Credit Default Swaps and Financial Risks in the 21st Century

Karin Martín Bujack, M. Teresa Corzo Santamaría

Universidad Pontificia Comillas

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Abstract

In this paper we pay tribute to one of the most successful financial innovations in recent times: the Credit Default Swap (CDS). Through a literature review on financial risks from 2000-2015 we develop a conceptual map to assess the importance and evolution of the CDS, along with the consequences of its use. CDSs emerge as a powerful and meaningful financial instrument. Given the CDS's versatility, the 21st-century literature about the CDS and its usefulness is very extensive, rendering the CDS a valuable guide with which to investigate the financial risks that have worried researchers, regulators and all of the participants in the financial system.

KEYWORDS: Credit Default Swap, credit risk, default risk, contagion, risk correlation, systemic risk.

JEL codes: G10; G13; G15

1. Introduction

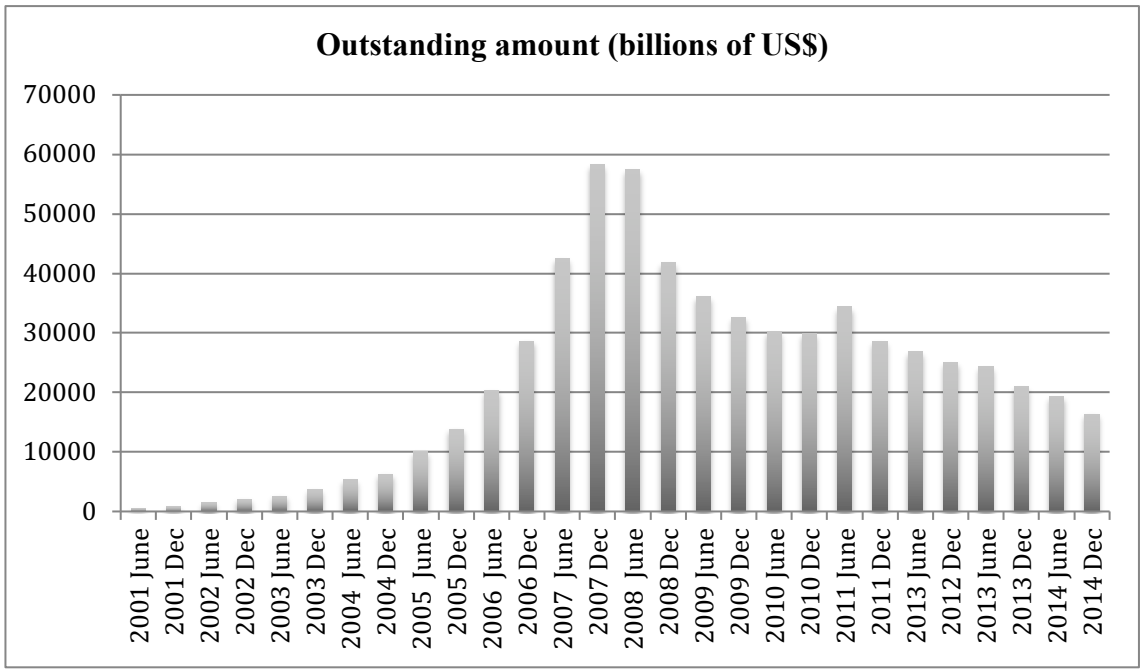
After the savings and loan crisis in the 1990s, an almost-new financial instrument gained popularity to diversify and mitigate financial risks, and specifically, credit risks: the credit default swap (hereafter CDS). CDSs protect against the risk of a credit event by a particular company or country in a manner similar to that of an insurance contract, although speculators can also use CDSs to take long/short positions on credit risk. Such contracts were very valuable in the risk-management industry in times of volatility and evolved quickly. Their use was so extensive that their outstanding amount grew from $631 billion in June 2001 to $58.244 billion by the end of 2007.

