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Effect of Securitization on the Bank's Equity Risk in the U.S.

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This paper examines the relationship between the effect of securitization and the equity risk for bank holding companies in the United States from Q2:2001 to Q4:2008. Securitization markets in the U.S. expanded significantly in the early 2000s but have declined since 2007. This paper investigates four types of loans, namely, mortgage, consumer, commercial, and "other" loans (loans secured by real estate other than mortgage loans). When all types of loans are considered as a group, the effect of securitization (the net effect of increasing off-balance sheet loans and reducing on-balance sheet loans) is insignificant in relation to the banks' equity risk. As a result, the banks use securitization as a financing source to fund new loans rather than as a risk reduction tool. The analysis of each type of loan indicates that the effect of the securitization of mortgage, consumer, and commercial loans is not significantly related to the banks' equity risk; however, the effect of the securitization of "other" loans is statistically significant in raising the banks' equity risk. The result shows that the banks still retain risk from securitization and that they use securitization as a financing source. Furthermore, during the subprime crisis, banks that securitized mortgage loans were exposed to risk from retained "credit-enhancing interest-only strips" rather than from the effect of securitization itself.

Keywords: equity risk, loans, securitization, off-balance sheet

JEL Classification: C12, C23, G01, G21

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Introduction

The recent economic crisis, which started in 2007 and followed-on from the subprime crisis, affected banks in the United States and then the global economy. One cause of the crisis was securitization, which is the process of transforming assets (e.g. loans) into securities (e.g. asset-backed securities or mortgage-backed securities). Securitization has changed the way banks do business. In traditional forms of banking, banks loan to borrowers under tight lending standards, keep loans on their balance sheets, and retain credit risk. In contrast, securitization not only enables banks to remove loans from balance sheets and transfer the credit risk associated with those loans, but also finances banks for new loans. This business model, which is called the originate-to-distribute model, creates incentives for banks to loosen lending standards since banks do not bear any risk and still have more funds to originate new loans.

Securitization markets in the U.S. significantly expanded in the early 2000s but have plunged since 2007. Moreover, beginning in Q2:2001, bank holding companies were required to disclose securitization in their notes to financial statements. From 2001 to 2008, the effective accounting standard concerned with securitization is the Statement of Financial Accounting Standards (SFAS) No. 140 (Financial Accounting Standards Board, 2000), which includes the standards for Accounting for Transfers and Servicing of Financial Assets and Extinguishments of Liabilities. It states that a transferor can only remove financial assets from a balance sheet if the transfer is a true sale, which means the transferor has surrendered control over transferred assets. Otherwise, those assets would still be on the balance sheet and the transfer is considered to be secured borrowing. Therefore, under true sale, once the transferor transfers the asset to the transferee, the transferor has no legal right or control over the transferred assets and does not provide any recourse or agreement to repurchase or redeem. Sale without recourse is a true sale. Interpretation 46(R) requires that the transferee must be a qualifying special purpose entity (QSPE) which is legally isolated from the transferor and is a bankruptcy-remote entity. This means that if the transferor goes bankrupt, the transferor's creditors cannot claim the transferred assets. Thus, banks (transferors) are able to remove loans from their balance sheets only when loan sales are true sales and are sold to the banks' special purpose vehicles (SPVs) (transferees) that satisfy QSPE criteria. Banks also recognize gain on sale

and profit at the time of sale. Moreover, banks do not have to consolidate the financial information of their SPVs.

The recent economic crisis reveals that securitization poses risks on banks and the financial system as a whole since banks have to put transferred loans back on their balance sheets by buying loans back from their SPVs and thus incur large losses. The banks' profits and stock prices decline dramatically and the value of the investment portfolio belonging to those who hold stocks in those banks depreciate considerably as well. In short, investors are exposed to greater equity risk. SFAS No. 140 has become questionable after the subprime crisis since banks can buy back securitized loans from SPVs to place on their balance sheets but they have no obligation to do so in order to protect their reputation as sponsors of SPVs. This practice is implicit recourse, which is not a true sale. With securitization, banks generally retain interests in securitized products as credit enhancements to attract more investors, to make their securities marketable, and to get a higher rate from rating agencies. Retained interests (residual interests) are banks' first risk of loss and they are securities on their balance sheets. Banks disclose securitization activities and retained interests in Schedule S in the notes to financial statements.

