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THE INFORMATIONAL ROLE OF THE LOAN ONLY CREDIT DEFAULT INDEX (LCDX) ON THE PRICING OF SYNDICATED LOANS

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Abstract

This paper explores the informational role of the Loan Only Credit Default Index (LCDX) on the pricing of syndicated loans. Despite an extensive body of research on credit indices and loan pricing, limited studies have comprehensively assessed the complex relationship between the LCDX and individual loan spreads. Contrary to indices like the CDX, which are largely linked to corporate bonds, the LCDX directly pertains to the syndicated secured loan market, offering valuable insights about the overall credit default market and the cost of credit risk insurance. Preliminary results reveal a pronounced positive correlation between the LCDX spread and the syndicated loan spread, particularly noticeable amongst borrowers with lower credit quality. The paper highlights the LCDX's pivotal role in conveying secondary credit market information, with critical implications for credit risk management and financial regulations.

Keywords: LCDX, Syndicated Loans

1. Introduction

The interplay between various credit indices and loan spreads has long been a subject of interest within the financial sector. Specific attention has been given to two major indices: the Loan Only Credit Default Index (LCDX) and the Credit Default Swap Index (CDX). Theoretically, while the LCDX is linked directly to the syndicated secured loan market, the CDX primarily pertains to corporate bonds, with no direct connection to individual bank loans.

Existing studies on the CDX and its effects on loan pricing have revealed mixed outcomes. Ashcraft and Santos (2009) found an increase in loan spreads for firms that trade Credit Default Swaps (CDSs), with higher spikes for riskier entities. Norden and Wagner (2008), however, argued that CDSs are pivotal in improving price discovery in loan prices, focusing on aggregate loan spread without considering borrower-specific information. Hirtle (2009) posited that banks involved in active hedging charge higher loan spreads. However, previous research has not been without limitations. A predominant drawback lies in the reliance on discrete measures such as the reference entity's trading status and the trading inception date for understanding CDSs.

The current literature does not fully capture the intricate relationship between the LCDX and individual loan spreads, leaving gaps in understanding how banks, with access to unique borrower information, differentiate between good and bad loans (Duffee & Zhou, 2001). This paper aims to cover this gap by studying the information role of the LCDX on the pricing of syndicated loans.

Specifically, we assume two channels through LCDX can potentially affect loan pricing. First, the LCDX provides valuable insights about the overall credit default market. Second, it reflects the cost of credit risk insurance for banks if they need to buy. We assume that the LCDX spread is a superior gauge of macro market trends compared to idiosyncratic firm trading status. It offers a more efficient and informative benchmark for hedging and portfolio diversification, especially as it reflects broader trends in the primary credit market. Thus, The LCDX spread may affect the syndicated loan spread positively and heterogeneously affect borrowers depending on creditworthiness and risk tolerance level.

The preliminary findings indicate significant positive correlation between the LCDX spread and the syndicated loan spread. The economic importance of LCDX is pronounced, especially among borrowers with low quality credit, characterized by unrated status, lower Z-scores, and above-median leverage. The influence of the LCDX appears to strengthen when lenders' risk tolerance deteriorates, and loan terms become riskier. These findings shed light on the nuanced interactions between credit market indices and loan pricing, highlighting the LCDX's substantial role in conveying information about secondary credit default markets. The results support the notion that the LCDX spread reflects broader trends and demands in the primary credit market, offering valuable implications for credit risk management, and financial institutions. For the practical implications, these findings suggest that the LCDX could be a valuable tool for financial institutions in assessing and managing credit risk more effectively. For instance, by monitoring LCDX trends, banks and other lenders could adjust their credit offerings and risk assessment models to better align with market conditions, thereby enhancing their risk management strategies. For financial regulations, regulators could use the LCDX as an early-warning system to identify emerging risks in the credit markets, allowing for timely intervention to prevent market instability. The findings could also inform the development of regulatory policies that more accurately reflect the realities of the credit market, particularly in terms of capital requirements and risk assessment for financial institutions.

2. Hypotheses Development

Financial markets continually evolve to meet the necessities of participants, with lenders frequently adopting new products to effectively shift credit risks to willing absorbers. Recent developments in credit derivative contracts have enabled lenders to maintain control rights over loans, offering a more flexible risk mitigation approach compared to earlier loan sales, securitization, or syndications. The most prevalent of these, the Credit Default Swap (CDS), allows bondholders and banks to hedge default risks by paying periodic premiums to an insurer. These contracts define specific terms such as the reference entity (borrower), obligation (bond or loan), trigger events (bankruptcy, failure to pay, etc.), and contract duration. The CDS market experienced significant growth, ballooning from $2 trillion in 2002 to $60 trillion in 2007 (Weistroffer, 2009).

