Asset Securitizations and Credit Default Swaps

ABSTRACT: This study examines the effects of off-balance sheet versus on-balance sheet securitizations on the originator's credit risk in the default swap (CDS) market across the recent business cycle from 2002 to 2009. I find that on-balance sheet securitizations demonstrate greater effects on the originator's CDS premium than off-balance sheet securitizations in the business cycle. While off-balance sheet securitizations' effects on the originator's CDS premium become significantly stronger after 2007 when the economy declines, on-balance sheet securitizations' effects on the originator's CDS premium do not experience a significant change with the onset of the recession. The results suggest that the CDS market views originators as having greater probabilities not to honour their implicit guarantees for off-balance sheet securitizations during the economic downturn. The results also indicate that on balance sheet and off-balance sheet securitizations have distinctly different risk properties. It would be beneficial to investors if regulations take into considerations the changing credit risks of off-balance sheet securitizations and the different structures of asset securitizations.

1 Introduction

Under both IFRS and US GAAP, asset securitizations can be structured as sales and therefore are off the balance sheet (i.e. off-balance sheet securitizations). Asset securitizations not structured as sales are recognized on the balance sheet as secured borrowings (i.e. on-balance sheet securitizations). The objective of this study is to examine the effects of these two types of asset securitizations on the originator's CDS premium.

Setting an appropriate regulatory framework for asset securitizations continues to be at the centre of financial reporting debate among policy makers and regulators. The debate hinges on how to accurately capture the levels of credit risk in asset securitizations (Barth et al. 2012; Cheng et al. 2011). For example, the Basel Committee on Banking Supervision proposes to impose different capital requirements for asset securitizations with different structures and credit risk properties. The Basel Committee is concerned that the capital requirement may have been too high for some types of securitizations while too low for the others (Basel Committee 2012). Therefore, investigating the credit risk of off-balance sheet and on-balance sheet securitizations provides useful insight in how to set appropriate regulatory requirements for different types of asset securitizations.

Although prior research has examined various aspects of off-balance sheet securitizations (Niu and Richardson 2006; Chen et al. 2008; Landsman et al. 2008; Dechow and Shakespeare 2009; Cheng et al. 2011; Barth et al. 2012), empirical evidence is scarce on the implications of asset

securitizations with different structures. In particular, little is known about on-balance sheet securitizations. Furthermore, prior research to date has examined the risk of asset securitizations using stock returns, bond yields and credit ratings. Compared with these measures, the CDS premium is a more direct measure of credit risk and the CDS market is a better venue to investigate credit risk than equity and bond markets (Hull et al. 2004; Callen et al. 2009). This study therefore addresses the gap in the literature by investigating: 'What are the effects of off-balance sheet and on-balance sheet securitizations on the investor's assessment of the originator's credit risk in the CDS market?'

To shed light on the above question, this study compares the associations of off-balance sheet and on-balance sheet securitizations with the CDS premium referenced to the originator. After searching the Edgar database, this study identifies a sample of 113 US securitizing firms with available data to run the tests across the latest business cycle (2002-09). The investigation of the relation between the CDS premium and the value of the securitized assets extends the CDS pricing model in Callen et al. (2009). As noted by Allen and Bali (2007), the neglect of the cyclicality in the macroeconomy can lead to fundamental flaws in the measurement of credit risk. Hence, the association with the CDS premium is examined through the latest business cycle (2002−2009). To detect material adjustments in this relation, this relation is examined before and after the start of the financial crisis (hereafter 'before 2007' and 'after 2007'),[1]

[1] The latest business cycle starts from 2002 and ends in 2009 (NBER, Business Cycle Dating Committee), which is hallmarked by a flourishing securitization market. SFAS 140 (FASB 2000) governed the accounting disclosures of securitizations during this time. Year 2007 is included in 'after 2007'.

which is considered a turning point in economic activity for the latest business cycle.[2]

I find that on-balance sheet securitizations have stronger effects on the originator's CDS premium than off-balance sheet securitizations in the business cycle. Off-balance sheet securitizations' effects on the originator's CDS premium become significantly stronger after 2007 when the economy declines. By contrast, on-balance sheet securitizations' effects on the originator's CDS premium do not experience a significant change with the onset of the recession. Compared with prior research in the equity and bond markets (Nui and Richardson 2006; Chen et al. 2008; Barth et al. 2010), this study provides different evidence from the CDS market. Prior research generally finds that off-balance sheet securitizations are risk relevant prior to the financial crisis, while this study finds that off-balance sheet securitizations have strong effects on the originator's CDS premium after the financial crisis.

The CDS market provides a better venue to examine credit risk associated with asset securitizations than equity and bond markets. The premium on a CDS contract is the product of the expected probability of default times the expected loss. The greater is the originator's obligation, the greater is the probability of default. For expected losses, the priority of claims matters. As the originator is not legally responsible for off-balance sheet securitizations, they should only count after all other debts have been paid off and will not be counted at all in bankruptcy. Prior research drawing

[2] US Federal Reserve's *Financial Crisis Timeline* (Federal Reserve Bank of St Louis 2010) is drawn on to estimate the onset of the financial crisis and the general deterioration of credit conditions in the economy. This timeline identifies that the financial crisis started from 2007. The trend in credit conditions can also be observed in the significant rise of the sample average CDS premium entering into 2007 as shown in Figure 1.

evidence from the equity market studies the residual claimant, which is ranked behind everyone else. Prior research also draws evidence from the bond market, where most issued bonds are secured. Evidence from these markets is less sensitive to the changes in credit risk. Therefore, the CDS market, which is highly sensitive to the changes in credit risk, provides unique evidence on credit risk of asset securitizations.

As suggested by the financial instability theory (Minsky 1970, 1982, 1995), in the benign economic conditions before the financial crisis, the CDS market views any loss from off-balance sheet securitizations as being fully covered by the implicit guarantees provided by the originator. After the financial crisis, the CDS market reassesses the credit risk with the views that the originator might not fully honour its implicit guarantees due to significantly increased losses associated with off-balance sheet securitizations. This explains why off-balance sheet securitizations may have stronger effects on the originator's CDS premium after the crisis. By comparison, on-balance sheet securitizations fully remain the originator's secured liabilities. There is little uncertainty about whether the originator would honour its guarantees.

The evidence provided in this paper has regulatory implications. The results suggest that the CDS market views originators as having greater probabilities not to honour on their implicit guarantees for off-balance sheet securitizations after 2007. The evidence also indicates the different risk properties of off-balance sheet and on-balance sheet securitizations. Therefore it would be beneficial to investors if regulations take into considerations the changing credit risks in off-balance sheet securitizations

and differentiate regulatory requirements for these two types of asset securitizations. Additionally, by documenting the effects of asset securitizations with different structures on the originator's CDS premium before and after the recent financial crisis, I contribute to the literature on the effects of information uncertainty on asset prices.

This study is organized as follows. Section 2 provides background on the institutional setting and reviews prior research related to accounting for securitizations. Section 3 develops hypotheses based on theory and prior research. Section 4 and 5 describe the model and the sample. Section 6 presents the empirical results. Section 7 discusses sensitivity analyses. Section 8 concludes the paper.

2 Institutional Background and Prior Research

Asset Securitizations

Asset securitizations are often called 'shadow banking', as they provide vital financing resources to firms at lower costs than the traditional banking. According to the Securities Industry and Financial Markets Association (SIFMA), the outstanding amount of global asset securitizations stands above $13 trillion in 2010.

Asset securitizations can be largely categorized into off-balance sheet and on-balance sheet securitizations. Although the majority of the originators engaged in off-balance sheet securitizations, there have been firms only having on-balance sheet securitizations. Since the financial crisis in 2007-2008, large amounts of off-balance sheet securitizations were brought onto the balance sheet as the market of mortgage backed securities (MBSs) collapsed.[3]

Off-balance sheet securitizations treat the securitized assets as being sold to investors, while retaining some percentage of the securitized assets (i.e. retained interests) on the balance sheet to cover losses in the securitized asset pools. Legally, the originator is not responsible for any losses beyond the retained interests. However, the originator often provides implicit guarantees to investors.

Implicit guarantee or recourse is voluntary in the sense that it is not legally binding for the originator to take on implicit obligations not mandated in contracts. In theory, the existence of the implicit recourse can

[3] For example, Bank of America, Legg Mason, SEI Investment Co., Sun Trust Banks Inc., Merrill Lynch, and Citigroup have all pumped cash into their off-balance sheet vehicles to provide enhancements to the trusts ('Bank of America, Legg Mason Prop Up Their Money Funds', Bloomberg.com, November 2007).

be explained from two perspectives. Ex ante, the implicit recourse is essential to assure the bankruptcy remoteness of SPEs (Landsman et al. 2008), thus reducing the bankruptcy costs in the transaction. Without the implicit recourse, investors would charge higher interests on lending in case the thinly capitalized SPEs might face liquidity shortages or other financial difficulties. It is the bottom line guarantee provided to investors by originators. Ex post, the implicit recourse reflects the originators' concerns about their future access to the capital market if they let their SPEs collapse. As witnessed in the financial crisis, many originators voluntarily repurchased securitized assets from, or extended credit to, securitization vehicles, even if they did not have contractual obligations to do so.[4] By providing such implicit guarantees to the investors, the originator intends to protect its own reputation capital (Gorton and Pennacchi 1995).

