September the fourth largest US investment bank filed for bankruptcy. Two days later the remaining two investment banks declared a change in status, giving up their independent position as investment banks and becoming commercial banks under control of the Federal Reserve. Goldman Sachs and Morgan Stanley, the two largest investment banks

changed their status in order to gain access to the broader sources of funding from the Federal Reserve. A few days earlier the two banks had declared that they are not interested in pairing with a commercial bank, arguing that they were financially healthy enough to survive as stand alone investment banks (Financial Times, Sept 16).

In light of the biggest restructuring since 1929, newspapers have heralded the end of Wall Street. The "Trennbanken"- system as it prevailed since the 1933 Glass Steagall Act, which divided the US financial industry into commercial and investment banks, appears to have ended. The latter banks have come to be referred to as the shadow banking system, as they are largely exempted from governmental control and able to take on high leverage.

Colm Kelleher, chief financial officer at Morgan Stanley, said, "These markets are all about confidence and we are proudly confident in the robustness of our franchise, business model and balance sheet." Finally, illiquidity was too severe a problem for Morgan Stanley and Goldman Sachs to keep the status of an investment bank. After the events of the last few months, the federal government now owns a large share in two brokerage firms, two government sponsored enterprises, and a multinational insurance company. The very American policy of free markets has been hit hard. Institutions like the World Bank and the International Monetary Fund (IMF) will have a hard time justifying their policy rhetoric in developing countries, when they are about to give credit on the requirement of free capital markets.

The current situation seems reminiscent in some respects to the Savings and Loan (S&L) crisis in the late 1980s. Then, the industry implosion led to the government bailout of almost all S&L institutions and eliminated the S&L banking system. In the LTCM crisis a Resolution Trust Corporation was founded, which bought the assets from the S&L institutions. The creation of the corporation allowed finding out the true values of the institutions that had run into trouble and brought the necessary "catharsis" to re-establish trust in the financial industry.

This time the problem manifests itself in illiquidity as well, as it did in other banking crises. But, contrary to the LTCM crisis in the 1990s, the source of the problem is massive insolvency and indebtedness of households.

Statistical offices deliver data that uniformly point at a recession. The government has bailed out several big financial players. The Federal Reserve provides liquidity funding through its discount window. But will the monetary policy actions taken by the Federal Reserve be effective?

As the persistently high LIBOR rate suggests, central bank liquidity injections are rather ineffective. Since the turmoil on financial markets has its roots in the inability of debtors to repay their debt, a recession is not averted by injecting money.

Weidensteiner, analyst at Commerzbank, said that much of the fresh Fed funds being pumped into money markets would find its way back into US Treasury bills rather than being extended as credit, because banks seek the safest investments possible. (Agence France Presse, 27th September 2008) This impedes the expansionary policy that delivers money to the real economy. The country is left in a liquidity trap.

Meanwhile markets wait for the $700 billion bank rescue plan discussed in the US Congress. Currently, there are two models under consideration. One is the Paulson model (supported by Bernanke), which proposes a *reverse auction*, after which the government is to buy the bad assets of financial institutions. The other model is *recapitalization* of banks by the government and is in line with Warren Buffet's idea of investing in Goldman Sachs. The difficulty with the Paulson plan lies in distributing the appropriate amount at the appropriate price to the appropriate debtors. But after a due diligence, which both plans provide, judgements about the asset values have to be reached. Interest rates on the preferred shares as well as warrant prices will give information about firms´ conditions in the recapitalization plan.

Both rescue plans deal with the supply side of finance, or "Wall Street". Helping to boost demand from "Main Street" by expanding fiscal policy is the second pillar of rescue. The means to address the downturn are rather weak in the US. The saving rate is at times negative and the budget deficit is mounting. The possibilities under Keynesian economics are already limited. Japan went through a similar crisis and ended up with an extended period of deflation and ineffective monetary policy to deal with the boom and bust of the real estate bubble.

The dollar crisis

The current crisis also constitutes a severe crisis of the dollar. With the euro as a viable alternative currency, the dollar has come under pressure to defend its role as a leading reserve currency. Low interest rates and a – up until recently depressed –dollar weaken its status as a world currency and induce countries to diversify their reserve portfolios.

Foreign central banks are already reducing the share of reserves they hold in the US dollar. Deutsche Bank predicts that the euro will constitute between 30 and 40 per cent of world reserves by 2010. In recent years, China, South Korea, Russia and a number of Middle East oil-exporting countries have all reduced the proportion of international reserves they hold in dollars, which reduces the benefits of US dollar seignorage.

Will the rest of the world decouple from developments in the US?

The crisis started in the US, but its repercussions are observed in the rest of the world. Financial contagion in the European financial industry has already been massive. In the current financial meltdown, the ones who financed the excessive risk taking are sovereign wealth funds of the Arab world and of Asia. Certain European countries also stand on the creditors´ side.