The increasingly use of this product led to the creation of CDS premiums data for a large number of firms and sovereigns. CDS spreads were seen as important indicators of credit quality and began to be used in many studies. Thus, since 2000, many researchers became interested in understanding the CDS and the information that it provides for use as an instrument to measure various types of risks. These contracts are the most liquid of the diverse credit derivatives traded, and provide a very feasible method of trading credit risk (Blanco, Brennan, and Marsh, 2005).

The ISDA (International Swaps and Derivatives Association) began to survey CDS use at mid-year 2001 (see evolution in Table 1). In an act of foresight, the chairman of the ISDA's board wrote that "The credit derivative numbers show impressive growth during a difficult period (…) being this a testimony to the value that these products bring to market participants in managing risk in times of volatility and uncertainty."[1]

Figure 1: Total notional amount outstanding for CDS

[1] International Swap and Dealer Association Market Survey 2001 (year-end).



Source: ISDA (years 2001 and 2002) and Bank for International Settlements (years 2003-2014).

As shown in the graph, the CDS market grew rapidly and CDS acquired great importance as an indicator of credit quality. This evolution led to the existence of data on CDS premiums for a large number of institutions, and many researchers found that CDS data were less likely to be influenced by the liquidity problem that affected many bond spreads, thus transforming the CDS into a more reliable default risk proxy. Others researchers focused on the flexibility and diversification advantages achieved through this derivative instrument. For a third group, the real innovation of this tool was not only that credit risk could be traded separately from the underlying debt but also that the CDS entailed a leverage effect, as explained in section 3.1. (e.g. Das and Hanouna, 2006).

As derivatives markets spread, researchers began to express concern about the possibility that the use of these instruments might increase the fragility of the financial system rather than contribute to better risk diversification. Researchers realized that CDSs were complex instruments with an unexpected downside effect in scenarios of financial distress. Others went further, stating that CDSs played a prominent role in the bankruptcy of Lehman

Brothers, the collapse of American International Group (AIG), and Greece's sovereign debt crisis (Subrahmanyan, Tang and Wang, 2014).

Either way, the importance of the CDS contract in various fields and its great contribution to the literature is undeniable. The CDS has demonstrated enormous versatility as an instrument affecting several areas of the financial markets and has had multiple uses, whereas CDS data have simultaneously served researchers in many studies, as evidenced by the large amount of literature on financial risks that uses CDS data. For authors such as Zinna (2013), the CDS offers a privileged view to study default risk and global investors' expectations.

In this paper, we address the importance and evolution of this financial product, while tracing the understanding of financial risks. This study contributes to the existing literature in two ways. First, using the CDS as a guideline, we organize and structure the financial risks' issues that concerned researchers prior, during, and after the subprime and sovereign crises. A bibliometric analysis has been performed as a tool to identify the contributions that have become a milestone and determined the course of financial research. Second, we develop a conceptual map that emerges from the literature, gathering the various purposes and meanings given to the CDS.

Recently it has been an interesting discussion by Augustin et al (2016) about future research directions in the CDS context[2]. They identify issues that need more dedicated attention and represent fruitful areas for academic work. Our paper differs from theirs substantially, and at the same time complements theirs findings. The main strategy of our paper is the use of CDS as a tool to disentangle the complex financial risks, rather than assess the strenghs and weaknesses, opportunities and risks of CDS as Augustin et al (2016) do. Additionally we use an unbiased bibliometric approach to select the main contributions within our financial risks restricted field, while Augustin et al (2016) support their points based on their appreciation of

[2] A broad CDS literature survey can be found in Augustin et al (2014).

the literature. With these different approaches both papers complement our understanding of this exceptional financial instrument.

The rest of the paper is structured as follows. In section 2 we perform a 15-year bibliometric analysis of CDS studies and the various types of financial risks studied in the context of the CDS. In section 3, we draw a CDS conceptual map and chronologically analyze the various permutations of the CDS, more specifically approximating the CDS concept. Section 4 concludes. References and appendices can be found at the end of the paper.