The purpose of this paper is to examine the relationship between the effect of securitization and the equity risk of bank holding companies in the United States during the securitization's boom and bust period from Q2:2001 to Q4:2008. The equity risk in this paper is the standard deviation of stock returns, which is a measure of how the stock returns of each bank move around its averages (stock volatility). Equity risk is the dependent variable because investors can evaluate performance of bank holding companies from publicly available annual reports and quarterly financial statements and consider risk from securitization when buying bank stocks. Variables related to securitization are on-balance sheet loans, off-balance sheet loans (securitized loans), and on-balance sheet retained interests in the forms of credit-enhancing interest-only strips[1] and subordinated securities.

[1] The Federal Deposit Insurance Corporation (FDIC) defines "credit-enhancing interest-only strip" as an on-balance sheet asset that, in form or in substance, (i) represents the contractual right to receive some or all of the interest due on the transferred assets, and (ii) exposes the banking organization to credit risk that exceeds its pro rata claim on the underlying assets whether through subordination provisions or other credit enhancing techniques.

In this research, loans are classified into mortgage, consumer, commercial and "other" loans[2] . This paper also examines whether banks securitize low quality loans or high quality loans. This paper is organized as follows: the conceptual framework is described followed by the methods and data, then the discussion of results and finally the conclusions.

Concepts

The consultative document, Credit Risk Transfer of the Bank for International Settlements (2008), listed three benefits of securitization: 1) banks can transfer credit risk, 2) banks can earn fees without retaining credit risk through the originate-to-distribute business model, and 3) banks can earn revenue from selling loans. Securitization transfers credit risk to investors if banks securitize high credit risk loans and leave low credit risk loans on their balance sheets. Furthermore, the Bank for International Settlements noted that securitization is also associated with reputation risk. That is, in order to protect their reputation, banks buy back securitized loans without any agreement to do so because damage to their reputation also affects existing and future relationships with customers and investors. Moreover, securitization also affects liquidity risk as banks are unable to provide funding at unplanned times when they are forced to buy back securitized loans on their balance sheets.

Cantor and Rouyer (2000) argued that in practice, banks generally securitize low credit risk loans to get a higher rating and lower funding cost. Therefore, banks tend to use securitization as a funding source rather than as a tool to transfer credit risk. Wolfe (2000) found that banks have an incentive to create a securitization pipeline structure since securitization allows banks to receive cash proceeds to generate new loans and to i ncrease return on capital without increasing deposit and capital. Moreover, at first, banks tend to securitize low credit risk or high quality loans with a low probability of default in order to establish the market. Later, as the market becomes more established, banks securitize lower quality or higher credit risk loans.

Murray (2001) argued that securitization can increase the risk to the financial system through lax lending standards to promote loan growth and that banks which use

[2] The "other" loan category is comprised of loans secured by real estate other than mortgage loans such as farmland and multifamily residential properties. It also includes loans to depository institutions, nondepository financial institutions, farmers, foreign governments, and loans for lease arrangements.

securitization as a vehicle to transfer loans off balance sheets are exposed to higher risk than investors. Murray also found that although securitization is a tool to transfer default risk to investors, in practice, banks fail to shift the default risk on securitized loans to investors. The accounting rules give the illusion of risk transfer since securitization affects bank financial statements but they do not change the nature of the underlying loans. Furthermore, securitization increases the risk of loss if banks securitize low credit risk loans and keep high credit risk loans on their balance sheets.

Dionne and Harchaoui (2003) examined commercial bank behavior in Canada from 1988 to 1998 and concluded that there is a positive relationship between securitization and banks' credit risk. Calomiris and Mason (2004) examined credit card securitization in 1996 and concluded that securitizing banks are able to transfer some risk but due to implicit recourse, risk still remains within the banks. Ambrose *et al.* (2005) examined conventional fixed rate mortgages originating between 1995 and 1997 and found that securitized mortgage loans have a lower ex-post default than on-balance sheet mortgage loans. This implies that banks securitize low credit risk loans and hold high credit risk loans on their balance sheets.

Niu and Richardson (2006) examined banks and firms that have securitization transactions from 1997 to 2003 and found that systematic risk (beta) is positively related to off-balance sheet debt and off-balance sheet securitized loans, while on-balance sheet debt have the same effect on beta. They suggest that securitizations should be considered as secured borrowings rather than sales since firms take assets back on their balance sheets due to implicit recourse or moral recourse when there is no obligation to do so. Their conclusion is that firms should not remove assets from balance sheets. Hansel and Krahnen (2007) studied the European collateralized debt obligations (CDOs) market from 1997 to 2004 and found that credit securitization increases the issuing banks' systematic risk, which is measured as equity beta.

Chen *et al*. (2008) used data from U.S. bank holding companies from Q2:2001 to Q4:2006 and categorized loans into mortgage loans, consumer loans, and commercial loans. Chen *et al.* found that the banks that recognize securitization as sales retain risk and that the banks' total equity risk, which is measured as the standard deviation of stock returns, is positively related to off-balance sheet securitized loans for all three loan types.