CDSs are believed to enhance liquidity flow and market transparency by providing new insights into traded companies, which positively influences the underlying market. Firms involved in CDS trading can secure loans with higher leverage and longer maturities (Saretto & Tookes, 2013). Differing from standard insurance, CDSs don't require the buyer to hold an underlying debt exposure, enabling both hedging and speculative opportunities based on the perceived credit quality of the reference obligation. In situations of credit scarcity, CDSs offer essential information for credit portfolio management and risk diversification. Under the Basel II framework, banks' Tier 1 capital is linked to risk-weighted assets, and regulators acknowledge CDSs in the evaluation of capital ratios, provided the protection seller's rating surpasses that of the banks (Duncan, 2006). Additionally, CDSs avoid the tax and accounting complexities associated with loan sales, thereby reducing transaction costs.

Interestingly, research also highlights some negative impacts of Credit Default Swaps (CDSs). Hirtle (2009) contends that the advantages of CDSs are somewhat constrained. Contrary to the effects observed in credit sales or securitization, banks do not necessarily expand their credit offerings when they employ CDS protection. This expansion in credit availability tends to be restricted to only substantial borrowers of term loans. Furthermore, Bolton and Oehmke (2011) suggest that tradable

CDS contracts enhance lenders' protection against negative credit events, consequently strengthening their negotiating position. This results in lenders becoming more stringent in negotiations, often reluctant to engage in costly measures that might benefit the borrower's financial situation, leading to the emergence of the 'empty creditor' issue. Additionally, Duffee and Zhou (2001) have developed a theoretical model addressing both CDSs and credit sales, raising concerns that the CDS market might negatively impact the market for loan sales.

Parlour and Winton (2013) outlined scenarios in which lenders might opt to sell a loan or purchase a Credit Default Swap (CDS). Their analysis suggests that for higher-risk loans, the option of selling the loan is more prevalent than using CDSs; conversely, for lower-risk loans, CDSs are more commonly utilized than selling the loans. They also observed that lenders' motivation to monitor borrowers diminishes when they secure CDSs. Chakraborty et al. (2023) provided evidence for the 'empty creditor' issue, indicating that lenders might engage in moral hazard behaviours, particularly in instances of borrowers violating loan covenants. This issue of moral hazard arises when banks intentionally issue low-quality loans without the intent to retain them (Gorton & Pennacchi, 1995). Additionally, Martin and Roychowdhury (2015) discovered that when a loan is retained with CDS coverage, lenders show reduced incentives to monitor borrowers, leading to less conservative reporting practices. Hence, retaining a loan, as opposed to selling it, can mitigate the moral hazard concern. In the context of CDS-traded firms, it is observed that lenders are less vigilant in monitoring early-stage loan violations and tend to impose higher interest rates following such violations. Moreover, the issue of adverse selection becomes prominent when the cost of insolvency significantly influences the decision to sell a loan (Carlstrom & Samolyk, 1995). This adverse selection issue is primarily driven by the unobservable quality of the loan.

Several empirical research has shed light on how Credit Default Swap (CDS) contracts influence the dynamics between lenders and borrowers. Notably, CDSs have been found to enhance the credit quality of borrowers, a benefit attributed to the lender's ability to hedge risk (Allen & Carletti, 2006). Furthermore, Parlour and Winton (2013) indicate that CDSs play a significant role in shaping the lender-borrower relationship, particularly benefiting those borrowers with strong credit profiles. However, the impact of CDSs isn't exclusively positive. Studies suggest that CDSs can negatively affect these relationships (Duffee & Zhou, 2001; Morrison, 2005), potentially escalating bankruptcy risks for borrowers (Saretto & Tookes, 2013; Subrahmanyam et al., 2014).

