

Subprime Mortgage Defaults and Credit Default Swaps

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Motivation

- The sharp increase in defaults on subprime residential mortgage loans was a driving force behind the 2007-2008 financial crisis.

“... of AAA-rated subprime-mortgage-backed securities issued in 2006, 93 percent — 93 percent! — have now been downgraded to junk status.” (Krugman, NYT, 2010)

- Did credit derivatives play a role? The popular press seems to think so.

“...they raise a moral hazard. ... The very ease with which derivatives allow each party to ‘transfer’ risk means that no one party worries as much about its own risk. ... the net result is a society with more risk overall.” (Lowenstein, NYT, 2010)

BUT,

“There is a dearth of serious empirical studies on the social benefits and costs of credit default swaps and other derivatives — not just in the last two years, but in the last several decades.” (Stulz, 2010)

Credit default swaps (CDS) and subprime mortgage defaults

- Early 2000s, mortgage loan securitizers were eager to supply world-wide demand for an estimated 70 trillion dollars of fixed income securities (MBS) that offered higher yields than U.S. Treasury securities.
- Private securitizers helped meet this demand by constructing pools of subprime mortgages which were put into seniority tranches, with the most senior tranche rated AAA, the mezzanine tranches given lower ratings (e.g., BBB), and an unrated equity tranche typically retained by the securitizer.
- When securitizers could use CDS to hedge their risk exposure, they were less concerned about the credit quality of loans, which in turn drove demand for more risky subprime loans.
- There was also demand pull for subprime loans from MBS investors because they could use CDS to hedge the credit risk of the loans underlying the MBS.
- Mortgage loan originators were happy to dig deeper into the pool of risky borrowers because they were earning fees from originating loans.

After the fact...

S.E.C. tackles conflicts of interest in securitization deals

There has been a long list of financial crisis cases settled by the S.E.C. and various subprime market players

“In the aftermath of the financial crisis, it became clear that firms were creating financial products, selling those same products to their customers and then turning around and making bets against those same products they just sold,”

Luis A. Aguilar, a Democratic commissioner of the S.E.C.

Prohibition against conflicts of interest in certain securitizations

*“Proposed Rule 127B under the Securities Act would prohibit certain persons who create and distribute an asset-backed security, including a synthetic asset-backed security, from engaging in transactions, within **one year** after the date of the first closing of the sale of the asset-backed security, that would involve or result in a material conflict of interest with respect to any investor in the asset-backed security.”*

Contributions of our paper

- We conduct the first empirical investigation of the influence of credit default swaps (CDS) on the surge in subprime mortgage defaults.
- Using extensive loan-level data, we provide evidence that suggests a causal link from CDS coverage to subprime mortgage defaults.
- We estimate that CDS coverage increased the delinquency of subprime mortgages by more than 10% during the financial crisis.
- Our study also contributes to the debate over Wall Street's role in the subprime mortgage crisis. In particular, who exploited credit derivatives on subprime MBS and in turn encouraged the origination of risky low-quality loans?

Literature review

- Several recent studies attribute the surge in defaults to looser lending standards associated with the “originate-to-distribute” model of mortgage lending (Mian and Sufi (2009), Keys, Mukherjee, Seru, and Vig (2010), and Purnanandam (2011)).
 - Under the originate-to-distribute model, the lender sells loans to a securitizer who packages them into mortgage-backed securities.
 - Mortgage securitization reduces originators’ incentive to screen and monitor borrowers (Parlour and Plantin (2008)).
- Others argue that inaccurate credit ratings on subprime mortgage-backed securities — driven in part by the issuer-pays model of credit ratings — contributed to the 2007-2008 financial crisis (Krugman (2010) and Opp, Opp, and Harris (2011)).

Data

- We use the CoreLogic LoanPerformance database to construct a sample of subprime residential mortgages originated from 2003 to 2007.
 - Sample contains more than 90% of subprime loans that are privately securitized (i.e., not securitized by Fannie Mae and Freddie Mac).
 - Detailed information on borrower and loan characteristics.
 - For each loan, we also collect regional economic data
- We use data from Intex Solutions, Inc. on synthetic CDOs to identify whether a loan in the sample has CDS coverage.
 - A synthetic CDO is a portfolio of CDS. Investors receive premiums in exchange for standing ready to cover losses on the referenced assets.
 - We first obtain a comprehensive list of all synthetic CDO deals that have CDS contracts referencing subprime MBS. We then work backward to uncover which loans have CDS coverage.