Chen *et al*. also found evidence that retained credit-enhancing interest-only strips of securitized mortgage and commercial loans are positively related to the banks' total equity risk whereas the retained subordinated securities of those securitized loans are insignificant. Both retained credit-enhancing interest-only strips and retained subordinated securities of securitized consumer loans do not affect the banks' total equity risk. However, banks tend to have implicit recourse due to the revolving nature of consumer loans.

Casu *et al*. (2011) scrutinized U.S. bank holding companies from 2001 to 2007 and found that securitizing mortgage and consumer loans contributes to a reduction of credit risk; however, securitization of other types of loans does not affect the banks' credit risk taking. Wu *et al*. (2011) studied the relationship between securitization and the banks' equity risk in U.S. bank holding companies from 2002 to 2007 and divided equity risk into systematic risk and idiosyncratic risk. They observed that before 2007 securitization had no significant impact on both systematic risk and idiosyncratic risk; however, in the year 2007, which was during the economic crisis, securitizing banks increased both kinds of risk. Furthermore, Wu *et al*. also mentioned a trade-off in the benefits of securitization between risk transfer and funding source. To have cheap funding source, banks have to provide credit enhancements and retain most of the risk.

Achaya *et al*. (2012) concluded that banks with asset-backed commercial paper are unable to transfer risk through their SPVs as banks incur more losses than third-party investors. They found that those banks have lower stock returns. Malekan and Dionne (2012) mentioned that securitization creates moral hazard problem as banks ease their lending standards; therefore, banks have to retain some portion of the securitization and they are still exposed to risk.

In sum, securitization is related to many kinds of risk, namely, credit risk, equity risk, systematic risk, and idiosyncratic risk. In this paper, the equity risk is considered as to investigate on how the investors perceive securitization transactions.

Methods

The objective of this empirical study is to analyze the effect of securitization on the equity risk of U.S. bank holding companies and the impact of on-balance sheet loans, off-balance sheet loans (securitized loans), and retained interests on equity risk.

The inclusion of both on-balance sheet loans and off-balance sheet loans is of crucial importance in identifying the effect of securitization on transferring risk. The effect of securitization is the net effect of increasing off-balance sheet loans and reducing on-balance sheet loans. This paper adapts the models of Chen *et al.* (2008) and Wu *et al.* (2011). In the analysis, on-balance sheet loans are set as independent variables instead of control variables since they are associated with the effect of securitization, and the loans are classified into four types. This paper also examines the loan quality of securitized loans. The banks have to make decisions as to which loans to securitize and which loans to keep on their balance sheets.

In the model, equity risk is the dependent variable and is measured as the standard deviation of stock returns. This variable is constructed on a quarterly basis from Q2:2001 to Q4:2008 in order to match the quarterly bank data. With regard to the independent variables, the main focus is on on-balance sheet loans, off-balance sheet loans, and two types of retained interests, which are credit-enhancing interest-only strips and subordinated securities. In addition, control variables are included to capture the banks' characteristics. The relationship between the equity risk and the variables related to securitization is expressed as follows:

$$\begin{aligned} SD_{i,t} = {} & a_0 + a_1 ON_{i,t} + a_2 OFF_{i,t} + a_3 RI1_{i,t} + a_4 RI2_{i,t} + a_5 SECUINC_{i,t} + a_6 SIZE_{i,t} \\ & + a_7 CASHDIV_{i,t} + a_8 CAP_{i,t} + a_9 DE_{i,t} + a_{10} LOANG_{i,t} \end{aligned} \quad (1)$$

where $SD_{i,t}$ is the equity risk or standard deviation of stock returns, $ON_{i,t}$ is the on-balance sheet loans divided by the market value of equity (market capitalization), $OFF_{i,t}$ is the off-balance sheet securitized loans divided by the market value of equity, $RI1_{i,t}$ is the retained credit-enhancing interest-only strips divided by the market value of equity, $RI2_{i,t}$ is the retained subordinated securities divided by the market value of equity, $SECUINC_{i,t}$ is the net securitization income divided by the market value of equity, $SIZE_{i,t}$ is the log of total assets, $CASHDIV_{i,t}$ is the cash dividend on common and preferred stock divided by net income, $CAP_{i,t}$ is the total risk-based capital ratio (capital divided by risk weighted assets), $DE_{i,t}$ is the debt-to-equity ratio, and $LOANG_{i,t}$ is the loan growth. The subscript i = 1,…, N represents bank 1 to bank N, and subscript t = 1,…, T denotes quarterly time period t, starting from Q2:2001 to Q4:2008.