In this research, the focus is placed on the Loan Only Credit Default Swap Index (LCDX), which encompasses syndicated senior and secured loans. The study aims to explore how the spread of the LCDX impacts the costs of underlying loans. This spread is instrumental in providing lenders with critical insights into the secondary credit default market, as well as fair market costs for credit risk protection. Norden and Wagner (2008) highlight that CDSs, being direct measures of hedging activities, exert a tangible influence on loan pricing. This is particularly relevant, as they offer a reliable benchmark for assessing debt costs, even for companies that are not actively traded. Their research underscores the dominant explanatory power of CDSs over traditional bond markets and other non-CDS factors in determining loan prices, emphasising its significance as a novel determinant of loan costs due to its more accurate reflection of lending relationships. However, it is important to note some limitations in their approach. The CDX spread in their study is derived from the CDS spread quotes of a single large investment bank, potentially not capturing the broader market perspective. Furthermore, the CDS spread they use encompasses unsecured corporate debts, including both bonds and loans, making it a less precise and relevant measure compared to the LCDX for senior syndicated and secured loans. Additionally, their method involves using time series data to calculate average loan spreads, without accounting for borrower-specific variations.

Similarly, Hirtle (2009) discovered that banks often employ CDSs in conjunction with other hedging strategies. Banks engaging in such comprehensive hedging practices tend to raise the spreads on larger loans as a means to balance out their hedging costs. This leads to the argument that banks consider the expense associated with transferring credit risk when issuing new loans and adjust their pricing strategies accordingly. In this context, the LCDX serves as a reliable benchmark for gauging

this cost. Consequently, as the cost of credit insurance borne by lenders rises, it translates into higher interest rates for borrowers. Based on this understanding, we propose the following hypothesis:

H1: The loan-only credit default swap market positively affects the individual loan spread.

Ashcraft and Santos (2009) observed that entities referenced in CDS contracts typically incur higher interest rates than those not involved in CDS trading. This elevation in rates varies across different firms, being particularly pronounced for firms perceived as riskier or less transparent. They suggest that the reduced monitoring efforts by lead arrangers for loans insured under CDSs contribute to this phenomenon. As a result, a higher spread is demanded by participants to compensate for the potential moral hazard associated with the lead arrangers, especially in the case of the loans specifically referenced in the CDS contracts. Additionally, Bolton and Oehmke (2011) contend that CDSs are more advantageous for borrowers characterised by high volatility and lower credit quality. Following these, we propose the following hypothesis:

H2: The loan-only credit default swap market impacts loan spread differently based on the underlying credit risks of the borrower.

The decision of banks to incorporate credit derivatives in their loan strategies is significantly influenced by the resources at their disposal. Major lending institutions, with ample resources, are likely to leverage the credit derivative markets, integrating this information into their loan pricing models. Furthermore, the number of lenders participating in a loan facility also plays a crucial role. Lead arrangers often take this factor into account when deciding whether to acquire credit derivatives for a particular loan. We contend that in scenarios where loans are highly concentrated, the motivation for lenders to procure credit insurance protection intensifies. Consequently, we propose the following hypothesis:

H3: The loan-only credit default swap market influences the loan spread variably, depending on the characteristics of the lenders' risk tolerance.

3. Data and Model

For this study, panel data is utilized, gathered from four distinct sources. Loan level data is procured from Thomson Reuter's Dealscan, and the daily spread for the 5-year on-the-run LCDX is taken from the Markit database. By aligning these two databases with the loan initiation date, the analysis is restricted to senior, secured, and syndicated loan facilities that involve multiple lenders. Additional borrower information is drawn from Compustat, linked with Dealscan using the connection provided by (Chava and Roberts, 2008). The analysis focuses on the loan facility, as each facility's loan spread defines the borrower's varying needs. We exclude all financial firms from the sample. We conduct the analysis through multiple regressions and construct the empirical model as follows:

$$loan\ spread_{i,t} = \beta_0 + \beta_1 LCDX\ spread_t + \delta * Loan\ characteristics_{i,t} + \theta * Borrower\ characteristics_{i,t-1} + \vartheta * Borrower\ industry\ fixed\ effects + \tau * Deal\ Purpose\ Dummies + \varphi * Top\ 10\ lead\ dummies + \varepsilon_{i,t} \quad (1)$$

The dependent variable is the all-in-drawn loan spread in basis points, representing the loan price. The key variable of interest is the LCDX spread, specifically the on-the-run LCDX spreads in basis points for five years. These are believed to provide the best market price for immediate credit risk protection. According to (Norden and Wagner, 2008), banks are increasingly efficient in reflecting CDS market information in loan pricing, justifying the use of the contemporaneous LCDX spread at the time of loan issuance. In recognizing the importance of a borrower's unique credit quality, we control for the borrowers' characteristics such as firm sales as a measure for size, leverage as a

measure of indebtedness, interest coverage as a measure for the ability to repay, ROA as a measure for profitability, cash flow volatility as a measure for risk, Tobin's Q as a measure for growth, and R&D expenses as a measure for capital expenses. Further, to control for any borrower's industry idiosyncrasies, we include industry fixed effects; to control for year differences, we include year dummies, and to control supply-side effect, we include the top 10 banks[1]' dummy variables. Furthermore, we control for all other loan characteristics including loan size, maturity, loan revolver, refinancing terms as well as the indicator variables for different loan purposes.