2. Bibliometric Analysis

Both the literature on the CDS and the literature that uses CDS data are extremely wide and it has been necessary to perform a bibliometric analysis to track the relevant studies. Through this search, we identify the most relevant journals and papers on financial risks that use CDS. Next we provide data tables and details of how the research was been conducted so that the approach can be replicated by interested readers.

We conduct two parallel searches then combine the results to identify the most relevant journals. On the one hand, we search for the most important finance/business journals through WoS, Scopus, the Academic Journal Guide of the Chartered Association of Business Schools and Google Scholar, disregarding journals on accounting, auditing, real estate, mathematics, and futures markets. The journals that we found were organized by considering their influence as expressed through the JCR, SJR and SNIP impact factors and their AJG and H5 indexes. The use of these tools has allowed us to identify both the relevant publications in the area and their influence at a citation level.

On the other hand, we look for the papers that have examined financial risks using CDS data. This systematic literature search has been conducted using the terms “risk” and “CDS” or “credit default swap” and their derivations (risks, risky, credit default swaps, etc.). We have restricted our search to the title, abstract, and keywords fields, because we believe that if the

desired concepts were not included in these fields, the publication would not be sufficiently specialized in the theme of our research. Both simple and advanced searches have been carried out to achieve the smallest possible number of false positives and false negatives.[3] Because of the dynamic nature of the terms, and given that CDSs were created in the mid-1990s, we have traced the first 15 years of the 21st century.

Table 2 and Figures 1 and 2 show a summary of the results obtained through WoS between January 2000 and December 2015. The specific results of the search of our keywords through the mentioned databases (WoS, Scopus, Ebsco, Dialnet) to identify the most relevant papers can be found in Appendix B.

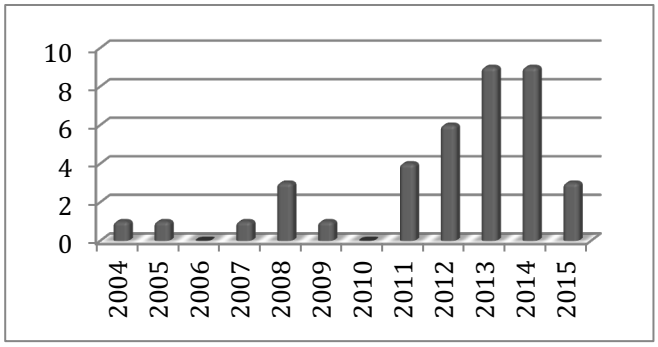
Table 1: Papers found while searching through WoS

Title	(risk*) AND (credit default swap*)
Published between	2000 and 2015
Results found	38
Times cited	498
Times cited without self-citations	480
Citing articles	400
Citing articles without self-citations	387
Average citations per Item	13.11
h-index	7

Date: study performed December 2015

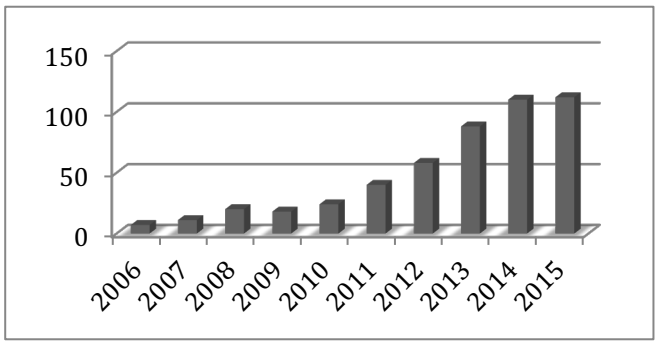
[3] When searching references, it has been necessary to filter the searches thoroughly to avoid missing any chance of finding relevant information. Therefore, we have used the Boolean operators to make each search more precise. Parentheses and quotation marks have also been used to avoid ambiguity, as in the cases in which it was necessary to use two words together and in a particular order ("credit default swap") and in the cases involving the use of elements such as (*) for all possible endings ("credit default swap" or " credit default swaps").