For further investigation, $ON_{i,t}$, $OFF_{i,t}$, $RI1_{i,t}$, and $RI2_{i,t}$ are classified into four types of loans. First, *MORTGAGE* denotes mortgage loans, which are 1-4 family residential loans. Second, *CONSUMER* represents consumer loans, which are the sum of home equity lines, credit card receivables, auto loans, and other consumer loans. Third, *COMMERCIAL* denotes commercial and industrial loans. Finally, *OTHER* takes care of all other loans. *OTHER* includes loans such as construction and land development loans, loans secured by farmland and multifamily (5 or more) residential properties, loans to finance agricultural production, loans to nondepository financial institutions, and lease financing receivables. Therefore, Equation (2) with loan categories is as follows:

$$\begin{aligned} SD_{i,t} = {} & a_0 + a_1 ON\_MORTGAGE_{i,t} + a_2 ON\_CONSUMER_{i,t} + a_3 ON\_COMMERCIAL_{i,t} \\ & + a_4 ON\_OTHER_{i,t} + a_5 OFF\_MORTGAGE_{i,t} + a_6 OFF\_CONSUMER_{i,t} \\ & + a_7 OFF\_COMMERCIAL_{i,t} + a_8 OFF\_OTHER_{i,t} + a_9 RI1\_MORTGAGE_{i,t} \\ & + a_{10} RI1\_CONSUMER_{i,t} + a_{11} RI1\_COMMERCIAL_{i,t} + a_{12} RI1\_OTHER_{i,t} \\ & + a_{13} RI2\_MORTGAGE_{i,t} + a_{14} RI2\_CONSUMER_{i,t} + a_{15} RI2\_COMMERCIAL_{i,t} \\ & + a_{16} RI2\_OTHER_{i,t} + a_{17} SECUINC_{i,t} + a_{18} SIZE_{i,t} + a_{19} CASHDIV_{i,t} + a_{20} CAP_{i,t} \\ & + a_{21} DE_{i,t} + a_{22} LOANG_{i,t} \end{aligned} \quad (2)$$

Cross-sectional time-series regression with fixed effects is applied to account for the nature of each bank holding company. Hausman test statistics with the random effect model as the null model and the fixed effect as the alternative model results in the rejection of the null model.[3]

The hypotheses with regard to Equation (1) are as follows. First, it is expected that increasing on-balance sheet loans increase risk for the banks; therefore, the coefficient of *ON* is expected to have a positive sign, i.e. $a_1 > 0$. This is because as banks add loans to their balance sheets, they are vulnerable to loan default. In addition, banks may loosen lending standard by originating credit loans with high risk since they consider securitization as a tool to transfer risk to outside parties.

Second, the coefficient of *OFF* (a_2) shows the effect of increasing off-balance sheet loans when the other variables are held constant. This includes the effect of decreasing on-balance sheet loans due to the securitization and the effect of increasing on-balance sheet loans where banks use the proceeds from securitization to fund new loans. In other words,

[3] Chi-square statistics are 38.89 and 47.34 for Equation (1) and (2), respectively.

the coefficient a_2 combines the effect on risk of securitizing loans (transferring loans from on- to off-balance sheet) and using the proceeds received from loan securitization to originate other on-balance sheet loans. Banks can decide the quality of loans to securitize. If the securitized loans and the new on-balance sheet loans are of the same quality, it is expected that a_2 is not significantly different, statistically, from zero. However, if the securitized loans are of a lesser quality than the new on-balance sheet loans, the coefficient of OFF is expected to be negative, i.e. $a_2 < 0$. In other words, banks with securitization effectively transfer credit risk if they securitize high credit risk or low quality loans and keep low credit risk or high quality loans on their balance sheets. In contrast, if the securitized loans are of higher quality than the new on-balance sheet loans, the coefficient of OFF is expected to be positive, i.e. $a_2 > 0$.

Third, the effect of securitization, which is the transfer of loans from on-balance sheet to off-balance sheet, is given by a_2-a_1. This is because a1 shows the effect of increasing on-balance sheet loans when other variables are held constant and a_2 shows the effect of increasing off-balance sheet loans when other variables are held constant. Since securitizing banks increase off-balance sheets loans and decrease on-balance sheet loans at the same time, the effect of securitizing loans is given by a_2-a_1. The sign of a_2-a_1 is an empirical question. If the difference is negative, i.e. a_2-$a_1 < 0$, banks successfully transfer risk through securitization since the transferred risk of on-balance sheet loans is higher than the retained risk of off-balance sheet loans. However, if the difference is positive, i.e. a_2-$a_1 > 0$, banks do not successfully transfer risk through securitization and still retain risk; therefore, banks are likely to use securitization as a funding source of new loans rather than a risk management tool.