Some important variable definitions

Loan performance: We measure loan performance by focusing on whether a loan is delinquent in the months following origination (as in Keys et al. (2010) and Demyanyk and Van Hemert (2011)). A loan is classified as delinquent if it's at least 60 days past due within the first 24 months after origination.

Concurrent versus subsequent CDS coverage: Since we don't know when CDS contracts are initiated (i.e., they are OTC derivatives), we calculate the time between the MBS closing date (issue date) and the synthetic CDO settlement date (formation date).

We define CDS coverage as “concurrent” if the synthetic CDO settlement date is within 180 days of the MBS closing date; otherwise, CDS coverage is “subsequent”. [We also use 90 and 30 days; and the time between the CDO settlement date and the loan origination date. Results are robust.]

Our objective with concurrent coverage is to maximize the chance that CDS coverage has an influence on the loan origination decision.

Table I
CDS coverage of subprime mortgage loans by origination year

	2003	2004	2005	2006	2007	2003-07
The percentage of loans with concurrent and any CDS coverage						
Concurrent	3.0	25.7	52.9	53.5	21.5	35.4
Any coverage	29.8	66.8	67.0	59.7	22.9	54.5
The percentage of loans with concurrent CDS coverage by loan type						
ARM	0.2	2.0	30.1	25.5	2.6	18.3
Balloon	0.7	9.4	84.2	78.3	36.9	65.6
FRM	2.1	19.5	32.2	33.6	13.8	20.6
Hybrid2	5.4	38.4	79.1	82.2	53.7	56.0
Hybrid3	1.8	18.1	36.8	34.5	9.8	23.1

Table III**Subprime loan delinquency rate (%) by concurrent CDS coverage and origination year**

	2003	2004	2005	2006	2007	2003-07
Concurrent CDS coverage	11.4	18.3	22.9	37.7	48.4	29.2
No CDS coverage or subsequent coverage	10.2	10.7	10.1	22.4	34.0	15.5

Subprime loan delinquency rate (%) by concurrent CDS coverage and loan type during origination years 2003-07

	ARM	Balloon	FRM	Hybrid2	Hybrid3
Concurrent CDS coverage	15.2	45.5	20.2	31.6	24.4
No CDS coverage or subsequent coverage	12.9	47.7	10.3	23.6	13.7

Table IV

The effect of CDS coverage on the probability of subprime mortgage delinquency

Marginal effects from probit regressions

** p-value = 0.01, *** p-value = 0.001 (Standard errors clustered by states)

Variable	Origination Yrs 2003-2007	Origination Yrs 2004-2006
CDS (= 1 for concurrent)	0.0040**	0.0076***
Controls	Yes	Yes
Time dummies	Yes	Yes
Pseudo R-sq.	0.26	0.20
Observations	9,606,797	7,050,658
Predicted Prob.	0.12	0.14
Observed Prob.	0.20	0.20

Reverse causality

- We claim that CDS contracts helped fuel risky subprime loan originations. However, MBS issuers and/or investors may only use CDS contracts to insure risky loans that already exist or would have been originated regardless of the CDS market.
- Hence, CDS coverage could simply be a proxy for omitted variables reflecting the riskiness of the loans.
- The results remain in subsamples of loans partitioned by origination year and loan type, and after accounting for heterogeneity in MBS issuers.
- We perform four additional tests to check for causality from CDS to risky loan origination: (1) varying the time window between MBS issuance and CDS coverage, (2) using propensity score matching, (3) stratifying the sample by geography (zip-code) and origination quarter, and (4) accounting for simultaneity between delinquency and CDS coverage.

(1) Varying the time window between MBS and CDS

The timing of CDS coverage on the probability of subprime mortgage delinquency

Marginal effects from probit regression

CDS 180+ days after MBS	-0.0003
CDS 90-180 days after MBS	0.0070**
CDS 0-90 days after MBS	0.0113***
CDS 0-180 days before MBS	0.0094**
CDS 180+ days before MBS	0.0048*
Controls	Yes
Time dummies	Yes
Predicted Prob.	0.14

(2) Using propensity score matching

We match subprime loans with CDS coverage (treatment sample) to those without CDS coverage (control sample) and compute the difference in the average delinquency rates in the two samples.

