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Securitization, Connectedness and Shadow Banking

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Abstract

This paper shows how securitization changes the linkages and the systemic risks in the regulated and unregulated "shadow" banking system. The theoretical framework includes an analysis of the transfer of idiosyncratic, systematic and systemic risks and the use of the proceeds from the transfer. The incentives of regulated banks to securitize and transfer risks to the shadow banking system and the implications for financial stability are discussed. The empirical analysis shows that securitization is associated with (i) increased connectedness of banks and (ii) increased systemic risk exposure of banks. Both the theoretical and the empirical analysis identify decreased risks on average but increased systemic risks that are most likely hidden and falsely interpreted as resilience. The results suggest that more research on the size and the risks of the shadow banking system is warranted.

1 Introduction

The "shadow" banking system poses a potential risk to the stability of the financial system since it is opaque and regulatory authorities do not know precisely how large the shadow banking system (SBS) actually is (e.g. see Bundesbank, 2014, ECB, 2012, Financial Stability Board, 2014a). Moreover, it is not clear how the shadow banking system is linked to the regulated banking system both in normal times and in periods of turmoil and financial instability. Securitization of loans in the regulated banking system and the risk transfer to the unregulated, shadow banking system creates or increases linkages between the two systems (e.g. Pozsar and Singh, 2011) which can increase the risks in the entire system.

A recent paper (Acharya et al. 2013), however, suggests that securitization did not always lead to a risk transfer. In contrast, securitization led to more risk and concentration of risk. The authors also show that financial regulation incentivized regulatory arbitrage and thus securitization. An alternative view is that securitization is not initiated by the regulated banking sector but by the shadow banking system which demanded securitized "safe" assets (e.g. Gennaioli et al., 2013 and Gorton and Metrick, 2010).

We first show theoretically that diversification of risks within the regulated banking system leads to increased connectedness of banks which reduce the benefits of both diversification and risk transfer. Hence, diversification of and the transfer of risks outside the regulated banking system appears to be a superior alternative. Indeed, if the risks are transferred to outside market participants that are not (yet) connected to the banking system, the banking system may be more stable. However, this perspective with a focus on the overall stability of the banking system does not explain why individual banks transferred the risks to entities outside the regulated banking system. The demand for securitized "safe" assets (see Gorton and Metrick, 2010) suggests that the entities in the shadow banking system were willing to pay more for the securitized assets than the regulated banking system. Regulatory arbitrage further incentivized banks to diversify and transfer the risks outside the regulated banking system (Acharya et al. 2013).

Whilst the diversification of risks among a larger group of entities including the shadow banking system appears to be a dominant strategy both for individual banks and from a macro perspective, it is arguably more difficult to monitor and control such a larger system. This is particularly true if the risks are (deliberately) hidden, if there are concentrations of risk, or if the interactions of risks with other risk factors are hidden and not well understood.

We use a theoretical framework to describe the dynamics in the financial system associated with securitization, diversification and the transfer of risk. We distinguish between idiosyncratic, systematic and systemic risk transfers and show that the type of risk that is transferred has fundamental implications for the overall risk in the system .

Furthermore, we discuss the question if two banking systems with the major difference that one system is regulated and partially protected by the state and the other system is not regulated can co-exist and neither system does jeopardize the stability of the other or the entire financial system.

The empirical analysis is based on the most active banks and financial institutions in securitizations and thus the issuance of asset-backed securities (ABS), mortgage-backed securities (MBS) and covered bonds (CB) over the last 25 years. We find that securitization is associated with the increased connectedness of regulated banks and of regulated banks with the unregulated "shadow" banking system. Moreover, we find clear differences among banks and the influence of securitizations through the sale of ABS, MBS and CBs. Finally, securitizations influence systemic risks measured through co-exceedances of bank equity returns. MBS tend to increase systemic risks whilst ABS tend to decrease them.

The paper is structured as follows. Section I theoretically analyzes the implications of securitization and risk transfer on the regulated and unregulated "shadow" banking system. The analysis distinguishes between idiosyncratic, systematic and systemic risk transfer within the regulated banking system and to the unregulated banking system. Section II presents an empirical analysis of the banks that were most active in the securitization of loans especially prior to the global financial crisis in 2008. Section III summarizes the main findings and provides concluding remarks.

2 Theoretical Background

In this section we describe the effects of securitization with and without risk transfer for two banks within the regulated banking system and then extend the example to the shadow banking system with one bank in the regulated banking system and one "bank" or financial institution in the shadow banking system. We first follow Baur and Joossens (2006) but update and extend their modelling framework significantly.

2.1 Banks contract and share risks

Assume that there are two banks A and B that face default if all assets are lost with a probability of p=0.1. The two banks and their losses are assumed to be independent of each other. The possible losses and probabilities are presented in Table A below.

Table A: Two banks with no linkage

		Loss B	
		0	**100**
Loss A	**0**	0.9^2	0.1·0.9
	100	0.1·0.9	0.1^2

If bank A and B transfer risk to each other and thus share risks, they create a link and become endogenously connected represented by the correlation coefficient ρ. The effects are presented in Table B for the case that both bank A and B transfer 50% of their assets to the other bank. Hence, if bank A suffers a loss of 100 that would have led to a default of bank A without risk sharing, the loss is shared among both banks A and B leading to a loss of 50 for bank A and a loss of 50 for bank B. The probability of this event is given by 0.1·0.9 (1-ρ). Since bank B also transfers 50% of its potential losses to bank A, the case (50, 50) occurs with probability 2·0.1·0.9 (1-ρ). The risk transfer implies a positive correlation ρ since any loss that occurs at either bank A or B is a joint event and not independent as assumed in Table A.

Table B: Two banks with risk sharing and linkage

		Loss B		
		0	**50**	**100**
Loss A	**0**	$0.9^2 + \rho \cdot 0.1 \cdot 0.9$		
	50		$2 \cdot 0.1 \cdot 0.9\ (1-\rho)$	
	100			$0.1^2 + \rho \cdot 0.1 \cdot 0.9$

Note that for $\rho=0$, the joint probabilities of "no default" and "default" do not change. However, the events (0/ 100) and (100/ 0) in Table 1 are transformed into (50, 50) in Table B. For $\rho > 0$, the probabilities of the extreme cases (no default and joint default) increase whilst the probability of the "intermediate" case (50/ 50) decreases. For high linkages between bank A and B and $\rho = 1$ the "intermediate" scenario even disappears and there are only two "extreme" events with a positive probability, the events (0/ 0) and (100/ 100). The increasing linkages essentially increase the probability mass of the events "no loss" and "joint losses". Note that the correlations are endogenous in the sense that they are the result of the diversification and the transfer of risks.

In a next step, we assume that banks A and B do not symmetrically share the losses but that only bank A transfers some of its risks to bank B. If we assume that a bank only defaults if it loses more than 50% of its assets, the assumptions shown in Table C would lead to the default of only one bank (bank B) even in extreme events with low probability for the loss pair (50/ 150). In other words, the systemic risk of a joint default is reduced through the risk transfer from bank A to bank B.

Table C: Two banks with asymmetric risk sharing

		Loss B		
		0	**75**	**150**
Loss A	**0**	$0.9^2 + \rho \cdot 0.1 \cdot 0.9$		
	25		$2 \cdot 0.1 \cdot 0.9\ (1-\rho)$	
	50			$0.1^2 + \rho \cdot 0.1 \cdot 0.9$

One crucial assumption that will play an important role below is that bank A is not reinvesting the proceeds of the risk transfer, i.e. from the sale of its assets. If we relax this strong assumption and assume that bank A reinvested the proceeds, the potential losses of bank A would change from the set (0; 25; 50) to (0; 50; 100). The aggregate losses could increase and the correlations between the two banks could also increase if they both invested in the same asset (e.g. an asset-backed security) and thus were exposed to the same risk factors.

2.2 Introduction of the shadow banking system

We now make a fundamental change to the modelling framework and assume that there is a large bank A which is part of the regulated banking sector and the shadow banking system which is substituted for bank B in the previous examples. If bank A transfers 50% of its assets and thus risks to the shadow banking system, the outcomes can be displayed as in Table D. Table D assumes for simplicity that the shadow banking system carries no prior or additional risks.