"Everyone assumes the American players took the vast majority of the writedowns. In fact, about 45 per cent of the total was taken by the Europeans."

Mr. Annunziata of UniCredit; Report on business; Sept 24th 2008

According to the IMF´s assessment of financial markets, the global figure for writedowns has been revised up to $1.4 trillion in October 2008. How severely the crisis will hit European banks and Europe's real economy is still a question for the future. A banking crash in the EU will depend on whether mistrust and uncertainty still allow banks to get funding. There is uncertainty about what level the losses in sub-prime loans will reach and by how much home prices are going to decrease. Uncertainty also prevails as to where the toxic assets are held.

Repercussions on Europe

Europe is already experiencing housing price deflating in Great Britain, Ireland, Denmark, Spain and Italy. According to the ECB, the sub-prime mortgage crisis spilled over to the euro area money market on 9 August 2007 as indicated by the spread between the three-month Euribor and the EONIA swap rate. The ECB and other central banks reacted to the situation of tight liquidity on the markets with additional operations to re-establish trust in the markets.

In a speech in August 2008, Central Bank president Trichet firmly stated that the ECB´s primary mandate is keeping price stability and being a solid anchor of inflation expectations. The proper functioning of the money market is the other mandate of the ECB. The organisation of the central bank reflects the distinction between these two mandates. The ECB clearly distinguishes between monetary policy decisions, which cover the midterm- stance and liquidity operations, which operate on a short-term basis. This separation, known as the "two pillar" model should allow for clear signals. Allotment decisions stand isolated from monetary policy decisions with the intent that liquidity management decisions do not provoke misunderstanding of monetary policy intentions due to active liquidity management.

The problem with increasing the allotment banks can get from the central bank is that this action still does not end the questioning of who is holding the toxic assets on their balance sheets. In order to end the money market meltdown it is necessary to eliminate the causes of the mistrust and uncertainty. European firms heavily depend on banks. The crisis will show whether the bank based system and relationship banking is able to act as shock absorber in hard times. If banks face large writedowns, then the real economy will also be hit by an ongoing credit squeeze.

The OECD says that the stronger role of European governments in their economies creates more effective means to address an economic downturn. Europe's automatic stabilizers – lower taxes and higher subsidies as economic activity slows – are three times more effective than those of the United States.
A problem that becomes more apparent in times of financial distress is the disunity of the European Union. Poorer countries, such as Spain and Italy, would need monetary stimuli, which are not compatible with the primary goal of price stability in richer euro zone countries.

Another very important issue concerns the euro zone and the relation to its Eastern European neighbours. If the old European member countries are not able to decouple from the US, Eastern Europe will not be able to decouple either. Eastern European countries heavily depend on foreign funding from euro zone banks, foremost Swedish and Austrian banks. High uncertainty will also withhold private and personal debt finance from these emerging markets. Since Europe has deeply invested in US assets and also competes on the export market, a depreciating dollar will have negative repercussions on countries´ foreign debt positions. Amid the high impact events in the US financial sector, the US dollar is not observed to tumble faster relative to the euro. The fact is that the rest of the world financed US housing-driven consumption. As analysis of the 1930 crisis shows, the lenders experienced the most protracted recession.

The worrying prospect is the type of deflation Japan has been experiencing for over a decade. This has reversed in the meantime. Deflation reflects a slump in demand and causes excess capacity. Irving Fisher (1933) wrote a paper on the vicious downward spiral that leads to an economic slump. Falling prices may cause consumers to put off purchases, inducing demand and prices to fall further. For economies already facing high levels of debt, this means that the debt burden is getting worse as prices are falling. As asset prices fall, credit contraction forces debtors to cut spending and to sell off assets. These are the repercussions of debt-deflation.

Central banks outside of the US still have some ammunition left for fighting deflation by cutting interest rates. If the US economy defaults on its debt, the creditors will have to suffer the losses. For the current situation, the beggar-thy-neighbour policy began with the inflating dollar. At the same time the value of assets lent out decreased. Countries that hold vast dollar reserves, as well as investors putting their money into assets (either directly or through complex financial products), that finally became worthless, will definitely carry the burden of the current crisis.

So far, policymakers around the world are trying to get debt-deflation on track by guaranteeing debt in order to slow the process of deleveraging and the downward spiral.

Repercussions on China and East Asia

Over the past decade, China's growth path has been lauded in the financial and academic press. Nevertheless, China's economic growth is controversial for several reasons. I list two, namely, that China's growth is mainly driven by the export sector and that it has not managed to pass on its export revenues to its people . Up until 2006 China fixed its exchange rate to the US dollar to keep its manufacturing industry competitive. This explains the asset price inflation without a simultaneous product price inflation in OECD countries. China's current account surplus with the US and the EU is large. China holds vast dollar reserves and government bonds. Jointly with Europe, Saudi Arabia and Brazil, China is a huge creditor to the US economy.