Finally, the coefficients of *RI1* and *RI2*, which are a_3 and a_4, respectively, are expected to be positive since the banks have retained credit-enhancing interest-only strips and retained subordinated securities as credit enhancements and they are generally rated as junior tranches, which are backed by high credit risk securitized loans.

The following hypotheses for the control variables are proposed. Income from securitization increases in the same direction as the securitization activities; therefore, the coefficient of *SECUINC* (a_5) is expected to show a positive sign since Chen *et al*. (2008) mention that as securitization transactions increase, operational risk from securitization also increases. Moreover, the expected sign of *SIZE* (a_6) is negative because larger banks are

likely to have better risk diversification, investment opportunities, and access to capital than smaller ones.

The sign of *CASHDIV* (a_7) is expected to be negative since banks that are able to pay dividends signal that they have extra liquidity and can generate cash in the future. Thus, cash dividends are perceived by investors to reduce banks' equity risk. The sign of *CAP* (a_8) could be either positive or negative. On the one hand, *CAP* could be expected to be positive as banks with higher risk weighted assets are likely to increase capital to absorb unexpected losses from those assets. On the other hand, *CAP* could be expected to be negative because securitizing banks earn higher income, increase their capital and thus reduce risk. Since debt-to-equity ratio indicates insolvency risk or financial leverage, *DE* is expected to be positively related to equity risk because banks with high leverage are likely to be unable to pay obligations. *LOANG* is also expected to have a positive relationship with equity risk since sharp increases in loans may reduce loan quality. Thus, the coefficients of both *DE* (a_9) and *LOANG* (a_{10}) are expected to be positive.

In regard to the Equation (2), the expected signs of all coefficients are similar to those in the Equation (1).

Data

The quarterly financial data for the U.S. bank holding companies were obtained from the Federal Reserve Bank of Chicago while the stock data came from the Center for Research in Security Prices (CRSP). The sample period was from Q2:2001 to Q4:2008. There were 54 bank holding companies and 666 bank-quarter observations. Table 1 contains relevant statistics for all variables. The mean of *SD* shows that the returns of banks in the sample vary around their average returns. Regarding *ON* and *OFF*, banks do not securitize all loans but select certain loans to securitize since the mean of *ON* is about three times higher than the mean of *OFF.* Mortgage loans form the largest group of securitized loans. Furthermore, all banks in the sample are adequately capitalized since the minimum capital ratio requirement is 8.

Table 1 Descriptive statistics and data from Q2:2001 to Q4:2008

Variable	Mean	Minimum	Maximum
SD	0.0048	3.38e-09	0.2825
ON	5.4281	0.2804	176.3641
ON_MORTGAGE	1.4943	0	30.3607
ON_CONSUMER	0.4252	0	6.3461
ON_COMMERCIAL	0.8382	0	13.0268
ON_OTHER	2.6704	0	141.0072
OFF	1.7405	1.35e-06	101.3639
OFF_ MORTGAGE	1.5591	0	100.9540
OFF_CONSUMER	0.0697	0	3.3726
OFF_COMMERCIAL	0.0225	0	1.4169
OFF_OTHER	0.0891	0	14.3899
RI1	0.0044	0	0.1035
RI1_MORTGAGE	0.0015	0	0.1035
RI1_CONSUMER	0.0020	0	0.0717
RI1_COMMERCIAL	0.0006	0	0.0810
RI1_OTHER	0.0003	0	0.0278
RI2	0.0102	0	0.9220
RI2_MORTGAGE	0.0053	0	0.9220
RI2_CONSUMER	0.0036	0	0.2174
RI2_COMMERCIAL	0.0002	0	0.0343
RI2_OTHER	0.0011	0	0.0493
SECUINC	0.0019	-0.0128	0.0738
SIZE	16.6599	12.4774	21.5812
CASHDIV	0.3965	-5.7724	5.3165
CAP	12.7226	8.4400	21.1200
DE	10.7067	5.7967	23.1730
LOANG	0.0293	-0.3711	0.8467

Source: Data from the Federal Reserve Bank of Chicago and the Center for Research in Security Prices

Data showing the relative value of off-balance sheet loans relative to on-balance sheet loans (*OFF/ON*) are provided in Table 2. Over the whole sample period, the relative size of off-balance sheet loans to on-balance sheet loans is 106.4% for mortgage loans, 50.4% for consumer loans, 3.3% for commercial loans, and 10.4% for “other” loans. Thus, on average, mortgage loans are much more likely to be securitized. There is also considerable variation over time in the ratio of securitized loans to on-balance sheet loans. For mortgage loans, this ratio is much higher than average in the earlier part of the period while it is much lower than average in the later part of the period. In contrast, regarding “other” loans, this ratio is much lower than average in the earlier part of the period while it is much higher than average in the later part of the period.