Figure 2: Published Works with (risk*) AND (credit default swap*) in the title.



Source: WoS. Updated to December 31st, 2015

Figure 3: Citations of papers with (risk*) AND (credit default swap*) in the title.



Source: WoS. Updated to December 31st, 2015

The search reveals that the highest literary productivity was between 2011 and 2015. Similarly, the number of citations increases every year during that period. Given the literature that we found, we note that after the fall of Lehman Brothers and the subprime crisis, researchers' interest in risks and the use of the CDSs significantly increases. This is especially true during the sovereign debt crisis, when studies about financial risks associated with CDSs are triggered.

Our third step is to combine the previous results to obtain the 20 top journals publishing about financial risks using CDS. By considering business/finance journals, their influence through the JCR, SJR and SNIP impact factors and their AJG and H5 index, along with the

papers about financial risks using CDS published in those journals, the top 20 journals were selected and are shown in Table 3.

Table 2: Selected main business/finance journals (avoiding journals on accounting, auditing, real estate, mathematics, and futures markets) publishing about financial risks using CDS.

	JOURNAL	JCR 2014	SJR 2014	SNIP 2014	AJG 2015	H5-index GS 2015
1	JOURNAL OF FINANCE	5.424	17.138	5.609	4*	108
2	JOURNAL OF FINANCIAL ECONOMICS	4.047	10.116	4.200	4*	113
3	REVIEW OF FINANCIAL STUDIES	3.174	10.726	3.299	4*	101
4	JOURNAL OF INTERNATIONAL MONEY AND FINANCE	2.117	1.114	1.418	3	45
5	JOURNAL OF FINANCIAL MARKETS	2.111	3.732	2.238	3	
6	REVIEW OF FINANCE	2.012	3.796	1.620	4	40
7	JOURNAL OF MONETARY ECONOMICS	1.726	4.779	1.952	4	
8	INTERNATIONAL REVIEW OF ECONOMICS AND FINANCE	1.704	0.754	1.589	2	
9	JOURNAL OF FINANCIAL INTERMEDIATION	1.661	1.700	1.760	4	34
10	JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS	1.566	3.355	1.948	4	51
11	FINANCIAL ANALYSTS JOURNAL	1.548	2.116	1.429	3	
12	IMF ECONOMIC REVIEW	1.525	3.764	2.095	3	
13	JOURNAL OF FINANCIAL STABILITY	1.506	1.370	1.852	3	32
14	WORLD BANK ECONOMIC REVIEW	1.488	0.970	1.309	3	
15	FINANCE AND STOCHASTICS	1.441	2.585	2.265	3	
16	JOURNAL OF FINANCIAL ECONOMETRICS	1.302	1.607	1.219	3	
17	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73
18	JOURNAL OF INTERNATIONAL FINANCIAL MARKETS, INSTITUTIONS AND MONEY	1.237	0.712	1021	3	
19	JOURNAL OF FINANCIAL SERVICES RESEARCH	1.200	0.874	1.153	3	
20	JOURNAL OF CORPORATE FINANCE	1.193	1.516	1.528	4	46

Note: Explanations of the various impact indexes can be found at the end of the paper in Appendix A.

Finally, after disregarding papers published in very specific areas (both because of their lack of representativeness and because they do not really use CDS to research financial risks) and combining the results obtained through the search of the main journals with those obtained

through the search of the most-cited papers and the latest working papers, the main authors and articles were identified. We find that the most appropriate papers are those that provide basic and updated sources of knowledge and are published in a recognized journal, along with conference proceedings and working papers series that help track, almost in real time, topics of current interest. This methodology leads to the selection of 81 papers as leading research pieces (for a complete list, see Appendix C), from which 40 were published in the top 20 journals. Of the remaining articles, 6 studies appeared in the Working Papers Series (ECB, IMF, NBER, NCCRFVRM and CAMP) and the remainder were published in 34 journals, showing that the CDS is both a topic of interest for many editors and a cross-curricular subject because it affects multiple financial concepts. Fifty-six of the 81 papers were published between 2011 and December 31, 2015 (this paper's closing date), whereas only 25 were published during the previous 11 years.