By contrast, on-balance sheet securitizations do not retain any first loss positions in securitized assets. On-balance sheet securitizations treat the whole of the securitized assets as the originator's liabilities and continue to keep the whole of securitized assets on the balance sheet (i.e. there is no retained interests). Investors have explicit recourse to the originator's assets for their losses related with the securitized assets. Because of this crucial difference in the structures, off-balance sheet and on-balance sheet securitizations may contain different risk properties.

Prior Research

[4] For example, Bank of America, Legg Mason, SEI Investment Co., Sun Trust Banks Inc., Merrill Lynch, and Citigroup have all pumped cash into their off-balance sheet vehicles to provide enhancements to the trusts ('Bank of America, Legg Mason Prop Up Their Money Funds', Bloomberg.com, November 2007).

Early research found that asset securitizations increase bank profit by widening investment channels and therefore either decreases risk (Greenbaum and Thakor 1987; James 1988; Lockwood et al. 1996) or has little impact on the originator's risk (James 1987; Pavel 1989; Hasan 1993). Recent literature focuses on the leverage-increasing effects of securitization and concludes that there is a positive relation between securitization and risk. Barth et al. (2010) examine the sources of the credit risk in off-balance sheet securitizations and find that retained interests and securitized assets are valued differently between the bond market and credit rating agencies. Cheng et al. (2011) find that asset securitizations increase banks' information uncertainty. Amiram et al. (2012) find that equity market reacts more to the impairment of retained interests after the financial cisis, suggesting information uncertainty at the risk assessment of asset securitizations during the crisis. This study extends the current literature on asset securitizations by measuring the credit risk associated with both off-balance sheet and on-balance sheet securitizations. Moreover, credit risk is measured by the pure credit risk pricing instrument of the CDS.

3 Hypotheses

Securitization, Leverage and the CDS Premium

Research into securitization finds that off-balance sheet securitization is a borrowing rather than a sale by the originator (Niu and Richardson, 2006; Landsman et al., 2008). If securitization is a borrowing, then securitization increases the leverage of the originator. It is well known that a boost in leverage increases the firm's credit risk (Merton, 1974; Callen et al., 2009; Ericsson et al., 2009). It is therefore predicted, as a maintained hypothesis, that securitization (both on and off-balance sheet) has a positive association with the originator's credit risk. Using the CDS premium to measure credit risk, this leads to the first hypothesis:

H1: The CDS premium of the originator is positively associated with asset securitizations.

Off-Balance Sheet Securitization and the CDS Premium

Economic fluctuations impact credit risk. For example, Fisher (1933) proposed that excessive borrowings depress asset price, increase default and cause recession. Minsky (1964, 1970, 1982, 1995) developed the theory of financial instability. According to Minsky, economic fluctuations originate from the interactions between income, debt and asset price. In a period of economic growth, there appear new opportunities of profitable investments. Entities start to borrow to fund the new investment in pursuit of higher profits. Expansions of investment push asset prices higher. However, the increase in debt will be faster than the increase in income. At the same time, increased competition in the market attenuates

the profitability of new investments. Decreased income will adversely impact asset price and lowers the ability of entities to repay debt. Refinancing then becomes difficult. To repay their debts, entities need to sell their extant assets. If many entities try to sell their assets to deleverage at the same time, the asset price will be depressed and the default rate rises.

Consistent with economic theory, there will be little risk in securitized assets during economic growth. The market believes that any loss from securitized assets in off-balance sheet SPEs can be fully covered by the implicit recourse provided by the originator in the benign economic conditions before the financial crisis. However, cash flows from securitized assets will become unstable during recessions. This instability may burgeon from falling income or deteriorating credit conditions. Consequently, investors view that the originator will not be able to honour fully its obligations to off-balance sheet SPEs due to significantly increased losses associated with the SPEs after the financial crisis.

The watershed in the latest business cycle comes at the beginning of 2007, the start of the financial crisis (Federal Reserve Bank of St Louis 2010). Therefore, it is predicted that off-balance sheet securitization's association with the originator's CDS premium rises after 2007. This leads to the second hypothesis:

H2: The CDS premium of the originator is more positively associated with off-balance sheet securitization after 2007 than prior to 2007.

On-Balance Sheet Securitization and the CDS Premium

In order to obtain the most favourable financing terms, the deal structures of securitization transactions sometimes will not be able to meet the regulatory requirements of true sales. Unlike off-balance sheet securitizations, these on-balance sheet securitizations remain the originator's liabilities and investors have full recourse for their losses. The deal structures that do not qualify as sales include the originator's right of remarketing of the securitized assets, holding unconditional call options on the securitized assets[5] and entering into derivatives to hedge interest rate exposure of securitized assets.[6] Under such deal structures, the originator still effectively controls the securitized assets and a true sale cannot be accomplished.

In general, on-balance sheet securitization would have greater effects on the originator's CDS premium than off-balance sheet securitization, as investors view on-balance sheet securitization as transferring minimum credit risk to the SPEs. The whole of securitized assets in on-balance sheet securitizations continue to be kept on the originator's balance sheet. Investors have full explicit recourse to the originator's assets to cover any losses from on-balance sheet securitizations. This leads to the hypothesis 3a:

H3a: The CDS premium of the originator is more highly associated with on-balance sheet securitization than with off-balance sheet securitization.

[5] For example, see page 93 of the SEC10-K filing of SLM Corporation for the fiscal year ended December 31, 2006.
[6] For example, see Note 8 of the SEC10-K filing of Wyndham Worldwide Corporation for the fiscal year ended December 31, 2007.

When the economy declines, the likelihood of providing recourse to deficient SPEs by the originator would still be greater for on-balance sheet securitization than for off-balance sheet securitization, as on-balance sheet securitization remains fully the originator's liabilities. This greater likelihood of recourse would be viewed favourably by the CDS market and translated into smaller increases in the CDS premium. This leads to the hypothesis 3b:

H3b: The increase in the association of on-balance sheet securitization with the CDS premium of the originator is smaller than off-balance sheet securitization after 2007.

4 Research Design

Callen et al. (2009) model the firm-level CDS premium as a function of income, leverage, interest rate, asset volatility, firm size and credit ratings. To answer the research question, this study extends Callen et al.'s (2009) model to include on-balance sheet and off-balance sheet securitizations. To test the fluctuation in the association between securitization and credit risk across the business cycle, a recession interaction term *R* is further added to the model. *R* is an indicator variable with 1 if the observation is after 1 January 2007 and 0 otherwise.[7] The extended model is:

$$\begin{aligned} CDS_{it} = {} & \gamma_0 + \gamma_1 R + \gamma_2 OffBS_{it} + \gamma_3 OffBS_{it} * R + \gamma_4 OnBS_{it} + \gamma_5 OnBS_{it} * R \\ & + \gamma_6 AROA_{it} + \gamma_7 OLEV_{it} + \gamma_8 CRT_{it} + \gamma_9 SDRT_{it} + \gamma_{10} SIZE_{it} \\ & + \gamma_{11} SPOT_{it} + \gamma_{12} DOC_{it} + \gamma_{13} D\_m + \gamma_j \Sigma_j Ind_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Where:

CDS	=	natural log of the CDS premium (in basis points);
R	=	indicator variable with 1 if the observation of CDS spread is after 1st January 2007 and 0 otherwise;
OffBS	=	outstanding dollar amount of financial assets securitized accounted for as sales less retained interests and servicing rights deflated by the sum of market value of equity and total liabilities of the firm;
OnBS	=	outstanding dollar amount of financial assets securitized accounted for as secured borrowings deflated by the sum of market value of equity and total liabilities of the firm;
AROA	=	net income before extraordinary items less securitization gains scaled by the sum of market value of equity and total

[7] Federal Reserve Bank of St Louis's *The Financial Crisis: A Timeline of Events and Policy Actions* (Federal Reserve Bank of St Louis 2010) starts from February 2007 when Freddie Mac stops buying risky subprime mortgage loans. Here it is advanced to 1 January 2007 to capture the sensitivity of the credit market. Whether cut in February or January 2007 does not have any significant impact on the results. There are only three CDS observations in January 2007 in the final sample.

liabilities of the firm;

OLEV	=	total liabilities minus the on-balance sheet securitization deflated by the sum of market value of equity and total liabilities of the firm;
CRT	=	Standard & Poor (S&P)'s long-term credit rating;
SDRT	=	standard deviation of daily returns during the current fiscal quarter ;
SIZE	=	natural log of the market value of equity at the end of fiscal quarter;
SPOT	=	one-year US T-bill rate;
DOC	=	indicator variable with 1 if the CDS contract has 'exclude restructuring' clause and 0 otherwise;
D_m	=	1 (0) if the CDS contract maturity is (is not) *m* years, *m*=3,5,7,10;
$\sum_j Ind$	=	1 (0) if a firm is (is not) in industry *j*, based on the 1-digit SIC codes;
i	=	firm subscript;
t	=	time subscript for quarter *t*.

