No. 2008/31

The Future of Securitization

Günter Franke and Jan Pieter Krahnen

Center for Financial Studies
Goethe-Universität Frankfurt ■ House of Finance
Grüneburgplatz 1 ■ 60323 Frankfurt ■ Deutschland

Telefon: +49 (0)69 798-30050
Fax: +49 (0)69 798-30077
http://www.ifk-cfs.de ■ E-Mail: info@ifk-cfs.de

Center for Financial Studies

The *Center for Financial Studies* is a nonprofit research organization, supported by an association of more than 120 banks, insurance companies, industrial corporations and public institutions. Established in 1968 and closely affiliated with the University of Frankfurt, it provides a strong link between the financial community and academia.

The CFS Working Paper Series presents the result of scientific research on selected topics in the field of money, banking and finance. The authors were either participants in the Center´s Research Fellow Program or members of one of the Center´s Research Projects.

If you would like to know more about the *Center for Financial Studies*, please let us know of your interest.

Prof. Dr. Jan Pieter Krahnen

Prof. Volker Wieland, Ph.D.

Center for Financial Studies
House of Finance ■ Goethe-Universität
Grüneburgplatz 1 ■ 60323 Frankfurt am Main ■ Deutschland

Telefon: +49 (0)69 798-30050
Fax: +49 (0)69 798-30077
http://www.ifk-cfs.de ■ E-Mail: info@ifk-cfs.de

CFS Working Paper No. 2008/31

The Future of Securitization*

Günter Franke[1] and Jan Pieter Krahnen[2]

Conference Draft, October 11, 2008

Abstract:
Securitization is a financial innovation that experiences a boom-bust cycle, as many other innovations before. This paper analyzes possible reasons for the breakdown of primary and secondary securitization markets, and argues that misaligned incentives along the value chain are the primary cause of the problems. The illiquidity of asset and interbank markets, in this view, is a market failure derived from ill-designed mechanisms of coordinating financial intermediaries and investors. Thus, illiquidity is closely related to the design of the financial chains. Our policy conclusions emphasize crisis prevention rather than crisis management, and the objective is to restore a "comprehensive incentive alignment". The toe-hold for strengthening regulation is surprisingly small. First, we emphasize the importance of equity piece retention for the long-term quality of the underlying asset pool. As a consequence, equity piece allocation needs to be publicly known, alleviating market pricing. Second, on a micro level, accountability of managers can be improved by compensation packages aiming at long term incentives, and penalizing policies with destabilizing effects on financial markets. Third, on a macro level, increased transparency relating to effective risk transfer, risk-related management compensation, and credible measurement of rating performance stabilizes the valuation of financial assets and, hence, improves the solvency of financial intermediaries. Fourth, financial intermediaries, whose risk is opaque, may be subjected to higher capital requirements.

JEL Classification: D82, G14, G21, G28, G30

Keywords: Financial Crisis 2007/08, Bank Regulation, First Loss Position, Rating Process, Securitization, Transparency

* Paper prepared for Brookings-Tokyo Club-Wharton conference "Prudent Lending Restored: Securitization After the 2007 Mortgage Securities Meltdown", Washington, October 16, 2008. We thank our co-authors on background papers, Dennis Haensel, Julia Hein, Thomas Weber, Christian Wilde, and many other colleagues as well as practitioners from banks and rating agencies for helpful conversations. We acknowledge support from Deutsche Forschungsgemeinschaft (DFG) and from Goethe University's Center for Financial Studies (CFS). However, all errors are our own.

1 University of Konstanz and CFS

2 Goethe-University Frankfurt, CFS and CEPR

1. Motivation and Introduction

By now, the so-called Credit Crisis is more than a year old. In its course, the crisis has caused enormous casualties, forcing large international banks to write off hundreds of billions of dollars. While most of these losses were borne by private investors, namely bank shareholders, the state had to absorb considerable casualties as well, particularly in the US, the UK and in Germany. Bailouts were experienced in Germany (IKB, Sachsen LB), the UK (Northern Rock) and most dramatically in the US (Freddie Mac and Fannie Mae, Bear Stearns, AIG and finally the huge $700 billion rescue package). Accumulated losses are estimated at more than $500 billion in September 2008 (Table 1) – this equals about 20% of the US budget or 3.6% of its GDP in 2007, or 18% of Germany's 2007 GDP.

The epicenter of the crisis is well known to lie in the so-called sub-prime segment of the US housing market, where loan-to-value ratios had been raised over time, often exceeding 1. The cooling down of the US real estate market in the first half of 2007, sometimes characterized as the bursting of a housing price bubble, led to write-downs of the banks' loan book. There were two major channels of contagion, one direct, the other more indirect, which shifted loan losses to investors. As to the direct channel of contagion, investors who had held chunks of these loan portfolios, for example in the form of tranches of securitized portfolios, experienced significant write-downs of their financial claims. Investors holding commercial paper were almost universally bailed out by the sponsoring banks or by the state if the former was in distress itself. Examples of loss-taking institutions are: Citibank, UBS, Deutsche Bank, JPMorgan Chase, among many others.

Region	Total	3Q08	2Q08	1Q08	4Q07	3Q07
Worldwide	516,3	18,1	115,1	168,0	167,9	47,2
America	263,0	18,1	70,3	69,3	75,9	29,4
Europe	229,5	0,0	41,3	89,3	81,3	17,6
Asia	23,9	0,0	3,4	9,4	10,7	0,4

Table 1: Accumulated write-downs by regions in billion USD, Losses per Quarter and in total as of early September 2008 (3Q 2008 – 3Q 2007), Source: DZ Bank Research Publication (2008)

Firm	Total	3Q08	2Q08	1Q08	4Q07	3Q07
Citigroup Inc.	55,1	0,5	11,7	19	18,2	5,7
Merrill Lynch	52,2	6,1	9	9,7	18	10,6
UBS	44,2	0	6	19,2	14,4	10,6
HSBC	27,4	0	9,5	4,2	10	3,7
Wachovia	22,7	0,3	13	4,4	3,2	1,8

Table 2: Top five loss-taking institutions in billion USD, Write-downs per Quarter and in total as of early September 2008 (3Q 2007 - 3Q 2007), Source: DZ Bank Research Publication (2008)

And then there is the indirect channel of contagion, following from the dramatic rise in CDS spreads and lending rates in the interbank market where lending rates reached record levels for an extended period, and markets became shallow. For some institutions, like Bear Stearns and Northern Rock in March 2008 and Lehman Brothers in September 2008, interbank lending became virtually impossible, experiencing a run on its reserves[1] at the same time. While Northern Rock was bailed out and Bear Stearns was taken over by JP Morgan Chase subsidized by the government, Lehman Brothers went bankrupt. This indirect channel mainly affected institutions with strong reliance on interbank lending, investment banks in particular. Extremely high levels of LIBOR over risk-free rates (see Figure 1) and an unprecedented small supply of funds in the interbank market forced banks to boost their liquidity reserves. The write-downs of their asset portfolios diminished the banks' equity capital and forced them to raise capital from investors, including Sovereign Wealth Funds.

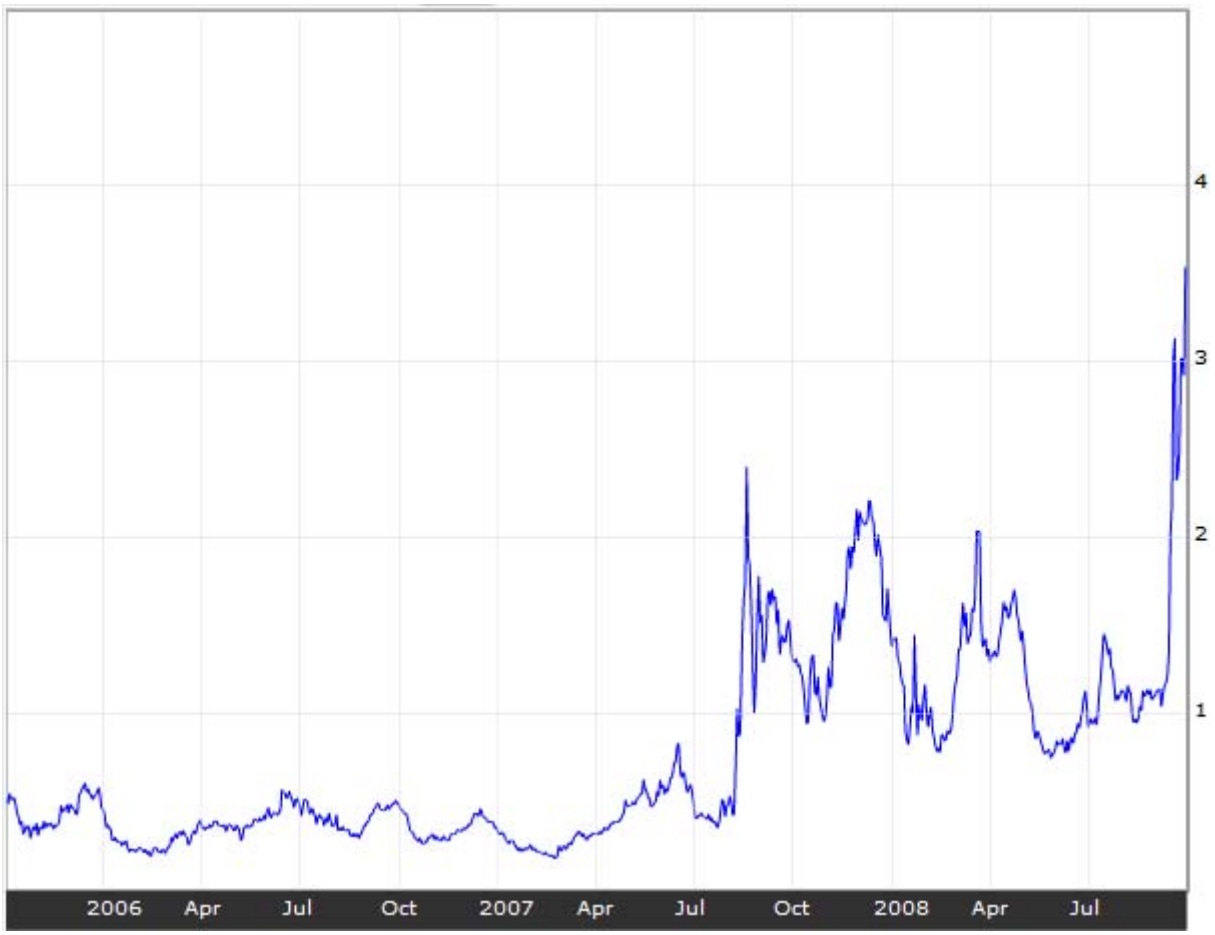

Figure 1: Spread between 3-month LIBOR and 3-month Treasury bills (TED spread, in percent) over the last 36 months (3Q 2005 – 3Q 2008), Source: Bloomberg

[1] On a single day, March 13, liquid assets of Bear Stearns shrank from $12.5 - to $2 billion, and credit lines were closed.

Furthermore, the break down of the interbank market urged Central Banks, notably the Fed, the Bank of England and the ECB, to provide ample access to liquidity for banks. While not being a bail out, the provision of large quantities of central bank lending facilities saved several large banks from becoming illiquid. These central bank interventions were initially intended to be of a short and transitory nature, but now such facilities have been extensively used for more than a year, and are still prolonged. In the course of these measures of liquidity assistance, some central banks are said to have taken huge stocks of low quality collateral on their books.

The broad and extended loss of confidence among financial institutions, which has caused the break-down of the interbank market, is probably the most distinguishing characteristic of the current financial crisis. It also differentiates this event from many earlier episodes of financial market turmoil, as for instance the Asian or the Russian crisis (see Allen/Gale 2007 for a survey).

Given the medley of terrifying headlines that filled the international newspapers over the past year, the call for new and stricter rules of bank supervision is all but surprising. For example, in the Report of the Financial Stability Forum (April 2008), and similarly in the Bank of England's Financial Stability Report (April 2008), regulatory measures to restore the overall confidence of investors in the functioning of the global financial system are proposed. After September 15, the Black Monday, governments claim even more that the observed market failure needs to be cured through more regulation. Theses measures relate to (1) prudential oversight of capital, liquidity, and risk management, allowing for countercyclical capital adjustments[2]; (2) improved transparency and regulation, facilitating the pricing and ensuring the tradability of complex financial instruments on secondary markets; (3) the rating process, stipulating different rating scales for structured and non-structured products; and (4) the increase in sophistication of supervisors as far as risk control is concerned.

In addition, the Bank of England has proposed to create a liquidity scheme, intended to break the adverse interaction ('spiral') between asset prices and balance sheets (see Bank of England 2008). This last point, in turn, is closely related to a proposed reform of the accounting standards, in an attempt to lower the suspected pro-cyclicality of the prevailing Basel II-capital standards[3].

But is tighter regulation reasonable? History teaches us that changes in the regulatory framework are long-lived, and are very hard to adjust once in place. Also, history has many examples suggesting regulatory overreaction following financial crises, with Sarbanes-Oxley being a recent example (see

[2] See also Kashyap/Rajan/Stein (2008) on this last point, emphasizing time-varying capital requirements, and state-contingent capital infusion.
[3] See Goodhart/ Persaud (2008a) on this.

Coates 2007). Furthermore, the case for or against a particular regulatory action should be well founded in an economic analysis of the causes and determinants of the current crisis.

Although we agree that the current situation witnesses a market failure, we first analyse its causes on the micro-level of financial intermediaries. We believe that incentives in banks and in financial value chains are at the core of the problem. Incentive misalignments tend to lower the quality of financial products, thus destabilizing asset valuation. Moreover, incentives misalignments tend to raise the leverage of financial intermediaries. Both effects undermine transparency about asset quality and risk positions of financial intermediaries. This cocktail inevitably destabilizes financial markets and the financial system. Therefore we argue that incentives need to be changed not only to align interests of managers and shareholders, but also to incentivize managers to preserve financial stability. These mechanisms can only be effective if there is enough transparency about financial assets and financial intermediaries. Intermediaries providing little transparency about their financial strength endanger financial stability and therefore should be required to provide higher equity capital.

Drawing on recent academic literature, including our own research, we will try to provide a consistent description of what has happened in the market for structured finance. Knowing about the mechanics of structured finance is essential for understanding why it could happen that so many experts – economists, financial engineers, bankers – were caught by surprise when the crisis set on in the late spring of 2007. Equipped with this interpretation, we will discuss required action as we see it. More generally, we will discuss the promises as well as the limits for the future of securitization.

2. What has happened? A brief recount

The current crisis witnesses large amounts of distressed loans, in particular, mortgage backed loans. Such a situation is not new. As Reinhart and Rogoff (2008) show, this type of crisis is reoccurring and appears to be related to economic downturns after boom phases. We do not ask what drives these repetitive crises. Instead, we ask what is new in the current crisis, and hope to find a first rough orientation relating to the future of securitization.

The historical events leading up to the current crisis have been aptly described by several authors recently. Brunnermeier (2008) and BIS (2008) give a detailed account of major events leading to the current crisis. One may distinguish a build-up phase and then three waves of devaluations of bank assets. The build-up starts roughly in the mid-nineties when the financial technique of securitization is gradually applied to a wider set of asset classes ranging from real estate investments to car loans and credit card debt. Simultaneously, the design of ABS transactions became more complex, starting with straightforward issues and culminating in CDO^3 transactions with hard-to-replicate stochastic

properties. Over the entire build-up period, spreads on credit instruments remained stable and relatively low.