Table D: Bank A transfers 50% of its risks to the Shadow Banking System

		Loss Shadow Banking System (SBS)		
		0	**25**	**50**
Loss A	**0**	$0.9^2 + \rho \cdot 0.1 \cdot 0.9$		
	25		$2 \cdot 0.1 \cdot 0.9\ (1-\rho)$	
	50			$0.1^2 + \rho \cdot 0.1 \cdot 0.9$

Table D shows that the aggregate losses of the SBS are given by losses of bank A (25 or 50) depend on the risk transfer to the SBS. Since bank A transfers 50% of its assets to a system and not a single financial intermediary, it is possible that the aggregate risks are smaller because the risks are shared within the system consisting of many different entities with ideally low concentrations of risks. Hence, the aggregate losses will be lower. More formally, this could be expressed by a variable c that is subtracted from the potential losses of the SBS, e.g. (25 – c) and (50 – c). If there are significant concentrations of risk with additional side effects this could be modelled with a negative c. In other words, the risk-sharing and risk-bearing capacity of a system represented by the SBS is potentially larger than that of a single bank which makes the entire system comprised of a regulated bank and the shadow banking system more stable, at least theoretically. However, the loss probabilities, again, depend on the linkages between bank A and the shadow banking system. If both bank A and the SBS depend on the same risk factors, ρ can be high and close to one which increases the likelihood of extreme events. Since there is also a high probability of no losses, especially for ρ equal to one or close to one, the system may appear stable even though the probability of an extreme negative event is significantly higher compared to a case in which there are no linkages between the entities of the two systems, i.e. the regulated banking system represented by bank A and the SBS. It is, of course, also possible that the risk transfer from bank A to the SBS does not increase the correlations due to the larger number of entities making up the SBS and less risk concentration in the SBS. An interesting case is obtained for negative correlations ρ. A negative ρ decreases the probabilities of the extreme scenarios including the extreme loss event and increases the probabilities of the intermediate loss cases. This probability shift could be beneficial for regulatory authorities and ultimately financial stability as it would not indicate a false resilience covering increased systemic risks. In this case, risk transfer could be more efficient from a macro perspective. The risk transfer can also be more efficient from an individual bank's perspective as the SBS generally pays more for securitized "riskless" assets and thus makes risk transfer more profitable for the regulated banks. It is important to note that there are two different views on the incentives for securitization of regulated banks. Gennaioli et al. (2013) argue that securitization is driven by the demand for "riskless" assets of the SBS (see also Gorton and Metrick, 2012) whilst

Acharya et al. (2013) argue that regulatory arbitrage of the regulated banks is driving securitization. Hence, the former assumes that securitization is essentially caused by the SBS whilst the latter assumes that securitization is initiated and thus caused by the regulated banking system. It is noteworthy, however, that both views can co-exist establishing bidirectional causality.

2.3 Introduction of the shadow banking system

Table D implicitly assumes that bank A is not reinvesting the proceeds from the sale of its assets to the SBS. If we assume that bank A is investing the proceeds in the market, the potential losses of bank A would exceed 50 and the correlations between bank A and the SBS increased if they invested in the same assets. The loss probabilities would also be different depending on the type of assets that are sold by bank A to the SBS. If bank A sold an asset similar to a "senior loss piece", i.e. an asset with a low probability of default but if it kept the most risky part of the assets, the extreme events could become more severe in terms of the magnitude of the losses whilst the probabilities for such extreme events would remain low. Table F presents such a case in which bank A only sells assets with a low probability of default, i.e. bank A transfers systemic risks, and keeps the assets with a higher probability of default, i.e. bank A keeps idiosyncratic risks.[1]

Table E: Systemic risk transfer without reinvestment

		Loss Shadow Banking System		
		0	**0**	**50**
Loss A	**0**	$0.9^2 + \rho \cdot 0.1 \cdot 0.9$		
	50		$2 \cdot 0.1 \cdot 0.9\ (1-\rho)$	
	0			$0.1^2 + \rho \cdot 0.1 \cdot 0.9$

If we assume that bank A's idiosyncratic risk is also transferred to the SBS and reinvested in systemic risks the potential losses for bank A would be 50 with low probability 0.12 + $\rho \cdot 0.1 \cdot 0.9$ and the losses for the SBS would be 50 with (intermediate) probability $2 \cdot 0.1$ 0.9 $(1-\rho)$. The set of losses for bank A and the SBS would change from (0; 50; 0) and (0; 0; 50) to (0; 0; 50) and (0; 50; 50), respectively. This scenario illustrates how the transfer of idiosyncratic risks (e.g. the sale of loan portfolios with a relatively high risk of default) and the reinvestment in systemic risks (e.g. in senior loss tranches of securitized assets) can increase both the probability and the severity of losses. More specifically, the severity of the losses could increase from 100 to 150.

An alternative scenario with a similar outcome is a process of continued origination of loans with idiosyncratic and systematic risks. This process would lead to a diversified portfolio of idiosyncratic risks with no exposure to idiosyncratic risks but full exposure to systematic risk. Since systematic risk includes systemic risks (see also Das and Uppal, 2004) , such a system of diversification would also lead to increased systemic risks with no idiosyncratic risks. Interestingly, this result is independent of the transfer of systemic risks during the origination of idiosyncratic risks. In other words, diversification through

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[1] Gennaioli et al. (2013) assume that the banks sell idiosyncratic risks.

the securitization of idiosyncratic risks transfers risks from a high-frequency/ low-severity event to a low-frequency/ high-severity event.

Note that the transfer of idiosyncratic risk per se does not necessarily enhance the resiliency and stability of the financial system but rather provides the transferring institution with incentives or signals that are potentially detrimental to financial stability. First, if the proceeds of the transfer are reinvested, the risk increases due to the increased linkages and thus probabilities of joint losses. Only if the risk is transferred to relatively unconnected market participants without significantly changing the connectedness the risk sharing can enhance financial stability.

Finally, Acharya et al. (2013) show that many banks did not transfer the (idiosyncratic) risks but instead kept the risks through guarantees and reinvested the proceeds of the sale into risky assets "leveraging up" and increasing their systematic and ultimately systemic exposure to risks. These effects are presented in Table F.

Table F: Sale of assets without risk transfer and reinvestment of proceeds

		Loss Shadow Banking System		
		0	**0**	**(50)**
Loss A	**0**	$0.9^2 + \rho \cdot 0.1 \cdot 0.9$		
	0		$2 \cdot 0.1 \cdot 0.9\ (1-\rho)$	
	100 + (50)			$0.1^2 + \rho \cdot 0.1 \cdot 0.9$

Table F shows the increase of potential losses if bank A leverages its systematic exposure through an investment of the proceeds of securitization (50) without the actual transfer of risk. The potential loss in the SBS is displayed in parenthesis to indicate that any loss is fully borne by bank A. Hence, the table aims to illustrate that bank A borrows from the SBS (50) using securitized assets as collateral without any true risk transfer implying a potential loss of 150 for bank A. Note that the table could also be expressed using only bank A with a no loss event with probability 0.92 + 0.1·0.9 and a loss event with probability 0.12 + 0.1·0.9.

Greenwood et al. (2014) describe an alternative propagation channel that involves fire sales. Fire sales can depress prices and contaminate seemingly unrelated assets and seemingly unrelated institutions. In the words by Shleifer and Vishny (2011): "A bank that simply suffers large losses may be forced to reduce its risk by selling assets at distressed or fire-sale prices. If other banks must revalue their assets at these temporarily low market values, the first sale can set off a cascade of fire sales that inflicts losses on many institutions. Thus, whether through defaults or fire sales, one troubled bank can damage many others, reducing the financial system's capacity to bear risk and make loans." Fire sales are not a specific problem of the SBS but are more likely to occur in the SBS due to its reliance on the repo market (e.g. see Gorton, 2009). Hanson et al. (2015) summarize the difference as follows: "traditional banks have a stable source of funding, while shadow banks are subject to runs and fire-sale losses." Fire sales also explain why securitization without actual risk transfer can lead to a systemic crisis similar to the one experienced in late 2008 with the collapse of Lehman Brothers.