Dependent Variable

The dependent variable (*CDS*) is the composite average CDS premium[8] written on the originator observed one day after the firm's SEC filing date. The composite CDS premium indicates the price of the credit risk of the entity rather than a particular debt issued by the entity (Callen et al. 2009; Ericsson et al. 2009).[9]

Independent Variables

[8] The Markit CDS premium data come from the book of trading records (daily closing price) or the most recent executable bid/offers if transaction record is unavailable. Markit CDS premium is a composite calculated as the average of the market CDS prices on the same entity contributed by multiple brokers and dealers. The Markit CDS data require at least three market prices to calculate the composite average.

[9] Naked CDS constitutes most of the CDS market. Naked CDS investors buy and sell protections without owning any debt issued by the reference entity. Naked CDS is estimated to account for 80 per cent of the CDS market ('Banning "Naked" Default Swaps May Raise Corporate Funding Costs', Bloomberg.com, July 2009).

The independent variables are on-balance sheet securitization (*OnBS*) and off-balance sheet securitization (*OffBS*). They are the book values of the amount of the firm's securitized financial assets (Niu and Richardson 2006; Landsman et al. 2008; Chen et al. 2008). *OnBS* is measured as the book value of securitized financial assets at the fiscal quarter end accounted for as secured borrowings. Since *OnBS* is accounted for as borrowings, the addition of *OnBS* needs to separate total liabilities into *OnBS* leverage and other leverage. *OffBS* is measured as the book value of securitized financial assets accounted for as a sale less the retained interest and servicing rights at the fiscal quarter end. The variables are scaled by the value of total assets (market value of equity plus book value of total liabilities).[10] The inclusion of *OffBS* leverage also requires the net income to be adjusted to exclude securitization gains to restate the sale accounting of securitizations back to the secured-borrowing accounting.

For H2, the prediction is $\gamma_3 > 0$. For H3a, the prediction is $\gamma_2 < \gamma_4$. For H3b, the prediction is $\gamma_5 < \gamma_3$. Equation (1) is also extended to a more complex version of interacting *R* with all the independent variables since Table 2.4 shows that all the control variables are significantly different before and after 2007.

The other variables follow the 'structural variables' that have been modelled and empirically tested to be the main drivers of CDS pricing (Callen et al. 2009; Das et al. 2009; Ericsson et al. 2009). They include leverage of the firm other than securitizations (*OLEV*), profitability of the firm (*AROA*), and volatility of the firm's assets (*SDRT*), risk-free interest

[10] The variables are also deflated using total assets; results are not sensitive to these changes.

rate (*SPOT*), size of the firm (*SIZE*), credit ratings of the firm (*CRT*) and an indicator for the restructuring clause in the CDS contract (*DOC*). More specifically, total liabilities scaled by the value of total assets are adopted as a proxy of total leverage (*LEV*). *OLEV* is estimated as *LEV* minus on-balance sheet securitization at fiscal quarter end scaled by the value of total assets (market value of equity plus book value of total liabilities). *ROA* is measured as income before extraordinary items and discontinued operations scaled by total assets at the end of the quarter. The adjusted *ROA* (*AROA*) is *ROA* minus the securitization gains. *SDRT* is measured by the standard deviation of daily returns during the firm's fiscal quarter. *SPOT* is the risk-free rate of interest (one-year US T-bill rate) at the SEC filing date. *SIZE* is the natural log of the market value of the firm's equity at the end of fiscal quarter. *CRT* is the firm's S&P 500 long-term credit rating at fiscal quarter end, which is sourced from the Compustat database and has been converted to a numerical scale. It shows a minimum of 2 (AAA) and maximum of 23 (C) with a median of 11 (BBB). *DOC* is an indicator variable with 1 if the CDS contract has 'exclude restructuring' clause and 0 otherwise.

5 Sample

Sample Selection

Securitization data, including the outstanding balance of financial assets securitized, retained interests, servicing rights and securitization gains, was gathered from firms' 10-Q and 10-K filings for the period from the first quarter of 2002 to the third quarter of 2009 (inclusive).[11] Firms with securitization disclosures are initially identified through a key-word search using Direct-Edgar. When a firm did not disclose retained interests, servicing rights or securitization gains, it is assumed these values are immaterial and set to zero.

CDS data was purchased from Markit.[12] Markit provides a composite at-market CDS premium for a certain maturity of a CDS contract. This composite is derived from the average CDS premium contributed by a group of investment banks and brokers. The Markit CDS data includes relevant information on the maturity, seniority, date, restructuring clauses and reference entity of the CDS contract. All the CDS contracts are daily. To enhance the homogeneity of the sample, this study only includes CDS contracts on the firm's senior debt.

Other financial statement data and share price data were gathered from the Compustat and Centre for Research in Security Prices (CRSP)

[11] SFAS 140 (FASB 2000) became effective beginning 2001 and governed the securitization disclosures during this period. During this period, FIN46R (FASB 2003) was adopted after December 2003 to strengthen rules on consolidations. Prior research shows that firms entered into restructuring arrangements to avoid consolidating off-balance sheet securitization vehicles (Bens and Monahan 2008).

[12] According to the *Wall Street Journal*, Markit Group Limited was founded in 2001 to provide credit risk pricing, especially the daily CDS pricing. Markit is owned by JP Morgan Chase & Co., Goldman Sachs Group Inc. and Credit Suisse Group. Markit shareholders also include Citigroup Inc., Deutsche Bank AG, Bank of America Corp., Barclays PLC, UBS AG, Morgan Stanley, HSBC Holdings PLC and asset managers. Markit is considered the dominant provider of credit market pricing and information ('US Tightens Its Derivatives Vise', WSJ.com, July 2009).

databases. Interest rate data was gathered from the Federal Reserve Bank's interest rate publications.

The sample selection process is summarized in Table 1. Initial CDS data includes 985,390 CDS contracts for 133 securitizing firms. Among the 133 firms, 121 firms have enough information on securitization disclosed in 10K and 10Q filings. This securitization dataset has 2,527 firm-quarter observations from 121 securitizing firms after merging with Compustat and CRSP. In this process, 74 firm-quarter observations were lost due to missing values. This dataset was then merged with Markit's CDS dataset using Markit Ticker symbols. Merging with the CDS dataset requires that each observation has at least a five-year CDS premium one day after the SEC filing date. If the CDS premium was missing on that date, the next first available CDS premium was then chosen.[13] This lag was cut off at the 30th day after the SEC filing date. This process yields a sample of 9,125 CDS contracts based on five-year CDS contracts for 114 firms (1,837 firm-quarters). After further excluding observations with missing CDS premium, the final sample has 8,470 CDS contracts (1,825 firm-quarters of 113 firms) for the test of securitization's associations with the CDS premium.

Table 2 shows the distribution of observations by four-digit SIC codes. The final sample includes 113 firms, covering 71 SIC industries. As would be expected, commercial banks are the largest sector covering 13.48 per cent of the total sample observations (including 16 commercial banks). The remainder of the sample firms are diversified across a wide range of industries. Compared with prior literature (Niu and Richardson 2006;

[13] Most of the observations have the CDS premium within a week after the SEC filing date.

Landsman et al. 2008; Dechow et al. 2010), this study has a larger and more diversified sample.[14]

Sample Characteristics

Table 3 provides descriptive statistics for the sample observations. The maximum value of off-balance sheet securitization is more than double that of on-balance sheet securitization (1.651 compared to 0.757), reflecting the more pervasive use of off-balance sheet securitization.[15] The CDS premium has a mean (median) value of 4.46 (4.43), which is consistent with Callen et al. (2009).

Firms engaging in securitizations typically have good credit ratings and are highly leveraged. The average of the firms' credit rating is above the investment grade. The average leverage of the sample firms is high at approximately 65 per cent of the sum of their market value of equity and total liabilities. The maximum values of *LEV* and *OLEV* are given by a low market value of equity and a large value of total liability.[16]

Table 4 compares the differences of means and medians of the main variables used in the credit risk tests before and after 2007. Allen and Bali's (2007) model shows that it is crucial to consider cyclicality in the measurement of business and credit risks. Consistent with their propositions, Table 4 shows that the mean and median values of all the

[14] By comparison, the sample of Niu and Richardson (2006) has 535 firm-year observations from 1997 to 2003. In their sample, approximately 22 per cent of the observations are from commercial banks. Their sample also includes 15.3 per cent of mortgage bankers, which are not part of the current sample due to the lack of the CDS premium data. Therefore, banks account for more than 37 per cent of observations in the prior study's sample.

[15] When observations of off-balance sheet securitization are available but those of on-balance sheet securitization are missing, on-balance sheet securitization is set to be zero and vice versa to maximize the total number of observations. The results are similar keeping only non-zero observations of either off-balance sheet or on-balance sheet securitization.

[16] This observation occurs in 2007 Q1 for Aramark Corp.

variables except leverage (*OLEV*) are significantly different before and after 2007. *OLEV* is not significantly different before and after 2007 because they are scaled by the sum of total liability and the market value of equity, in which the market value of equity significantly drops after 2007. In general, Table 4 shows that values of variables affecting firms' credit risk are significantly different before 2007 and after 2007, which strengthens the case for measuring credit risk through the business cycle.