Whether China is able to decouple from the economic slowdown in OECD countries is still uncertain. There are various scenarios for the future path of China.

First of all, since China finances the US, it is in its interest to keep the exchange rate to the US dollar from appreciating too rapidly. The dollar has already depreciated against the renminbi. A fall in the dollar value relative to the Chinese currency means a loss for the Chinese government and Chinese citizens. Following the financial turmoil in the US it appeared that the credit squeeze would bring in its wake a correction of the American and Chinese current account imbalance, due to a declining dollar value and slowing exports. Since the export sector accounts for half of China's GDP, a depreciation of the dollar relative to the renminbi severely affects China's growth. A mitigating effect of this development is put forward in several scenarios for China's future by Tyers and Bain (2008).

For one scenario Tyers and Bain argue that global investments are experiencing a transitory flight and are finally pouring into Chinese investment (McKibbin and Stoekel, 2007). If China is able to absorb additional investment it can have favourable effects for the Chinese people. In the longer run, growth redirects investment towards a rising the service sector.

With funding from North America and Western Europe, China's declining imports can be offset by this change in financial capital movements. While China's exports take a hit as the currency appreciates, the closing financial capital imbalance and the associated boost in

China's GDP ensures that import growth is more than sustained. A worsening of the export sector need not become true if appreciation is not larger than the huge productivity increase.

The currency would appreciate further. This scenario implies that China, which already holds a large capital stock, and other emerging economies in East Asia would be able to direct further investments to the real economy. China is already investing 45% of its GDP annually (Rosen and Hauser, 2007).

In another scenario the Chinese government would not expose the country to risky investment inflows that might destabilize the system. One explanation for this is that an inflow of capital would inevitably drive up the exchange rate causing either faster inflation or more rapid nominal appreciation. Tyres and Bain (2008) argue that the recent rise in the renminbi/dollar exchange rate was driven by illegal capital inflows and not intended by the government. In order to stay competitive Chinese authorities might choose a policy response implementing tighter controls on capital inflows. The other policy choice is reserve accumulation to set off exchange rate adjustments. Further reserve accumulation of its main trading partners would increase the Chinese saving rate further. Since investment that does not enter China is put somewhere else, other emerging economies might experience a capital inflow. In return, their currencies would appreciate, putting them into a less competitive position than China, which kept its currency low.

INSTITUTIONAL CHANGES

The crisis has already brought about the search for what has gone wrong and whether institutional changes are needed to address the issues of financial instability. Free capital markets seem to have been replaced with stricter capital controls.

Remsperger (2008), director at the German control bank, argues that the preconditions for a self regulated market in the financial industry are not given since banks have access to central bank money. It has become obvious that market forces are not able to avoid bubbles and their

repercussions. I agree that easy money through the Greenspan – and now Bernanke – put increases moral hazard; but I am not of the opinion that the access to central bank money is the sole argument that explains why the financial industry has become so unstable and unable to regulate itself. The availability of central bank money makes it harder to aim at finding the true value of an asset, as does the complexity of the financial industry and global business ties. Under what conditions industries are able to regulate themselves, without state intervention, is another point for further discussion, which I will not elaborate here.

In any case, an extension of the supervisory framework is heavily demanded. Whether the state regulation will be prescriptive and detailed or rather oriented towards known principles remains open to discussion.

Regulators argue for higher equity ratios in the credit business. Apart from the traditional credit industry, the focus for regulation lies on the players that so far have been exempted from state regulation: hedge funds and investment banks (on those that still exist). Moreover, critics also attack the rating agencies, since Basel II uses ratings from those agencies to assess credit risks. Basel II is a framework for a more comprehensive measure for capital adequacy and sets up minimum standards.

Basel II seeks to promote a more forward-looking approach to capital supervision. The Basel credit risk standards try to make capital requirements more risk sensitive. Assets are evaluated at their current values. This fact has come into criticism since it is said to enhance procylicality. Borio (2007) analyses macro- prudential policy stances in order to increase stability. He addresses the problem of measures and standards that enhance cyclicality. For the Securities and Exchange Commission (SEC), rating agencies are first on the list of scapegoats for the global financial crisis. The SEC calls for resolving conflicts of interest, as I discuss them in the chapter on rating agencies.