Table F is silent about the potential losses of the SBS due to fire sales caused by large losses of bank A. To some degree this reflects the situation prior to the global financial crisis in which risks seemed to be fully diversified and generally low. It is well possible that some types of risk transfers or the implicit guarantees extended by the originators of the loans were not known, opaque or "neglected". In that case Table F may have (misleadingly) resembled Table D where risks are seemingly diversified and shared.

To conclude, the transfer of risk is not the problem per se but the linkages created by the transfer of risk and the reinvestment of the proceeds. The increased linkages and reinvestments raise the overall risks in the entire financial system, the probability and the severity of extreme losses. A key to a more stable and truly resilient system is a system with less diversification and thus lower linkages since for very high linkages the system appears stable but in fact only hides the extreme risks.

3 Hypotheses and empirical implications

The theoretical description of the effects of securitization and risk transfer shows that the linkages of the involved entities increase with securitizations, that the exposure to systematic risk increases if idiosyncratic risks are sold, diversified away or if the proceeds from a risk transfer are invested in assets with systematic risk exposure and that systemic risks increase with securitizations. Given these three theoretical implications, we can derive three hypotheses that can be tested empirically.

H1: Securitization increases the linkages among banks

H2: Securitization increases the exposure of banks to systematic risks

H3: Securitization increases systemic risks

Hypothesis 1 aims to test the influence of securitizations on the linkages among banks. As a measure for linkages we use the cross-sectional dispersion of bank equity returns as it is an instantaneous measure and can be calculated for each month and for all banks. In a market model framework increased correlations imply similar and thus less dispersed returns, i.e. a bank beta closer to one. The econometric model is based on the cross-sectional dispersion of bank returns (disp) and the relationship to the issuances of securitized assets.

$$disp_t = \beta\, disp_{t-1} + \Sigma_i\, \gamma_i \log Issuance_{i,t} + \varepsilon_t \qquad (1)$$

where *log Issuance* is the aggregate issuance of securitization type ABS (i=1), MBS (i=2) and CB (i=3) for each month *t*. The error term ε includes the dispersion of bank return that is not explained by its own lag and the log issuances. If securitization and thus the issuance of asset-backed securities indeed increases the linkages (and decreases the dispersion of returns) among banks or financial institutions in general, the coefficient for the issuance type is expected to be negative, i.e. H_0: $\gamma_i < 0$. Since there are significant qualitative differences between ABS, MBS and CB issuances, we expect different results for the hypothesis tests based on γ_i.

Hypothesis 2 tests if the banks' exposure to systematic risk increases with securitization. The econometric model is given by equation (2) as follows:

$$rm_t = \beta\, rmW_t + \Sigma_i\, \delta_i\, rmW_t \log Issuance_{i,t} + \varepsilon_t \qquad (2)$$

where *rm* is the average bank return and *rmW* is the global market return. If securitizations increase systematic risk exposure proxied by *rmW* and measured by β the interaction term of the market return with the log issuances should have a positive impact on the returns of banks. Hence, the formal hypothesis test is H_0: $\delta_i > 0$. Equation 2 can also be used to test if the aggregate and outstanding issuances have an influence on the returns of the banks if the second term is not an interaction variable but only includes the log issuances.

Finally, hypothesis 3 focuses on systemic risks using co-exceedances.[2] We calculate the exceedance for each bank and time *t* below a certain threshold τ and obtain a time-series of co-exceedances denoted by Φ.[3] If the number of co-exceedances increases with the aggregate securitization activities of banks, there is evidence of increased systemic risk, i.e. extreme joint co-movements of banks' equity returns. The econometric model is given by equation (3) below.

$$\Phi(\tau)_t = \beta rm_t + \Sigma_i \gamma_i \log \text{Issuance}_{i,t} + \varepsilon_t \quad (3)$$

where $\Phi(\tau)_t$ is the co-exceedance conditional on a threshold (quantile) τ at time *t*. The formal test is based on H_0: $\gamma_i > 0$. If γ is positive issuances increase systemic risks.

4 Empirical analysis

This section presents the empirical analysis. It consists of a description of the data followed by the presentation and discussion of the estimation results based on the econometric models and the associated hypotheses described in the theoretical section above.

4.1. Data

We obtain asset-backed securities from DCM published by Thomson Dealogic. We select all deals between 1990 and November 2015 and require deals in our sample to report *Deal Type* is "Asset-Backed Security", "Mortgage Backed Security", or "Covered Bonds" and *Deal Cancelled Date* is empty. We download observations at tranche level, so that we keep tranche level information such as the pricing and rating. The sample includes 158,431 tranches, and 65,200 deals of which 20,807 deals are Asset-Backed Securities (31.91%), 19,898 Mortgage-Back Securities (30.52%) and 24,495 covered bonds (37.57%). The total amount in 2015 constant US dollars in the whole period 1990-2015 is $12.9 trillion (ABS), $18.1 trillion (MBS), and $7.5 trillion (Covered bonds).

Each deal reports issuers and bookrunners. The bookrunner is the lead bank of the deal which is in contact with the issuer and searches for bond buyers. The dataset reports no information about institutions purchasing the deals. Nevertheless, for agency problems

[2] The concept of co-exceedances in the context of changes of linkages and contagion was introduced by Bae, Karolyi and Stulz (2003).

[3] If the 1% quantile threshold of a bank's equity returns is -5%, all events at which the equity return at t is below the -5% threshold is defined as an exceedance. Since such exceedances generally occur at different points in time exceedances can also be presented as a time-series. Similarly, the joint exceedance of two bank equity returns at time t (e.g. at time t* both bank A equity return is below its 1% quantile threshold and bank B equity return is below its 1% quantile threshold) forms a time-series of co-exceedances. Exceedances and co-exceedances can be defined for quantiles, e.g. the 1% quantile for each series, or for absolute values such as the -5% return.

bookrunners typically hold a large share of the bonds so that risk sharing mechanisms prevent bookrunners from shirking efforts in producing information and pricing. We thus assume that bookrunners bear a large share of the credit risk of the bond. The amount retained after bond issuance is never reported in the data. Yet, it is standard practice in league table construction to assign the whole deal value to the bookrunner.[4] The lead bank ensures the liquidity of the security through dealing by holding a large share of the issuance. Bookrunners represent the system and capture the extent to which the risk is passed to the system.

In our sample, each of the 158,431 tranches report a unique issuer, of which 53,184 also report a unique originator. Nevertheless, of these 53,184 tranches, 46,867 (88%) report the same name for the issuer and the originator. Originators of a deal are the institutions which provided the loans (e.g., mortgage and car loans) and are selling to the special purpose vehicle. The issuer is the institution which "buys" the loans from the originator and creates a separate entity – the SPV – which backs up the loan purchase with bond issuance. As numbers tell in most cases, originators set up the SPV and are responsible for the bond payments (just like any bond issuer). Through manual check we noticed that whenever issuer and originator names did not match, the issuer was a separate entity of the originating institution, we decided to substitute all issuer names with the originator name whenever the originator name was not missing. The name of the issuer was thus substituted for 6,317 tranches which represents about 4% of the sample.

Table 1 shows the total amount of the top 50 issuers in volumes (current dollars) in the period 2000-2015. There is clearly a strong concentration at the top end, with 7 banks issuing nearly half of the whole amount. Remarkably, the group of banks shown in the table issued nearly 100% of the market. Top issuers are the US housing state agencies, namely Freddie Mac (rank: 1) and Fannie Mae (rank: 2) which totaled more than a fifth of the market. This reflects the driving force of the US housing market in asset-backed securities markets. Noticeably there are also non-banking core business companies like Porsche Automobile and General Electric but with market shares lower than 1%.

Table 2 reports the total amount of the top 50 bookrunners of the market in the period 2000-2015. Bookrunning is also relatively concentrated. Six banks only have arranged more than 50% of the bond issuances in the period, with a total amount of $14.7 trillion. With no surprise, investment banks lead the table.

[4] Whenever DCM reports several bookrunners we select the first bank in the list. Indeed, the first listed bank is the lead bank of the pool of banks and will benefit the most from private information and will provide most of the support to the issuing company.