Table 5 reports Pearson (Spearman) correlations above (below) the diagonal. Only the Pearson correlations are discussed. As expected, *OffBS* are positively correlated with leverage (*LEV*). *OnBS* are negatively correlated with other borrowings (*OLEV*). The CDS premium is positively correlated with leverage (*LEV* and *OLEV*). This is consistent with the theory that borrowings increase the firm's credit risk. The CDS premium is also positively correlated with standard deviation of the firm's daily stock returns (*SDRT*). This is consistent with the theory that the increase in the volatility of asset values increases default risk. The CDS premium is positively correlated with the firm's coded credit ratings (*CRT*). The CDS premium is negatively correlated with firm size (*SIZE*) and interest rate (*SPOT*). Intuitively larger size and higher interest rate lead to more wealth in the firm and lower credit risk. Profitability after adjusting for securitization gains (*AROA*) is negatively correlated with the CDS premium. This is consistent with prior research showing that higher earnings are negatively associated with the firm's credit risk.

Figure 1 shows that the CDS premium decreased from late 2002 until the end of 2006 to the lowest level. In 2007, the CDS premium started

to rise significantly and peaked at mid-2009. Throughout 2009, the CDS premium remained relatively high. Consistent with the theoretical propositions in H2, Figure 1 shows a significant increase in the CDS premium after 2007.

Figure 2 shows the trend of the 'margin of security' in asset securitizations, indicated by the movements in retained interests as percentages of securitized assets.[17] Retained interests serve as first loss when assets underlying securitizations default. The larger the stake retained by the originator, the safer the securitized assets will be. As show in Figure 2, retained interests decreased from 2003 onwards until to the lowest level in 2007. The amount of interests retained in securitizations significantly increased after 2007. The trend suggests that the 'margin of security' of asset securitizations decreases during economic growth and rises when the economy declines in the latest business cycle, which is consistent with the theoretical propositions in H3.

[17] As the information about the retained interests of on-balance sheet securitization is not disclosed by firms, the retained interests in Figure 2 belong to newly securitized assets of off-balance sheet securitization.

6 Primary Regression Analyses

Panel A of Table 6 reports the results of OLS estimations of three versions of Equation (1), including the basic version, which does not have the recession interaction term of *R*, and the extended version of interacting *R* with all of the variables.[18] As the cross-sectional data include multiple observations from the same firm, the t-statistics for the coefficients are calculated using robust standard errors clustered at firm level (Petersen 2009).[19] The tests also directly control for industry with industry-fixed effects (suppressed) based on the 1-digit SIC codes to have sufficient number of firms within each industry.

Column (1) of Panel A reports the regression results without interacting with the indicator variable of *R*. The total explanatory power of the model is high, with adjusted R^2 at 78 per cent.[20] H1 predicts that securitization (both on and off-balance sheet securitizations) is positively associated with default risk. Consistent with the prediction from H1, the coefficients on *OffBS* and *OnBS* are both positive and significant. The results indicate that securitization is on average positively associated with the originator's credit risk.

The coefficients on the control variables are also consistent with theory and prior research. The standard deviation of returns (*SDRT*) and leverage (*OLEV*) are positively correlated with the CDS premium. The risk-

[18] Although no significant multicollinearity was detected by *variance inflation factor*, the regressions have also been run after demeaning all continuous independent variables. The results remain similar.

[19] The t-statistics are also calculated using standard errors clustered by year and firm-year (two dimensions). The results remain similar.

[20] The high R^2 is in line with prior research on pricing of CDS (Benkert 2004; Callen et al. 2009; Das et al. 2009; Bongaerts et al. 2011). Different from share price, the CDS pricing is pervasively based on the structural and reduced structural models. If the main structural variables used in these pricing models are controlled, the R^2 is expected to be high.

free interest rate (*SPOT*) and *SIZE* are negatively correlated with the CDS premium. Higher credit rating is also associated with a lower CDS premium. Earnings adjusted for securitization gains (*AROA*) are negatively correlated with the CDS premium. As securitization gains often constitute a substantial part of the originator's earnings and are priced as value relevant by the market (Niu and Richardson 2006), the coefficient of *AROA* becomes insignificant after excluding such gains from accounting earnings.

H2 and H3 are jointly tested and reported in columns (2) and (3) of Panel A. Column (2) of Panel A reports the model in Equation (2), which includes an indicator variable *R* to account for a higher CDS premium during the recession period. In this model, *R* is interacted only with *OffBS* and *OnBS*. H2 predicts *OffBS* is more strongly correlated with the CDS premium after 2007 than before 2007. Consistent with this prediction, the coefficient on *OffBS*R* is positive and significant. The coefficient on *OffBS* without the interaction term is insignificant. These results indicate that off-balance sheet securitization's association with the CDS premium significantly rises after 2007.

H3a predicts that on-balance sheet securitization is more positively associated with the CDS premium than off-balance sheet securitization. The coefficient on *OnBS* is significantly greater than the coefficient of *OffBS* (t=2.59), suggesting on-balance sheet securitization is more highly associated with the CDS premium before 2007. The coefficient on *OnBS*R* is negative but insignificant, which indicates that on-balance sheet securitization does not experience significant change in credit risk after 2007. The difference between the coefficient on *OnBS*R* and the

coefficient on *OffBS*R* is insignificant (*t*=1.23), which is inconsistent with H3b. The sum of the coefficients on *OnBS* and *OnBS*R* is significantly greater than the sum of the coefficients on *OffBS* and *OffBS*R* (*t*=2.32), which indicates overall on-balance sheet securitization transfers less credit risk after 2007. Taken as a whole, on-balance sheet securitization has significantly stronger effects on the originator's CDS premium than off-balance sheet securitization, which is consistent with H3a. Moreover, on-balance sheet and off-balance sheet securitizations demonstrate significantly different risk properties in the CDS market through the latest business cycle (2002–2009).

Since many firm and market characteristics changed and the risks in the firms' assets increased after 2007, the model in Column (3) of Panel A allows *R* to interact with all the independent variables. The coefficient on *OffBS*R* remains significantly positive and the coefficient on *OffBS* remains insignificantly different from zero. This is consistent with the prediction in H2. The results for H2 persist after imposing a stricter specification. The coefficients and significance levels of *OnBS*R* and *OnBS* are similar with those in Column (2) of Panel A. The coefficient on *OLEV*R* remains significantly positive. It suggests the credit risk in other liabilities, in contrast to on-balance sheet securitizations, generally increased after 2007.

Asset securitizations' effects on the originator's CDS premium are likely to vary with the (initial) maturity of the CDS contract. Panel B of Table 6 presents the regression results after interacting maturity indicators with off-balance sheet and on-balance sheet securitizations. *OffBS_m* and

OnBS_m represent the incremental effects of securitizations on the CDS premium with contract maturity *m* (*m*=3, 5, 7, 10), relative to one-year maturity contract. Column (1) of Panel B shows that higher levels of securitizations significantly increase the premium of one-year CDS contract. The marginal incremental effects for maturity interactions are negative but insignificant except for *OffBS_3*, which indicates that on average securitizations' associations with the CDS premium are not significantly different across maturities. Column (2) of Panel B shows the regression results of further interacting *R* with maturities. The coefficients on *OffBS*R* decrease with longer maturities (except for *OffBS_5*R*), indicating a weaker association between off-balance sheet securitizations and the CDS premium as the maturity increases during the recession. The coefficients on *OnBS*R* are also negative across maturities, but only the coefficients on *OnBS_3*R* and *OnBS_5*R* are marginally significant.

Panel C of Table 6 reports the total maturity effects, computed as adding the marginal effects shown in Panel B. As expected, coefficients on *OffBS*R* and *OnBS* are significant. The coefficients on *OnBS* become larger as the maturity increases, indicating stronger associations between on-balance sheet securitizations and the CDS premium as the contract maturity increases. By contrast, the coefficients on *OffBS*R* demonstrate an overall decreasing trend with increasing maturities, which is counterintuitive because the CDS premium is normally more expensive for longer maturities. A possible explanation is that the demand of CDS contracts with shorter maturities was much greater than those with longer

maturities during the recession, reflecting a potential liquidity preference of shorter maturities over longer maturities.

In summary, the results are consistent with H2 and H3a. Both off-balance sheet and on-balance sheet securitizations are positively associated with the originator's CDS premium before controlling for the recession. Strong results are found that off-balance sheet securitization's association with the CDS premium significantly increases after 2007 when the economy declines. After 2007, on-balance sheet securitization does not experience a significant increase in the association with the CDS premium. In general, on-balance sheet securitization is more highly associated with the CDS premium than off-balance sheet securitization. These results indicate that the CDS market becomes doubtful about whether the originator could fully honour its implicit guarantees for off-balance sheet securitizations. The evidence also points that off-balance sheet and on-balance sheet securitizations have different credit risk properties.