3. The CDS Conceptual Map

Next, we adopt a holistic approach to CDS, develop a conceptual map and delve into the details of the various permutations of the concept.

3.1. The CDS concept

A CDS is a complex concept with many permutations, rendering it necessary to note that in this paper, we understand CDS to mean the contract that protects against the risk of a credit event by a particular company or country. The buyer of protection makes periodic payments to the seller (typically a recurring quarterly fee) until either the occurrence of a credit event or the maturity date of the contract, whichever comes first. The annualized fee is called the CDS price or CDS spread. This premium will be higher for CDS on reference entities with poor credit (Blanco, Brennan and Marsh, 2005). If a credit event occurs, the buyer is compensated

for the loss incurred as a result of the credit event, which is equal to the difference between the par value of the bond or loan and its market value after default, and the buyer must pay the accrued fee. If there is no default event before maturity, the protection seller pays/receives nothing.

The economic effect of a CDS is similar to that of an insurance contract. The legal distinction between the two arises out of the fact that it is not necessary to hold an insured asset (e.g., the underlying bond or loan) to claim "compensation" under a CDS. Speculators can take long (short) positions on credit risk by selling (buying) protection without the need to trade the cash instrument. CDSs also allow a bank to exchange its current borrowers' credit risk for the credit risk of a different set of borrowers: the risk-return profile of the bank may thus be improved without negatively affecting its relationship with customers (Draghi, Giavazzi and Merton, 2003).

Consistent with Weithers (2007), credit derivatives were first publicly introduced by ISDA in 1992; however, they were not broadly traded until after the 1999 standardization of CDS documentation. A volatile economic situation enhanced the incentive to use derivatives to achieve better risk distribution in the economy.

Through our literature review, we have observed that CDS data have served researchers in many domains. Here, we adopt a holistic view of that evolution.

The first studies on credit risk focused on pricing issues. Little empirical work was carried out. These studies were related to the bond market and concerned the determinants and dynamics of the yield spread between a risky bond and a government bond (considered secure). However, some authors such as Blanco, Brennan and Marsh (2005) and Longstaff, Mithal and Neis (2005) began to suggest that CDS prices are useful indicators of credit risk and can be used as measures of default risk. Empirical studies using CDS started to analyze the influence of various factors on CDS rates and therefore on credit risk, addressing the complexity of pricing this type of risk. Authors such as Hricko et al. (2003) have suggested

that CDS prices are better proxies for credit risk than the difference between the yield on a bond of a risky counterparty and a government bond. Others have investigated whether CDS spreads and bond spreads are in line with each other and which one responds faster to changes in credit conditions, i.e., which one leads what we refers to as the price-discovery process.[4] Researchers have looked not only for factors affecting CDS and bond spreads but also for correlations between different types of risks using CDS data, such as market and credit risk correlation or correlation between the default risk of the protection seller and that of the underlying entity.

During the turmoil of 2007-2009, authors such as Jorion and Zhang (2007, 2009) have examined the information-transfer effect of credit events across the industry and the effect of bankruptcy announcements on creditors, attempting to explain the excess clustering observed in defaults. The crisis led to different studies about sovereign risk contagion, risk transmission from peripheral to central EU economies, the "flight-to-quality" phenomenon, and risk spillovers between banks and sovereigns, among others, resulting in the need to analyze private-to-public and public-to-private risk contagion.