Table 1: Sample description: Issuers. The table reports the top 50 issuers of securitized assets bonds in the period 2000-2015, *asset-backed securities*, *mortgage-backed securities*, and *covered bonds* issued.

Issuer	**Volume $bn**	**Rank**	**Markets share**	**Cumulative Market Share**
Freddie Mac	2,255	1	12.38	12.32
Fannie Mae	1,830	2	10.04	22.31
Bank of America	1,438	3	7.89	30.16
JPMorgan	1,133	4	6.22	36.35
Ginnie Mae	1,122	5	6.16	42.47
Santander	638	6	3.50	45.96
Ally Financial Inc	592	7	3.25	49.19
Lloyds Banking Group	582	8	3.20	52.37
Wells Fargo	482	9	2.65	55.00
Lehman Brothers	466	10	2.55	57.55
Royal Bank of Scotland	439	11	2.41	59.94
Credit Suisse	406	12	2.23	62.16
Citibank	387	13	2.12	64.27
Commerzbank	373	14	2.05	66.31
Morgan Stanley	327	15	1.79	68.09
UniCredit	275	16	1.51	69.59
BPCE	262	17	1.44	71.02
Barclays	260	18	1.43	72.44
SLM Corp	250	19	1.37	73.81
Goldman Sachs	246	20	1.35	75.15
Deutsche Bank	245	21	1.34	76.49
LBBW	217	22	1.19	77.67
BBVA	216	23	1.18	78.85
Japan Housing Finance Agency	210	24	1.15	80.00
NordLB	210	25	1.15	81.14
Ford Motor Co	198	26	1.09	82.23
UK Asset Resolution Ltd	192	27	1.06	83.28
CIT Group Inc	180	28	0.99	84.26
La Caixa	175	29	0.96	85.22
CECA	164	30	0.90	86.11
BFA Tenedora de Acciones SA	150	31	0.82	86.93
UBS	147	32	0.81	87.73
Rabobank	142	33	0.78	88.51
HSBC	139	34	0.76	89.27
ABN AMRO	136	35	0.75	90.01
ING	135	36	0.74	90.75
Nationwide Building Society	134	37	0.73	91.48
Helaba	131	38	0.72	92.19
Capital One Financial Corp	129	39	0.71	92.90
General Electric Co	127	40	0.70	93.59
Caisse Francaise de Financement Local	125	41	0.68	94.27
Porsche Automobil	120	42	0.66	94.93
BayernLB	120	43	0.66	95.59
Intesa Sanpaolo	113	44	0.62	96.21
BNP Paribas	105	45	0.58	96.78
Aareal Bank AG	103	46	0.56	97.34
Korea Housing Finance Corp	102	47	0.56	97.90
Banco de Sabadell SA	102	48	0.56	98.46
Dexia	102	49	0.56	99.02
Westpac	91	50	0.50	99.51

Table 2: Sample description: bookrunners. The table reports the top 50 bookrunners of securitized assets bonds in the period 2000-2015. Securitized assets bonds include asset-backed securities, mortgage-backed securities, and covered bonds. We assign the whole bond amounts to lead bookrunners.

Bookrunner	Volume $bn	Rank	Market share	Cumulated Market Share
Barclays	3,166	1	11.4	11.4
Bank of America	3,031	2	11	22.4
JPMorgan	2,764	3	10	32.4
Royal Bank of Scotland	2,004	4	7.2	39.7
Citibank	1,934	5	7	46.6
Credit Suisse	1,761	6	6.4	53
Deutsche Bank	1,617	7	5.8	58.9
Goldman Sachs	1,145	8	4.1	63
Morgan Stanley	1,090	9	3.9	66.9
UBS	843	10	3	70
BNP Paribas	648	11	2.3	72.3
Wells Fargo	554	12	2	74.3
Commerzbank	405	13	1.5	75.8
Lloyds Banking Group	350	14	1.3	77.1
Nomura	337	15	1.2	78.3
Santander	329	16	1.2	79.5
Credit Agricole	316	17	1.1	80.6
HSBC	282	18	1	81.6
UniCredit	229	19	0.8	82.5
BBVA	214	20	0.8	83.2
LBBW	184	21	0.7	83.9
Intesa Sanpaolo	175	22	0.6	84.5
Natixis	171	23	0.6	85.2
BayernLB	163	24	0.6	85.7
NordLB	147	25	0.5	86.3
SG	142	26	0.5	86.8
ABN AMRO	137	27	0.5	87.3
Rabobank	132	28	0.5	87.8
RBC Capital Markets	127	29	0.5	88.2
Bankia	111	30	0.4	88.6
Helaba	107	31	0.4	89
Mizuho	103	32	0.4	89.4
ING	93	33	0.3	89.7
CaixaBank	90	34	0.3	90
Daiwa Securities	88	35	0.3	90.4
DZ Bank	81	36	0.3	90.7
Dexia	79	37	0.3	90.9
Jefferies LLC	72	38	0.3	91.2
Danske Bank	64	39	0.2	91.4
Macquarie Group	62	40	0.2	91.7
DekaBank	57	41	0.2	91.9
Mitsubishi UFJ Group	57	42	0.2	92.1
Westpac	56	43	0.2	92.3
Banco de Sabadell SA	50	44	0.2	92.4
Banco Popular Espanol SA	49	45	0.2	92.6
KDB Daewoo Securities	48	46	0.2	92.8
Commonwealth Bank Australia	45	47	0.2	93
ANZ	44	48	0.2	93.1
HSH Nordbank	44	49	0.2	93.3
DNB Markets	41	50	0.1	93.4

4.2. Descriptive Analysis

Table 3 presents the list of banks that are used to test the effects of securitization and the descriptive statistics of the banks' equity returns over a 25-year sample period from 1990 – 2015.

Table 3: Sample description: combining bookrunning and issued amounts. The table ranks the 28 banks in our sample which are both among top 50 bookrunners *and* top 50 issuers. We calculate volumes as the sum of book run and issued amounts of securitized assets bonds in our sample (volumes are reported in Tables 7 and 8). The ranking is based on all *asset-backed securities*, *mortgage-backed securities*, and *covered bonds* issued in the period 2000-2015. Consistent with standard league table practice, we assign the full amount of the bond to the lead bookrunner. Market shares are calculated in the sub-sample of 28 banks.

Bookruning + Issuing Amounts	Volume $bn	Rank	Market Share	Cumulative Market Share
Bank of America	4469	1	13.6	13.6
JPMorgan	3897	2	11.9	25.5
Barclays	3426	3	10.4	36.0
Royal Bank of Scotland	2443	4	7.5	43.4
Citibank	2321	5	7.1	50.5
Credit Suisse	2167	6	6.6	57.1
Deutsche Bank	1862	7	5.7	62.8
Morgan Stanley	1417	8	4.3	67.1
Goldman Sachs	1391	9	4.2	71.3
Wells Fargo	1036	10	3.2	74.5
UBS	990	11	3.0	77.5
Santander	967	12	2.9	80.5
Lloyds Banking Group	932	13	2.8	83.3
Commerzbank	778	14	2.4	85.7
BNP Paribas	753	15	2.3	88.0
UniCredit	504	16	1.5	89.5
BBVA	430	17	1.3	90.8
HSBC	421	18	1.3	92.1
LBBW	401	19	1.2	93.3
NordLB	357	20	1.1	94.4
Intesa Sanpaolo	288	21	0.9	95.3
BayernLB	283	22	0.9	96.2
Rabobank	274	23	0.8	97.0
ABN AMRO	273	24	0.8	97.8
ING	228	25	0.7	98.5
Dexia	181	26	0.6	99.1
Banco de Sabadell SA	152	27	0.5	99.6
Westpac	147	28	0.4	100.0

The statistics display positive mean returns for all banks except for one but large extreme positive and negative returns for all banks.

Figure 1 shows the average (equally-weighted) prices of all banks and the MSCI World equity index as a proxy for systematic risks.