Though there were early whistle blowers, for instance at the BIS in their annual reports since 2006, the first serious signs of a crisis appeared in July 2007, when two of Bear Stearns' hedge funds got into trouble and had to be bailed out by the mother company, the investment bank. Only a few days later a first wave of devaluations struck the financial industry. Together with a decline of house prices in much of the US, refinancing became almost impossible for ABCP programmes. While there are now write-offs in many parts of the banking industry, the first institution to run into deep trouble is a European bank at the far end of the financing chain, IKB in Germany. Together with Sachsen Landesbank, these two over-exposed semi-state-owned institutions had to be bailed out, mostly by the German state. Soon thereafter, following a depositor run on the bank's assets, a British retail mortgage bank who had copied the US subprime lending model, Northern Rock, was rescued and nationalized.

The ensuing second phase of the crisis extends roughly one year from September 2007 until summer 2008. Banks in the US, the UK, and in Europe were experiencing regular large quarterly asset write-downs, particularly warehousing banks (Tables 1 and 2), while the interbank market almost completely dried out. Central banks intervene and open additional discount windows which grow over time to ever larger liquidity infusions. The infusions are accompanied by a rising volume of government paper issues, largely neutralizing the money supply. Simultaneously, investment banks around the world try to raise additional capital, which gives sovereign wealth funds from China and other Asian countries the opportunity to enter the market. However, the speed at which capital is eroding is not matched by the build-up of new capital.

The third phase of the crisis starts in the summer 2008 when the worlds' biggest private real estate financiers, Freddie Mac and Fannie Mae, have to be taken over by the state. The resulting additional problems in the interbank market swamp the investment banks which, one after the other, lose much of their market capitalization before they are either liquidated, taken over by a commercial bank, or transform themselves into a commercial bank.

The three phases of the crisis, as of today, are accompanied by different reactions of regulators. While the regulators did not care much about securitization markets before summer 2007, they responded by selectively rescuing institutions like Bear Stearns, IKB and Northern Rock. Only in the second phase came the willingness to nationalize these institutions, in particular Fannie Mae and Freddie Mac, intending to stabilize the market. In the third phase, still under way today, the nationalization of bad assets, rather than bad institutions is making its way ahead.

The steady intensification of state intervention, from selective bailout of institutions to comprehensive take-over of loss suffering assets, is a remarkable feature of this crisis. Opaqueness of financial markets and institutions is another unique feature. Investors obviously retreat from markets where asset or counterparty risk cannot be reasonably estimated. A third remarkable feature is the complete breakdown of interbank market – which gives central banks a big role to play, effectively substituting for the interbank market.

3. Why did it happen? A perspective on costs and benefits of securitization

3.1. Introduction

In this subsection we use results from the academic literature on contract design in order to assess the contribution of asset securitization to market efficiency and (investor) welfare. Theory and evidence – the latter often scarce—are confronted. We demonstrate that some key assumptions of the textbook securitization model were effectively not met, and that the theory, therefore, was descriptively false.

We find four key arguments requiring further discussion: (i) improved risk allocation: enhancing economy-wide risk sharing via contingent claims (achieving market completion); (ii) responsible disintermediation: preserving monitoring incentives in a lending relationship with market funding; (iii) low cost transparency of assets: disentangling information-sensitive and information-insensitive assets (creation of high-quality claims out of a pool of lower quality assets), (iv) transparency of financial intermediary risk stabilizing their funding.

As a corollary to (ii) and (iii), we argue that secondary market liquidity of complex financial instruments is directly related to the reliability (accuracy and persistence) of announced asset quality which, in turn, is a function of responsible disintermediation.

3.2 Risk transfer and diversification

3.2.1 Theory

Improving worldwide risk allocation and enhancing investor diversification are major benefits which securitization is said to achieve. By securitizing otherwise non-tradable assets, like credit card debt, corporate and consumer loans, the creditor can transfer asset risks to other financial intermediaries and private investors (households). Eventually risks are always borne by private investors, regardless whether risks are intermediated or not. Therefore a bank may retain some risks which, under normal market conditions, are effectively borne by its shareholders. However, securitized claims are easier to trade than loan portfolios, just like bonds are easier to trade than loans.

Another benefit of securitization derives from the fact that the underlying typically is a portfolio of claims rather than a single claim. Investing into a securitization tranche corresponds to buying a highly diversified claim. Therefore, no extra effort is needed to diversify individually, at presumably higher transaction costs. This benefit resembles the benefit realized by buying exchange traded funds instead of a large number of individual stocks.

3.2.2 Evidence

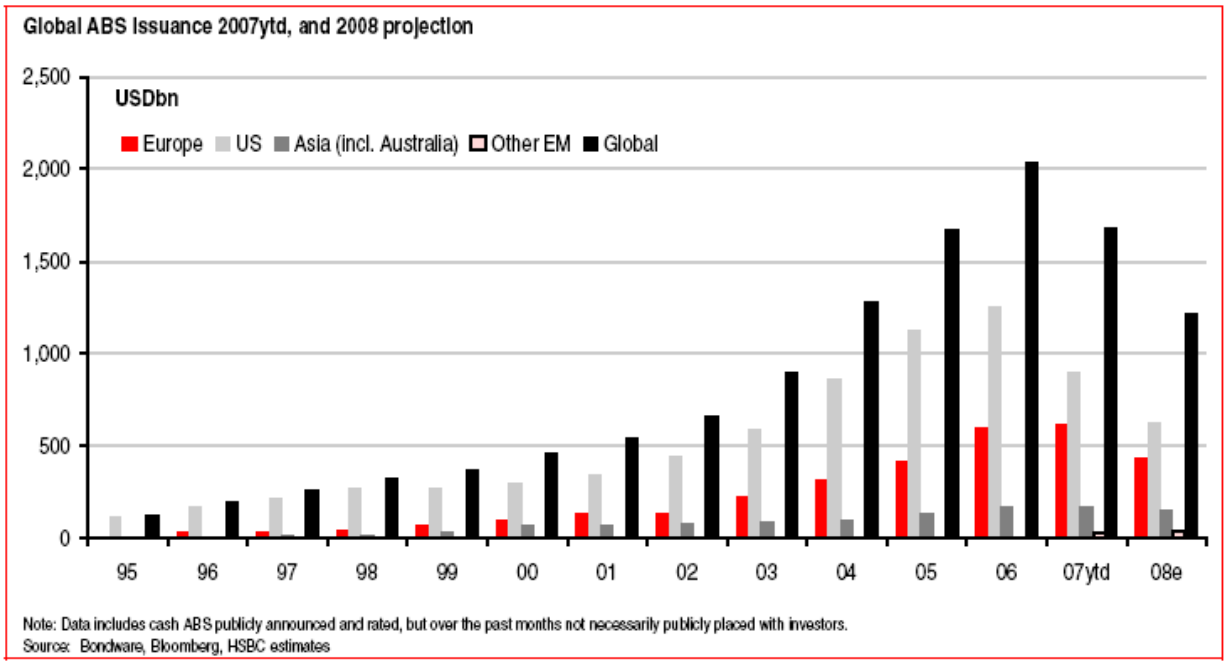

Figure 2: Global ABS issuance, Source: Bondware, Bloomberg, HSBC estimates

The available empirical evidence in terms of market growth is consistent with the theoretical benefits mentioned before. Figure 2 is from HSBC, published on Dec 20, 2007. It portrays the strong worldwide growth in securitization issuance until 2006 indicating strong reallocation of default risks. Even though statistics on the allocation of securitization tranches are still rather incomplete, the available figures on write-downs of bank asset positions give some indication, see Table 1 and 2.

These write-downs include all bank assets. They are not confined to securitization tranches, but include also loans, in particular, leveraged loans related to mergers and acquisitions. According to Table 1, at the beginning of September 2008, banks worldwide had written off $516 billion, 51% of which relate to US-banks, 45% to European banks and the rest to Asian banks. These figures indicate that at least European banks bought a large share of securitized risks and leveraged loans as the above theory on the gains of diversification would suggest. Moreover, previous crises in the US-real estate sector were domestic, with little recognition in Europe and outside the US in general,

suggesting that securitization helped the current crisis to be spread around the world. Therefore, we conclude that securitization contributed to a broader worldwide risk allocation.

The empirical evidence also supports the existence of strong diversification benefits. Usually the mortgage-backed loans pooled in RMBS-transactions add up to a par value of at least $1 billion per transaction. Since a single loan typically does not exceed a par value of $1 million, more than 1000 different residential mortgage-backed loans are pooled in a single transaction. The ensuing diversification benefit is very strong even though regional risk factors or loan type-risk factors (like subprime vs. other loan types) may be strong. Similarly, diversification is very good in credit card, auto loan and corporate loan securitizations, while it tends to be smaller in corporate bond transactions. In a study of 169 European securitizations, Franke, Herrmann and Weber (2007) find an average Moody's diversity score of 88 for corporate loan securitizations, but only 45 for corporate bond securitizations.

3.3 Risk transfer and asymmetric information

The benefits of securitization stated in the previous subsection come at a cost, however. The cost is related to the problems implied by information asymmetries. Securitization is a technology which attempts to handle the inherent conflict between efficient decision making and optimal worldwide risk allocation. Efficient decisions are supported if the decision maker has to bear all the consequences of her decision. This is typical of the bank-based model in which a bank takes the lending decision and retains the loan on its book until maturity foregoing benefits from improved risk allocation. In the market-based model the bank takes the lending decision, but transfers the risks to others. Thus, risk allocation is improved, but decision making is no longer efficient. The latter follows because in a world of asymmetric information the bank inevitably tries to benefit from adverse selection and moral hazard rendering its decisions second best. Securitization combines the bank and the market based model in order to use its strength avoiding its weaknesses. So far the empirical evidence puts large question marks to this model.

Securitization is one way to use the screening technology of an originator without being constrained by her ability to generate capital on her own balance sheet. Therefore, securitization facilitates the specialization among financial intermediaries. It may increase the scale of operations of these institutions, and at the same time it broadens the investor base willing to fund these assets directly rather than via bank deposits or bank bonds, and to bear the accompanying risk. To the extent that securitization leads to better risk allocation and to more investors entering capital markets, potential welfare benefits arise.

However, securitization raises agency problems on various levels. First, there is a conflict between the originating bank and investors buying securitization tranches. Second, there are additional conflicts if loan origination and servicing is not concentrated in the bank, but split into several specialized jobs which are delegated to various agents in a value chain. Third, there is an agency problem between the bank manager and the bank shareholders. Fourth, bank shareholders may also be interested in bank policies which benefit them at the expense of financial stability. We will address these problems step by step.

3.3.1 Two-tier agency relationships: Theory

If all activities of securitization are concentrated in one bank, then borrowers, the bank and investors are involved. We address the agency conflict between the bank and investors. Information asymmetries between lending banks and investors in securitization tranches motivate adverse selection and moral hazard. This is a typical agency problem. The lending bank grants the loans and transfers the risk to investors. The bank has a strong incentive to overstate the quality of the loans so as to buy protection at lower cost. More importantly, a quality deterioration of loans as in the subprime crisis which is neither fully recognized by investors nor by the rating agencies, leads to downward biased credit spreads on securitization tranches. As long as the credit spreads on the underlying loans correctly reflect the loan quality, securitization profits are upward biased. This improves the originator´s opportunities for adverse selection. More generally, mispricing in one market may create opportunities for adverse selection in risk transfer. Gorton (2008) points to product complexity as another reason for adverse selection. The seller understands the product, but the buyer does not and pays too much.

Besides adverse selection the bank being the servicer of the loans is subject to moral hazard. Once the default risk is transferred, the bank has little incentive to monitor the obligors and potentially restructure the loans so as to reduce the default risk. From standard agency theory, the conflict between the principal and the agent is resolved in a second best solution in which the agent bears some of the default risk through her income which is inversely related to the defaults. The share of the risk held by the agent trades off monitoring effort and risk sharing. Thereby the interests of the principal and the agent are partially aligned.

In securitization transactions, the 'magic' trick of incentive alignment is achieved by a contractual device which is very familiar from insurance contracts, i.e. a deductible[4]. Of all the issued tranches

[4] Despite its self-contained terminology, the contractual design in structured finance is largely identical of what has been practiced in the reinsurance industry during centuries. Non-proportional reinsurance in the form of aggregate excess loss leads to similar payoff patterns as observed in a ABS or CDO issue. For an early description see Kopf (1929). Doherty (2005) discusses alternative ways and means to align incentives. The optimality of deductibles is shown in Arrow (1971).

with different priority, the lowest ranked tranche is supposed to be retained by the issuer. This note is called the first loss piece, or the equity tranche. By construction, the first loss piece fully absorbs all default losses up to its notional amount. In most practical cases, this implies that the first loss piece will have lost much of its face value before the bond matures, explaining its widespread characterization as 'toxic waste'. If the bank fully retains the first loss piece, then it retains most of the default risk. This strongly mitigates information asymmetry problems, but it also strongly limits the risk transfer and hence is a strong barrier to optimal risk allocation. Agency theory, however, does not require the bank to fully retain the first loss piece. As in insurance contracts, the insured may retain a deductible of, for example, 20% of the damage, up to a given limit. This may be sufficient to effectively constrain moral hazard. Similarly, if the bank retains, say 20% of the first loss piece, this may be sufficient to effectively constrain adverse selection and moral hazard. Whether this is true or not, is an empirical issue.

Securitization not only tranches the underlying portfolio into a first loss piece and a rest, instead it splits the rest into several tranches according to strict subordination. The basic technique used in securitization consists of pooling the payment stream of a given asset pool and routing these cash flows to different classes of bonds, called tranches, so as to offer a wide variety of claims of different qualities. This enables different groups of investors to buy those claims which fit their needs best. Strict subordination implies: Investors buying part of the lowest tranche, the first loss piece, will only receive payments after all other investors buying more senior tranches have fully received their interest and principal claims. Similarly, a mezzanine tranche will receive payments only after all more senior tranches have been fully served, and so on until the highest, most senior tranche which will be served before all other tranches.

However, the first to be served is the originating bank. It gets fees for arranging and servicing. Often this bank also is the swap counterparty for the special purpose vehicle, allowing it to collect additional fees hidden in the swap terms. Therefore the originating bank has a first profit position. This position is a super-senior position and, hence, almost risk-free. To illustrate the first profit position, consider a true sale transaction. Usually the market value of the underlying portfolio exceeds the par value by some percentage points. But the par values of all tranches together never exceed the par value of the underlying portfolio. The surplus is translated into the first profit position. It motivates the originator to expand the transaction volume so as to generate higher profits, irrespective of default risk. The super-seniority of the first profit position creates another wedge between the originator and investors./Krahnen

The properties of pooling and tranching have been analyzed in the security design literature, in particular by Greenbaum/Thakor (1987), Duffie and DeMarzo (1999), Plantin (2003), DeMarzo (2005), Franke/Krahnen (2006). These papers show that under certain conditions relating to information distribution, risk management capacity and risk aversion, tranching can emerge as an optimal contractual device to allocate cash flows. In particular, tranching allows for incentive alignment when the underlying assets are subject to moral hazard or adverse selection. Securitization, thus, should optimally trade-off the costs and benefits of an improved risk allocation among the agents in the economy.