7 Sensitivity Analyses

As shown in the descriptive statistics, there are large values in the observations of the CDS premium and leverage. Therefore, the CDS premium and leverage are separately winsorized at the upper tails to mitigate the potential influences. The previously discussed results of the regression analyses persist after winsorizing these extreme observations at either the one per cent or five per cent level.[21]

Potential omitted variables that may explain changes in the CDS premium have been considered. Cumulative stock returns, the market-to-book ratio, the yield curve and the liquidity curve are included in the regressions to test the robustness of the results. Stock returns are proxies for the changes of the economic condition of the firm. The slope of the yield curve (the difference between one year and 10 year t-bill rates) is a proxy for expectations of future interest rate changes. The slope of the liquidity curve (the difference between the one-year interest rate swap rate and one-year t-bill rate) is a proxy for the changes of liquidity conditions in the market. The results are not sensitive to the inclusion of these variables.

To address the concerns about whether the results are driven by the possible market-wide panic during the financial crisis, Equation (1) is estimated after omitting the observations in 2008. Year 2008 is the period when the market received consecutive major shocks. These major events include the seizure of Northern Rock by British Treasury (February), the sale of Bear Sterns to JPMorgan Chase (March), the near collapse of American International Group (September) and the demise of Lehman

[21] Deleting potentially influential observations (with absolute values of Student residuals greater than 2) yields similar results, except that on-balance sheet securitization becomes *significantly* negative when interacting with *R* (*OnBS*R*).

Brothers (September). The results persist after deleing the observations in 2008.

Instead of level analysis, the change of CDS premium is regressed on the change of securitizations. The coefficients on the change variables are significant only for half-yearly results. As suggested by Barth et al. (2001), significant levels results suggest that securitizations are relevant in assessing credit risk in the CDS market. The less significant changes results suggest the securitization disclosures contained in the notes of financial statements are not timely.

Propensity-Score Matching

Although robust standard errors clustered by firm have considered firm characteristics, there might still be some endogeneity concerns in the research design. Such concerns originate from a firm's endogenous choice of on-balance sheet versus off-balance sheet securitization, which can be correlated with credit risk. To address such concerns, I adopt the propensity-score matching process, which is a preferred approach to address the issue (Lawrence et al. 2011).

Following prior research (Armstrong et al. 2010; Lawrence et al. 2011), I match a range of firm characteristics, which are considered related to the choice of on-balance sheet or off-balance sheet securitization. The attribute-based matching naturally phases out the effects of the differences in on-balance sheet or off-balance sheet securitization firms' characteristics on the CDS premium. I use a logit model to estimate the probability of choosing off-balance sheet versus on-balance sheet securitization, and save

the estimated probability (the propensity-score). I then match, without replacement, a firm with on-balance sheet securitization with a firm with off-balance sheet securitization that has the closest predicted value from the logit model within a maximum distance of three per cent. The logit model is specified as follows:

$$SECTN_{it} = \alpha_0 + \alpha_1 LEV_{it} + \alpha_2 NSI_{it} + \alpha_3 RENG_{it} + \alpha_4 OPTN_{it} + \alpha_5 GROW_{it} + \alpha_6 FUND_{it} + \alpha_7 SDRT_{it} + \alpha_8 SIZE_{it} + \varepsilon_{it} \quad (1a)$$

Where:

SECTN	=	1 if the firm chooses off-balance sheet securitization, and 0 if the firm chooses on-balance sheet securitization;
LEV	=	total liabilities deflated by the sum of market value of equity and total liabilities of the firm;
NSI	=	net issue of stock, measured as the difference between common and preferred stock sale and purchase divided by average total assets;
RENG	=	renegotiation costs, measured as long-term debt due within one year, that is, debt in current liabilities divided by average total assets;
OPTN	=	CEO equity incentive, measured as the fair value of CEO option awards divided by CEO total compensation, winsorized at 99th percentile;
GROW	=	proprietary costs, measured as the growth rate of revenue from quarter t to quarter t+4 adjusted for the corresponding growth rate of total assets; revenues of banks are measured as interest income plus non-interest income;
FUND	=	availability of internal funds, measured as the sum of cash flow from operating and cash flow from investing divided by average total assets;
SDRT	=	standard deviation of daily returns during the current fiscal quarter ;
SIZE	=	natural log of the market value of equity at the end of fiscal quarter;

i = firm subscript;

t = time subscript for quarter t.

One of the benefits of off-balance sheet securitizations is to reduce book leverage while increasing actual leverage (Dechow and Shakespeare 2009). In contrast, firms using on-balance sheet securitizations may need to rely more on external equity financing than firms using off-balance sheet securitizations. Therefore, I include financial leverage (*LEV*) and net share issue (*NSI*) in Equation (1a). Moreover, when lenders do not have enough knowledge of borrowing firms' off-balance sheet leverage, off-balance sheet securitizations will not increase renegotiation costs (*RENG*). Higher leverage is associated with greater volatility of share price. Greater volatility of share price increases the value of CEO's option awards (*OPTN*) (Guay 1999; Coles et al. 2006). Another benefit of asset securitizations is to improve the firm's cash flows (*FUND*).[22] Therefore, I also add *FUND* in Equation (1a). Off-balance sheet securitization increases information uncertainty about the firm (Cheng et al. 2011), while on-balance sheet securitization stays as the originator's borrowings and generates little uncertainty about the risk transfer. Therefore, it is possible that firms having higher future growth opportunities and more uncertain future prospects will tend to use less of off-balance sheet securitization and more of on-balance sheet securitization. Therefore, I include future growth

[22] It has to be acknowledged that quarterly cash flows (*FUND*) may not be the ideal proxy of cash flows associated with asset securitizations, because firms often manage the timing of asset securitizations to window dress balance sheet at the end of the year (Dechow and Shakespeare 2009). *FUND* is, however, the proxy currently available in prior research.

of the firm (*GROW*), measured as the revenue growth for one year forward.[23]

Using Equation (1a) to calculate propensity scores and imposing a calliper distance of three per cent, I obtain a propensity-score matched sample of 3,378 firm-quarter observations, of which 1,689 belongs to firms with off-balance sheet securitization and 1,689 belongs to firms with on-balance sheet securitization.

Table 7 presents the means and standard deviations of the main characteristics of the matched firms. The propensity-score model appears to be effective in forming a balanced sample of firms with off-balance sheet securitization and on-balance sheet securitization, as the main variables related to securitization appear to be insignificantly different. The difference in *CRT* is not surprising, because it merely reflects the fact that credit rating agencies include off-balance sheet securitization in the calculation of a firm's leverage.

Table 8 presents the regression results of estimating Equation (1) using the propensity-score matched sample. In Column (1) of Table 8, the coefficient on *OnBS* remains significantly positive, but the coefficient on *OffBS* becomes insignificant. In Column (2) of Table 8, the coefficient on *OffBS* becomes significantly negative and the coefficient on *OffBS*R* remains significantly positive, indicating significant increase in credit risk of off-balance sheet securitization only after 2007. The coefficient on *OnBS*R* is insignificant, which indicates the credit risk of on-balance sheet

[23] As the sample includes commercial banks, the revenue of a bank is measured as interest income plus non-interest income.

securitization does not experience significant change after 2007. The results are generally consistent with the main predictions.

8 Conclusion

This paper investigates the effects of off-balance sheet and on-balance sheet securitizations on the originator's CDS premium. To the best of my knowledge, this is the first empirical evidence on the effects of asset securitizations with different structures. Using a more direct measure of credit risk than stock returns, bond yields and credit ratings, I find that the off-balance sheet securitizations' effects on the originator's CDS premium significantly rise after 2007. On-balance sheet securitization's effects on the originator's CDS premium are generally stronger than off-balance sheet securitizations across the business cycle, but on-balance sheet securitization's effects on the originator's CDS premium do not significantly change after 2007.

These results have implications for regulators. They suggest that the CDS market reassesses the risk associated with off-balance sheet securitizations with the view that the originator might not fully honour its implicit guarantees for off-balance sheet securitizations after the crisis. It would be beneficial to investors if regulations could take into considerations the changing credit risks in off-balance sheet securitizations. Moreover, the evidence also indicates that on-balance sheet and off-balance sheet securitizations contain different risk properties. It may be necessary to differentiate regulatory requirements, such as capital requirements, for these two types of asset securitizations. Additionally, by documenting the effects of asset securitizations with different structures on the originator's CDS premium before and after the recent financial crisis, I contribute to the literature on the effects of information uncertainty on asset prices.

With the expectations that there will be more on-balance sheet securitization, future research can further investigate whether the secured-borrowing treatment overstates the leverage and the risk of the originator. Due to the constraints of data availability, this study could not carry out further analyses on the impact of different types of securitized assets on credit risk. Such information is not disclosed in firms' 10K or 10Q filings. This study acknowledges such a major limitation in the study. With more detailed disclosures becoming available in the future, future research can examine how the types of underlying assets will impact the risk of a securitizing firm.