Figure 1: Bank equity index prices and MSCI World equity index price

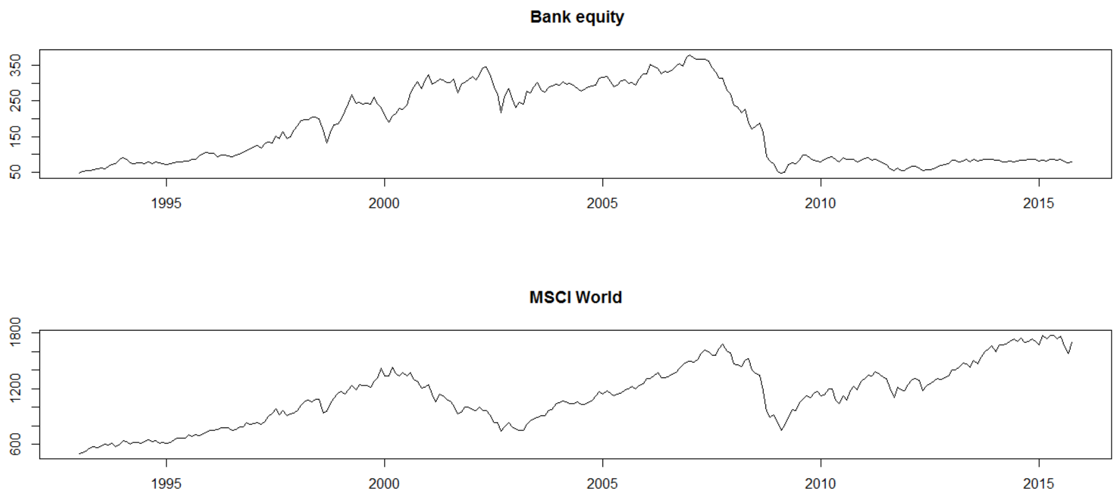


Figure 1 illustrates that bank equity prices and global equity prices co-move in several periods and seem to fall jointly in the global financial crisis in 2008. Figure 2 also shows time-varying correlation estimates of the returns and reveals that the correlations did not increase but decreased and thus decoupled from each other. This finding is inconsistent with classical definitions of financial contagion (e.g. see Forbes and Rigobon, 2002) that require correlations to rise to identify contagious spillovers.

Figure 2: Financial Contagion: The graph shows a decreasing correlation (decoupling) between bank equity returns and global equity market returns around the Global Financial Crisis from July 2007 – December 2008. The decreasing correlation in a crisis period rejects financial contagion defined through a crisis-specific increase in correlation.

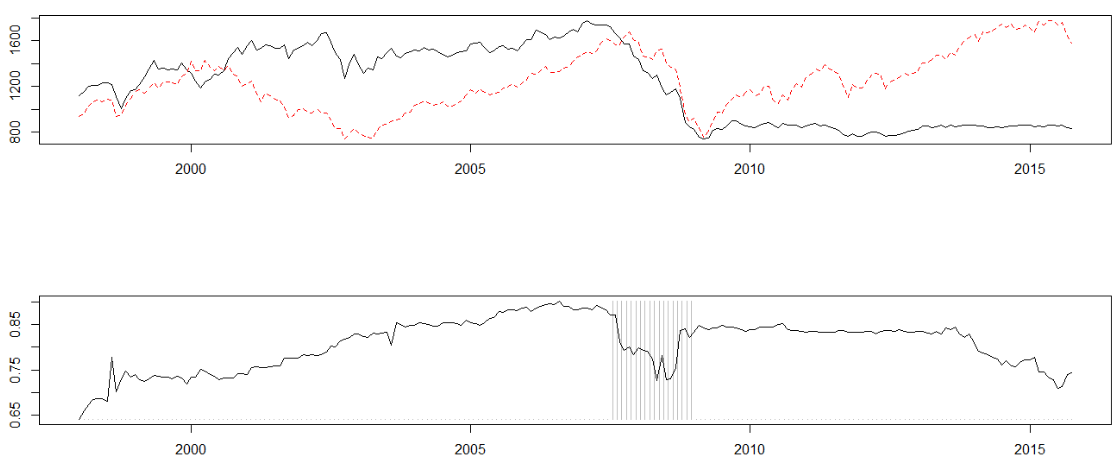
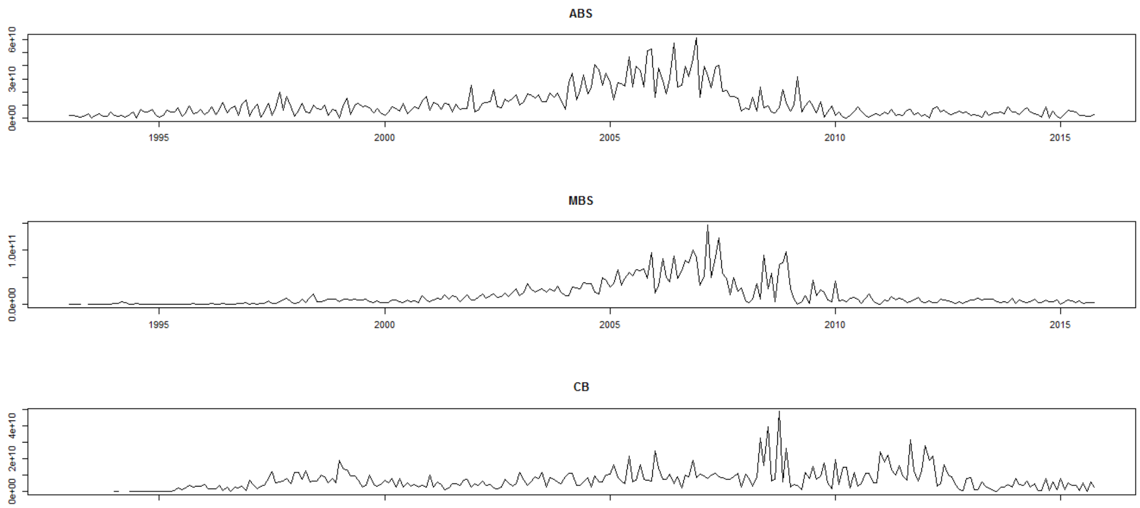


Figure 3 presents the aggregate volume of *asset-backed securities* (ABS), *mortgage-backed securities* (MBS) and *covered bonds* (CB) issuances, i.e. securitizations of all banks from 1990 to 2015. The graphs show an inverted u-shape pattern for securitizations with virtually no issuances before 1995, strongly rising issuances between 1995 and 2008 and strongly falling issuances with the onset of the Global Financial Crisis.

Figure 3: Aggregate ABS, MBS and CB issuances between 1990 – 2015



4.3. Econometric Analysis

In this section we present the estimation results of the econometric models and their associated hypotheses as specified in equations (1) – (3).

4.3.1. Hypothesis 1

Figure 4 presents the plot of the cross-sectional dispersion of the bank equity returns and the monthly aggregate ABS, MBS and CB issuances of all banks. Visual inspection indicates some positive and negative relationships between the level of dispersion and aggregate issuances. A more systematic analysis is provided by Table 4 which shows that the cross-sectional dispersion is persistent and that ABS exhibit a negative influence on the dispersion of bank equity returns whilst MBS and CB display a positive but statistically insignificant influence. The negative coefficient for ABS implies that ABS issuances increase the similarity and thus the connectedness of bank equity returns. This effect demonstrates that risk transfer through ABS increases the linkages of the banks whilst the issuance of MBS and CB do not increase the linkages. If MBS regularly did not entail an actual risk transfer as reported by Acharya et al. (2013) the similarity of MBS with CB is not surprising.