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Appendix

Appendix 1: Distribution analysis of the S&P 500 - R output

```
> daten<-read.table(file="D:/Mappe2.txt",header=T,sep="\t")
> dim(daten)

[1] 9776    7
> plot(rev(daten[,5]),t="l",log="y")


> close<-rev(daten[,5])                      #data closing price S&P 500


> returns<-(close[-1]-close[-length(close)])/close[-length(close)]
>                hist(returns.m,breaks=100,freq=F,main="Distribution
S&P500",xlab="Returns",ylab="",axes=F)                         #Histogram
>      curve(dnorm(x,     mean=mean(returns),     sd=sd(returns)),
add=TRUE,col="green",lwd=2)           #graph normal distribution
>
> axis(side=1, at=seq(-0.08,0.08,0.04), labels=seq(-0.08,0.08,0.04))
>
> require("fTrading")                                    #load package
Lade nötiges Paket: fTrading
In  library(package,  lib.loc  =  lib.loc,  character.only  =  TRUE,
logical.return = TRUE,  :
> jarque.bera.test(returns)                      #Jarque Bera Test


        Jarque Bera Test
data:  returns
X-squared = 201948.9, df = 2, p-value < 2.2e-16
> skewness(returns)                                           #Schiefe
[1] -0.8865226
```

```
> kurtosis(returns)                                    #Kurtosis
[1] 22.19144
>
> mean(returns)*100                      #mean returns in percent
[1] 0.03107635
> sd(returns)*100      #standard deviation daily returns in percent
[1] 0.9976125
>
> sd(returns)*sqrt(252)*100    #standard deviation yearly returns in
percent (*100)
[1] 15.83661
>
```

Abstract (English):

In my thesis I analyse factors which contributed to the financial crisis that first became evident on the US housing market and late off, after the collapse of Lehman Brothers on September 15th, had spilt over on markets in the rest of the world. My analysis ends by November 1st 2008. Risk perception, financial innovation, global imbalances and both fiscal and monetary policies are now subject to a closer analysis drawing on findings form historic crises. I stress the fact that our environment is too complex to model it with linear assumptions. Measurement errors in the mathematical models underlying investment decisions and a changed environment for investment products, including falling asset prices, are further analysed. Since monetary policy significantly contributed to the crisis I take a closer look at transmission mechanisms. I study cross-country differences in the financing system and elaborate the features of a bank-based versus a market-based banking system, which prevails in Europe and the US, respectively. Moreover I discuss implications of fiscal policy for the behaviour on financial markets. My economic outlook focuses on the economies of the United States, Europe and Asia and the role of the United States as "world banker".

The thesis is sought to put the discussion over the remedies to the crisis on a broader base and to emphasize the need to take into account the issues of risk, financial innovations, global imbalances and both monetary and fiscal policy.

Abstract (German):

Meine Diplomarbeit beschäftigt sich mit der Analyse der unterschiedlichen Faktoren, die in ihrem Zusammenspiel zu der Entwicklung der Finanzmarktkrise - beginnend 2007 am US amerikanischen Immobilienmarkt - beigetragen haben. Meine Analyse, die auch die Ausweitung der Schweirigkeiten auf die Finanzmärkten der restlichen Welt miteinbezieht, endet mit November 2008. Innovative Finanzprodukte, globale Ungleichgewichte, die Wahrnehmung von Risiko, sowie geld- und fiskalpolitische Maßnahmen sind nun Gegenstand meiner Arbeit und stehen im Kontext zu vergangenen Krisen. Kritisches Augenmerk lege ich auf Annahmen, die versuchen ein komplexes Umfeld in ein lineares Model zu fassen. Statistische Messfehler und ihre Verarbeitung in mathematischen Modellen entziehen Investmententscheidungen die Rechtfertigung, wenn Vermögenswerte einem massiven Preisverfall ausgesetzt sind. Geldpolitische Entscheidungen übertragen sich nicht immer in gewünschter Form auf die Realwirtschaft. Die Übertragungsmechanismen der Zinspolitik bedürfen daher einer genaueren Betrachtung. Anhand der Arbeiten von Kaufmann und Valderrama (2007, 2008) untersuche ich länderspezifische Unterschiede in den Finanzsystemen der USA und Europas in Bezug auf den Übertragungsmechanismus des Kreditsektors. Das in den USA vorherrschende Finanzsystem lässt sich als marktbasiert kennzeichnen, während das Prinzip der Hausbanken in Europa auf ein bankbasierendes System schließen lässt.

Abschließend fasse ich die Erkenntnisse aus meiner Analyse in einem Ausblick auf die zukünftige Entwicklung der Volkswirtschaften der USA, Europas und Asiens zusammen und diskutiere die Rolle der USA als „world banker". Ziel meiner Arbeit ist es die Diskussion über mögliche Maßnahmen zur Bewältigung der Krise auf eine breite Basis zu setzen, und Grundlage für die Kritikpunkte an Risikomessung, globalen finanziellen Ungleichgewichten, sowie der Geld- und Fiskalpolitik, zu bieten.

Curriculum Vitae

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