As argued above, agency theory tells us that the party affecting the level of default losses through its activities should bear a substantial portion of these losses. Hence the originating bank should retain a substantial part of the first loss piece. Mezzanine tranches often carry below investment grade ratings because their default probability is substantial. In Plantin (2003), mezzanine tranches are marketed to sophisticated investors, i.e. investors with a comparatively high monitoring capability. The reason is that the buyers of mezzanine tranches face a substantial probability of being hit by default losses before the bond matures, implying the need to take over the monitoring task from the holder of the first loss piece. Once the first loss piece is completely absorbed, the mezzanine tranches are effectively taking over the role of the most junior claim. Since the task of monitoring requires special expertise, mezzanine note holders are likely to be sophisticated investors, like fellow investment banks or hedge funds, effectively shielding senior tranche holders from the cost of incentive misalignment, i.e. from a further decrease in asset quality, see also Franke/Krahnen (2006).

This brings us to another hypothesized contribution of securitization to welfare, namely the creation of information-insensitive senior tranches. More precisely, senior tranches are information-insensitive in the sense that their payoff strongly depends on macroeconomic tail risk, not on idiosyncratic or firm-specific risk[5]. This allows remote investors like households or pension funds to directly fund the asset pool without having to worry about firm-specific information or the monitoring of the originating bank. Information-insensitive tranches require no expertise of buyers in risk management and, thus, are well suited for remote investors. Information-sensitive tranches, however, should be purchased by sophisticated investors. This benefit of strict subordination should clearly contribute to welfare gains achieved by securitization. Therefore, theory predicts substantial first loss piece retention by the originating bank in a typical securitization transaction, while

[5] On a more general level, securitization may be interpreted as completing the market, since the tranches issued in the process of securitization are non-proportional claims on the underlying risk. Their payoffs are macro factor dependent, therefore securitization may be seen as a technique to create state contingent claims. Investors buy notes carrying predominantly tail risk characteristics. Such securities are called senior bonds, and in today's markets a large fraction of these bonds carry a standardized risk load, rated triple A, signalling a very low expected default probability.

mezzanine tranches are held by sophisticated investors and the most senior tranches are held by remote investors.

Information insensitivity of senior tranches is also of great relevance to the emergence of a secondary market for such instruments. With insensitivity to firm-level information, notes can be traded among investors essentially without recourse to firm-level information, and therefore without fear of adverse selection and moral hazard. This reduces the information cost of traders and stabilizes the market values of senior tranches.

Summarizing, apart from the benefits of improved risk allocation we find three characteristics of securitization transactions that are potentially relevant for valuation of these instruments. First, incentive alignment between originator and investor is achieved through an adequate level of recourse, typically through retention of the equity piece[6]. Second, incentive alignment is further secured by mezzanine investors, since they are potentially substituting for the holders of the equity tranche if portfolio losses reach higher levels. That is why mezzanine tranches are held by sophisticated investors. Third, senior tranches are exposed to systematic tail risk only, making these notes an ideal asset class for non-informed investors, like households, pension funds.

Predictions regarding the originating bank are threefold. First, securitization allows banks to transfer tail risk from bank balance sheets to investors outside the financial sector, relying on senior tranches. Second, securitization will not lead to unlimited risk transfer, as equity tranches tend to be retained. This is also in the interest of the bank because it reduces the cost of buying protection. Third, if a bank transfers part of its loan risk to the capital market, this enables the bank to take new risks. It may even induce more risk taking of the bank if investors are not aware of it or if more risk taking allows the bank to benefit more from adverse selection and moral hazard.

3.3.2 Two-tier agency relationships: Evidence

Eventually risks have to be borne by individuals. In an intermediated world risks are borne to some extent by the intermediaries. But given the substantial costs of intermediary insolvency, their insolvency risk should be strongly constrained. Securitization of bank loans is considered to be one mechanism of reducing intermediary insolvency risk because the lending bank would transfer at least part of the loan default risk to other players. Whether securitization achieves this objective, depends on various effects: First, to what extent are default risks transferred in securitization transactions? Second, does the risk transfer in securitizations reduce or increase the overall risks taken by

[6] This presupposes that the equity piece is large enough to cover a suitable quintile of the loss distribution. There are functionally equivalent alternatives to equity piece retention, like contractually specified conditional recourse.

securitizing banks? Third, does the risk transfer in securitizations undermine the quality of bank lending? Fourth, does this risk transfer render risk allocation in financial markets more opaque? The last two questions will be dealt with in the following subsections.

First, we analyse the size and the allocation of the first loss piece. In a sample of 40 European securitization transactions, Franke and Krahnen (2006) find that in most transactions, the FLP covers a quintile of more than 85% of the portfolio loss rate distribution[7]. Of course, this number strongly depends on the ratings assigned to the underlying asset pools by the rating agencies as well as on the default correlations assumed in the simulations. We use similar correlations as the rating agencies. Given this high loss absorption by the first loss piece (FLP), forcing the arranger to fully retain it, would mostly eliminate the default risk transfer. But full retention is not necessary as argued above. Nevertheless, we might expect the originator to retain a portion of 15 to 25%. If investors know the retained portion, then they can condition their expectations on these incentives and obtain more accurate estimates of their default risk.

Surprisingly, however, the allocation of risks in securitization transactions is one of the well guarded secrecies of the industry. Originating banks never appear to commit in public to retaining a certain fraction of the FLP. Maybe, they consider it important to maintain freedom in changing their position in the FLP over time. Maybe, originators expect some investors to believe naively that they retain a large fraction. So they may be afraid to disappoint these investors by announcing low fractions. On the other hand, anecdotal evidence indicates that smart investors only buy rated tranches if the originator promises to retain some minimum fraction of the FLP. Particularly in the year before the outbreak of the subprime crisis, anecdotal evidence showed an increasing number of transactions being issued with no retention of the first loss[8]. Of course, even if the FLP is sold completely, the originator retains the almost risk-free first profit position. Although some servicer fees may be declared in the offering circular, investors know little about the size of the first profit position.

[7] Further studies that confirm the extreme riskiness of the first loss piece are Haensel/Krahnen (2007) and Franke, Herrmann and Weber (2007). Both studies find that the FLP bears, on average, between 80% and 90% of the expected default losses of the securitized portfolios. These numbers are derived from replicating the loss rate distribution of the underlying asset portfolios, since the allocation of expected losses to individual tranches is not public information. Furthermore, these numbers cannot be used to gauge effective risk transfer, since this depends on whether a tranche is retained by the issuer.

[8] We have no hard evidence to back up this claim, as we rely on reports from managers in the industry in private conversations.

Buyers of the FLP-risk presumably are mostly banks and, to a smaller extent, hedge funds and insurance companies[9]. A BIS-study of 2008 notes, based on surveys conducted by the Basel institution among leading international banks, that equity tranches were predominantly acquired by asset managers (serving as arrangers), active traders and institutional investors (p. 18). Retention is not even mentioned here. Again, even though the empirical evidence is quite limited, the theoretical prediction that the originator mostly retains a substantial fraction of the FLP is very likely wrong.

This FLP-risk transfer conjecture is supplemented by the suspicion concerning the transfer of rated tranches, mezzanine and senior. Originators do not inform the public about their sale of rated tranches. This makes it difficult for the outsider to estimate the risk of the underlying portfolio kept by the originator on its book. The naive view that the rated tranches are mostly sold to outsiders has been questioned, too. Citibank assumes most AAA-tranches to be retained within the banking sector. According to Citibank (2007), banks bought about 30% of the AAA-tranches, SIVs and conduits about 20% and money market funds about 25%, adding up to 75%. The BIS study also argues that over the past few years, issuers have increasingly retained the senior and super-senior tranches. Also monoline insurers have taken on a considerable share of senior risk (see BIS 2008, p. 17), curtailing the risk transfer to remote investors.

Even though the risk of money market funds is, in legal terms, borne by the buyers of these funds, the issuing banks can effectively not impose substantial losses on them since money market investments are perceived as almost risk free investments. And rightly so, issuers of money market funds typically extend liquidity guarantees to these funds which, in the event of prolonged illiquidity, imply fund buyers to hold a put option against the issuer. Therefore banks appear to hold most of the AAA-risk.

This is also supported by the very restricted evidence regarding synthetic securitization transactions. Franke/Herrmann and Weber (2006) find that in synthetic transactions the non-securitized AAA-portion exceeds 80% of the par value of the transaction. Casual talks with bankers indicate that a large part of this non-securitized risk is not insured through senior credit default swaps and, hence, borne by the originator. This is somewhat inconsistent with the BIS-study mentioned earlier and Lehman Brothers[10], arguing that monoline insurers have taken on a considerable share of senior risk. The rationale behind the bankers' reluctance to insure the senior risk is probably that the default probability of AAA-tranches is very small so that buying insurance appears too costly. Also, the low

[9] According to the Credit Derivatives Report of the British Bankers Association, in the credit default derivatives market of 2006, banks sold 59 % of the default risk while they bought 44 %. Hedge funds sold 28 % and bought 32 %, insurance companies sold 6 % and bought 17 %.

[10] Graph displayed in Gorton 2007, p. 43.

risk weight attached by Basel II to AAA-tranches does not motivate originating banks to transfer this risk. Therefore we conclude that also the second theoretical prediction claiming that the most senior tranches are held by remote investors is wrong.

Summarizing, it appears that originators sell a large part of the FLP in the first place to other banks and, in the second place, to insurance companies and hedge funds. A large portion of the large AAA-tranches is retained in the banking sector. The proportion of default risk in securitizations retained by the originating banks is not publicly known. We conclude that the observed risk transfer is quite different from what theory (and the common pre-crisis understanding) predicts. That is why we label the risk transfer story a myth.

3.3.3 Multi-tier agency relationships

So far we analysed securitization starting from a bank, which concentrates all bank activities in-house. Industry has outsourced many parts of the production process so as to reduce production costs and benefit from specialized skills and innovations of their suppliers. Banks also started outsourcing various parts of the production process. This is apparent in the subprime crisis. This led to a replacement of two-tier agency relationships to multi-tier agency relationships. Ashcroft and Schuermann (2008) discuss in much detail the various parties involved in the securitization of subprime loans. They also analyse the various agency problems induced by this division of banking activities and mechanisms to mitigate these agency problems. The parties involved in managing the subprime business form a value chain of highly specialized parties, each having its own interests and its own manager. The benefits of specialization are indisputable. The agency costs of the value chain are difficult to estimate. The important question is whether a coordination mechanism can be designed for the involved parties to assure sufficient quality of the overall product. Part of this coordination mechanism is the incentive system.

First, have a look at the value chain in mortgage lending. In the subprime business, the originators of mortgage backed loans and the mortgage brokers cooperating with them are involved mostly in the beginning. Once the loans are contracted, originators are no longer involved, subject to the rule that they may have to repurchase loans not properly contracted or loans if the debtor fails to pay within a limited time period after contracting. Hence originators and mortgage brokers tend to have a short term perspective. Their reward mostly depends on the loan volume they contract, but not on the long term loan performance. This is rational in the sense that they have no influence on the handling of the loans by other parties later on. Thus, they desire protection against agency behavior of agents involved later on. But this also implies that hidden characteristics of the loans induced by non-observable behavior of originators and mortgage-brokers which may show up much later do not

matter for their reward. Therefore they tend to raise the volume of loans, but also to reinforce adverse hidden quality-characteristics.

Another party involved is the warehouse lender which initially funds the loans. It may have some influence on the choice and the activities of the originator, but not on the choice and the activities of the servicer. Hence, the warehouse lender prefers a reward independent of the servicer actions.

The servicer of the loans is responsible for collecting interest and principal payments, for making sure that the real estate on which the mortgage is written, is kept in good shape and for potential action in case of delinquency or default. As pointed out by Ashcroft and Schuermann (2008), the servicer collects servicing fees until default so that she has a strong incentive to defer default through restructuring the loan even though this may raise default losses. As argued by Moody's, the quality of the servicer may have a strong impact on the foreclosure value. Not surprising, the originator does not want a reward which depends on the servicer quality on which he has no influence. Similarly, the servicer has no influence on the choice of the originator and therefore does not like a reward depending on the originator quality.

The only party involved throughout the securitization process is the arranger. She sets up a special purpose vehicle for securitizing loans and mostly manages it. Therefore she is in the best position to coordinate and monitor the activities of all parties involved. The SPV buys the loans and securitizes them. Tranches are sold to investors who usually have little information on the underlying assets. They may rely on the ratings of rating agencies and, in addition, on the advice provided by investment managers. While rating agencies are also involved long term in the transaction through monitoring and adjusting ratings, investment managers are mostly involved at the start of the SPV when the loan portfolio of the SPV is composed. Later on the portfolio may be adjusted again using the advice of the same or other investment managers. Rating agencies and investment managers do not have a financial stake in the transaction. But their reputation is at stake.

As pointed out by Ashcroft and Schuermann (2008), the cooperating parties set up rules to safeguard the quality of the transaction. If these rules are violated, then the negligent party may have to pay the damage. But this liability is subject to a time horizon. Also the negligent party may restrict its potential payments by limited liability and low equity capital. Moreover, often it is difficult to prove negligent behavior so that the negligent party may escape recourse. Hence default losses which could have been avoided by careful behavior may be imposed on other parties, in particular investors. Of course, investors anticipate that and charge a premium. But they are exposed to a high level of operational risk with so many parties being involved. Effective coordination of these parties appears to be very difficult.

Can these problems be resolved by incentive systems? Standard theory suggests that, in the absence of asymmetric information and agency problems, all parties should take a share in the overall risk[11]. The share a party takes increases with its wealth. This simple allocation is no longer optimal if parties have different expectations and affect the overall risk by different activities which are only partially or not all observable by the other parties. Ceteris paribus, from standard agency theory, the stronger is the influence of some party on the overall risk, the more risk it should bear.

If, for example, the originator has a strong influence through her screening activities, then she should bear a relatively high share of the risk. But there are two counterarguments. First, she has little control of the other parties involved in the transaction. This should reduce her risk share. Second, the parties are involved in the transaction in different time phases. The originator is involved only at the beginning. She has no control over the transaction later on. Hence, as argued before, she desires protection against agency behavior of the other parties, for example through reducing her risk share over time. This would be even more efficient if the effects of her own conduct would show up early in the transaction so that she would bear more of the consequences of her behavior in the early years in which her risk share is relatively high.

If, however, the consequences become visible only in later years, then her risk share should decline at a slower rate exposing her more to agency problems induced by other parties. Similarly, warehouse lenders are involved with their funding activities only for short while. Asset managers may be replaced, reducing their time horizon, too. Hence constant long term risk sharing of these parties appears inefficient. Also, long term risk sharing would necessitate long term risk management which is not the core business of these parties.

This explains why we do not observe long term financial stakes of various parties. To some extent these problems might be mitigated through reputation effects, but we are sceptical about these.

Given these difficulties, a way out could be to give the arranger a very prominent role in setting up the transaction, choosing and monitoring other parties. Then her strong role should be incentivized by a long term financial stake bearing a substantial part of the default losses. She could do this by retaining a substantial part of the First Loss Piece. But the empirical evidence shows that arrangers are reluctant to retain substantial parts of this toxic waste piece. In recent years, as has been pointed out before, in some cases the arrangers sold the First Loss Piece completely. Hence this incentive mechanism clearly failed in these cases.

[11] More precisely, if all parties have homogeneous expectations and time additive-utility functions belonging to the class of functions with hyperbolic absolute risk aversion with the same exponent, then all parties would buy a share in the overall market risk.