Along this contagion line, the systemic feature of the recent financial crisis has captured the interest of researchers who have demonstrated the CDS paradox: the CDS helps transfer risk but concentrates systemic risk because of increased interconnections in the financial system. In concert with this paradox, the benefit of clearinghouses has been questioned. With respect to the interconnection issue, some authors have studied what they call the systemically large banks finding that they are "too large to fail" or "too interconnected to fail" institutions, although others discuss "too big to save" institutions. Some of these researchers have underlined the importance of determination whether a country's membership in an economic and monetary union is significant given such unions' sensitivities to the health of the

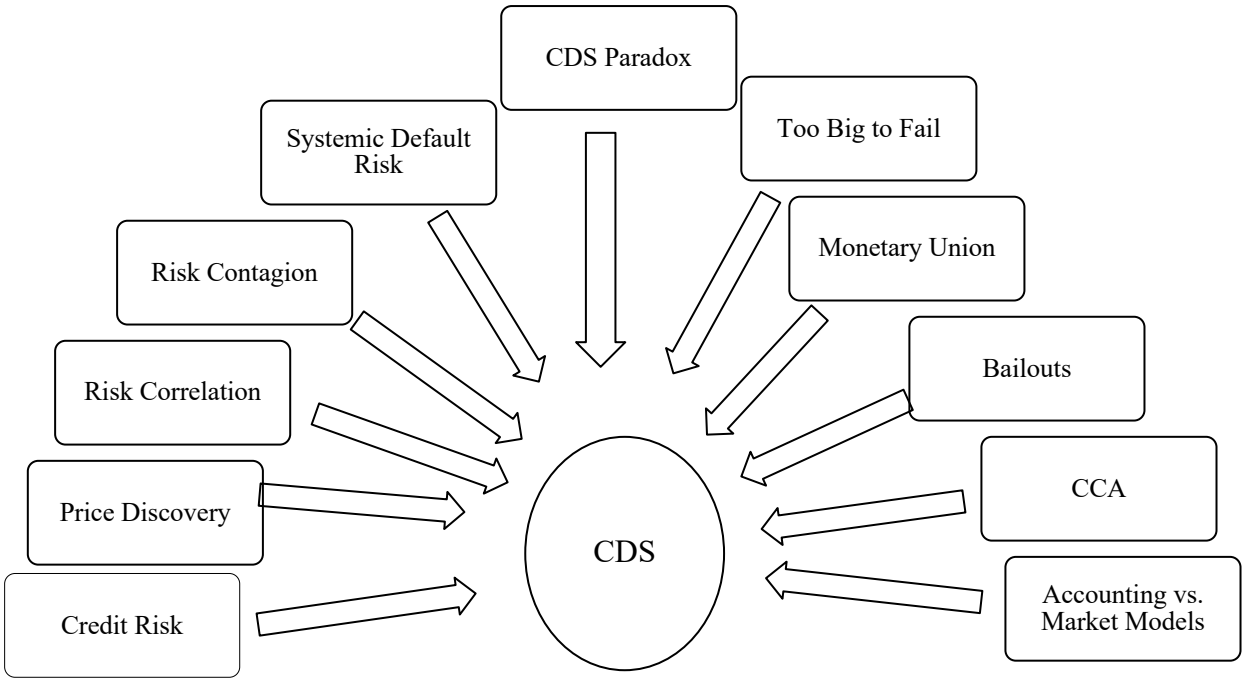
[4] The price discovery process is explained in section 3.3, "Role of CDSs in the Price Discovery Process."

financial system; some of these scholars have studied the effect of government rescue packages on risk spreads and sensitivities.

Finally, other studies have focused on new approaches to measure default risk, on contingent claim analysis, on the benefits of accounting or/and market models for explaining credit risk, on liquidity factors in the valuation of CDS, on the impact of sovereign wealth fund investments on the credit risk of target companies, etc.

This evolution has led us to conceive a CDS conceptual map that shows the main permutations (Figure 3).