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Figure 1
Trend of Monthly Means of Sample CDS Premia

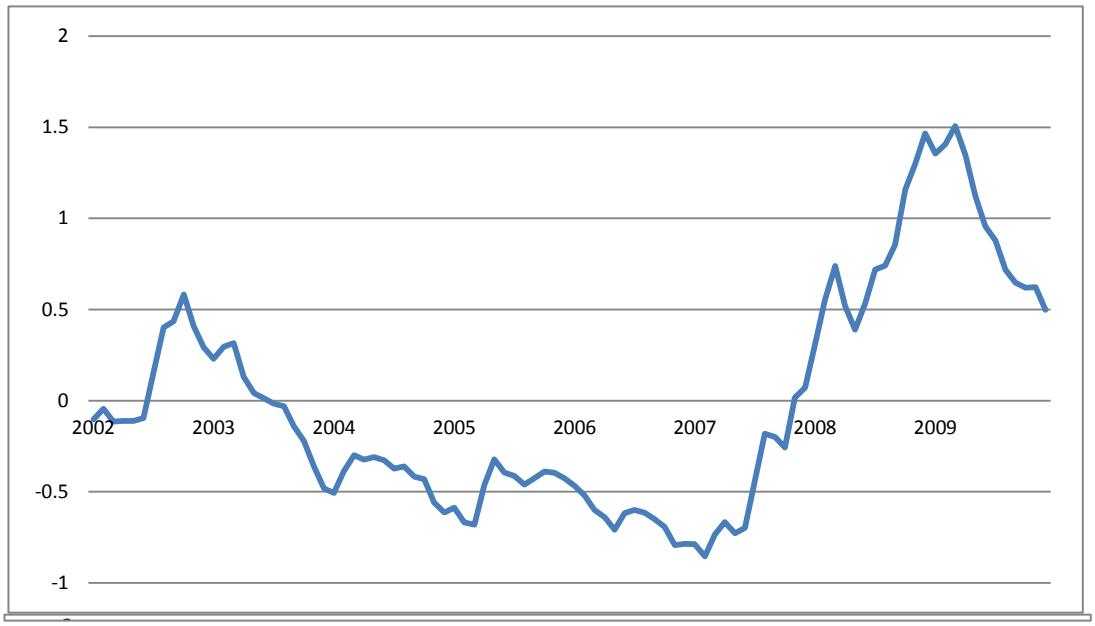

Figure 2.1 represents the monthly mean values of the sample CDS premia from January 2002 to December 2009. The mean values are calculated from natural logs of 211,611 daily observations of the premium (in basis point) of the CDS contract with five-year maturity provided by Markit.

Figure 2
Trend of the 'Margin of Security' Indicated by Retained Interests as Percentages of Securitized Assets

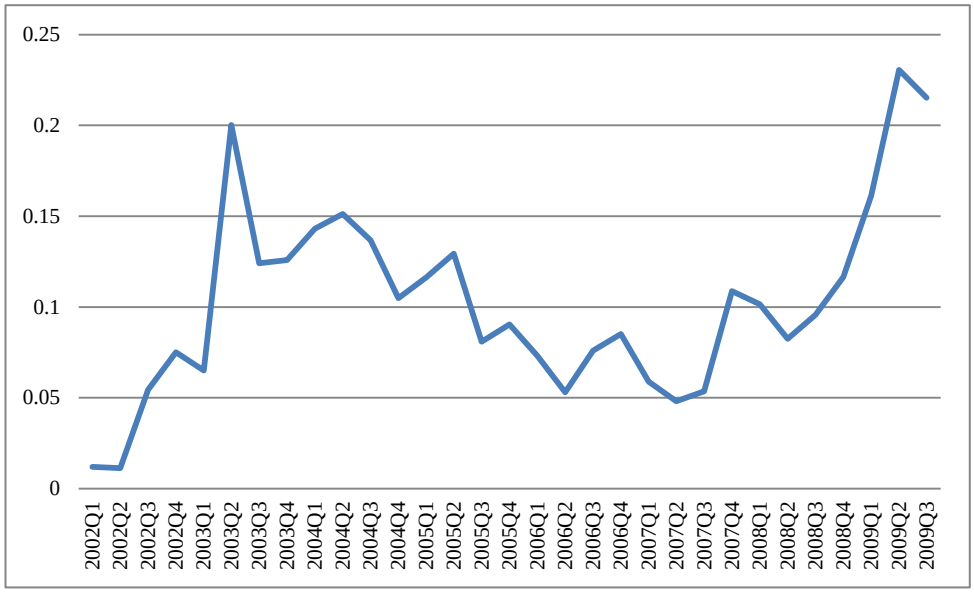

Figure 2.2 represents the quarterly median values of retained interests as percentages of securitized assets of the sample firms from 2002 Q1 to 2009 Q3. The median values are calculated from the amount of interests retained in securitized assets divided by the amount of securitized assets. The values of retained interests and securitized assets are hand collected from the sample firms' 10-Q and 10-K filings.

Table 1
Sample Selection

Sample Structure	Observations
Number of observations in CDS daily dataset	985,390 daily observations of 133 firms
Number of observations in the securitization dataset with firms initially identified through Direct-Edgar and securitization observations collected from 10-k and 10-Q filings (2002–2009)	2,527 firm-quarter observations of 121 firms
Merging the securitization dataset with the Compustat/CRSP database for 2002–2009	2,453 firm-quarter observations of 121 firms
Merging CDS dataset with the merged securitization dataset, requiring that each observation has at least a five-year CDS premium within 30 days after the SEC filing date	9,125 contracts based on five-year CDS, 1,837 firm-quarters of 114 firms
Excluding observations with missing CDS premium in other than five-year CDS contracts	8,470 CDS contracts, 1,825 firm-quarters of 113 firms

Table 2
Sample Distribution by Industry

SIC Code	SIC Name	N (Obs.)	N (Firm)	Frequency (%)
6020	Commercial Banks	1142	16	13.483
3711	Motor Vehicles & Passenger Car Bodies	402	3	4.746
6211	Security Brokers, Dealers & Flotation Companies	375	3	4.427
4931	Electric & Other Services Combined	360	5	4.250
3672	Printed Circuit Boards	287	3	3.388
6111	Federal & Federally-Sponsored Credit Agencies	246	3	2.904
3714	Motor Vehicle Parts & Accessories	244	3	2.881
2631	Paperboard Mills	234	2	2.763
6199	Finance Services	225	2	2.656
3523	Farm Machinery & Equipment	218	2	2.574
7011	Hotels & Motels	205	2	2.420
6141	Personal Credit Institutions	198	3	2.338
2860	Industrial Organic Chemicals	180	2	2.125
3531	Construction Machinery & Equip	155	1	1.830
2836	Biological Products, (No Disgnostic Substances)	150	1	1.771
3942	Dolls & Stuffed Toys	150	1	1.771
4911	Electric Services	141	2	1.665
5531	Retail-Auto & Home Supply Stores	140	1	1.653
6172	Finance Lessors	140	1	1.653
6282	Investment Advice	132	1	1.558
3312	Steel Works, Blast Furnaces & Rolling Mills (Coke Ovens)	130	1	1.535
2821	Plastic Materials, Synth Resins & Nonvulcan Elastomers	128	1	1.511
3411	Metal Cans	128	1	1.511
4011	Railroads, Line-Haul Operating	125	1	1.476
3944	Games, Toys & Children's Vehicles (No Dolls & Bicycles)	115	1	1.358
2650	Paperboard Containers & Boxes	111	2	1.311
3221	Glass Containers	110	1	1.299
3510	Engines And Turbines	110	1	1.299
3826	Laboratory Analytical Instruments	109	1	1.287
1221	Bituminous Coal & Lignite Surface Mining	106	1	1.251
5912	Retail-Drug Stores And Proprietary Stores	105	1	1.240
7373	Services-Computer Integrated Systems Design	97	1	1.145
2011	Meat Packing Plants	91	1	1.074
2911	Petroleum Refining	90	1	1.063
6411	Insurance Agents, Brokers & Service	90	1	1.063
3721	Aircraft	85	2	1.004
Other*		1416	38	16.718
Total		8470	113	100%

This table reports the sample distribution by industry. N (Obs.) is the number of observations of a particular 4-digit SIC industry in the sample. N (Firm) is the number of firms of a particular 4-digit SIC industry in the sample. Frequency is a 4-digit SIC industry's percentage proportion in the sample.

The final sample consists of 8,470 observations between 2002 and 2009.

Other*: All the industries with less than 1 percent of the sample observations. The total number of 4-digit SIC industries represented in the sample is 71.