The previous discussion raises a general question: How many parties in the value chain are desirable? There is a trade-off between the cost advantage of outsourcing parts of the production process to specialized parties and the corresponding agency costs. The function relating the cost advantage to the number of specialized parties should increase at a declining rate (diseconomies of specialization). The function relating the agency cost to the number of specialized parties should also increase. But we do not know whether it increases at a constant, declining or increasing rate. If n denotes the number of parties, then the number of bilateral agency relationships, $n(n-1)/2$, increases disproportionally. This might indicate that agency costs also rise disproportionally. So far we lack empirical evidence. The view of Ashcroft and Schuermann (2008) that agency problems can be reasonably resolved at each bilateral stage appears quite optimistic. Their view is partly based on reputation cost arguments. Similarly, Gorton (2007) argues that implicit contracts between originators and other involved parties align interests. Presumably, he also refers to reputation mechanisms. We doubt this, given the evidence on the deterioration of mortgage backed loan quality.

Based on casual evidence, there are some banks which have fully separated different stages in the lending process from each other. For example, one German bank has established an internal pricing scheme according to which loan origination is compensated by a flat fee, while all loan cash flows (i.e. return and risk) are transferred to a Credit Risk Unit, which sets loan rates, and which decides whether a particular loan is sold, securitized, or kept on the books. This system leaves the incentive alignment between originating and processing unit unresolved.

Two implications emerge. First, it does not make sense to maximize benefits from specialisation of parties. A standard model for securitization might be to have one party for both, arranging and servicing. Both activities are long term and, thus, can be coordinated by one party without conflicts of different time horizons. If loan origination is outsourced, then the arranger having also the information from servicing could monitor originators more effectively. It might be better, however, if some of the origination is also done by the arranger-servicer. Then she would have more updated information on origination which she can also use for more effective monitoring of other originators. This benefit might outweigh the foregone cost benefit of complete outsourcing.

Second, there should be a trade-off between outsourcing activities in a more extended value chain and the retention of default risk by the transaction coordinator. The more activities are outsourced, the more problems emerge from information asymmetries, the more effectively investors should be protected against negligent behavior of parties. Regarding the FLP, the arranger should commit to retain a larger fraction of the FLP if the value chain is extended. This would clearly demonstrate a

trade-off of risk and return of outsourcing for the arranger. If she extends the value chain, she would benefit from cost savings. At the same time, she would have to take a higher default risk discouraging her from imposing more agency costs on investors.

Apart from the difficulty of maintaining comprehensive incentive alignment all along the value chain, a further issue of non-integrated (out-sourced) business processes is credibility in the market. Effective coordination of the different parties of a value chain appears to be a requirement for financial stability because otherwise some parties may not worry about risks. This may lead to excessive risks imposed on others like investors who suddenly retreat from the market once they learn about this failure. As a consequence, markets break down triggering a crisis. For illustration, part of the subprime crisis is often related to the role of originators and mortgage brokers. If they are rewarded independently of the default risk of the contracted loans, then this clearly violates conditions for effective value chain coordination.

3.4 Compensation and incentives

Risk transfer and the conservation of lending relationships are conflicting objectives. This is in particular true for financial assets, where the random terminal value is sensitive to moral hazard and adverse selection. While the previous sections focussed on agency conflicts between different legal entities, we now discuss agency conflicts between managers and shareholders of a bank to get an understanding about potential reasons for excessive risk-taking. In the current section we turn to management compensation as a possible source of conflict. The focus is on the sharing of risks between the manager, shareholders and third parties and on the term structures of payoffs to these different parties. The purpose of this exercise is to show that certain manager compensation schemes may incentivize the bank manager to choose a very risky bank portfolio. This is not necessarily in conflict with shareholder value maximization, but it may endanger financial stability. Therefore, it is not sufficient to look at managers and shareholders, but also default probabilities of banks are essential as a proxy for costs imposed on the financial system.

There are four major results in this section. First, if the bonus is backend-loaded, e.g. based on the bank's terminal value, then there is no or little conflict of interest between management and shareholders[12]. Yet, the probability of bankruptcy may be substantial. Second, if the bonus is frontend-loaded, e.g. based on the present value of expected profits instead on market values, then the management decision clearly differs from shareholder preferences. Third, if the manager gets a bonus annually, then her preferred asset quality strongly depends on the compensation package. Fourth, the manager has a strong incentive for high bank leverage if the bonus is nonnegative and

[12] …except for differences in risk aversion, which introduce a departure from optimality.

the profit for bonus does not include a penalty for high leverage. Therefore it is essential to replace the bonus system by a bonus/malus system so as to discourage the manager from very strong risk taking. This is even true if shareholders also benefit from high risk taking because it may endanger financial stability as well. A malus system needs to be carefully designed so as to hinder the manager to undercut the malus by her bank policy, similar to undercutting bank regulation by regulatory arbitrage.

Before presenting a numerical example, linked to securitization, we mention that there is a large literature on manager compensation and risk taking. On the theoretical side, Ross (2004) demonstrates that conventional wisdom may be misleading. He shows that, for example, the conventional wisdom that stock options motivate the manager to raise business risks may be wrong. Nonlinear compensation structures induce three different conflicting effects on risk taking so that general statements cannot be made (see also Lewellen 2006). On the empirical side, Jin (2002) finds that performance dependent incentive levels for CEOs tend to move inversely to the systematic and non-systematic business risk if the CEOs face hedging constraints. Coles, Daniel and Naveen (2006) find that higher sensitivity of CEO wealth to stock volatility (Vega) induces the CEO to implement riskier business policies. They also find a positive impact of business risk on the Vega of the CEO compensation. A more detailed analysis of dynamic risk taking of hedge fund managers is provided by Hodder and Jackwerth (2007). They show in a simulation model that hedge fund managers tend to take very high risk when the fund value is close to the high water mark.

The public discussion on incentives in bank management starts from the observation that today bank managers are strongly incentivized by bonus systems and that this may induce them to take excessive risks. We take a closer look at these incentive systems and ask what could be done to mitigate induced problems of risk taking. To start with a few examples, taken from annual reports, top management is often compensated by a package of (1) a base salary, (2) a cash bonus based on results of 2006 and (3) stock options and stock-like claims subject to a minimum holding period. The following table displays the values of these components in percentage of the value of the overall compensation for UBS in 2006 and 2007 and for Deutsche Bank in 2007.

Firm	Base salary	Cash bonus	Stock and stock options
UBS 2006	6%	47%	47%
UBS 2007	22%	50%	28%
Deutsche Bank 2007	13%	52%	35%

Table 3: Compensation package of UBS and Deutsche Bank, 2006 and 2007, Source: Annual report

While 2006 was a good year for UBS, this is not true of 2007 explaining the relative increase of the base salary. In all three cases, the base salary is rather small and the cash bonus is quite high.

Regarding conflicts between managers and stock owners, the third long-term component serves to align their interests. More critical is the second component because it provides short-term incentives for managers which may be in conflict with shareholder value. Discussing incentive systems in the financial sector needs to take into consideration organizational aspects. The bank is managed by a team of managers so that one might want to look into team theories. We will not discuss the team aspect here, instead we assume a single bank manager.

A simple numerical example

Since we are looking into potential causes of the subprime crisis, we illustrate our arguments by using securitization as an example. Our example of the manager's choice is a deliberately simple one and completely ignores moral hazard problems and reputation effects. We just look at the initial manager choice to pinpoint some important aspects to consider in setting up an incentive system. Like in securitizations the manager can choose between loan portfolios of different quality, all with a maturity of 7 years. The best portfolio has an AAA-rating, the worst one a B-rating. We are not concerned about tranching the portfolio into an equity piece and rated tranches but assume that the bank retains the default risk itself. In the first scenario, the bank has a given amount of money to invest. In the second scenario, a leverage option is included. In this scenario, the manager cannot only invest the given amount of money, but can also borrow money elsewhere and invest this money in addition into an augmented loan portfolio.

Scenario 1

In the first scenario, the bank has given 100 loans, each with a par value of $1 million, the same initial rating and 7 years to maturity. The risk free rate is 3.25% p.a., the credit spreads for the loans are given in Table 4 together with the cumulative default probabilities over 7 years. These probabilities are taken from S&P. In case of default, the loss given default is assumed to be 60%. The credit spreads are chosen such that the annual net risk premium divided by the annualized expected default loss is about 9.25 for AAA-loans and declines to about 1.5 for B-loans. The annual net risk premium is defined as the credit spread minus (annual transaction costs of 50 bp plus the annualized expected default loss).

Rating	Default probability	Credit spread	Annual net risk premium
AAA	0,285 %	0,75 %	0,226 %
AA	0,701 %	0,85 %	0,290 %
A	1,368 %	0,95 %	0,333 %
BBB	4,443 %	1,45 %	0,569 %
BB	15,110 %	3,45 %	1,655 %
B	32,903 %	7,70 %	4,380 %

Table 4: Default probabilities, credit spreads and net annual risk premiums for loans of different ratings

A loan defaults in year t if its rating changes to D. Rating transitions are simulated using the S&P transition matrix year by year. The 100 loans belong to 10 different industries. The rating transitions of loans belonging to the same industry are correlated with 20%, those of loans belonging to different industries are correlated with 5%.

In the first scenario, the manager only chooses the initial rating of the loans. Every year she receives a base salary and a bonus which cannot be negative. The bonus equals the bonus-profit of the year, multiplied by the participation rate. The bonus-profit is the internal profit on which the bonus depends. The bonus-profit in year t equals the credit spread earned on the loans which have not defaulted until the beginning of the year minus the loss given default (60%) on the loans which default in this year. Thus, the annual transaction cost of 50 bp is excluded in the bonus-profit[13]. In each year the certainty equivalent of the manager's compensation is derived using a power utility function with relative risk aversion λ. Then the total income of the manager is derived as the date 0-present value of the certainty equivalents in years 1 to 7, using the risk-free rate as the discount rate.

In this simple setup, the manager does not bear any outside risks and she cannot hedge any income risks. It is well known that in a complete market the manager can hedge every risk so that incentives of performance related compensation packages disappear.

The shareholders of the bank invest $100 million initially and receive the terminal portfolio value after 7 years. This value equals the principal plus interest income (= risk-free rate plus credit spread) on all non-defaulted loans, compounded at the risk-free rate to the terminal date, plus the compounded recovery values of all defaulted loans, minus the compounded payments to the manager. For the shareholders the terminal portfolio value is also converted into a certainty equivalent using a slightly modified power function with given relative risk aversion. The modification is that the shareholders´ terminal wealth is composed of the terminal portfolio value plus some given exogenous wealth, for example $50 million. Therefore the risk premium implied by the certainty equivalent is rather small. Finally the certainty equivalent is discounted at the risk-free rate to date 0 to yield the shareholder value of the portfolio[14].

Table 5 displays the results. The left panel shows the total income of the manager for different loan qualities, assuming a constant relative risk aversion coefficient, $\lambda = 2.5$. The right panel shows the

[13] The transaction cost could be included, but this would not change the results in any significant way, because the manager will be compensated by an increase in her base salary.
[14] Alternatively, one could use an exogenously given pricing kernel to derive the market value of the portfolio. The results would be similar.

shareholder values, assuming an identical $\lambda = 2.5$ for the shareholders. They, however, have additional terminal wealth of $50 million, making them less risk averse. In order to see the impact of the profit participation rate, we consider four different participation rates of 1%, 8%, 10% and 20%. The base salary will be adjusted to the participation rate such that the total income the manager will earn is roughly the same.

Total Income of Manager (in 1000 $)					**Shareholder Value (in million $)**			
Base salary	125	40	35	20	125	40	35	20
Participation	1 %	8 %	10 %	20%	1 %	8 %	10 %	20 %
Rating								
AAA	817.1	605.4	661.3	986.4	103.7	103.9	103.8	103.5
AA	821.7	631.7	690.6	**1,007.6**	104.0	104.1	104.2	**103.7**
A	825.6	648.0	705.3	964.2	**104.1**	**104.2**	**103.9**	**103.3**
BBB	804.8	682.7	722.4	799.0	104.0	104.0	103.9	103.3
BB	892.7	794.1	796.6	636.5	103.3	102.9	102.7	101.6
B	**979.9**	**994.4**	**977.0**	719.0	102.3	101.3	100.9	98.9

Table 5: The table displays manager total income and the shareholder value for different combinations of base salary and profit participation rate. The first column shows the rating of the underlying portfolio. Bold figures show the highest total income resp. shareholder value, given the compensation package.

Given a participation rate of 1% and a base salary of $125,000, the manager clearly chooses the poor loan quality B, earning a total income of about $980,000. This is due to the high annual profit generated with B-loans. The manager benefits strongly from this profit because she earns 1% of it when defaults are rare and in case of many defaults she does not suffer through a negative bonus. Moreover, a 1% bonus also imposes little risk on the manager so that she does not suffer from a substantial risk premium. The situation is different for the shareholders. Shareholder value is roughly the same for all loan qualities. This appears reasonable since credit spreads are market rates. Given the high B-risk, shareholder value is slightly lower due to imperfect diversification. Shareholder value is highest for the A-portfolio.

With a participation rate of 8 or 10%, the manager still prefers the B-quality. For substantially higher participation rates, she prefers loans of better ratings. A high participation rate imposes a high risk on the manager which reduces her certainty equivalent substantially for low quality loans.[15] Therefore the certainty equivalent of the bonus first increases and then declines with a higher participation rate, given the loan quality.

[15] Disentangling the effects of the participation rate, first, consider the call option feature of the bonus. Since the bonus is nonnegative, the bonus is a call option on the portfolio payoffs. A call option is more valuable if the underlying risk, represented by Vega in most option pricing models is higher. This effect is also present here. But in contrast to option pricing models, in which the pricing kernel is exogenously given, the manager evaluates the risk individually, given her utility function. This means that doubling her income in a given state of nature does not double her utility in that state, because the utility function is strictly concave. In other words, the endogenous risk premium of the bonus is rather high if the participation rate and the underlying risk are high.

The important implication is the relation between the participation rate and the loan quality chosen. A high participation rate lowers the shareholders' risk through better loan quality, it also lowers the bankruptcy probability of the bank. If shareholders prefer better loan quality, then they should not choose a low participation rate. If they prefer very good quality, then a rather high participation rate is needed.

This finding does not change substantially if shareholders combine a bonus with a small share in the terminal value of the portfolio (TV share), equivalent to the extreme form of bonus deferral and similar to stock-based compensation with a long holding period. The reason why the findings are similar is that with no leverage, the probability of bank losses is rather small so that the option feature of the bonus does not really matter. Hence a low (high) participation rate and a small (large) terminal value share have similar effects and induce the manager to choose B-loans (AAA-loans). The higher the participation rate and the terminal value share, the better is the portfolio quality chosen by the manager.

Scenario 2

The story changes fundamentally in the second scenario in which the manager can also choose the bank's leverage. So far the portfolio had a par value of $100 million, fully financed by equity capital. Now the manager can borrow $100x million from outside and invest in the portfolio $100 (1+x) million. Hence (1+x) can be interpreted as the volume of the bank's portfolio in units of $100 million, while x is the leverage of the bank, i.e. its debt/equity ratio. With leverage, each loan volume is inflated by the factor (1+x), holding the credit spread constant as is typical in buying securitization tranches. For simplicity, the manager gets a base salary plus a bonus, but no terminal value share.