4. Result

The study's results, obtained after restricting the sample to 1,768 unique loan facilities issued to non-financial firms as secured, syndicated loans, present intriguing insights. Table 1 offers summary statistics.

Table 1: Summary statistics

		N	Mean	Sd	Media	p25	p75
All in-drawn (Spread)	Basis Points	1768	301.66	143.51	275.00	200.00	375.00
LCDX (Spread)	Basis Points	1768	478.68	358.98	380.70	286.80	478.20
Borrower characteristics							
Log (Sale)	Natural log of sales	1768	5.75	1.35	5.73	4.86	6.60
Tobin's Q	Total Market value/Total Assets	1768	1.45	0.73	1.25	1.04	1.61
R&D rate	RD expense/Sales	1768	0.01	0.05	0.00	0.00	0.00
ROA	Net Income/Total Assets	1768	0.00	0.06	0.01	0.00	0.02
Leverage	Total debt/Total Assets	1768	0.35	0.25	0.31	0.16	0.49
Log (Cash flow volatility)	Natural log of standard deviation of Operating cash flows	1768	-3.19	1.52	-3.31	-4.18	-2.35
Interest rate coverage	Operating Income After Depreciation/Interest Expenses	1768	31.76	466.72	3.17	1.24	8.23
Investment grade	Long term SP rating above BBB	1768	0.06	0.23	0.00	0.00	0.00
High yield grade	Long Term SP rating below BBB	1768	0.49	0.50	0.00	0.00	1.00
Loan characteristics							
Log (loan amount)	Natural log of loan amount	1768	6.00	1.19	5.93	5.20	6.82
Log (loan maturity)	Natural log of loan maturity in months	1768	3.86	0.49	4.09	3.65	4.10
Loan revolver dummy	If the loan is a revolver loan	1768	0.65	0.48	1.00	0.00	1.00

[1] Top 10 banks: JP Morgan, Bank of America Merrill Lynch, US bank, Bank of America, Royal Bank of Scotland Plc, Wells Fargo & Co, Citibank, Deutsche Bank AG, BNP Paribas SA, SunTrust Bank

		N	Mean	Sd	Media	p25	p75
Refinancing indicator	If the loan is for refinancing	1768	0.93	0.26	1.00	1.00	1.00
Lender characteristics		1768	0.29	0.45	0.00	0.00	1.00
Top10	If the lenders belong to top 10	1768	0.29	0.45	0.00	0.00	1.00
Number of lenders (Facility)	Number of participating banks in the facility	1768	8.45	6.84	6.00	4.00	11.00

Note: This table reports summary statistics for all variables used in this study.

In Table 2, Pearson correlations reveals a positive association between loan cost and the LCDX, with a 0.23 correlation significant at the 5 percent level. This relationship is further confirmed as all control variables significantly correlate with the loan spread, legitimizing the variable selection.