Table 3
Descriptive Statistics

Variable	N	Mean	Min.	Q1	Median	Q3	Max.	SD.
OffBS	8470	0.084	0.000	0.006	0.021	0.067	1.651	0.167
OnBS	8470	0.021	0.000	0.000	0.000	0.000	0.757	0.080
LEV	8470	0.648	0.068	0.467	0.679	0.850	0.999	0.229
OLEV	8470	0.626	0.068	0.447	0.645	0.829	0.999	0.227
SDRT	8470	0.012	0.005	0.007	0.008	0.013	0.044	0.009
SIZE	8470	8.982	–3.388	7.983	8.951	10.000	12.944	1.537
CDS	8470	4.462	0.344	3.430	4.425	5.485	10.304	1.421
AROA	8470	0.003	–0.472	0.001	0.004	0.011	0.199	0.034
CRT	8470	10.823	2.000	8.000	11.000	13.000	29.000	3.597
SPOT	8470	0.028	0.003	0.013	0.023	0.047	0.053	0.017
DOC	8470	0.920	0.000	1.000	1.000	1.000	1.000	0.271
R	8470	0.503	0.000	0.000	1.000	1.000	1.000	0.500

This table reports the descriptive statistics of the variables used in Equation (1).
Variable Definitions:

OffBS outstanding dollar amount of securitized financial assets accounted for as a sale minus the retained interests and servicing rights as of the fiscal quarter end scaled by the sum of market value of equity and total liabilities;

OnBS outstanding dollar amount of securitized financial assets accounted for as secured borrowings as of the fiscal quarter end scaled by the sum of market value of equity and total liabilities;

LEV total liabilities scaled by the sum of market value of equity and total liabilities;

OLEV total liabilities less the amount of on-balance sheet securitization scaled by the sum of market value of equity and total liabilities;

SDRT standard deviation of daily stock returns for the current fiscal quarter;

SIZE natural log of the market value of equity ($ millions);

CDS natural log of CDS premium (in basis point) for CDS contract first observed within 30 days after the SEC filing date;

AROA net income before extraordinary items minus the securitization gains scaled by total assets;

CRT S&P long-term credit rating;

SPOT US one-year t-bill rate;

DOC indicator variable with 1 if the CDS contract has ‘exclude restructuring’ clause and 0 otherwise;

R indicator variable for the recession period with 1 if an observation of CDS premium is after 1 January 2007 and 0 otherwise.

Table 4
Differences in Variables Before 2007 and After 2007

	Before 2007		After 2007		*t*-test	Wilcoxon
Variable	**Mean**	**Median**	**Mean**	**Median**	***p*-value***	***p*-value ***
CDS	4.0322	3.8782	4.8877	4.9057	<.0001	<.0001
SIZE	9.2016	9.2094	8.8473	8.7793	<.0001	<.0001
OLEV	0.6307	0.6734	0.6250	0.6233	0.2493	0.4138
AROA	0.0058	0.0042	0.0011	0.0045	<.0001	0.0009
SDRT	0.0081	0.0070	0.0157	0.0123	<.0001	<.0001
CRT	10.4402	11.0000	11.2027	11.0000	<.0001	<.0001**
SPOT	0.0321	0.0330	0.0240	0.0197	<.0001	<.0001
OffBS	0.0967	0.0266	0.0750	0.0169	<.0001	<.0001
OnBS	0.0150	0.0000	0.0269	0.0000	<.0001	<.0001**

This table reports differences in means and medians of the main variables used in Equation (1) for before 2007 and after 2007. The sample consists of 8,470 observations between 2002 and 2009. *T*-test (Wilcoxon) *p*-values test for differences in means (medians) for before 2007 and after 2007.

*: *P*-value is probability > |t| for differences of means and probability > |Z| for differences of Wilcoxon median scores (rank sums).

**: The Wilcoxon *p*-value can still be significant even when the medians are equal, because Wilcoxon tests are rank sum tests and the values other than those at the median from two groups can have different ranks even if the medians are equal.

The variables are defined in Table 3.

Table 5
Correlations

	N	*OffBS*	*OnBS*	*LEV*	*OLEV*	*SDRT*	*SIZE*	*CDS*	*AROA*	*CRT*	*SPOT*
OffBS	8470	1	**0.260**	**0.259**	**0.170**	**–0.036**	**0.122**	**–0.047**	**–0.085**	**–0.248**	**0.027**
OnBS	8470	**–0.341**	1	**0.208**	**–0.145**	**0.053**	**–0.184**	**0.106**	**–0.030**	**–0.109**	**–0.024**
LEV	8470	**0.353**	**0.114**	1	**0.938**	**0.139**	**0.022**	**0.239**	**–0.273**	**–0.085**	**–0.125**
OLEV	8470	**0.321**	**–0.095**	**0.924**	1	**0.122**	**0.087**	**0.205**	**–0.265**	**–0.048**	**–0.118**
SDRT	8470	**–0.054**	**0.125**	**0.137**	**–0.265**	1	**–0.180**	**0.423**	**–0.202**	**0.077**	**–0.626**
SIZE	8470	**0.236**	**–0.201**	**0.079**	**0.129**	**–0.144**	1	**–0.560**	**0.153**	**–0.623**	**0.155**
CDS	8470	**–0.068**	**0.143**	**0.210**	**0.171**	**0.421**	**–0.562**	1	**–0.251**	**0.670**	**–0.403**
AROA	8470	**–0.268**	**–0.065**	**0.210**	**–0.617**	**–0.108**	**0.100**	**–0.304**	1	**–0.167**	**0.110**
CRT	8470	**–0.268**	**0.035**	**–0.151**	**–0.129**	**0.052**	**–0.677**	**0.685**	**–0.094**	1	**–0.054**
SPOT	8470	**0.035**	**–0.088**	**–0.132**	**–0.121**	**–0.712**	**0.139**	**–0.388**	**0.110**	**–0.047**	1

Pearson (Spearman) correlations for the sample of Equation (1) are reported above (below) the diagonal.
Correlations significant at the five per cent level in a two-tailed test are in boldface.
This table reports the correlations of the main variables used in Equation (1). The variables are defined in Table 3.

Table 6
OLS Regression Results for the Associations of Off-Balance Sheet and On-Balance Sheet Treatments of Securitizations with the CDS Premium

$$CDS_{it} = \gamma_0 + \gamma_1 R + \gamma_2 OffBS_{it} + \gamma_3 OffBS_{it} * R + \gamma_4 OnBS_{it} + \gamma_5 OnBS_{it} * R + \gamma_6 AROA_{it} + \gamma_7 OLEV_{it} + \gamma_8 CRT_{it} + \gamma_9 SDRT_{it} + \gamma_{10} SIZE_{it} + \gamma_{11} SPOT_{it} + \gamma_{12} DOC_{it} + \gamma_{13} D\_m + \gamma_j \Sigma_{ij} Ind_{it} + \varepsilon_{it} \quad (1)$$

Panel A: Regressions of CDS Premium on Off-balance Sheet and On-balance Sheet Securitizations

Variable (Predicted Sign)	Without interaction with *R*	Interacting *R* with *OffBS* and *OnBS*	Interacting *R* with all the variables
Intercept	1.02***	0.91**	0.87
	(2.65)	(2.44)	(0.95)
R(+)		0.24***	–0.17
		(4.19)	(–0.17)
OffBS(+)	0.39**	–0.11	0.09
	(2.04)	(–0.59)	(0.51)
*OffBS*R(+)*		1.11***	0.58***
		(3.12)	(2.80)
OnBS(+)	3.26***	3.95***	3.93**
	(6.37)	(2.48)	(2.28)
*OnBS*R(–)*		–1.34	–0.97
		(–0.69)	(–0.50)
AROA(–)	–0.33	–0.50	–1.76**
	(–0.53)	(–0.80)	(–2.09)
*AROA*R(–)*			1.30
			(1.32)
OLEV(+)	1.73***	1.74***	1.40***
	(6.99)	(6.81)	(4.68)
*OLEV*R(+)*			0.69***
			(2.96)
CRT(+)	0.21***	0.22***	0.27***
	(12.82)	(14.11)	(8.46)
*CRT*R(+)*			–0.07**
			(–2.06)
SDRT(+)	32.40***	24.10***	63.88***
	(10.54)	(9.36)	(9.45)
*SDRT*R(+)*			–46.47***
			(–6.54)
SIZE(–)	–0.08***	–0.07**	–0.13*
	(–2.52)	(–2.24)	(–1.87)
*SIZE*R(–)*			0.13

			(1.61)
SPOT(–)	–16.11***	–17.32***	–13.05***
	(–11.87)	(–12.97)	(–8.65)
*SPOT*R(–)*			–8.99***
			(–3.99)
DOC(+)	0.49***	0.49***	0.29***
	(5.88)	(6.12)	(3.01)
*DOC*R*			0.31**
			(2.22)
D_3	0.49***	0.49***	0.49***
	(31.75)	(31.93)	(31.62)
D_5	0.77***	0.78***	0.77***
	(29.49)	(29.89)	(29.43)
D_7	0.89***	0.89***	0.89***
	(30.07)	(30.20)	(30.05)
D_10	0.10***	0.99***	0.10***
	(28.09)	(28.26)	(28.15)
Industry-fixed effects	Yes	Yes	Yes
Adj. R^2	0.777	0.791	0.813
# Observations	8470	8470	8470