First assume that the interest expense on bank borrowing charged to the bonus-profit increases linearly with the borrowed amount, i.e. the charged interest rate is independent of the leverage. Then, given the quality of the portfolio and the base salary, the manager maximizes the leverage. The reason is obvious. Leverage implies that the bonus-profit increases linearly with leverage. Since the bonus can never be negative, the bonus will be multiplied by the factor (1+x) through leverage. This represents a first order stochastic dominance improvement of the bonus. Hence, given loan quality, the total income of the manager increases monotonically with leverage. Since the risk premium of the bonus increases disproportionally with leverage[16] and the base salary stays constant,

[16] Given a positive base salary, the manager displays increasing relative risk aversion with respect to the bonus. Her relative risk aversion approaches λ so that for high leverage levels her total income increases almost proportionally to leverage.

the total income increases with leverage at a declining rate. This is visible, in particular, for bad loan qualities.

The incentive to maximize leverage would be even stronger if leverage would not multiply the par value of each of the 100 loans, but multiply the number of loans to different obligors in each of the given industries so that the diversification of the loan portfolio improves. This would imply an additional second order stochastic dominance improvement which benefits both, the manager and the shareholders. Table 6 illustrates these results. The base salary is always $40,000 and the participation rate is 8%. The computations are based on a loan portfolio in which the par value of each loan is multiplied by (1+x).

Total Income of Manager (in 1000 $)					**Shareholder Value (in million $)**			
Base salary	40							
Participation Rate	8 %							
Volume	1	2	25	35	1	2	25	35
Borrowing Rate	3.25 %	3.25 %	3.25 %	3.25 %	3.25 %	3.25 %	3.25 %	3.25 %
Rating								
AAA	605.4	954.3	**8,345.8**	**11,306.1**	103.9	108.0	202.7	243.8
AA	631.7	994.8	7,097,7	8,886.4	104.1	108.6	209.0	**252.1**
A	648.0	1,007.7	5,237.6	6,159.1	**104.2**	**108.8**	**209.8**	**252.1**
BBB	682.7	992.2	2,604.5	2,708.3	104.0	108.6	183.8	202.6
BB	794.1	1,020.4	1,470.6	1,485.7	102.9	107.2	104.7	100.2
B	**994.4**	**1,223.1**	1,579.7	1,579.7	101.3	104.7	69.7	66.5

Table 6: The table displays manager total income and the shareholder value for different portfolio volumes due to leverage. The manager earns a base salary of $40,000; her profit participation rate is 8%. The first column shows the rating of the underlying portfolio. The bank always pays 3.25% on its debt. Bold figures show the highest total income resp. shareholder value, given volume.

Given a low portfolio volume, the manager chooses the B-quality. High volumes increase the bonus risk. To mitigate this effect, she chooses a better loan quality. For a volume of x=25 and more, she prefers AAA-loans. More generally, the higher the volume or leverage, the better is the loan quality. This finding is consistent with highly leveraged vehicles like SIVs and ABCP-conduits which usually are highly levered and mostly hold AAA-assets.

For the shareholders the effects of leverage are quite different. Shareholder value increases with leverage for a wide range, given high quality loans. The additional credit spreads outweigh the additional risk, since default risk is low. The situation is different for low quality loans. High default losses are fully borne by the shareholders until all equity capital is fully absorbed. These losses increase with leverage eating up more of the terminal value. This is evident in table 3, in particular, for B-loans. For a volume of 35, shareholder value drops to $66.5 million. Since shareholders have

limited liability, the bank may go bankrupt. The bankruptcy probability strongly increases with leverage destabilizing financial stability, irrespective of loan quality.

If the manager would participate in the terminal value like a shareholder, then this would have little effect on the manager's choice. As Table 6 shows, the shareholders also benefit from a very high leverage, given very good portfolio quality. Therefore, terminal value participation does not discourage the manager to choose a very high leverage.

What do we learn from this simple model? The good news is that although the manager generally prefers high to low leverage, this preference is strongest for good portfolio quality. Shareholders are also happy with this policy. This simple model appears to portray quite well what happened in several banks before the subprime crisis. They bought high quality tranches of RMBS-transactions using high leverage. The bad news is twofold. First, the model results depend heavily on the parameters underlying the simulation. Once these parameters are questioned, the implications of high leverage can be highly significant for the bank's default probability[17]. Given some recent years with small default losses, the temptation is to be careless, adjusting parameters to this favorable development ignoring the usual long term swings. This would yield misleading model results and render risk controlling ineffective.

The usual argument that risk controlling driven by the shareholders' interest, assures strict limits of risk taking does not appear to be credible once the parameters used for risk controlling are questioned[18]. This doubt is reinforced by the possibility that also the shareholders might believe to benefit from a higher leverage and, therefore, are not interested in strict risk control. This benefit would be even stronger if some risks of high leverage are not borne by the shareholders themselves, but by third parties.
Second, given a bonus which increases with leverage by first and/or second order stochastic dominance, the manager's interest in high leverage is quite strong. This endangers not only the bank's solvency, but also financial stability.

Therefore, we believe that the current crisis is partly triggered by the strong interest of some managers in high leverage. This may explain why the Swiss Federal Banking Commission proposes stricter limits on banks' leverage as a simple cure. However, we believe that a far more promising

[17] Particularly dangerous is a short term funding policy of banks because bank creditors may feel strongly exposed to the default risk and refuse further lending.
[18] The manager may spend much energy in reengineering model parameters so as to make her high leverage policy appear less risky.

route for controlling risk taking is to change the reward system for managers. The bonus component should be supplemented by a malus component so that the manager's interest in taking high risk is clearly mitigated. There are several possibilities of doing that.

One possibility is to fire the manager when default losses exceed a certain trigger. This policy can be made credible by an employment contract which defines these triggers. What are the implications? If fired, the manager's income is unlikely to be zero. First, she may get some unemployment compensation, and second, it may take only a limited time to get a new job. Since the bank is not allowed to communicate the bad performance of the manager, reputation damages may be small enabling her to find a job again. In addition, the manager might expect to be fired in case of substantial losses even if her employment contract does not state that. Therefore, we are sceptical about the effectiveness of a contractual firing trigger. Yet, as shown in the appendix, a firing trigger would constrain the manager's preferred leverage.

Another more effective malus component is to adjust the bonus-profit for leverage. Instead of using a firing trigger, we assume that the bonus-profit is derived using an interest rate for bank borrowing which increases with leverage, but is otherwise independent of the bank's policy. This may appear to be in conflict with rational expectations of creditors, but it illustrates a typical phenomenon of liquid asset markets, that is the managerial option to change bank risk very fast through trading liquid financial assets without informing creditors. Therefore, we assume that the borrowing rate charged to the bonus-profit, only depends on leverage. Since credit spreads paid by banks are clearly lower than credit spreads paid on securitization tranches, we choose a rather modest increase of the borrowing rate with the leverage. Table 7 illustrates the results.

Total Income of Manager (in 1000 $)							**Shareholder Value (in million $)**					
Base salary	40											
Participation Rate	8 %											
Volume	1	2	10	15	20	25	1	2	10	15	20	25
Borrowing Rate	3.25%	3.3%	3.36%	3.44%	3.55%	3.75%	3.25%	3.3%	3.38%	3.48%	3.6%	3.75%
Rating												
AAA	605.4	891.2	2,913	2,925	**3,065**	**2,527**	103.9	107.4	135.6	146.9	150.4	135.2
AA	631.7	931.6	**3,008**	**3,284**	1,919	1,813	104.1	108.0	138.3	150.9	155.5	**141.0**
A	648.0	951.1	2,784	3,239	2,834	1,319	**104.2**	**108.2**	**139.2**	**151.8**	**156.3**	140.3
BBB	682.7	936.1	1,875	1,661	1,155	1,149	104.0	108.0	136.0	143.1	138.2	113.1
BB	794.1	990.7	1,310	1,280	1,194	1,132	102.9	106.7	112.1	101.0	87.7	70.4
B	**994.4**	**1,203**	1,482	1,482	1,411	1,344	101.3	104.4	82.2	71.9	64.6	56.5

Table 7: The table displays manager total income and the shareholder value for different portfolio volumes due to leverage. The manager earns a base salary of $40,000; her profit participation rate is 8%. There is no firing of the manager. The interest rate paid by the bank increases with volume as shown in line five. The first column shows the rating of the underlying portfolio. Bold figures show the highest total income resp. shareholder value, given volume.

Given the volume restrictions in table 7, the manager maximizes her total income choosing AA-loans and a volume of 15, i.e. a leverage of 14. In this example, the malus imposed on the manager

by increasing funding costs is very effective. Hence, market discipline imposed by credit spreads can be an effective malus. Also shareholders are quite satisfied. The manager's choice also protects creditors quite well since AA-loans have low default risk, so that financial stability is protected. The strength of these effects depends, of course, on the relationship between the imputed borrowing rate and the bank's leverage.

The manager's choice would be similar if she also participates in the terminal value like a shareholder. In the example, shareholders would prefer A-loans with a volume of 20.

The malus effects would not only be weakened by a smaller sensitivity of the borrowing rate to leverage, but also by the manager's attempts to undercut the malus. Managers have more decision parameters than just loan quality and leverage. They can effectively design loans to shift hazard rates from the early to the late years so as to mitigate the adverse effects of loan defaults. One method is to extend loans in case of financial distress of the debtor so that the loan does not become delinquent or does not go into default. Alternatively, in the subprime crisis, many loans granted were sweetened with teaser rates. In the first one or two years, debtors are charged low interest rates and subsequently there is a strong step up in interest rates. The effect is not only to provide debtors some relief in the first periods, but also to shift the hazard rates of the loans from early to late years. This is illustrated in the appendix.

Regarding the manager's incentives, it is critical how the annual bonus-profit is determined. If, as in the teaser rate-example, profits are artificially shifted from the late to the early years, then this tends to shift the manager's income-certainty equivalents to the early years, too. This might render her more aggressive. More importantly, the bonus-profits in the first years are misleading because they do not reflect the shift of default risks to the later years. A bonus-profit scheme should avoid these time distortions so as to provide undistorted long term incentives for the manager. More generally, the bonus-profit should be designed in a forward looking manner such that expected late period losses and risks are anticipated on an annualized basis. Otherwise the manager is riding on the distorted term structure of bonus-profits rendering malus components ineffective.

The previous examples demonstrate the dangers inherent in various incentive systems. One might question several assumptions made in these examples. For instance, the manager might be less risk averse inducing her to take more risks. She might be able to hedge part of the bonus risk which also might induce her to take more risk. But the qualitative conclusions from these examples are similar even if we change the parameters. Therefore the qualitative conclusions appear to be robust so that we do not present more simulation results.

Lessons learned from scenarios 1 and 2

What are the lessons to be learned? First, a bonus system with a low (high) participation rate is likely to motivate the manager to acquire low (high) quality financial assets given low leverage. Hence shareholders can influence the quality of financial assets through the participation rate.
Second, nonnegative bonus payments induce the manager to choose high leverage. Even though high leverage usually goes together with good quality of financial assets, high leverage may put a high loss risk on shareholders and endanger financial stability through a substantial default probability of the bank. Therefore a bonus/malus system is required which clearly puts a threat on the manager for high leverage. The bonus/malus system should induce long term manager orientation. Accounting of bonus-profits needs to be forward looking in the sense that losses and risks which materialize in future periods need to be incorporated already today.

The effects of an incentive system depend on the manager's risk attitudes and on the investment and financing policies available to her. Moreover, they depend on the bank's internal control system. Therefore the effects are difficult to predict for outsiders. This leads to an important conclusion, namely that any outside regulation of a bank's incentive system seems to be inappropriate. It might be useful, however, for other market participants interacting with the bank to have information on the bank's incentive system. This information might improve their understanding of bank risks.

We add a more speculative remark on performance based compensation regarding the balance of managerial concern between her income and financial stability. We suspect that a manager with a strong short term performance-based compensation worries little about the impact of her policy on financial stability. In contrast, a manager with a significant long term performance-based compensation is more concerned about financial stability because she has to lose relatively more in a financial turmoil. This effect is likely to be even stronger for a manager with a high base salary and low performance based compensation. In other words, we suspect that performance based compensation reinforces a manager's concern about her income at the expense of public welfare showing up in financial stability. Given that this view is correct, then compensation packages should have a low bonus component unless the bonus-profit can reliably be designed to be long term forward looking. But the current crisis proves how difficult it is to design such a bonus-profit scheme. Hence, it appears that in designing compensation packages not only interests between managers and shareholders should be aligned, but equally important, interests between managers and the public as reflected in financial stability should be aligned.

A final remark on compensation and securitization relates to the observation that the huge supply of securitization tranches in previous years allowed the manager to acquire loans of any quality in almost unlimited amounts at constant credit spreads. A similar possibility does not exist in

traditional banking. A bank cannot substantially expand its loan business with its own clientele at constant credit spreads. It would have to lower credit spreads or acquire new customers which usually also requires lower credit spreads, holding default risk constant. This would limit bank expansion and, thus, on risk taking, in contrast to the securitization business.

3.5 Effects of Risk transfer on Loan Quality and Bank Risk taking

The previous discussion of various agency problems illustrated various perils of the financial system. Clearly, the multi-tier lending system with insufficient alignment of incentives along the value chain endangers lending standards, thereby negatively affecting the average quality of loans. This hazard will be reinforced if both, bank managers and shareholders benefit from this quality degradation. This is the case if loan volume can be expanded so as to earn higher profits from securitizing loans, without assuming the increased default risks.

Thus, does the risk transfer in securitizations undermine the quality of bank lending? There is ample evidence that the lending standards in the US MBS market have been eroded over the past couple of years[19]. It is well known that the share of subprime loans in overall US mortgage backed (MBS) lending increased in 2005 and 2006. It is also likely that the strong increase in US MBS lending would not have been possible without spreading the risks across various parts of the world through securitization. The reason is simply that otherwise the lending institutions would have run into serious problems with their regulatory capital requirements. Yet, the US MBS lending cannot simply be generalized to other segments of bank lending. First, in Continental Europe MBS lending has mostly been conservative over the last years. Also, credit standards for corporate and private borrowers in Europe have changed somewhat over time, but not strongly[20]. Hence it will be difficult to argue that the strong increase in European securitization over the period from 2000 to 2006 (according to HSBC (2007), the average annual growth rate was 40.2% with an issuance volume of about $80 billion in 2000 and about $725 billion in 2006) has loosened credit standards. Therefore we argue that the loosening of credit standards in the US MBS market was supported by securitization, but cannot be attributed solely to it.

Purnanandam (2008) compares mortgage-related write-offs among banks that differ with respect to their involvement in true sale securitizations. The author finds charge-offs to be significantly higher for firms engaged in securitizations. He interprets this finding as evidence in favour of the loan quality deterioration hypothesis, a natural consequence of an aggressive mortgage lending.

---

[19] See, for example, the article „Fed Shrugged as Subprime Crisis Spread", published in the New York Times, Dec.18, 2007. This article gives account of many discussions in the Fed regarding mortgage related lending practices, starting in 2000.

[20] The European Central Bank regularly publishes reports on credit standards in its monthly reports.

Data limitations have frustrated attempts to estimate the moral hazard effects of MBS-securitizations. Keys/Mukherjee/Seru/Vig (2008) take an indirect approach in comparing default rates of loans that, according to the standardized FICO rating, are eligible for a securitization transaction with Fannie Mae and Freddie Mac[21]. After controlling for other possible determining factors, the authors find above FICO-621 loans to have a default probability 20% higher (1% higher in absolute terms) than FICO-619 firms[22]. The authors explain this difference by the higher likelihood of the FICO-621 loans to be securitized that motivated banks to reduce monitoring of these loans. While the evidence is somewhat indirect, since they cannot show that lenders are lenient with those borrowers whose loans are securitized – their result is the first widely cited evidence of material incentive problems in securitizations.