Figure 4: Dispersion of bank equity returns and Securitizations

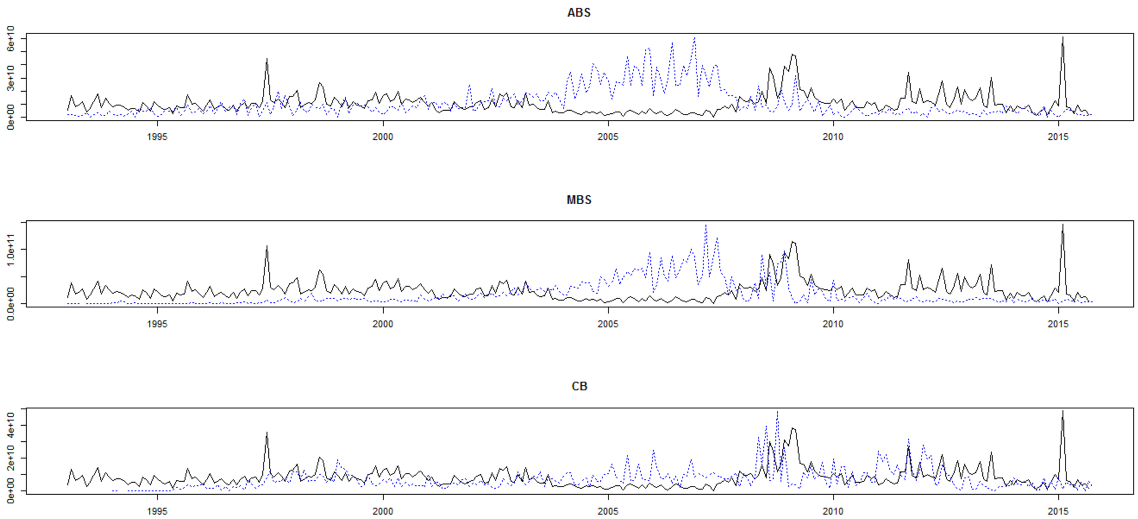


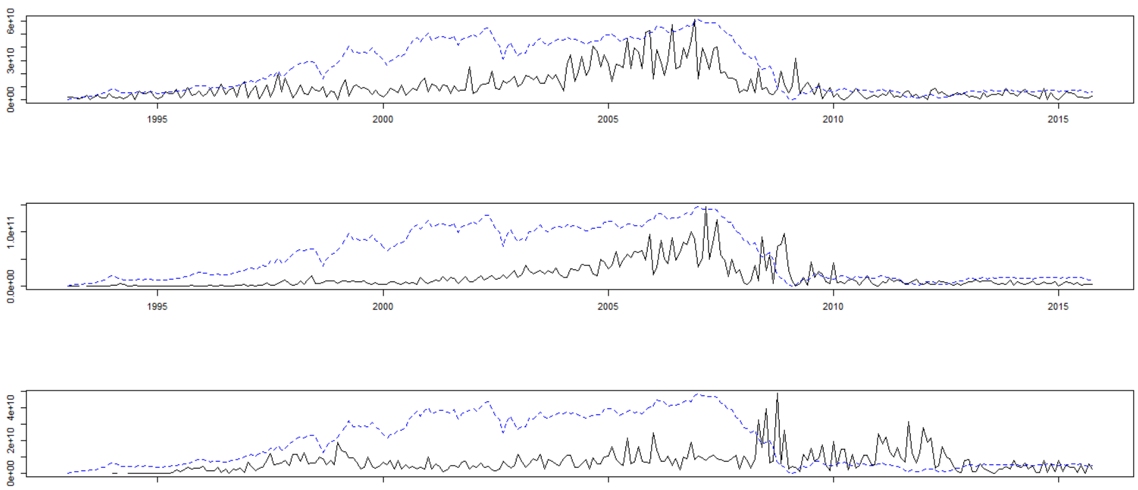
Table 4: Bank equity return descriptive statistics. The table reports the returns on equity of the main banks in our sample for both issuing and arranging securitized asset-backed securities. The frequency of the sample is monthly, and the period is January 1993 – November 2015.

Ticker	**mean**	**std. dev.**	**min**	**max**	**skewness**	**kurtosis**
BARC.L	0.009	0.111	-0.452	0.902	2.064	20.759
BAC	0.007	0.110	-0.533	0.727	0.356	12.214
JPM	0.010	0.091	-0.306	0.317	-0.191	4.290
RBS.L	0.005	0.114	-0.623	0.706	-0.191	12.555
C	0.008	0.120	-0.578	0.687	0.151	10.812
CSGN.VX	0.006	0.097	-0.396	0.379	-0.007	5.293
DBKGn.DE	0.005	0.100	-0.406	0.458	0.126	5.551
GS	0.010	0.096	-0.277	0.312	0.194	3.777
MS	0.012	0.109	-0.437	0.507	-0.030	5.215
UBSG.VX	0.006	0.095	-0.422	0.491	0.181	7.263
BNPP.PA	0.008	0.090	-0.307	0.308	-0.162	4.629
WFC	0.012	0.081	-0.360	0.405	0.092	8.350
CBKG.DE	0.000	0.121	-0.482	0.441	0.070	6.276
LLOY.L	0.005	0.103	-0.357	0.584	0.588	7.374
SAN.MC	0.009	0.090	-0.331	0.401	-0.075	5.193
HSBA.L	0.007	0.078	-0.325	0.313	0.108	5.148
CRDI.MI	0.004	0.105	-0.295	0.505	0.546	5.278
BBVA.MC	0.010	0.091	-0.305	0.355	0.140	5.007
ISP.MI	0.011	0.122	-0.323	1.071	2.363	23.394
BLGGgi.F	0.003	0.073	-0.260	0.256	-0.322	6.478
ING.AS	0.011	0.110	-0.515	0.708	0.116	11.232
DEXI.F	-0.013	0.178	-0.632	1.429	2.604	24.698
WBC.AX	0.010	0.058	-0.156	0.186	-0.205	2.926

4.3.2. Hypothesis 2

Hypothesis 2 tests if securitizations and issuances of a bank increase the systematic risk exposure of the bank. The underlying mechanism is that the issuance and thus the sale of assets allows the bank to reinvest the proceeds from the sale. If the bank invests the proceeds in a diversified portfolio the bank implicitly invests in systematic risk. In the context of an increasing exposure to systematic risks we first analyse the question if securitizations of a bank have an influence on the returns of the bank's equity. A long-run perspective is provided by Figure 5. Panel A of Table 5 indicates that MBS decrease the returns whilst there is no statistically significant effect for ABS and CB. The results illustrate that MBS issuances are associated with losses that decreased the equity returns. Another implication of this finding is that MBS issuances did not always imply a true transfer of risk.

Figure 5: Bank equity prices and Securitizations



Panel B of Table 5 presents the results based on equation (2) and shows that none of the three types of securitizations and issuances significantly affects the systematic risk exposure of the banks. This result is not surprising in light of the fact that the analysis is based on aggregate measures but also given the opacity of some of the deals and the size of the deals in the period leading up to the global financial crisis. It is well possible that investors did not have the information or the resources to obtain the information that was needed to fully understand the influence of a bank's securitizations on the future prospect of the bank and thus its equity returns. In other words, securitizations and the associated risk transfer were opaque in many cases.[5] The problem may have been more severe due to the fact that the financial institutions were often both issuers and bookrunners simultaneously.

The findings obtained by testing Hypothesis 1 can also be interpreted as a test for the influence of securitization and issuances on systematic risk. Since dispersion is a measure of the co-movement of bank equity returns, it is a measure of systematic risk. The

[5] Opacity in market betas was recently analyzed by Gilbert et al. (2014). The issue of opacity is also related to neglected risk as discussed by Gennaioli et al.. (2013).

empirical findings derived from Hypothesis 1 therefore support Hypothesis 2 that ABS issuances increase systematic risks.

Table 5: Dispersion of bank equity returns and Securitizations. Cross-sectional dispersion of monthly bank equity returns regressed on lagged dispersion and log ABS, MBS and CB issuances. ABS decrease dispersion and thus increase linkages among banks whilst there is no significant effect for MBS and CB.

	Estimate	**Std. Error**	**t-value**	**Pr(>|t|)**
Constant	4.166e-02	5.297e-03	7.864	<0.01 ***
Lagged dispersion	4.290e-01	5.596e-02	7.666	<0.01 ***
Log ABS	-7.374e-13	2.637e-13	-2.797	<0.01 **
Log MBS	8.976e-14	1.268e-13	0.708	0.47978
Log CB	4.856e-13	3.222e-13	1.507	0.13306
Multiple R-squared: 0.2716, Adjusted R-squared: 0.2601				
F-statistic: 23.59 on 4 and 253 DF, p-value: < 0.01				

4.3.3. Hypothesis 3

Finally, we report the estimation results for hypothesis 3 which tests if securitization increases systemic risk. Figure 6 presents the monthly co-exceedances based on each bank's equity returns for the -30% and -10% return thresholds, i.e. for each bank and month exceedances are calculated and summed up across all banks for each month resulting in a time-series of monthly co-exceedances.[6]

The time-series plot illustrates that the co-exceedances are very volatile, not persistent and exhibit regimes consistent with volatility clustering and contagion.