Table 2: Pearson's correlations

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1)	All in-drawn (Spread)	1														
(2)	LCDX (Spread)	**0.23**	1													
(3)	Log (Sale)	**-0.23**	**-0.04**	1												
(4)	Tobin's Q	**-0.14**	**-0.12**	**-0.07**	1											
(5)	R&D rate	**0.06**	0	**-0.09**	**0.04**	1										
(6)	ROA	**-0.19**	**-0.18**	**0.1**	**0.16**	**-0.09**	1									
(7)	Leverage	**0.23**	**0.04**	**0.02**	**-0.08**	**-0.03**	**-0.17**	1								
(8)	Cash flow volatility	**0.26**	**0.15**	**-0.3**	**-0.11**	**0.11**	**-0.27**	**0.18**	1							
(9)	Interest rate coverage	**-0.04**	-0.01	-0.01	**0.09**	-0.02	**0.04**	**-0.08**	**-0.03**	1						
(10)	Log (loan amount)	**-0.1**	**-0.13**	**0.57**	0.02	**-0.05**	**0.09**	**0.14**	**-0.1**	0.01	1					
(11)	Log (loan maturity)	**0.03**	**-0.23**	0	**0.04**	**-0.03**	**0.1**	**0.05**	**-0.09**	0	**0.15**	1				
(12)	Loan revolver dummy	**-0.19**	**-0.04**	**-0.07**	0	**-0.02**	0.01	**-0.12**	**-0.06**	0	**-0.07**	**0.11**	1			
(13)	Refinancing indicator	**-0.03**	-0.02	**0.13**	**-0.11**	**-0.07**	0	**0.1**	**-0.07**	**-0.04**	**0.16**	**0.17**	**0.13**	1		
(14)	Investment grade	**-0.33**	-0.02	**0.42**	**-0.04**	-0.02	**0.07**	**-0.07**	**-0.12**	-0.02	**0.23**	**-0.14**	0.01	0.01	1	
(15)	High yield grade	**0.2**	0	**0.16**	**-0.08**	-0.02	**-0.07**	**0.34**	**0.06**	**-0.03**	**0.23**	**0.14**	**-0.07**	**0.1**	**-0.39**	1

Note: This table reports the correlations between the dependent variable, the variable of interest, and borrower characteristics. The variable descriptions are in the appendix. The values in bold represent correlations that are significant at 5%.

Table 3 exhibits the baseline regression, displaying a positive and significant effect of the LCDX spread at 1 percent. The influence of LCDX remains substantial, with a 0.21 standard deviation increase in loan spread corresponding to a one standard deviation increase in LCDX (0.09*360.47/155.11). Explanatory power is measured at 41%, supporting Hypothesis 1. Nearly all control variables align with expectations, except interest coverage and high yield rating. As hypothesized, investment-grade, profitable, and growth companies pay lower interest rates, whereas riskier borrowers pay more.

Table 3: Baseline analysis in loan level

Variables	All in-drawn (Spread)	
LCDX (Spread)	**0.10*** **	**0.09*** **
(P value of one-sided test)		**-0.003**
Borrower characteristics		
Log (Sale)		10.86**
Tobin's Q		-21.83***
R&D rate		251.70*
ROA		-216.86***
Leverage		65.57***
Log(Cash flow volatility)		11.19***
Interest rate coverage		0
Investment grade		-88.89***
High yield grade		6.39
Loan characteristics		
Log (loan amount)		-12.15**
Log (loan maturity)		-27.10**
Loan revolver dummy		-59.77***
Refinancing indicator		-26.62*
Constant	254.34***	509.56***
Observations	**1,768**	**1,768**
R-squared	**0.06**	**0.41**
Industry FE	NO	YES
Time FE	NO	YES
Deal purpose dummies	NO	YES
Top 10 Lender dummies	NO	YES

*Note: This table shows the univariate and multivariate OLS results. The dependent variable is the loan interest payment over LIBOR (All-in-drawn spread). The key independent variable is Loan only Credit Default Swap spread (LCDX). The coefficient estimates are based on the robust standard errors clustered at the borrower level. The ***, **, and * represent significance at the 1, 5, and 10% levels respectively.*

Table 4 demonstrates a split by credit quality, revealing the LCDX's high significance for distressed, unrated, and highly indebted firms but not for safe, rated, and low-indebted firms. Columns 1 and 2 divide the sample according to the Altman Z-score, with Column 1 focusing on distressed firms and Column 2 on firms deemed financially stable. Columns 3 and 4 categorize the sample by credit rating; results for unrated firms are in Column 3, while Column 4 encompasses rated firms. Additionally, Columns 5 and 6 distinguish the sample based on whether firms have above or below median leverage. This supports Hypothesis 2, showing heterogeneous effects across borrower types. Table 5 considers top lenders' ability to purchase the LCDX and how loan concentration (measured by the number of lenders in the syndicate) may affect the results.