Regarding financial stability, not only the impact of securitization on loan quality matters, but also the question whether securitization makes banks more vulnerable through higher risk taking. Does the risk transfer in securitizations reduce or increase the overall risks taken by securitizing banks?

So far, the existing empirical evidence is not very strong, due to a lack of appropriate studies. The enormous growth in securitizations over the last couple of years is one indicator of a rise in overall risk, since not all the risks have been transferred to outside investors. Worldwide growth rates in securitization often exceeded 25% over the last years. Some of this growth is also due to arbitrage transactions and, therefore, does not reflect increased lending. But these numbers do not clearly indicate whether originating banks expand their lending activities because of securitization. Cebenoyan and Strahan (2004) do not find a clear relation between a bank's risk and its securitization activities. A study by Minton, Stulz and Williamson (2005) looks at balance sheet data of banks and finds that securitizing banks tend to buy more protection in the credit derivatives market and also tend to have low capital ratios. The latter finding is consistent with more risk taking. Franke and Krahnen (2005) analyse the stock market betas of securitizing banks and finds that they increase with securitization transactions, in particular, with repeated transactions. This finding is consistent with the interpretation that securitizing banks expand their loan portfolios so that the systematic risk of these portfolios increases. Based on credit risk-models like the KMV-model, the credit risk of a bank should be correlated with stock price movements of borrowers. Hence the market value of a more granular credit portfolio which also drives bank market value, should be correlated more with the stock market index, leading to higher betas of bank stocks. Therefore this finding supports the view that securitizing banks tend to take more credit risk. A related finding is reported in Haensel/Krahnen (2007).

[21] The critical rating below which transfer to FM and FM is rules out is 620. Thus the study compares loans with Fico score 621 to a comparison group with a score of 619.
[22] The authors argue that the qualities of firms with FICO scores of 619 and 621 are basically indistinguishable.

To summarize, the process of securitization has led to a decomposition of the once-integrated value chain into a chain of isolated activities. Of course, these activities need to be coordinated, in order to avoid moral hazard over the life of the underlying contractual relationship, and adverse selection at origination[23]. Effective coordination along the value chain appears hard to implement. The available evidence is still weak, but it shows clearly in the direction of quality deteriorations of US MBS loans triggered by securitization. Similarly, the evidence about securitization on bank risk taking also indicates a positive impact, but of course more robust tests are needed to establish the relevance of incentive alignment for the rise in credit risk in securitization markets.

3.6 The Transparency Failure

3.6.1 Transparency about asset quality

Intransparency is often quoted as one of the main drivers of the asset market and the interbank market illiquidity. Transparency has different layers, one being transparency about the quality of financial assets, the other one being transparency of counterparty risks in the interbank market. We start with the transparency of asset quality.

For remote investors, the quality of structured financial assets is hard to evaluate. When banks are interested to buy protection from others, they are interested to play down the risks to be insured. Hence their quality statements are not entirely credible. In contrast, the quality statements of the big rating agencies have been regarded with some trust by market participants. The value of rating information for market participants depends on the stationarity of the rating-default mapping.

Concerning stability of the rating process, Blume/Lim/McKinlay (1998) largely confirm stability of the rating process; they cannot identify any loosening of rating standards over time, they rather find a slight hardening of these standards. Their findings are consistent with the theoretical models of the rating industry, which emphasize credibility and reputation with respect to information collection and firm monitoring for understanding the business model of agencies, see for instance Millon/Thakor (1985).

More recent papers stress the two-way interaction between rating agencies and firms concerning, e.g., capital structure or investment decisions. For example, Kisgen (2006)[24] shows that firms

[23] Note that value chain optimization has been a popular project area for bank consultancies, like Accenture, Mercer Oliver Wyman among many others. Given the IT-driven agenda of these exercises in business process re-engineering, it is a t least imaginable that the issue of incentive alignment was largely neglected, leading to the above results.
[24] Drawing on the theoretical work by Boot/Milbourn/Schmeits (2006).

endangered to loose a particular rating notch, try to 'improve' their capital structure, i.e. to issue less debt relative to equity than otherwise. The author concludes that firms want to meet standards set by agencies, thereby showing that rating downgrades are in fact costly for firms.

Investment grade (BBB+-rated and above) has become a well-known quality label, even in colloquial language, classifying financial instruments as of low default risk. This is even more relevant for the top rating notch, AAA. Financial instruments with a top notch rating from one of the big agencies are expected to have a very low ex-ante default probability. For example, averaged over the past 20 years, an AAA classified bond has experienced a one-year default incidence of less than 0.1 percent[25]. For this reason, obtaining a large-as-possible AAA tranche was a key objective in transaction design. AAA fixed income investment products were widely seen as an asset class of minimal risk, thus well suited for investors with little expertise in risk assessment. AAA rated assets are therefore deemed to be particularly attractive to remote investors, that is investors with little or no ability to monitor the intermediary, let alone the ultimate borrower. The flourishing market for AAA rated securities and tranches is (or was) relying on the credibility of an independent and reliable rating process. The risk assessment of structured finance products was believed to be transparent, despite the complex design of some of these instruments. Of course, transparency is only a borrowed transparency, borrowed from the rating agencies as delegated monitors.

As pointed out in the introduction, asset securitization evolved over the nineties, following the typical dynamics of (financial) innovations, see Ross (1989)[26]. Rating agencies played an important role in this process. Riddiough/Chiang (2003) concludes that rating agencies, through the process of standardization, have played "a unique role" in developing and popularizing the market for securitization transactions among investors.

As independent experts, agencies evaluated the asset portfolios and assigned subordination levels to the tranches with given ratings. Investors were apparently trusting delegated monitoring, and were acting as if the risk characteristics of securitization tranches were transparent to them. The expertise of major rating agencies, and their ability to separate safe, investment grade assets from risky, non-investment grade assets, allowed complex financial instruments, like CDO tranches or CDO squared notes to be marketed worldwide. According to BIS (2008), the downgrading avalanche experienced

[25] These probabilities are taken from a rating table, which draws on the time series of thousands of bond issues over the past decades.

[26] As shown by Riddiough/Chiang (2003), in their clinical study on the emergence of the Structured Finance industry, two companies were formative for market development at about the same time, the early 1990ies, namely Nomura Securities and Lehman Brothers. The securitization model used by Nomura emphasized a "straightforward" waterfall structure. Due to its simplicity, Nomura became the standard setter for the industry. Lehman, in contrast, was said to focus on complex structured finance products, using lower quality asset pools. Ironically, at the time of writing, it was apparently Lehman Brother's own book of structured products, involving protection sold, that eventually brought the firm down.

in October and November 2007 was unheard of among corporate bonds[27]. For these bonds, rating migration has followed a fairly stable distribution.

The massive wave of downgrades for basically all structured finance asset classes in the year 2008 has raised the question whether the methodologies used by the agencies were appropriate for such structures. We suspect that this is not the case. It is well known, that the tranching is very susceptible to the distributional assumptions describing the underlying pool of claims, in particular, asset correlations and the moments of the portfolio loss rate distribution[28].

Krahnen/Wilde (2008), in a numerical analysis, point out that AAA tranches and corporate bonds of the same rating quality possess very different sensitivities to a macro risk factor. Given the same default probability for tranches and bonds, e.g. 1 percent for a maturity of 10 years, their macro factor sensitivity differs considerably. It is much stronger for the tranche than for the bond. This is due to the strong diversification in AAA tranches making them much more sensitive to the macro-factor. This explains why tranche ratings are more sensitive to macro factor deteriorations than bonds. It is also well known among experts that an increase in correlation among underlying assets shifts potential default losses from the FLP to the AAA tranche. In contrast, a first order stochastic dominance deterioration of the loss rate distribution raises potential default losses of the FLP and the AAA-tranche.

Such differences in sensitivities between tranches and bonds were not widely known, and they were certainly not reported to the outside investor[29]. Even experts in the industry hardly saw any need to qualify the use of well-known bond ratings for assessing default risk of tranches from a securitization transaction, or to add caveats to their use as risk.

The strong impact of a first order stochastic dominance deterioration of the loss rate distribution on the default risk of an AAA-tranche is relevant for our analysis. This is because another, typically non-reported piece of information may have a strong impact on the portfolio loss rate expected by the market. This critical piece of information is the originator's recourse, or his retention of the FLP, because of its effect on incentives.[30] In this context it deserves mention that to date, despite all efforts by analysts and researchers, there exists no overview of equity piece allocation, perhaps

[27] Of the 198 AAA-rated tranches downgraded in this period, the median downgrade is reported to be 7 notches, while 30 tranches were downgraded by more than 10 notches. Looking at downgrade statistics from 1970 to today, AAA bonds wee never downgraded by more than 6 notches – and even these cases are extremely rare (p. 22).
[28] Krahnen/Wilde (2008), Franke/Hein (2008).
[29] Gibson (2004) presents a detailed description of the pooling and tranching methodology used by the major agencies.
[30] A more complete presentation of this argument will have to lay out the value enhancing effect of long-term relationships, accompanied by risk underwriting and, therefore, long-term incentive alignment concerning initial screening, intensive monitoring, and proper bail-out incentives (see Brunner/Krahnen 2008).

because financial institutions did not recognize yet the signalling potential a revelation of equity retention could have on the market[31].

Thus the retention decision is a necessary piece of information if one wishes to estimate the default risk of an asset portfolio and of securitization tranches. Rating agencies may have some knowledge about the whereabout of equity pieces, but they apparently have not made use of this information publicly.

Furthermore, it appears that the retention question was typically not discussed among model builders, as they probably felt it to be irrelevant for their estimations[32]. Since these models rely on historical loan portfolio data in validating ratings, and since on-balance sheet transactions were the norm before the advent of securitization, the models used by the agencies may fail to recognize the importance of first loss piece retention.

The issue of opaqueness of effective risk allocation has been addressed by several authors, e.g. Gorton (2008), and Brunnermeier (2008). These authors point at the complexity of the pooling and tranching methodology, and the difficulty to see through the many layers of CDOs, conduits and other financial institutions. However, they do not address the retention decision which we believe to be at the core of the problem. Note that opaqueness relating to the location of senior tranches, as mentioned by Gorton (2008), will have little, if anything, repercussion on the underlying asset value. Hence senior tranche opaqueness will have less dramatic consequences than opaqueness relating to junior tranches. Interestingly, it is apparently easier to obtain information on the allocation of senior tranches[33].

To summarize, we find transparency about financial assets, in particular, securitization tranches, to be quite limited, as investors typically relied on rating agencies when assessing the risk of individual instruments. Whether that it leads to a systematic underestimation of default risk, awaits empirical research. The issue of opacity was seriously discussed only after mid 2007, perhaps because at that

[31] On an ECB conference on statistics in 2006, the need of detailed information on equity piece allocation was discussed, and proposals for implementation were discussed as a novel idea, see Haensel/Krahnen/Wilde (2006).
[32] Despite many attempts by both authors to address this topic in workshops with practitioners, mostly financial engineers, and on industry gatherings since 2004, the question was never given a serious response, or debate. Another sign of complete negligence vis-à-vis the incentive issue relates to the technical manuals published by the rating agencies, explaining their modelling technique. While these manuals do not specify the exact details of the procedure, presumably to avoid exact replication by rivals and customers, we could not find any hint to the sort of retention-related agency problems we are addressing. See also Gorton (2008).
[33] See the table "Estimated holdings of AAA CDO tranches", p. 43 in Gorton (2008), which shows a breakdown of holdings by type of buyer. Similar tables for junior tranches do not exist.

point it became clear to many investors that the incentives in the underlying business were misaligned[34].

3.6.2 Transparency about counterparty risks

In 2008, several investment banks collapsed even though their tier 1 and tier 2 capital ratios were clearly above the levels required by Basel II. Speculative attacks by investor's short-selling stocks of these banks proved very profitable. Therefore in many countries short-selling was restricted. This raises the question why these banks apparently could not survive. Our explanation assumes a serious failure of transparency about counterparty risks. Even though banks publish quarterly reports, these reports do not present a clear picture of the overall risk position of these banks. Even fellow banks will find it hard to evaluate the risk position of their peers.

As an example, consider the value at risk-figures published by banks before the onset of the crisis. Typically, these numbers were quite small, relative to the write-downs required thereafter. A second indication is that the models used for the write-downs are not explained clearly. The series of additional write-downs shown by many financial institutions over the past 15 months may be caused by a fall of secondary market prices, but they may also be due to bank reporting policy, independent of market price movements. Third, banks are eager not to disclose their risk taking policy. This is probably motivated by the negative impact disclosure can have on the profitability of a particular trading strategy. Disclosure may furthermore increase the bank's vulnerability with respect to strategic attacks by investors. Fourth, banks can alter their risk position very quickly, using financial assets, in particular, financial derivatives. Since derivatives can be traded with little impact on liquidity, such transactions are particularly easy to carry out.

These arguments explain why bank risks may be difficult to evaluate from the outside. They also explain why risk reporting of banks is an important topic on the current policy agenda. The immediate implication of these problems is that it is very difficult to evaluate the counterparty risk implied by doing business with such banks. Another implication is that a bank cannot credibly invalidate adverse rumors about its solvency making it vulnerable to speculative attacks.

Here we see another private good, public bad problem. Bank managers consider information about bank risk as valuable private information and, therefore, are reluctant to disclose it to the public. At the same time, financial markets cannot work properly without sufficient information on bank risks. Hence this information has a public good character. By not disclosing this information, managers try to free ride on financial stability, i.e. they hope that they can extract all the benefits from trading in

[34] Ben Bernanke in a speech on the subprime lending market held on May 17, 2007, concluded: "In sum, some misalignment of incentives, together with a highly competitive lending environment and, perhaps, the fact that industry experience with subprime mortgage lending is relatively short, likely compromised the quality of underwriting."

financial markets without contributing the necessary ingredients to the functioning of financial markets.

3.7. Liquidity

The final arguments of the previous subsection are closely related to the loss in market liquidity which has been documented widely[35]. This liquidity loss is observed in financial asset markets as well in the interbank market. Looking at financial asset markets first, market micro-structure research has emphasized the importance of information on trading and pricing of financial assets. Glosten/Milgrom (1985), among others, has argued that transaction costs on asset markets, i.e. their degree of liquidity, is determined by the presence of informed traders. Their presence will force market makers to adjust the bid-ask spread upwards. Thus, the higher the likelihood to trade with an informed rather than with an uninformed trader, the higher must be the required spread in order for the market maker to break even. By setting a wide spread, the market maker effectively insures himself against a bad trade with an informed party.

By a similar argument, the bid price for an asset will be inversely related to the degree of asset opacity. The term opacity describes the extent to which a bidder, using available information, is able to asses the "true" cash flow expectation and the riskiness of an asset. Thus, the liquidity (or rather: illiquidity) of an asset can be related to its informational regime. As we have argued in the previous subsections, transparency about securitization tranches is impaired by a lack of information on the agency problems in the value chain, on the retention of the FLP, and on the quality and stability of ratings as the main providers of transparency. Apparently, before the onset of the crisis, this lack of information was not felt to be critical by investors. Suddenly, investors became aware of this problem leading to a collapse of asset market liquidity. Not surprisingly, the opacity in asset valuation translates into opacity of financial intermediaries trading asset risks (see also Adrian and Shin (2008)). Given this and the refusal of managers to provide reliable risk reporting, the interbank market was doomed to collapse as well.