Table 2 Relative value of securitized loans relative to on-balance sheet loans (OFF/ON)

Quarter	Mortgage Loans	Consumer Loans	Commercial Loans	Other Loans
Q2:2002	228.39%	32.28%	7.85%	7.13%
Q3:2002	216.86%	27.52%	7.74%	8.90%
Q4:2002	188.29%	23.62%	11.59%	6.99%
Q1:2003	155.49%	54.88%	7.32%	3.63%
Q2:2003	165.01%	56.74%	6.58%	3.64%
Q3:2003	162.60%	55.26%	6.91%	3.70%
Q4:2003	156.39%	53.11%	7.26%	3.99%
Q1:2004	83.48%	55.51%	7.07%	4.60%
Q2:2004	79.75%	53.39%	3.54%	7.77%
Q3:2004	74.42%	52.48%	3.00%	8.06%
Q4:2004	70.65%	48.34%	3.56%	8.35%
Q1:2005	70.20%	46.98%	3.00%	9.63%
Q2:2005	66.83%	45.23%	2.12%	9.50%
Q3:2005	83.79%	48.84%	2.08%	8.38%
Q4:2005	73.89%	50.14%	1.54%	7.76%
Q1:2006	77.01%	48.87%	1.28%	8.49%
Q2:2006	64.68%	51.43%	0.58%	9.08%
Q3:2006	65.67%	51.70%	0.45%	11.29%
Q4:2006	70.17%	56.89%	0.53%	15.07%
Q1:2007	70.82%	51.23%	1.10%	12.61%
Q2:2007	74.35%	53.11%	1.19%	12.51%
Q3:2007	77.83%	54.97%	1.02%	12.89%
Q4;2007	69.13%	53.30%	1.49%	14.08%
Q1:2008	104.55%	54.45%	1.74%	14.39%
Q2:2008	104.73%	54.67%	2.05%	14.71%
Q3:2008	102.97%	54.15%	1.81%	15.75%
Q4:2008	102.88%	53.87%	1.60%	15.32%
Average	106.40%	50.35%	3.27%	10.39%

Note: The percentages are ratios of off-balance sheet loans (securitized loans) to on-balance sheet loans.

Source: Data from the Federal Reserve Bank of Chicago.

Results

Table 3 presents the results of the regression analysis of Equation (1) and (2). Regarding Equation (1), the coefficient of *ON* is positive as expected. That is, on-balance sheet loans increase the banks' equity risk. Banks that consider securitization as a pipeline to originate new loans are likely to loosen lending standards so much that new loans increase banks' risk. The coefficient of *OFF* is significantly and positively related to banks' equity risk, implying that banks securitize low credit risk loans to get a higher credit rating for their SPVs' securities and then use the proceeds to generate new high credit risk loans on their balance sheets. In other words, the securitized loans are of higher quality than the new on-balance sheet loans.

Table 3 Regression analysis of equity risk

Variable	Expected sign	Equation (1)	Equation (2)
CONSTANT		-0.0842	-0.0068
		(0.0553)	(0.0496)
ON	+	0.0008 ***	
		(0.0001)	
ON_MORTGAGE	+		0.0005
			(0.0006)
ON_CONSUMER	+		0.0134 ***
			(0.0045)
ON_COMMERCIAL	+		0.0075 ***
			(0.0018)
ON_OTHER	+		-0.0007 ***
			(0.0002)
OFF	+/-	0.0011 ***	
		(0.0004)	
OFF_ MORTGAGE	+/-		-0.0010 **
			(0.0005)
OFF_CONSUMER	+/-		-0.0037
			(0.0099)
OFF_COMMERCIAL	+/-		-0.0307
			(0.0359)
OFF_OTHER	+/-		0.0085 ***
			(0.0020)
RI1	+	0.4586 ***	
		(0.0954)	
RI1_MORTGAGE	+		0.3726 ***
			(0.1155)
RI1_CONSUMER	+		-0.0377
			(0.2359)
RI1_COMMERCIAL	+		0.5457
			(0.9439)
RI1_OTHER	+		-0.0644
			(0.3458)
RI2	+	-0.0183	
		(0.0182)	
RI2_MORTGAGE	+		-0.0349 **
			(0.0162)
RI2_CONSUMER	+		0.0502
			(0.0740)
RI2_COMMERCIAL	+		0.0587
			(0.3248)
RI2_OTHER	+		-0.1297
			(0.1313)
SECUINC	+	-0.4087 ***	-0.0270
		(0.1388)	
SIZE	-	0.0040	0.0001
		(0.0030)	(0.0027)
CASHDIV	-	-0.0022 *	-0.0024 **
		(0.0012)	(0.0010)
CAP	+/-	0.0015 **	0.0003
		(0.0006)	(0.0005)