Table 4: Sensitivity of LCDX to Borrowers' risk characteristics

Variables	z<1.81	z>2.99	No SP rating	SP rating	above Leverage	below Leverage
LCDX (Spread)	**0.07*** **	**0.01**	**0.08** **	**0.05**	**0.09** **	**0.02**
Borrower characteristics						
Log (Sale)	10.34*	11.4	14.22**	5.93	11.30**	13.58**
Tobin's Q	-16.61	-19.75***	-16.90***	-28.08***	-17.68**	-20.79***
R&D rate	403.29***	66.69	148.08	364.96**	138.38	245.48
ROA	-173.65***	-97.23	-307.13	-212.86***	-110.28*	-630.85***
Leverage	54.09**	114.80***	92.20***	84.61***	68.25**	-33.14
Log(Cash flow volatility)	11.76***	6.65	13.83***	9.00**	8.42***	12.88***
Interest rate coverage	-0.23	0	0	0.02	-1.55***	-0.00*
Investment grade	-93.20***	-146.35***			-77.19***	-97.53***
High yield grade	1.34	-3.33			6.76	11.38
Loan characteristics						
Loan amount	-13.45**	-8.49	-0.47	-20.32***	-27.07***	-1.06
Loan maturity	-37.80***	-23.82	-39.55**	1.87	-39.38***	-14.28
Loan revolver	-66.98***	-19.68**	-63.25***	-51.07***	-63.02***	-56.87***
Refinancing	-8.14	-25.34	-17.66	-11.49	2.03	-33.29
Constant	575.68***	421.35***	501.49***	442.57***	575.88***	286.20**
Industry FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Deal purpose dummies	YES	YES	YES	YES	YES	YES
Syndication Dummy	YES	YES	YES	YES	YES	YES
Top 10 Lender dummies	YES	YES	YES	YES	YES	YES
Observations	1,245	288	801	967	977	791
R-squared	0.4	0.59	0.39	0.49	0.43	0.47

*Note: This table shows the results for the subsample analyses. Columns 1 and 2 show the results for the borrower's risk tolerance by its Z score. Columns 3 and 4 show the results for borrowers with non SP and SP ratings. Columns 5 and 6 show the results for above and below median leverage of borrowers. All of the lender's, borrower's, and the loan's characteristics as well as time and borrower industry fixed effects are controlled for. The coefficient estimates are based on the robust standard errors clustered at the borrower level. The ***, **, and * represent significances at the 1, 5 and 10% levels respectively.*

In Table 5, Columns 1 and 2 present the regression analyses for the top 10 lenders compared to lenders outside this group. Column 3 details the findings for the diversified lending group, while Column 4 focuses on the concentrated lending group. The result suggests that larger banks factor in the LCDX spread when setting their loan prices. Notably, the LCDX spread maintains a significant positive correlation with loans from the concentrated group, whereas its significance diminishes for loans from the diversified group. This indicates that loan syndication, which allows for credit risk sharing, diminishes the importance of credit protection as measured by the LCDX. Conversely, for lenders facing credit concentration risk, protection against default risk assumes greater importance. Therefore, the impact of the LCDX spread is more pronounced in such scenarios.

Table 5: Sensitivity of LCDX to Lenders' risk characteristics

Variables	TOP 10 lenders	Non TOP10	Above number of lenders	Below number of lenders
LCDX	**0.16*** **	**0.05**	**-0.01**	**0.13*** **
Borrower characteristics				
Log (Sale)	12.83*	9.93*	6.42	16.53**
Tobin's Q	-12.26	-27.21***	-24.69***	-13.24
R&D rate	181.4	366.61**	444.05*	163.67
ROA	-317.25**	-180.57***	-143.04	-188.53**
Leverage	56.06	85.57***	42.46*	72.94**
Log(Cash flow volatility)	15.91***	11.96***	8.89***	11.73***
Interest rate coverage	-0.04**	0	0	0
Investment grade	-82.35***	-102.93***	-81.37***	-120.53***
High yield grade	-16.86	7.95	2.5	8.95
Loan characteristic				
Log (loan amount)	-12.14*	-23.97***	-17.13***	-7.31
Log (loan maturity)	-17.51	-32.63**	1.79	-41.81***
Loan revolver dummy	-81.79***	-59.57***	-33.39***	-86.43***
Refinancing indicator	-0.95	-44.77**	-10.11	-34.19
Time FE	YES	YES	YES	YES
Deal purpose dummies	YES	YES	YES	YES
Syndication Dummy	YES	YES	YES	YES
Top 10 Lender dummies	NO	NO	YES	YES
Constant	522.55***	567.04***	544.44***	572.78***
Observations	514	1,254	1,034	734
R-squared	0.43	0.39	0.44	0.44

*Note: This table shows the results for the subsample analyses by lender's level of risk tolerance. Columns 1 and 2 show results for loans issued by top 10 lenders and non-top 10 lenders. Columns 3 and 4 show the results for the above and below median of number of lenders in the facility. All of the lender's, borrower's, and the loan's characteristics as well as time and borrower industry fixed effects are controlled for. The coefficient estimates are based on the robust standard errors clustered at the borrower level. The ***, **, and * represent significances at the 1, 5 and 10% levels respectively.*

Table 6 delineates the effect on revolving and non-revolving loans. The LCDX remains significantly positive, but its economic significance doubles for riskier non-revolving term loans, indicating a heightened significance of LCDX effect for riskier loans. Furthermore, the LCDX plays a more crucial role in refinancing loans.