We therefore believe that the liquidity loss in secondary markets for notes, bonds and commercial papers, as well as the shutdown of the interbank market is not a natural disaster, caused by a sudden decline of house prices in the US, nor is it the consequence of euphoria and fear in asset markets. Rather it is, at least in part, an implication of externalities imposed on financial market stability by those financial intermediaries that used securitization technology without regard to the stability of underlying asset quality.

[35] See Allen/Carletti (2008) and Brunnermeier (2008) on the enormous loss in liquidity, emanating from the CDO market and then spreading to neighbouring markets with similar opacity characteristics.

4. The future of securitization

4.1 Introduction

Taking a helicopter view of today's financial market turmoil, one is inevitably reminded of an old economic tale, the tragedy of the commons. Originally coined by Gerrit Hardin in his seminal paper in Science in 1968, the author recounts the age-old story of the demise of community graze land, open to all dwellers belonging to a township. The upshot is, of course, that individuals pursuing their self-interest may exert external effects in the form of overgrazing, ultimately destroying the common resource.

The crisis we now witness has some similar characteristics. Financial stability is a commons that is being undermined by overleveraging standard banking activities, by erosion of real estate loan quality, and by designing complex financial instruments, like CDOs, that eventually lost investor confidence. Market liquidity eroded to the point of complete market disruption, and prices fell to levels unimaginable at the time of issue.

Still, eyed from the helicopter, we now realize that misaligned incentives on the micro level, i.e. the pursuit of individual happiness on the firm level, can lead to complete opacity on the macro level, eliminating vital market functionalities, namely pricing efficiency, market depth and liquidity.

As usual, deficiencies on the micro-level are not universal. A large number of financial intermediaries retained a prudent policy over the last years. But others, including some large players, did not. This set off the infection which first hit these players, but then undermined the confidence in the financial system on a large scale with far-reaching contagion effects.

As we tried to show in the earlier sections of this paper, this crisis is a "rational crisis", it is not the result of irrational exuberance of any sort, nor is it the consequence of euphoria and fear, as some observers have argued (see Greenspan, FT 2008). We have identified weaknesses and violations of rules of prudent financial engineering that may be called the root cause of the immense degradation of asset value over the past 18 months. These violations have also contributed to the strong drying-up of market liquidity in several of the most popular financial instruments of the last decade, like CDOs, CPs, and ABS in general.

We have thus delivered a structural explanation of why the crisis was predictable, given the incentives of market participants, and given a set of inadequate "rules of the game" currently in place.

These constructional faults mainly refer to the design of securitization transactions, which in turn determine the subsequent decision making of banks, firms and households. Consider incentive compatible engineering. The tranching of asset portfolios, which is the key construction element of these transactions, did not (or not sufficiently) take into consideration the externality that a loan sale exerts on loan quality, both ex-ante and ex-post. Since incentive alignment can minimize this externality, one would have expected investors to ask for ample information describing incentive arrangements in these issues. But nothing of this sort happened; neither did the issuers inform the market, nor did the rating agencies address incentive compatibility publicly.

As a result, the market was flooded with financial instruments whose underlying quality was doomed to deteriorate over time. The degradation of asset quality came as a surprise to individual and institutional investors, whose trust in agency ratings was badly disappointed. Investors responded rationally by shutting down the market.

However, the question remains: why did financial engineers and managers pursue a strategy creating externalities in the first place? We have offered a view on this issue in the third chapter, but we acknowledge the existence of other explanations that produce similar predictions. Research may eventually tell the full story. One plausible explanation starts from an individual manager using securitization to maximize his wealth. The ensuing transfer of long-term assets from the balance sheet to investors in the market allows reaping almost risk free profits at the time of issue which, however, weakens long term incentives.

To see this consider a set of assets held on the balance sheet, and producing a stream of profits stretched out over time. The very same set of assets securitized and sold in the market will earn the originator an almost risk-free first profit position. If he fully sells the FLP, then the originator is left with a position which is almost equivalent to a gain on sale. Thus, securitization allows to frontend-load the transaction, while it would have produced more backend loaded profits if retained on the balance sheet.

Provided that bank management is incentivized by some profit sharing bonus, we predict bank managers to be interested in asset securitization simply because it may increase their income with no commensurate risk premium imposed – the risk in the form of increased default probabilities is mostly borne by shareholders and third parties in case of bank insolvency. In other words, the incentive to expand securitizations was upheld by the fact that the management payoff was cashed out as a bonus well before the externality was felt in the proftit/loss of the bank. In addition, profit sharing through bonus without malus invited a risk-increasing bank policy, since it allowed managers

to appropriate returns privately while the added risks were largely borne by shareholders and third parties. [36]

Who, then, is to blame? We claim that, apart from the lack of a malus, internal accounting rules for deriving bonus-profits were not designed for the 'hybrid' world of modern banking that emerged over the past 10 years. To date, there is no explicit accounting recognition of future losses and risks in profits and losses.

Thus, by marketing information-sensitive assets, financial intermediaries could realize and distribute profits that otherwise would accrue only later on, and only under favourable ('normal') circumstances. The preponement of earnings partially explains the enormous interest of investment bankers in these transactions – it also explains why such transactions simultaneously tended to undermine the real value of the underlying portfolios[37].

If we now turn to the policy options, we will take our structural explanation of the crisis as the basic building block from which to derive the policy options. Since we see negative externalities at work, there is indeed a case for policy intervention. The aim shall be to internalize, to the extent possible, the externalities found in these markets.

4.2. Securitization 2.0

If we go back a few years, we encounter another financial crisis that has shaped our understanding of equity markets. Around the year 2000, the so-called dotcom bubble, a drastic fall in stock prices of mostly young technology firms, wiped out the wealth of many equity investors. Preceding the crisis was a long and enormous rise in market valuation for high-tech firms, which eventually proved to be unsustainable. Of particular importance in these markets were web-oriented business models. With hindsight we know that many of these firms did not have a sustainable business model.

Only a few years later, the market is embracing a number of firms that are built on very similar web-based business models. These successful firms are said to cope much better with the difficulties of generating earnings in the otherwise free, open-access internet. These amended business models are often subsumed under the heading "Web 2.0", to indicate their advanced degree of sophistication (O'Reilly 2007). But in fact, the now-successful enterprises have profited from the dotcom bubble as an important learning experience.

[36] Of course, a malus can be imposed by giving the manager a share in the terminal value.
[37] Ralf Ewert alluded us to the Enron-Woldcom cases which display quite similar features, notably concerning the use of earnings preponement, see Benston/Hartgraves (2002).

In quite a similar fashion we expect securitization to face a strong future – after having digested the lessons from the current credit crisis. This is why we look for the minimum government intervention required to assure these lessons to have an effect in the markets. Our recommendations fall into three broad categories, which we refer to as incentive-related, information-related, and market infrastructure-related.

4.2.1 Retention and compensation

a) Retention

As we have explained in Section 3, the lack of public information about the status of incentive alignment along the securitization value chain is probably the single most important reason for the investor strike[38]. This insight, however, does not imply that the arrangers should be forced to retain a certain fraction of the issue as suggested by the European Union. It does not even imply that the arranger ought to retain any part of the issue as long as investors know it.

Rather, the analysis suggests that, for each issue, the market needs to know precisely who holds the first loss piece. Regardless of whether the investor is a monitoring specialist like the local commercial bank, or a banking amateur like a pension fund – once investors know the allocation of the first loss piece, they will be able to understand the risk implications. Thus, we claim that public information about incentive alignment by issuer will lead the market to sort it out, to establish different prices that reflect incentive alignment, or the lack thereof.

Once prices reflect individual qualities, opacity is diminished, as is necessary for liquid asset markets. Of course, with transparency on first loss piece holdings, arrangers will internalize effects of selling the equity piece, and we predict that substantial first loss piece retention will be the model of choice whenever the underlying assets are highly information-sensitive[39].

In practice, first loss piece retention alone will not be sufficient for 'comprehensive incentive alignment', as explained in Section 3.3.3. However, this information can be amended by a more comprehensive measure of incentive alignment throughout the securitization value chain. This statistic could be produced and continuously monitored by independent information providers, like auditing firms or rating agencies. Simultaneously, the market reaction to this information may be to induce the arranger to reshape the value chain so as to mitigate incentive problems. Thus, we may see some re-intermediation.

---

[38] The term 'investor strike' refers to the refusal by private and institutional investors, and by banks, to buy securitization tranches.

[39] Information-sensitive in this context refers to underlying assets that are prone to adverse selection and moral hazard.

The important innovation of our suggestion is that public information on incentive alignment obtains the prominence in the market that it deserves – and that is completely absent in ABS markets today. We are confident that the industry will quickly develop reasonable standards how to take the incentive issue seriously into consideration.

b) Compensation

In Section 3 we have argued that frontend-loading in securitization transactions is the reason why performance-oriented remuneration generates perverse incentives. Here, perverse means: without proper regard to the implications for the longer-term quality of the underlying assets. Compensation systems provide strong incentives for transactions which allow for large gains on sale, for example, through first profit positions[40] [41]. Risks imposed on others tend to be ignored. Moreover, the incentives of an annual bonus depend on bonus-profit accounting. If the profit in early years does not correctly anticipate losses and risks which may materialize in later periods only, then the present value of manager bonuses will be overstated. Finally, if the manager does not face a threat to risk taking through a malus, then we should not be surprised by very high bank leverage.

If one looks for remedies against departures from incentive compatible backend loaded compensation, we do not see much room for the regulator. The only instrument available to encourage incentive harmonization is, once again, transparency. Let investors know how deals are compensated for, and they will learn how to sort out the major incentive problems. Furthermore, once the market differentiates between deals according to their incentive design, there will be a competitive pressure in the financial industry to install appropriate compensation systems.

Once again, information providers like auditors and rating agencies are candidates for the task of producing information about compensation-related incentive alignment, regularly updating this information, and communicating it to the market. Rating agencies have demonstrated in the past that even coarse information systems, like bond rating schemes can fulfil this task quite well.

While we see a positive role for the regulator to get such a reporting system started, we see no role for him in the design of the compensation system.

4.2.2 Accounting and rating

[40] Also the accounting for retained tranches, in particular, the equity tranche, poses serious problems. These tranches are booked at fair values. Since there is no active market for these instruments, management has discretion to select a value. In effect, management can select, within certain boundaries, the size of the gain to be booked into the income statement, see for example Dechow/Myers/Shakespeare (2007) or Karaoglu (2005).

[41] There is some evidence in the empirical accounting literature that earnings management in gains-on-sale transactions is indeed an issue, see for instance Dechow/Shakespeare (2006).

In this subsection we discuss the information set required by the market to properly price structured financial instruments, like tranches in asset backed securities transactions. Prices should reflect the individual quality of the assets in order to avoid a pooling equilibrium, as we have witnessed throughout the past twelve months. In tune with what we have said in earlier sections in this paper, transparency in the market about complex products is deficient.

The main deficiency is the complete absence of information on incentive alignment. Again, for asset pricing this seems to be a required piece of information. Some associations, like the European Securitization Forum, have recently started an initiative to improve information availability. In this case, ESF has started to set up a webpage containing all descriptive data from the offering circular, along with further statistical and qualitative information provided by the issuer of a particular transaction.

While we appreciate the improved access to statistical data, particularly for research purposes, this is not the kind of transparency required to liquefy ABS markets. As we have argued in the subsection on transparency, the key providers of information to investors in these markets are rating agencies[42]. These institutions have a strong record of judging default risk of corporate bonds, but they were not adequately prepared to handle asset backed securities. The potential failure to properly account in the rating process for misaligned incentives in the underlying transactions design necessitates clarification.

Is regulation needed there? Yes, we see a positive role for regulation here, although perhaps very different from the policy recommendations vis-à-vis rating agencies we have seen to date. As explained above, we see the need for a separate report on the incentive status of ABS transactions, where the exact methodology still has to be developed. Agencies shall be free to develop their own methodology, just as they have done in the case of bond ratings. The rating process itself should therefore not be subject to regulatory oversight. What, however, a regulatory body could do is to take care of the measurement and publication of rating performance.

Rating performance refers to the validity of ratings assignments, i.e. the accuracy with which the default probability is measuring the default likelihood. There is a set of common accuracy statistics. In theory, accuracy determines the economic value of agency ratings. Solid rating performance requires a precise and long-lived data base of assigned ratings and of observed defaults and an independent body analysing the data. This also includes the difficult task of reliably estimating default correlations in asset portfolios, or, even more complicated, copula parameters. Otherwise,

[42] Rating information is widely known to be coarse and slow, but nevertheless relevant for remote investor. It is coarse and slow as it reports broad rating notches only, and does not provide continuous update.

tranching of portfolios cannot be viable. Today, investors rely on statistics produced by the agencies themselves, which may be biased due to conflicts of interest.

4.2.3 Reducing opacity: differential capital charges and comprehensive exposure survey

a) Differential capital charges

While the previous recommendations addressed opacity in incentives and asset quality, the following recommendations address opacity in banks and risk exposure of the banking sector. Perhaps the most basic insight of our analysis is that bank managers have strong incentives to hide information on financial assets and on the risks of their institutions. This leads to opacity on the macro-level and impairs liquidity of asset markets and of the interbank market, i.e. it generates strong negative externalities. Capital regulation can be used to encourage financial institutions to increase transparency. One way to achieve this is through capital charges that are inversely related to transparency, holding risk constant. Requiring banks to hold equity against opacity, in addition to holding capital against risk weighted assets, would be an innovation in capital regulation. It explicitly addresses incentive problems at the bank level through capital requirements. Note that such a regulatory extension need not imply an increase in overall capital charges. If, for example, an average capital charge of 8% is desired, the differential charges may range from 6% for wholly transparent, incentive-aligned banks to a charge of 10% for institutions with low transparency[43]. Differential charges signal to banks that more transparency pays off, stabilizing financial stability at the same time. We have no recommendation how to construct an opacity index for banks. This is not an easy job similar to the problems encountered in improving bank risk reporting.

b) Exposure survey

Another issue of transparency which we did not address so far is sector specific information, in particular information on the exposure of the banking sector to specific risks. A single bank may be strongly exposed to some risks, but that would not endanger financial stability when these risks materialize. If, however, the banking sector is strongly exposed, then these risks may easily drain out the interbank market and destabilize the system. Therefore, sector specific information can act as an early warning system making banks more careful taking those risks[44]. Central banks and supervisors should be able to map out the allocation and distribution of risk exposures in financial markets. This is clearly not the case today, and some research effort is needed to develop tools and concepts for drawing an international risk map.

[43] How to determine the incentive alignment score is still an open question; we do not go into any details here.
[44] It might also have the opposite effect if bank managers prefer to herd.

In many ways, this is what the BIS did over the past few years. No doubt, their reports will become more recognized after this crisis, as BIS has pointed at the weak sides of the once-celebrated risk transfer market as early as 2005. A comprehensive risk reporting and communication task has to look at the large global financial institutions, including those entities that so far have managed to stay outside the reporting obligations demanded by regulatory bodies, like hedge funds, or institutions domiciled in offshore financial centers. The comprehensive risk survey we are envisaging is a regular rather than a continuous exercise, with the objective of becoming an early warning system for market participants and regulators alike.

The early warning mechanism can be strengthened further by setting up an international credit register, aggregating liabilities on the debtor level, both nationally and internationally. If the scope of such a credit register is defined to encompass financial institutions as well, supervisors will have a data base to evaluate systemic risk for the first time[45].