The largest co-exceedances can be observed around the Global Financial Crisis (GFC) in 2008. These large co-exceedances could be associated with securitizations but there is also a relatively long period and regime between 2003 and 2008 in which almost no co-exceedance occurred despite significant securitizations. The relationship between securitizations and co-exceedances are shown in Figure 7.

The graphs indicate that high levels of securitizations and issuances cause extreme events, i.e. events in which no significant losses are incurred and events in which large losses must be borne. The increased probability for extreme events is a result derived in the theoretical section (e.g. Table B) and is fully consistent with the time-series plot. In other words, the apparent resiliency prior to the GFC was most likely not a sign of stability but a sign of increased systemic risk.

[6] The more standard quantile thresholds (e.g. 1%, 5% and 10%) yield similar results but the aggregate losses cannot be directly identified from a visual inspection which is the motivation for the usage of absolute return thresholds such as the -30% and -10% thresholds.

Figure 6: Co-exceedances: The graphs show estimates of time-varying co-exceedances/ joint negative returns below a certain threshold. The time-series plots indicate that the losses can be severe and affect a large number of banks. The largest co-exceedances can be observed for the year 2008. The -30% threshold implies that six banks displayed negative returns of at least -30% in a month in 2008. For the -10% threshold, the number of banks that suffer a 10% loss in their equity increases to 20. Prior to the 2008 spike in co-exceedances, there was a long period without any co-exceedances and thus an apparent stability and resiliency.

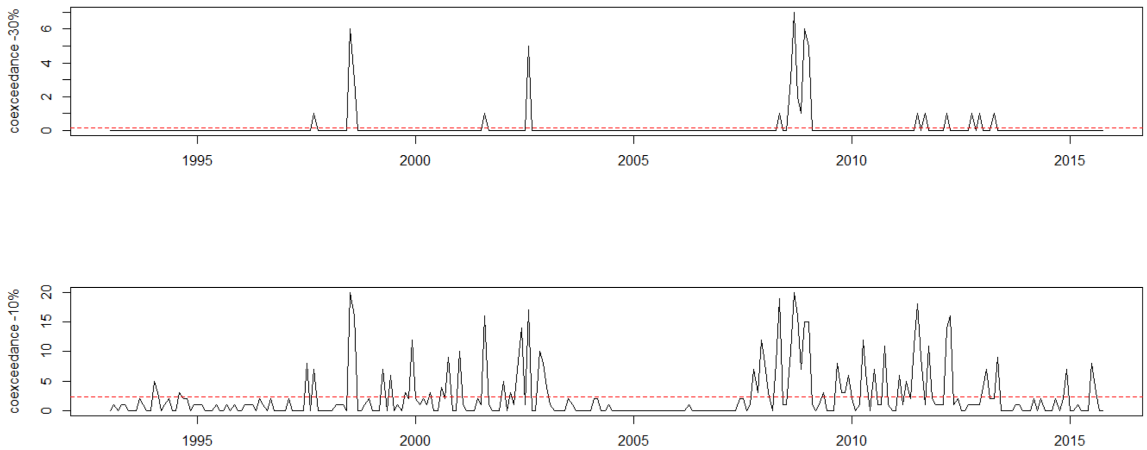


Figure 7: Co-exceedances and Securitizations. The graphs present the -30% co-exceedances and the long-run relationship with aggregate ABS, MBS and CB issuances. High levels of securitizations seem to lower the risk of co-exceedances.

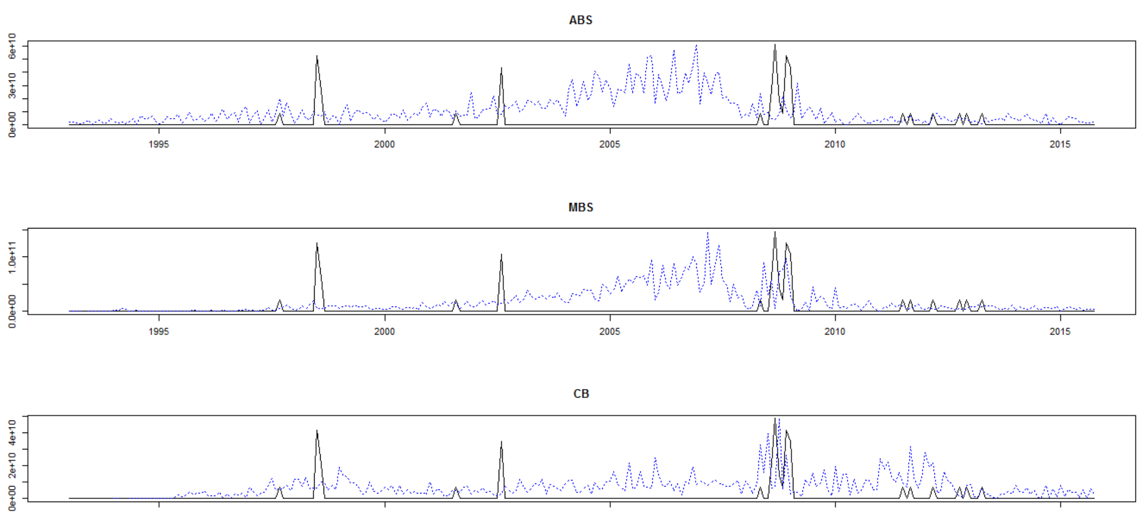


Table 6 displays the estimation results of equation (3) for the -10% threshold and shows that MBS and CB tend to increase co-exceedances and thus systemic risk whilst ABS tend to decrease co-exceedances. One explanation for the differences is that the risk transfer worked for ABS but not for MBS and CB (CB does generally not involve any risk transfer). If the risk was not truly transferred but kept through explicit guarantees (see Acharya et al., 2013), it is well possible that some types of securitizations led to increased risk, MBS in this case. The positive effect of CBs on co-exceedances is rather weak statistically and disappears if the market returns are included in the regression as shown in Panel B of the Table. Since CBs do not entail a risk transfer but provide new capital which can be invested in risky projects the positive effect is economically intuitive. The effects for ABS and MBS weaken through the inclusion of the market return in the regression but the signs and the statistical significance remain. Finally, it is remarkable that a relatively simple systemic risk measure such as co-exceedances replicate and thus fully support the theoretical findings that securitizations increase extreme events.

Table 6: Bank equity returns and Securitizations

Panel A: Does securitization affect bank equity returns? The estimates show that MBS decrease bank equity returns whilst ABS and CB do not influence bank equity returns.

	Estimate	**Std. Error**	**t-value**	**Pr(>|t|)**
Constant	4.830e-03	4.306e-03	1.122	0.2631
Market ret.	1.208e+00	5.899e-02	20.484	<0.01 ***
Log ABS	3.543e-13	3.307e-13	1.071	0.2850
Log MBS	-2.837e-13	1.622e-13	-1.749	0.0816 .
Log CB	-4.780e-13	4.095e-13	-1.167	0.2442

Multiple R-squared: 0.6468, Adjusted R-squared: 0.6412

F-statistic: 115.8 on 4 and 253 DF, p-value: < 0.01

Panel B: Does securitization affect exposure to systematic risks? The estimates show that securitizations do not significantly influence banks' exposure to systematic risks. The strongest effect (albeit statistically insignificant) is found for MBS which implies an increased exposure to systematic risks.

	Estimate	**Std. Error**	**t-value**	**Pr(>|t|)**
Constant	0.0002873	0.0025923	0.111	0.912
Market ret.	1.2752312	0.1044557	12.208	<0.01 ***
Rm x log(ABS)	-0.0083017	0.0076080	-1.091	0.276
Rm x log(MBS)	0.0041719	0.0028462	1.466	0.144
Rm x log(CB)	-0.0065913	0.0077484	-0.851	0.396

Multiple R-squared: 0.6419, Adjusted R-squared: 0.6362

F-statistic: 113.4 on 4 and 253 DF, p-value: < 0.01

Table 7: Co-exceedances and Securitizations.