Table 6: Sensitivity of LCDX to loans' risk characteristics

VARIABLES	Revolver loan	Non-Revolver loan	Refinancing loan	Non-refinancing loan
LCDX	**0.07*** **	**0.14** **	**0.09*** **	-0.02
Borrower characteristics				
Log (Sale)	6.36*	16.66**	11.19**	20.48
Tobin's Q	-19.23***	-25.26***	-22.47***	-20.1
R&D rate	109.51	411.49*	278.04*	-308.5
ROA	-187.34***	-227.39**	-234.90***	-237.54
Leverage	64.65***	67.88**	77.48***	-161.85**
Log(Cash flow volatility)	8.00***	14.41***	10.54***	74.04***
Interest rate coverage	0	0.01	0	-0.04
Investment grade	-62.89***	-120.81***	-91.06***	8.13
High Yield grade	10.04	0.51	2.06	48
Loan characteristic				
Log (loan amount)	-5.68	-20.64**	-11.42**	-10.16
Log (loan maturity)	-32.68***	-26.86	-18.99*	-52.34
Loan revolver dummy			-55.63***	-103.92**
Refinancing indicator	-17.37	-49.85		
Constant	429.57***	395.62**	389.55***	640.33***
Time FE	YES	YES	YES	YES
Deal purpose dummies	YES	YES	YES	YES
Syndication Dummy	YES	YES	YES	YES
Top 10 Lender	YES	YES	YES	YES
Observations	1,151	617	1,636	132
R-squared	0.48	0.36	0.4	0.73

*Note: This table shows the results for the subsample analyses by the lender's level of risk tolerance. Columns 1 and 2 show the results for revolver and non-revolver loans, and Columns 3 and 4 show the results for refinancing loan and non-refinancing loans. All of the lender's, borrower's and the loan's characteristics as well as time and borrower industry fixed effects are controlled for. The coefficient estimates are based on the robust standard errors clustered at the borrower level. The ***, **, and * represent significances at the 1, 5 and 10% levels respectively.*

The validity of the LCDX spread as a benchmark is tested by relaxing restrictions on loan security and syndication. Columns 1 to 3 in Table 7 show that the LCDX spread loses significance when applied outside of its coverage loans, indicating it might not be an appropriate benchmark for other loan types.

Table 7: Sensitivity of LCDX to non-secured and non-syndicated loans

Variables	SSS	Non-secured	No-syndicated
LCDX	0.09***	0	0.13
Borrower characteristics			
Log (Sale)	10.86**	-9.16*	4.6
Tobin's Q	-21.83***	-17.63***	-10.93
R&D rate	251.70*	-36.59	-24.43
ROA	-216.86***	154.09	-159.82
Leverage	65.57***	92.20*	40.91
Log(Cash flow volatility)	11.19***	9.03**	26.08***
Interest rate coverage	0	0	0.01
Investment grade	-88.89***	-0.48	-93.74
High Yield grade	6.39	26.72	-17.11
Loan characteristic			
Log (loan amount)	-12.15**	-4.16	11.17
Log (loan maturity)	-27.10**	20.91**	-11.08
Loan revolver dummy	-59.77***	-25.85**	-75.99***
Refinancing indicator	-26.62*	-19.58	26.75
Time FE	YES	YES	YES
Deal purpose dummies	YES	YES	YES
Syndication Dummy	YES	YES	YES
Top 10 Lender dummies	YES	YES	YES
Constant	509.56***	405.86***	182.67
Observations	1,768	777	347
R-squared	0.41	0.44	0.52

*Note: This table shows the results for the subsample analyses by loan characteristics. Columns 1 shows the results for secured, syndicated, senior loans; Column 2 shows the results for non-secured, syndicated, senior loans; and Columns 3 shows the results for secured, non-syndicated, senior loans. All of the lender's, borrower's and the loan's characteristics as well as time and borrower industry fixed effects are controlled for. The coefficient estimates are based on the robust standard errors clustered at the borrower level. The ***, **, and * represent significances at the 1, 5 and 10% levels respectively.*

The study also refers to the 2008 subprime mortgage crisis, highlighting concerns regarding excessive risk-taking and counterparty risk in Table 8. This leads to the examination of whether insured entities need to worry about the insurer's ability to fulfil credit default claims.