4.3 Summing up

Building upon our analysis of how misaligned incentives on the bank level can bring down the entire financial market, provided many banks use a similar lending and funding technology, we propose five regulatory measures. The objective is the restructuring of the now defunct asset and the interbank market. These five rules of greater transparency and soundness are:

First, transparency with respect to tranche allocation in ABS transactions, especially concerning equity pieces, is required for all transactions.

Second, transparency about the use of frontend and backend loaded compensation systems, including a balance between bonus and malus components has to be achieved. For both transparency measures, a reporting methodology has to be developed, and rating agencies as well as auditors are seen as adequate intermediaries to perform this task.

Third, the information content of agency ratings for corporate bonds and for securitization tranches has to be validated by credible and independent institutions, such as supervisory bodies and auditors.

[45] There may also be indirect measures of systemic risk, like the correlations of bank stock prices with a market index, as suggested in Haensel/Krahnen/Wilde (2006).

Fourth, we propose opacity-related capital charges, in addition to risk-related charges for regulating banks. Again, the metric for capturing degrees of opacity still has to be developed – but we are confident that this will be possible.

Fifth, and last, risk exposures of financial institutions should be aggregated for reporting purposes across countries and over time, to convey a full picture of the sector exposure.

These "Five Rules of Greater Transparency and Soundness" fall behind many of the ambitious regulatory proposals that are discussed in the public domain today, at least if the severity of proposals is considered. However, we believe that many of these proposals go beyond what is required, thereby possibly degrading market functionalities, since the proposals are often not backed by theory or empirical research. An example is the request of the European Parliament forcing banks to retain 10% flat of every securitized transaction. The German government went even further demanding 20% retention on all asset backed securitizations. However, forced retention cannot be derived from theory. Conversely, the X%-retention rule actually invites banks to bypass the intentions of the recourse by gaming the loss rate distribution. The economically correct conclusion would be to force banks to disclose their retention decision.

In concluding we emphasize that there are currently two camps in the debate. One is stressing the hypothesis that the credit crisis we are witnessing is caused by an exogenous liquidity or solvency shock, with prices diverging from fundamental values, and limits-to-arbitrage arguments are employed to rationalize the enduring fall in price. In contrast, the second group in this debate claims that the credit crisis is all about incentives, or rather misaligned incentives and ensuing intransparency. Our paper clearly belongs to the second camp. Whatever the correct analysis, the legislator should wait for a better understanding of the credit crisis before taking significant regulatory action.

References

Adrian, T. and H. S. Shin (2007), Liquidity and Leverage. Discussion paper, Princeton.

Allen, F. and D. Gale (2007). Understanding financial crises, Oxford University Press.

Allen, F. and E. Carletti (2008). The role of liquidity in financial crises, 2008 Jackson Hole Symposium.

Andrews, E. L. (2007). Fed shrugged as subprime crisis spread, New York Times, December 18, 2007. also available at http://www.nytimes.com/2007/12/18/business/18subprime.html.

Arrow, K. J. (1971). Control in large organizations: Essays in the theory of risk-bearing, Markham Publishing Co.

Arrow, K. J. (1974). Optimal insurance and generalized deductibles, Scand. Act. J. 1, 1-42.

Ashcraft, A. B. and T. Schuermann (2007). Understanding the securitization of subprime mortgage credit, Federal Reserve Bank of New York.

Bank for International Settlements (2008). Credit risk transfer - developments from 2005 to 2007.

Bank of England (2008). Financial Stability Report 23.

Barrett, R. and J. Ewan (2006). BBA Credit Derivatives Report 2006, Credit derivatives report, British Bankers' Association.

Benston, G. J. and Al L. Hartgraves (2002). Enron: what happened and what we can learn from it, Journal of Accounting and Public Policy 21 (2002) 105-127.

Bernanke, B. S. (2007). The Subprime Mortgage Market, speech delivered at the Federal Reserve Bank of Chicago's 43rd Annual Conference on Bank Structure and Competition, Chicago, May 17, 2007 at www.federalreserve.gov/boarddocs/speeches/2007/20070517/default.htm.

Blume, M. E., F. Lim and A. C. McKinlay (1998). The declining credit quality of U.S. corporate debt: Myth or reality?, Journal of Finance 53, 1389-1413.

Boot, A. W. A., T. T. Milbourn and A. Schmeits (2006). Credit ratings as coordination mechanisms, Review of Financial Studies 19 (1), 81-118.

Borch, K. (1960). The safety loading of reinsurance premiums, Scandinavisk Aktuarietskrift 43, 163-184.

Brunner, A. and J. P. Krahnen (2008). Multiple lenders and corporate distress: Evidence on debt restructuring, Review of Economic Studies 75 (2), 415-442.

Brunnermeier, M. (2008). Deciphering the 2007-08 liquidity and credit crunch, Journal of Economic Perspectives, forthcoming.

Cebenoyan, A. S. and P. E. Strahan (2004). Risk management, capital structure and lending at banks, Journal of Banking and Finance 28, 19-43.

Coates, J. C. (2007). The goals and promise of the Sarbanes-Oxley Act, Journal of Economic Perspectives 21 (1), 91-116.

Coles, J. L., N. D. Daniel and L. Naveen (2006). Managerial incentives and risk taking, Journal of Financial Economics 79, 431–468.

Dechow, P. M. and C. Shakespeare (2006). Do managers Time Securitization Transactions to Obtain Accounting Benefits?, Working Paper, 1-47.

Dechow, P. M., L. A. Myers and C. Shakespeare (2007). Fair Value Accounting and Gains from Asset Securitizations: A Convenient Earnings Management Tool with Compensation Side-Benefits, Working Paper, 1.-44.

DeMarzo, P. and D. Duffie (1997). A Liquidity-Based Model of Security Design, Working Paper.

DeMarzo, P. (2005). The pooling and tranching of securities: A model of informed intermediation, Review of Financial Studies 18, 1-35.

Doherty, N. A. and K. Smetters (2005). Moral Hazard in reinsurance markets, Journal of Risk and Insurance 72 (3), 375-391.

Financial Stability Forum (2008). Report of the Financial Stability Forum on enhancing market and institutional resilience.

Franke, G. and J. P. Krahnen (2006). Default risk sharing between banks and markets: the contribution of collateralized debt obligations, in: The Risks of Financial Institutions, ed. by M. Carey and R. Stulz (NBER-book), 603-634.

Franke, G., M. Herrmann and T. Weber (2007). Information asymmetries and securitization design, Working Paper, University of Konstanz.

Franke, G. and J. Hein (2008). Securitization of Mezzanine Capital in Germany. Financial Markets and Portfolio Management 22, 219-240.

Gibson, M. (2004). Understanding the risk of synthetic CDOs, Finance and Economics Discussion Series, Federal Reserve Board.

Glosten, L. and P. Milgrom (1985). Bid, ask, and transaction prices in a specialist market with heterogeneously informed agents, Journal of Financial Economics 14 (1), 71-100.

Gollier, C. and H. Schlesinger, (1996). Arrow's Theorem on the optimality of deductibles: A stochastic dominance approach, Economic Theory 7, 359-363.

Goodhart, C. and A. Persaud (2008a). How to avoid the next crash, Financial Times, 20 January.

Goodhart, C. and A. Persaud (2008b). A party pooper´s guide to financial stability, Financial Times, 4 June.

Gorton, G. (2008). The panic of 2007, 2008 Jackson Hole Symposium.

Greenbaum, S. and A. Thakor (1987). Bank funding modes, Journal of Banking and Finance 11, 379-401.

Greenspan, A. (2008). We will never have a perfect model of risk, Financial Times, 16 March, also available at http://www.ft.com/cms/s/0/edbdbcf6-f360-11dc-b6bc-0000779fd2ac.html?nclick check=1.

Haensel, D. and J. P. Krahnen (2007). Does credit securitization reduce bank risk? Evidence from the European CDO market, Working Paper, Goethe-University Frankfurt.

Haensel, D., Krahnen, J.P. and C. Wilde (2006). Monitoring risk transfer in capital markets: statistical implications, commissioned paper for the Third ECB Conference on Statistics: Financial Statistics for a Global Economy, Frankfurt.

Hardin, G. (1968). The tragedy of the Commons, Science 162, 1243.

Hodder, J. and J. Jackwerth (2007), Incentive Contracts and Hedge Fund Management, Journal of Financial and Quantitative Analysis 42, 811-826.

Instefjord, N. (2005). Risk and hedging: Do credit derivatives increase bank risk?, Journal of Banking and Finance 29, 333-345.

Jin, L. (2002). CEO compensation, diversification, and incentives, Journal of Financial Economics 66, 29-63.

Karaoglu, N. E. (2005). Regulatory Capital and Earnings Management in Banks: The Case of Loan Sales and Securitizations, Federal Deposit Insurance Corporation Center for Financial Research Working Paper No. 2005-05.

Kashyap, A. K., R. G. Rajan and J. C. Stein (2008). Rethinking capital regulation, Conference Draft.

Keys, B. J., T. Mukherjee, A. Seru and V. Vig (2008). Securitization and screening: Evidence from subprime mortgage backed securities, Working Paper, London Business School.

Kisgen, D. J. (2006). Credit ratings and capital structure, Journal of Finance 61 (3), 1035-1072.

Kopf, E.W. (1929). Notes on the Origin and Development of Reinsurance, Proceedings of the Casualty Actuarial Society 16, 33-34.

Krahnen, J. P. and C. Wilde (2008). Risk Transfer with CDOs, Working Paper, Goethe-University Frankfurt.

Lewellen, K. (2006). Financing decisions when managers are risk averse, Journal of Financial Economics 82 (3), 551-589.

Millon, M. and A. Thakor (1985). Moral hazard and information sharing: A model of financial information gathering agencies, The Journal of Finance, 40(5), 1403-1422.

Minton, B., R. Stulz and R. Williamson (2005). How much do banks use credit derivatives to reduce risk?, Working Paper, Ohio State University.

Ongena, S. and D. C. Smith (2000). The duration of bank relationships, Journal of Financial Economics 61 (2001) 449-475.

O'Reilly, T. (2007). What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software, Communications & Strategies, No. 65, 1-35.

Plantin, G. (2003). Tranching, Working Paper, London School of Economics.

Purnanandam, A. (2008). Originate-to-distribute model and the sub-prime mortgage crisis, University of Michigan.

Reinhart, C. and K. Rogoff (2008). Is the 2007 US-Sub-Prime Crisis So Different? An International Historical Perspective, American Economic Review 98, 339-344.

Riddiough, T. and R. Chiang (2003). Commerical mortgage-backed securities: An exploration into agency, innovation, information, and learning in financial markets, Working Paper, University of Wisconsin.

Ross, S. A. (2004). Compensation, incentives, and the duality of risk aversion and riskiness, Journal of Finance 59 (1), 207-225.

Ross, S.A. (1989). Institutional Markets, financial marketing, and financial innovation, Journal of Finance 44 (3), 541-556.

Appendix

Managers have more decision parameters than just loan quality and leverage. They can effectively design loans to shift hazard rates from the early to the late years so as to mitigate the adverse effects of getting fired. One method is to extend loans in case of financial distress of the debtor so that the loan does not become delinquent or does not go into default. Alternatively, in the subprime crisis, many loans granted were sweetened with teaser rates. In the first one or two years, debtors are charged low interest rates and subsequently there is a strong step up in interest rates. The effect is not only to provide debtors some relief in the first periods, but also to shift the hazard rates of the loans from early to late years.

Consider, for example, standard BB+-loans with a default probability of 10.7% over 7 years. The hazard rate of such loans is basically constant over the 7 years, about 1,6%. Hence the expected profit from granting such loans is almost constant over time. If the credit spread for these loans is 3%, then the expected profit in the first year would be 3 - 1.6 * 0.6 = $2.04 million, in the last year $2.04 * 0.984^6$ = $1.85 million. Hence the expected profit declines only by 1.6% per year.

Now consider loans with teaser rates such that in the first two years debtors only need to pay the risk free rate but later on there is an annual step up in the interest rate such that the average credit spread over the 7 years equals 3.15%. Hence the annual step up in the interest rate after the second year is 1.47%. Critical is how the teaser rates change the hazard rates. To simplify things, suppose that the hazard rate is 0.3% in the first two years, and then increases annually with 0.6% implying a cumulative probability of default over 7 years of 10.6%. This figure is slightly below the 10.7% in the standard case.

Regarding manager incentives, it is critical how the annual profit for the bonus is determined. One possibility would be to derive in each year the profit as the earned credit spread minus default losses. But this would imply losses in the first two years because the credit spread is zero. The manager would presumably object to this bonus system. Therefore we look at a bonus system in which in each year the profit is defined as the average credit spread of 3.15% on non-defaulted loans minus default losses. Then the expected profit equals 3.15- 0.3 * 0.6 = $2.97 million in the first year and in the seventh year $(1\text{-}PD_6)$ * (3.15 - 3.3 0.6) = (1-0.0757) * (3.15 - 3.3 0.6) = $1.08 million.

Relative to the standard BB+-portfolio the expected profit in the first year increases from 2.04 to $2.97 million. Hence the manager's income-certainty equivalent in the first year increases by more than her participation rate times the difference in expected profits. In the last year, the expected profit declines from $1.85 to $1.08 million, in addition, the profit risk is much higher since the

hazard rate increases from 1.6 to 3.3%. Therefore, manager income-certainty equivalent in the last year declines by more than her participation rate times the difference in expected profits. As a consequence, with teaser rates the manager earns most of the bonus in the first years.

This example serves to emphasize two aspects. First, the effects of the incentive system depend on the accounting rules for the bonus-profits. If, as in the example, profits are artificially shifted from the late to the early years, then this tends to shift manager income-certainty equivalents to the early years. For a medium-term oriented manager this creates an incentive to take more risk given nonnegative bonus payments only. It also postpones the danger of being fired once a certain level of default losses is realized. Second, given the bonus system, the effectiveness of the bonus system depends on manager policy. Often the manager has many different policy variables which enable her to undermine the effectiveness of the incentive system as intended by shareholders.

CFS Working Paper Series:

No.	Author(s)	Title
2008/30	**Karin Assenmacher-Wesche** **Stefan Gerlach**	Financial Structure and the Impact of Monetary Policy on Asset Prices
2008/29	**Tobias J. Cwik** **Gernot J. Müller** **Maik H. Wolters**	Does Trade Integration Alter Monetary Integration
2008/28	**Nikolas Hautsch** **Dieter Hess** **Christoph Müller**	Price Adjustment to News with Uncertain Precision
2008/27	**Francis X. Diebold** **Canlin Li** **Vivian Z. Yue**	Global Yield Curve Dynamics and Interactions: A Dynamic Nelson-Siegel Approach
2008/26	**Francis X. Diebold** **Kamil Yilmaz**	Measuring Financial Asset Return and Volatilty Spillovers, with Application to Global Equity Markets
2008/25	**Günter W. Beck** **Volker Wieland**	Central Bank Misperceptions and the Role of Money in Interest Rate Rules
2008/24	**Christos Koulovatianos** **Carsten Schröder** **Ulrich Schmidt**	Confronting the Robinson Crusoe paradigm with household-size heterogeneity
2008/23	**Jin Cao** **Gerhard Illing**	Endogenous Systemic Liquidity Risk
2008/22	**Zeno Enders** **Gernot J. Müller** **Almut Scholl**	How do Fiscal and Technology Shocks affect Real Exchange Rates? New Evidence for the United States
2008/21	**Miriam Sperl**	Quantifying the Efficiency of the Xetra LOB Market. A Detailed Recipe

Copies of working papers can be downloaded at http://www.ifk-cfs.de