Table V, Panel A: Matching based on interval of common support for the propensity scores of treatment and control samples *before* matching.

Common Support	Average delinquency		Difference	T-statistic
	Treatment (w/ CDS)	Control (w/o CDS)		
[0, 1]	0.282	0.278	0.004	6.87***
[0.10, 0.90]	0.277	0.272	0.005	7.98***
[0.20, 0.80]	0.262	0.252	0.010	15.14***
[0.25, 0.75]	0.256	0.244	0.012	16.78***
[0.25, 0.50]	0.190	0.170	0.020	25.55***
[0.50, 0.75]	0.297	0.276	0.021	20.22***

(4) Accounting for simultaneity between delinquency and CDS coverage

The effect of predicted concurrent CDS coverage on the probability of subprime mortgage delinquency

Marginal effects from probit regressions

	Stage 1 Probability of CDS Coverage	Stage 2 Probability of Delinquency
Predicted probability of CDS coverage		0.0152***
Economic significance		10.9%
Delinquency	0.0062*	
Economic significance	1.5%	
Controls	Yes	Yes
Time dummies	Yes	Yes

The relation between loan delinquency and MBS issuer type

- Private label (i.e., non-agency) MBS issuers can be classified by their participation in the *subprime mortgage supply chain* – loan origination, securitization, and access to CDS.
 - **Type Depository MBS issuers – Commercial banks:** Actively participate in all phases of the subprime mortgage supply chain (e.g., BofA).
 - **Type Independent MBS issuers – Mortgage finance companies:** Specialize in loan origination and/or securitization but have limited access to the CDS market (e.g., New Century).
 - **Type Multi-sector MBS issuers – Investment banks:** Actively participate in loan securitization and the CDS market but have/had limited to no involvement in loan origination (e.g., Bear Sterns).

Table X
The effect of issuer type on the relation between CDS coverage and the probability of subprime loan delinquency

Type D MBS issuers = Commercial banks

Type I MBS issuers = Mortgage finance companies

Type M MBS issuers (left-out or baseline group) = Investment banks

Marginal effects from probit regressions

** p-value = 0.01, *** p-value = 0.001 (Standard errors clustered by states)

Variable	Origination Yrs 2003-2007	Origination Yrs 2004-2006
CDS	0.0006	0.0037**
CDS × Type D issuer	0.0129***	0.0185***
CDS × Type I issuer	0.0020	-0.0008
Type D issuer	-0.0234***	-0.0275***
Type I issuer	-0.0117***	-0.0099***
Controls	Yes	Yes
Time dummies	Yes	Yes

MBS issuer reputation

- MBS issuers may have reputation concerns when using CDS to hedge/shift default risk because it might be perceived as a conflict of interest with their investors.
- We divide MBS issuers into four quartiles by dollar volume of MBS issuance.
- We find that the smallest and largest issuers are most sensitive to the gain/loss of reputation (i.e., the change in the probability of delinquency for loans going from no CDS coverage to CDS coverage is insignificant for the group with either the lowest dollar volume (want to build a reputation) or the highest dollar volume (don't want to damage a reputation)).

The effect of MBS issuer reputation on the relation between CDS coverage and the probability of subprime mortgage delinquency

Marginal effects from probit regression

** p-value = 0.01 (Std. errors clustered by states)

CDS × Q1 (smallest)	-0.0020
CDS × Q2	0.0041**
CDS × Q3	0.0065**
CDS × Q4 (largest)	0.0029

Conclusions

- This paper provides the first empirical investigation of the influence of credit default swaps on the surge in subprime mortgage defaults, which is widely believed to be a driving force in the 2007-2008 financial crisis.
- Controlling for all known determinants of mortgage performance, we find that CDS coverage increased the probability of subprime loan delinquency by as much as 10%.
- We provide evidence that suggests a causal link from CDS coverage to risky subprime loan originations.
- While subprime loans securitized by investment banks had significantly worse performance, the effect of CDS coverage on subprime loan delinquency is strongest for MBS issued by commercial banks.