Table 8: Sensitivity of LCDX during the crisis

Variables	2008	2009	2010
LCDX	0.12***	0.01	0.17**
Borrower characteristics			
Log (Sale)	27.11***	31.16**	1.73
Tobin's Q	5.1	-47.91***	-23.17*
R&D rate	401.78**	-77.73	284.9
ROA	-192.8	-142.8	-177.10**
Leverage	88.86*	139.60***	44.65
Log(Cash flow volatility)	10.40*	9.3	15.49***
Interest rate coverage	0	-0.29**	-0.05**
Investment grade	-130.73***	-32.19	-95.28***
High Yield grade	-0.73	34.07	-10.76
Loan characteristics			
Log (loan amount)	-13.18	-45.71***	1.25
Log (loan maturity)	-20.06	12.42	-38.18*
Loan revolver dummy	-77.78***	-58.39**	-57.58***
Refinancing indicator	-24.27	-74.81	-36.94
Time FE	NO	NO	NO
Deal purpose dummies	YES	YES	YES
Syndication Dummy	YES	YES	YES
Top 10 Lender dummies	YES	YES	YES
Constant	348.14***	479.65***	629.44***
Observations	314	299	459
R-squared	0.44	0.37	0.44

*Note: This table shows the results for the subsample analyses by years. Column 1 shows the results for before the crisis, Column 2 shows the results for during the crisis, and Column 3 shows the results for after. All of the lender's, borrower's and the loan's characteristics as well as time and borrower industry fixed effects are controlled for. The coefficient estimates are based on the robust standard errors clustered at the borrower level. The ***, **, and * represent significances at the 1, 5 and 10% levels respectively.*

Lastly, a sensitivity analysis across different time periods reveals that the significance of the LCDX spread holds for 2008 and 2010 but loses its importance in 2009. This finding underlines the LCDX's sensitivity to market trust, showing that as the market recognizes an insurer's inadequacy and doubts its capacity, the information in the LCDX spread ceases to be relevant.

5. Limitation and Future Research

This research acknowledges certain limitations. Primarily, the focus on senior, secured, and syndicated loans might not fully capture the complexities of other loan types and their interplay with the LCDX. Moreover, a potential endogeneity issue, especially regarding simultaneity, is noteworthy. The bidirectional relationship between the LCDX and individual loan spreads suggests that while the LCDX could influence loan spreads by setting benchmarks or through market sentiment, changes in individual loan spreads due to firm-specific news or broader economic factors could also impact the LCDX's value. This interdependence highlights the need for further investigation into the causal dynamics between the LCDX and loan spreads.

Additionally, the study's timeframe could raise questions about the temporal context of our findings, particularly considering significant economic events like the subprime mortgage crisis between 2007 and 2012. This period's selection is vital, given the heightened market volatility and credit risk reassessment during these years, which could profoundly affect our study's results. Future research should aim to justify this period selection more robustly and consider how varying market conditions like COVID or a more stable economic environment might influence the outcomes.

Furthermore, the analysis is constrained by the available data's scope and depth, possibly omitting crucial market dynamics or a complete spectrum of credit instruments such as the CDX. Future studies could explore the impact of the LCDX on a wider variety of loan types, including subordinated debts, under different market conditions. It would also be beneficial to assess the potential long-term effects of LCDX movements on credit market stability and delve deeper into the LCDX's implications for smaller, less creditworthy borrowers.

6. Conclusions

In this study, we investigate the influence of the LCDX spread on contemporary loan issuances, emphasizing its role as a market health indicator and a signal of credit risk protection costs for lenders. The findings reveal that as the LCDX spread rises, the loan spread also increases, with a more significant effect for riskier borrowers. The information role of the LCDX, however, is sensitive to loan types and market cycles, losing significance for loans outside its coverage. It suggests that the LCDX may not be an appropriate benchmark for certain loans and that information-advantaged lenders may react selectively to the most credible information. In conclusion, the LCDX's role is significant for senior, secured, and syndicated loans, particularly when lenders are likely to seek credit protections, highlighting a complex relationship that warrants further investigation.

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