Table 3 (Continued)

DE	+	-0.0003	-0.0003
		(0.0005)	(0.0005)
LOANG	+	0.0017	-0.0083
		(0.0076)	(0.0063)
F-statistic		23.73	31.40
P-value		0.0000	0.0000
Within R^2		0.2827	0.5393
Between R^2		0.0324	0.0620
Overall R^2		0.1453	0.4000

Note: The dependent variable is equity risk (the standard deviation of stock return). The estimation is cross-sectional time-series regression with fixed effects. Hausman test statistics indicate that the null hypothesis of the random effect model is rejected. For Equation (1), the Hausman chi-square test is 38.89 with 10 degrees of freedom (P=0.0000). For Equation (2), the Hausman chi-square test is 47.34 with 19 degrees of freedom (P=0.0003). ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Furthermore, *RI1* is positively related to the banks' equity risk as expected while *RI2* is insignificant. This evidence is consistent with the results of Chen *et al.* (2008) who find that retained credit-enhancing interest-only strips are riskier than retained subordinated securities since the former receives no principal while the latter receives principal payment but only after senior securities.

SECUINC is hypothesized to have a positive effect on equity risk but the results show a negative effect. Banks' equity risk decreases as banks earn more securitization income. Investors may believe that banks with an increased securitization income are able to earn higher revenue and profit and thus reduce risk. Additionally, *CASHDIV* is negatively related to the banks' equity risk as expected. Banks that pay dividends to investors have the potential to grow and have plenty of liquidity. *CAP* has the expected positive sign as investors are aware that banks increase capital to buffer unexpected losses and thus take on more risk. As banks increase their capital, they are perceived as being safe and sound. Finally, *SIZE, DE,* and *LOANG* have no significant effect on the equity risk.

In Equation (2), the variables *ON, OFF, RI1,* and *RI2* are classified into four types of loans. The following discussion is organized based on loan type. With regard to mortgage loans (*MORTGAGE*), *ON_MORTGAGE* is insignificantly related to the banks' equity risk, indicating that an increase in on-balance sheet mortgage loans does not

affect the banks' equity risk. However, *OFF_MORTGAGE* is negatively related to the banks' equity risk. Banks securitize high credit risk (low quality) mortgage loans and use the proceeds to create new low credit risk (high quality) mortgage loans on their balance sheets. *RI1_MORTGAGE* is significantly positive while *RI2_MORTGAGE* is significantly negative. This evidence is consistent with Chen *et al.* (2008) who mentioned that retained credit-enhancing interest-only strips are riskier than retained subordinated securities. Hence, the banks still retain some risk arising from retained credit-enhancing interest-only strips.

Regarding consumer loans (*CONSUMER*), *ON_CONSUMER* has a significantly positive effect on the banks' equity risk. However, *OFF_CONSUMER* is insignificant, implying that the securitized consumer loans and the new on-balance sheet loans are of the same quality. Both *RI1_CONSUMER* and *RI2_CONSUMER* variables do not significantly affect the banks' equity risk and this result is consistent with Chen *et al*. (2008). According to Chen *et al*. (2008), retained interests that are related to the banks' equity risk only derived from explicit recourse (conditions stated in contracts); however, banks with consumer loans are generally exposed to implicit recourse, which is not stated in contracts. As a result, banks have to increase the value of the securitized loans in SPVs to benefit reputation and future securitization. Chen *et al.* (2008) argued that implicit recourse holds for revolving loans or consumer loans.

With respect to commercial loans (*COMMERCIAL*), *ON_COMMERCIAL* has a positive effect on the banks' equity risk. The banks' equity risk increases as the on-balance sheet commercial loans increase. The coefficient of *OFF_COMMERCIAL* is statistically insignificant, meaning that the securitized commercial loans and new on-balance sheet loans are of the same quality. Both *RI1_COMMERCIAL* and *RI2_COMMERCIAL* variables are also not significant. This result contradicts Chen *et al*. (2008) who found that retained credit-enhancing interest-only strips from commercial loans are positively related to the banks' equity risk; however, retained subordinated securities from those loans are still insignificant.