Panel A: Impact of securitizations on systemic risk. The estimates show that securitizations influence co-exceedances and thus systemic risks. ABS securitizations decrease co-exceedances and MBS and CB increase co-exceedances. The results indicate that the type of securitization and risk transfer is very important.

	Estimate	**Std. Error**	**t-value**	**Pr(>|t|)**
Constant	1.304e-01	8.966e-02	1.455	0.14693
Log ABS	-2.051e-11	6.874e-12	-2.984	0.00313 **
Log MBS	9.314e-12	3.381e-12	2.755	0.00630 **
Log CB	1.466e-11	8.547e-12	1.715	0.08756

Multiple R-squared: 0.05759, Adjusted R-squared: 0.0465

F-statistic: 5.194 on 3 and 255 DF, p-value: 0.00169

Panel B: Robustness

	Estimate	**Std. Error**	**t-value**	**Pr(>|t|)**
Constant	1.769e-01	7.941e-02	2.228	0.0268 *
Rm	-6.052e+00	7.104e-01	-8.520	<0.01 ***
Log ABS	-1.095e-11	6.176e-12	-1.772	0.0775 .
Log MBS	5.098e-12	3.028e-12	1.683	0.0936 .
Log CB	9.080e-12	7.581e-12	1.198	0.2321

Multiple R-squared: 0.2671, Adjusted R-squared: 0.2555

F-statistic: 23.14 on 4 and 254 DF, p-value: <0.01

5. Conclusions

This paper analysed both theoretically and empirically how securitization and risk transfer affects the exposure of banks to bank-specific risks and market risks.

The theoretical model shows that securitization and risk transfer of banks can create exposures to common risk factors increasing the linkages of the banks and the linkages with the market. The theoretical predictions are also confirmed empirically for a sample of the most active banks in securitizations and monthly issuances of securitized assets over a 25-year sample period from 1990 to 2015. Moreover, both the theoretical model and the empirical results suggest that securitization leads to increased systemic risks, i.e. large joint losses that occur with a low probability. The co-exceedances that are used as an empirical measure of systemic risk further suggest that mortgage-backed securities (MBS) increased systemic risks whilst asset-backed securities had no impact on systemic risks.

This result is consistent with findings in the literature that suggest that some banks did not actually transfer the risk but retained it through explicit guarantees and instead increased the risk exposure. The co-exceedances also identify a period of apparent market resiliency (2003 – 2008) in which securitizations and bank linkages increased but the associated rise in systemic risks was not evident and thus hidden.

The theoretical modelling explains this relationship between apparent market resiliency and systemic risks. We have shown that securitization and risk transfer leads to an increased probability of extreme events, i.e. no loss events with high probability and large loss events with low probability, and a decreased probability of intermediate events. In other words, securitization and risk transfer reduces marginal loss probabilities and increases joint loss probabilities. For high correlations of the entities involved in securitization, the intermediate events even disappear explaining what we call "seeming resiliency", i.e. the small-losses with high-probability occurrences are assumed to imply intermediate-losses with low probability whilst the risk of an extremely large and systemic loss event is not considered.

We argued that the shadow banking system may enhance the stability of the financial system if it shares and diversifies risks in an efficient manner. Given its size, it is very likely that it can diversify risks and then absorb shocks more efficiently. However, its opacity also poses a risk as concentrations of risks and unknown linkages and channels of transmission cannot be readily identified.

Given the limited information that regulators seem to have about the size of the shadow banking system more research is needed to reduce the "shadowy" nature of the system and to better understand the risks that are associated with known and unknown linkages and channels of shock transmission.

References

[1] Acharya, V.V., Schnabl, P. and G. Suarez (2013), Securitization without Risk Transfer, *Journal of Financial Economics* 107, 515–536

[2] Acharya, V.V., Gale, D. and T. Yorulmazer (2011), Rollover Risk and Market Freezes, *Journal of Finance* 66(4), 1177-1209

[3] Adrian, T. and A. Ashcraft (2012), Shadow Banking: A Review of the Literature, In: *The New Palgrave Dictionary of Economics*. Palgrave Macmillan.

[4] Adrian, T. and H.S. Shin (2009), The Shadow Banking System: Implications for Financial Regulation, *Federal Reserve Bank of New York Staff Reports* No. 382

[5] Bae, K.-H., G.A. Karolyi, and R.M. Stulz (2003), A new approach to measuring financial contagion. *Review of Financial Studies* 16, 717-763.

[6] Baur, D.G. and E. Joossens (2006), The effect of credit risk transfer on financial stability, JRC - EU Commission *EUR Report* EUR 21521

[7] Deutsche Bundesbank (2014), The shadow banking system in the euro area: overview and monetary policy implications, Monthly Report March 2014

[8] Das, S.R. and R. Uppal (2004), Systemic Risk and International Portfolio Choice, *Journal of Finance*, 59 (6), 2809 - 2834

[9] ECB (2012), Shadow Banking in the Euro Area – An Overview, *ECB Occasional Paper Series No 133*

[10] ECB (2015), Euro area non-bank entities (Chapter 3.1.3), *ECB Financial Stability Review*

[11] European Commission (2013a), Shadow Banking – Addressing New Sources of Risk in the Financial Sector, Communication from the Commission to the Council and the European Parliament, 4.9.2013

[12] European Commission (2013b), Commission Staff Working Document Impact Assessment – Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on Money Market Funds, 4.9.2013

[13] Financial Stability Board (2014a), Global Shadow Banking Monitoring Report 2014

[14] Financial Stability Board (2014b), Transforming Shadow Banking into Resilient Market-based Financing - An Overview of Progress and a Roadmap for 2015, November 2014

[15] Gennaioli, N., Shleifer, A. and R.W. Vishny (2013), A Model of Shadow Banking, *Journal of Finance* Vol. LXVIII, No. 4

[16] Gilbert, T., Hrdlicka, C., Kalodimos, J, and S. Siegel (2014), Daily Data is Bad for Beta: Opacity and Frequency-Dependent Betas, *Review of Asset Pricing Studies*, 4(1), 78-117

[17] Gorton, G. (2009), Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007, *Yale Working Paper*

[18] Gorton, G. and A. Metrick (2010), Regulating the Shadow Banking System, *Brookings Papers on Economic Activity,* Fall 2010

[19] Gorton G. and A. Metrick (2012), Securitized Banking and the Run on Repo, *Journal of Financial Economics* 104:425 - 51.

[20] Greenwood, R., Landier, A. and D. Thesmar (2014), Vulnerable Banks, *Journal of Financial Economics* 115 (3), 471 – 485

[21] Hanson, S.G., Shleifer, A., Stein, J.C. and R.W. Vishny (2015), Banks as Patient Fixed-Income Investors, *Journal of Financial Economics* 117 (3), 449–469.

[22] IMF (2014), Mapping the Shadow Banking System through a Global Flow of Funds Analysis, *IMF Working Paper* No. 14/ 10

[23] IMF (2015), Shedding Light on Shadow Banking, *IMF Working Paper* No. 15/ 1

[24] Nijskens, R. and W. Wagner (2011), Credit risk transfer activities and systemic risk: How banks became less risky individually but posed greater risk to the financial system at the same time, *Journal of Banking and Finance*, 35 (6), 1391 - 1398

[25] Pozsar Z., T. Adrian, A.B. Ashcraft and H. Boesky (2010), Shadow Banking, *Federal Reserve Bank of New York Staff Report 458*

[26] Pozsar, Z. and M. Singh (2011), The Nonbank-Bank Nexus and the Shadow Banking System, *IMF Working Paper* No. 11/ 289

[27] Shleifer, A. and R. Vishny (2011), Fire Sales in Finance and Macroeconomics, *Journal of Economic Perspectives*, Winter 2011

[28] Wagner, W. (2011), Systemic Liquidation Risk and the Diversity-Diversification Trade-Off, *Journal of Finance* 66 (4), 1141 – 1175.

List of abbreviations and definitions

SBS	Shadow Banking System
ABS	Asset-Backed Securities
MBS	Mortgage-Backed Securities
CB	Covered Bonds
SPV	Special Purpose Vehicle
GFC	Global Financial Crisis

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