Panel B: Regressions with Maturity Interaction

Variable (Predicted Sign)	Without interaction with *R*	Interacting *R* with *OffBS* and *OnBS*
Intercept	0.99***	0.89**
	2.58	(2.37)
R(+)		0.24***
		(4.18)
OffBS(+)	0.51**	−0.18
	(2.01)	(−0.61)
OffBS_3	−0.16**	−0.001
	(−2.12)	(−0.02)
OffBS_5	−0.10	0.03
	(−0.61)	(0.15)
OffBS_7	−0.18	0.08
	(−1.03)	(0.40)
OffBS_10	−0.15	0.21
	(−0.72)	(0.87)
*OffBS*R(+)*		1.51***
		(3.17)
*OffBS_3*R*		−0.35**
		(−2.32)
*OffBS_5*R*		−0.30
		(−1.11)
*OffBS_7*R*		−0.57**
		(−2.19)
*OffBS_10*R*		−0.79***
		(−2.51)
OnBS(+)	3.67***	3.34*
	(7.26)	(1.71)
OnBS_3	−0.13	0.61**
	(−0.50)	(2.41)
OnBS_5	−0.86	0.81
	(−1.11)	(1.60)
OnBS_7	−0.42	0.77
	(−0.87)	(1.41)
OnBS_10	−0.57	0.76
	(−1.05)	(1.18)
*OnBS*R(–)*		0.14
		(0.05)
*OnBS_3*R*		−1.04*
		(−1.75)
*OnBS_5*R*		−2.40*
		(−1.83)
*OnBS_7*R*		−1.73

		(−1.44)
*OnBS_10*R*		−1.92
		(−1.40)
AROA(–)	−0.33	−0.50
	(−0.53)	(−0.79)
OLEV(+)	1.73***	1.74***
	(6.99)	(6.81)
CRT(+)	0.21***	0.22***
	(12.84)	(14.13)
SDRT(+)	32.40***	24.12***
	(10.54)	(9.39)
SIZE(–)	−0.08***	−0.07**
	(−2.52)	(−2.23)
SPOT(–)	−16.11***	−17.31***
	(−11.87)	(−12.93)
DOC(+)	0.49***	0.49***
	(5.88)	(6.09)
D_3	0.50***	0.50***
	(31.06)	(30.03)
D_5	0.80***	0.80***
	(28.5)	(28.05)
D_7	0.92***	0.92***
	(29.66)	(28.82)
D_10	1.02***	1.02***
	(27.64)	(26.97)
Industry-fixed effects	Yes	Yes
Adj. R^2	0.777	0.792
# Observations	8470	8470

Panel C: Tests for Off-balance Sheet and On-balance Sheet Securitizations across Maturities and Interactions with *R*

	OffBS	*OffBS*R*	*OnBS*	*OnBS*R*
1-Year CDS	−0.18	1.51***	3.34*	0.14
	(−0.61)	(3.17)	(1.71)	(0.05)
3-Year CDS	−0.18	1.16***	3.95**	−0.90
	(−0.76)	(2.95)	(2.30)	(−0.42)
5-Year CDS	−0.15	1.21***	4.15***	−2.26
	(−0.80)	(3.16)	(2.79)	(−1.20)
7-Year CDS	−0.1	0.94***	4.11***	−1.59
	(−0.56)	(2.94)	(2.80)	(−0.99)
10-Year CDS	0.03	0.72***	4.10***	−1.79
	(0.23)	(2.55)	(2.98)	(−1.22)

*,**,*** Indicates statistical significance at the 0.10, 0.05 and 0.01 levels, respectively, under two-tailed tests.

Reported are the coefficients from models using firm-clustered standard errors and industry-fixed effects (suppressed); t-statistics are in parentheses. Industry-fixed effects are based on the 1-digit SIC code.

Panel A (columns 1–3) reports OLS estimation of the basic version (without interaction with *R*) of Equation (1), Equation (1) and extended version (interacting *R* with all the independent variables) of Equation (1). Column (1) reports the result of the estimation of the base model without the indicator variable *R*. Column (2) reports the result of the estimation of Equation (1). Column (3) reports the result of the estimation of the extended model of interacting *R* with all the independent variables in Equation (1).

Column (1) of Panel B extends the regression results in Panel A by interacting off-balance sheet and on-balance sheet securitizations with the maturity indicator variables. The *OffBS* and *OnBS* coefficients with suffix *m* (*m*=3,5,7,10) represent the interaction of *OffBS* and *OnBS* with *D_m*, an indicator variable equal to 1 if the CDS contract maturity is m years and 0 otherwise (*m*=3,5,7,10). Thus, *OffBS_m* and *OnBS_m* represent the incremental effect of *OffBS* and *OnBS* on the premium of the CDS contract with maturity *m* over the impact of *OffBS* and *OnBS* on the premium of the CDS contract with one year to maturity. Column (2) of Panel B further interacts *R* with *OffBS_m* and *OnBS_m* to show the effect of economic declines on the relations of *OffBS* and *OnBS* to the premium of the CDS contract with maturity *m*.

Panel C reports the overall coefficients for *OffBS* and *OnBS* for the different maturities; t-statistics are in parentheses.

*D_m*is 1 (0) if the CDS contract maturity is (is not) m years (*m*=3, 5, 7, 10). ∑jInd is 1 (0) if a firm is (is not) in industry j, based on 1-digit SIC codes. All other variables are defined in Table 3.

Table 7
Differences in Means of the Main Variables:
Propensity-Score Matched Sample

Variable	Firms with *OffBS*		Firms with *OnBS*		*t*-test
	Mean	Std. Dev.	Mean	Std. Dev.	*p*-value*
CDS	4.7578	1.3464	4.7869	1.4041	0.5394
SIZE	8.8046	1.5623	8.7182	1.3408	0.0844
LEV	0.6642	0.2184	0.6735	0.2045	0.2026
AROA	–0.0003	0.0466	0.0011	0.0303	0.2992
SDRT	0.0139	0.0100	0.0138	0.0100	0.9098
SPOT	0.0258	0.0175	0.0260	0.0176	0.8672
CRT	11.5222	3.7819	11.2647	3.3020	0.0351

This table reports differences in means of the main variables of the propensity-score matched sample for firms with *OffBS* and firms with *OnBS*. The sample consists of 3,378 observations between 2002 and 2009 with 1,689 observations for firms with *OffBS* and 1,689 for firms with *OnBS*.

*: *P*-value is probability > |t| for differences of means. *T*-test (*p*-values) is for differences in means between firms with *OffBS* and firms with *OnBS* in the matched sample.

The variables are defined in Table 3.

Table 8
OLS Regression Results for the Associations of Off-Balance Sheet and On-Balance Sheet Treatments of Securitizations with the CDS Premium: Propensity-Score Matched Sample

$$CDS_{it} = \gamma_0 + \gamma_1 R + \gamma_2 OffBS_{it} + \gamma_3 OffBS_{it} * R + \gamma_4 OnBS_{it} + \gamma_5 OnBS_{it} * R + \gamma_6 AROA_{it} + \gamma_7 OLEV_{it} + \gamma_8 CRT_{it} + \gamma_9 SDRT_{it} + \gamma_{10} SIZE_{it} + \gamma_{11} SPOT_{it} + \gamma_{12} DOC_{it} + \gamma_{13} D\_m + \gamma_j \Sigma_j Ind_{it} + \varepsilon_{it} \quad (1)$$

Variable (Predicted Sign)	Without interaction with *R*	Interacting *R* with *OffBS* and *OnBS*
Intercept	0.12	0.43
	(0.26)	(1.01)
R(+)		0.12
		(1.41)
OffBS(+)	− 0.40	− 1.57***
	(− 0.80)	(− 2.82)
*OffBS*R(+)*		2.36***
		(4.09)
OnBS(+)	2.33***	2.08**
	(4.88)	(1.99)
*OnBS*R(–)*		0.91
		(0.78)
AROA(–)	− 1.11*	− 1.47***
	(− 1.81)	(− 2.64)
OLEV(+)	1.63***	1.73***
	(4.78)	(5.16)
CRT(+)	0.24***	0.22***
	(10.63)	(11.16)
SDRT(+)	28.64***	21.95***
	(6.36)	(5.43)
SIZE(–)	0.03	− 0.01
	(0.61)	(− 0.17)
SPOT(–)	− 17.38***	− 16.97***
	(− 7.21)	(− 7.31)
DOC(+)	0.29**	0.41***
	(2.07)	(3.40)
D_3	0.45***	0.45***
	(18.42)	(18.34)
D_5	0.69***	0.70***
	(17.36)	(17.52)
D_7	0.80***	0.80***
	(17.17)	(17.20)
D_10	0.87***	0.87***
	(15.97)	(16.05)
Industry-fixed effects	Yes	Yes

Adj. R^2	0.766	0.788
# Observations	3378	3378

*,**,*** Indicates statistical significance at the 0.10, 0.05 and 0.01 levels, respectively, under two-tailed tests.

Reported are the coefficients from models using firm-clustered standard errors and industry-fixed effects (suppressed); t-statistics are in parentheses. Industry-fixed effects are based on the 1-digit SIC code.

This table reports OLS estimation of the basic version (without interaction with *R*) of Equation (1) and Equation (1) for the propensity-score matched sample. Column (1) reports the result of the estimation of the base model without the indicator variable *R*. Column (2) reports the result of the estimation of Equation (1).

*D_m*is 1 (0) if the CDS contract maturity is (is not) m years (*m*=3, 5, 7, 10). ∑jInd is 1 (0) if a firm is (is not) in industry j, based on 1-digit SIC codes. All other variables are defined in Table 3.