Regarding the "other" loans (*OTHER*), *ON_OTHER* has a significantly negative effect on the banks' equity risk. However, *OFF_OTHER* is positively related to banks' equity risk as banks securitize other loans that are of high quality and use the proceeds to fund new on-balance sheet other loans that are of lower quality than those securitized loans.

Both *RI1_OTHER* and *RI2_OTHER* variables are not significant. Considering the control variables, the only significant variable is *CASHDIV.* The negative sign indicates that investors perceive that the banks with dividend payments do not retain much risk.

Table 4 shows the effect of securitization (the difference between the coefficient of OFF and the coefficient of *ON*). Those coefficients are derived from Table 3. In regard to Equation (1), the effect of securitization is not statistically significant for the banks' equity risk. Since the sign is not significantly negative, the banks do not successfully use securitization to transfer credit risk. Banks rather use securitization as a funding tool instead of risk management tool during the sample period.

Table 4 The effect of securitization (OFF-ON)

Coefficient	Equation (1)	Equation (2)	
OFF-ON	0.0003		
	(0.4193)		
OFF_ MORTGAGE-ON_MORTGAGE		-0.0015	
		(0.1292)	
OFF_ CONSUMER-ON_CONSUMER		-0.0170	
		(0.1572)	
OFF_ COMMERCIAL-ON_COMMERCIAL		-0.0382	
		(0.2941)	
OFF_ OTHER-ON_OTHER		0.0092	***
		(0.0000)	

Note: The Wald test is used to test the statistical significance of the effect of securitization. The null hypothesis is that the sum of both coefficient estimates equal zero. P-values are in parentheses. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

In Equation (2), the effect of securitization of mortgage, consumer, and commercial loans is also insignificantly related to banks' equity risk, indicating that banks do not successfully transfer risk and purposely use securitization to fund new on-balance sheet loans. Unlike the three types of loans mentioned above, the effect of securitization, *OFF_OTHER-ON_OTHER*, is significantly positive to banks' equity risk, indicating that banks do not successfully transfer risk through securitization of other loans and securitization of "other" loans increases banks' equity risk. Similar to the first three types of loans, banks use securitization as a funding tool.

Conclusions

This paper examines the relationship between the effect of securitization and the banks' total equity risk in U.S. bank holding companies from Q2:2001 to Q4:2008, and investigates the quality of securitized loans and the variables related to securitization, which are on-balance sheet loans, off-balance sheet loans (securitized loans), and retained interests in the forms of credit-enhancing interest-only strips and subordinated securities.

When all loan types are considered as a group, banks are found to be still exposed to risk from off-balance sheet loans as they securitize lower credit risk loans and use the proceeds to generate higher credit risk loans on their balance sheets. Furthermore, the banks do not successfully transfer risk through securitization and use securitization as a funding tool rather than a risk reduction tool.

Different types of loans yield different results. Banks with mortgage loans securitized low quality loans and generated high quality loans on their balance sheets. The effect of mortgage loan securitization does not have a significant impact on the banks' equity risk. Thus, the banks are likely to use mortgage loan securitization to fund new loans rather than to transfer risk. In addition, the results indicate that during the subprime crisis, banks that securitize mortgage loans were exposed to risk from retained interest rather than from the effect of securitization itself.

In regard to consumer and commercial loans, securitized loans and on-balance sheet loans are of the same quality. Moreover, securitization of both types of loans has no significant effect on the banks' equity risk, meaning that banks do not successfully reduce risk through securitization; they were using securitization to access funding sources.

With respect to "other" loans, banks that securitize such loans increase risk from off-balance sheet loans by securitizing low credit risk loans and generating high credit risk loans. Unlike the previous three types of loans, "other" loans are the only loan type that increases the banks' equity risk. Banks with "other" loans use securitization to access financing sources rather than to transfer risk.

Although the effect of securitization for all types of loans (the aggregate) is insignificant for the banks' equity risk, securitization of "other" loans (loans secured by real estate other than mortgage loans) is found to significantly raise the banks' equity risk. This

result supports the contention that securitizing banks do not successfully transfer risk and that they use securitization as a funding source. In other words, banks still retain some, if not all, the risk from securitization. Therefore, SFAS No. 140 should recognize loan transfer as secured borrowing (financing) instead of true sale so that loans are still on the banks' balance sheets; the banks would then be able to allocate adequate capital to absorb unexpected losses from securitization activities. It should be noted that SFAS No.166 and 167, which are the amendments to SFAS No. 140 and Interpretation 46(R), respectively, requires that securitized loans be retained on balance sheet. They become effective at the beginning of the first annual reporting period after November 15, 2009. (Financial Accounting Standards Board, 2009).

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