Figure 4: Map of the various CDS purposes, ordered according to chronological emergence

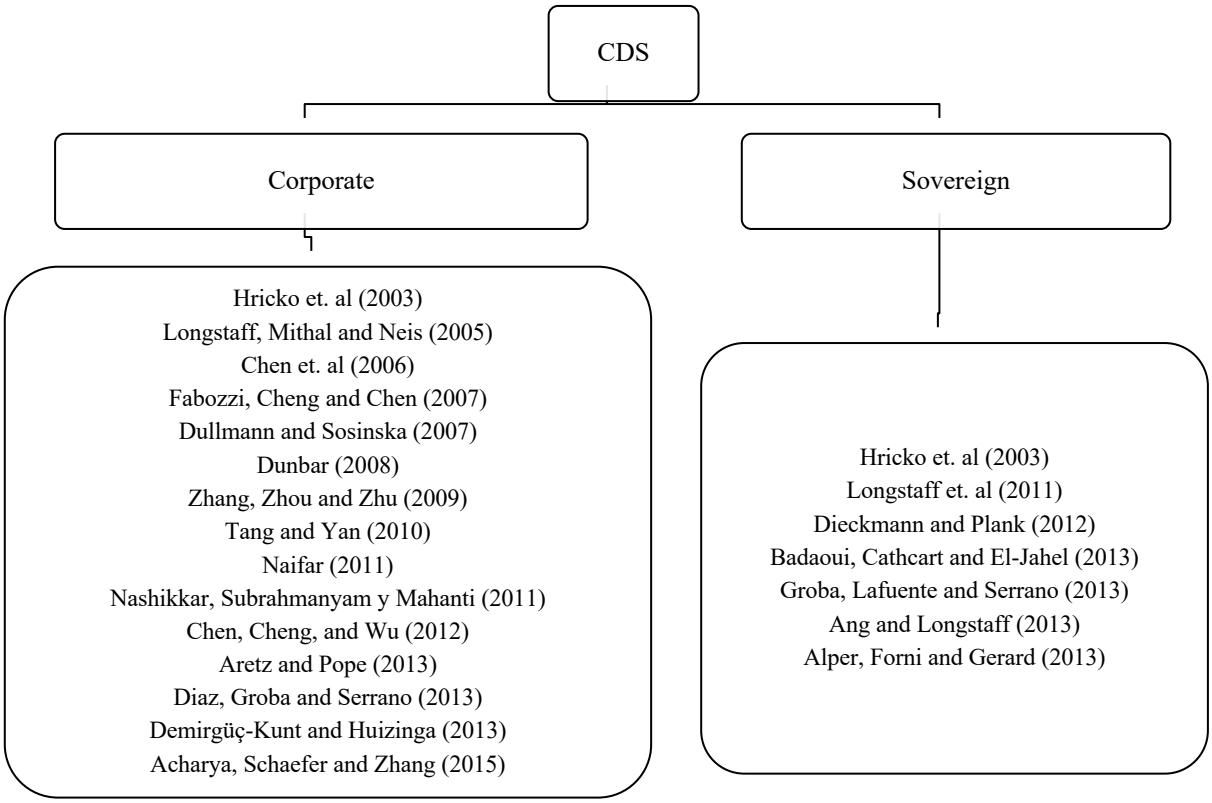


We will now detail the major items that have resulted in milestones in how we understand CDS and thus, their financial risks. For this purpose, we will take into account all of the relevant acceptations displayed in each selected paper.

3.2. CDSs as a source of information on credit risk: What determines the price?

We have found many studies that have analyzed the factors of the CDS spread to understand the pricing of corporate/sovereign credit risk, the corporate default premia or the systemic sovereign credit risk, thus seeking an understanding of the sources of credit risk as risk indicator. In fact, this is the area regarding financial risks using CDS where the most research has been found and as shown in figure 4, we have categorized these papers depending on whether they address corporate or sovereign credit risk.

Figure 5: Literature on the determinants of the credit risk price classified according to focus on corporations/sovereigns.



By investigating the influence of various factors on CDS rates and therefore on credit risk, Hricko et al. (2003) note that the rating is the most important single source of information on credit risk overall, although the sensitivity of these rates to ratings is different for high/low rated debt and for sovereigns versus corporations. Along this same line, Aretz and Pope (2013) state that credit risk is not homogenous amongst sovereigns/corporations and US/non-US underlings.

That notwithstanding, these studies disagree about whether the local or the global factors have the strongest effect on CDS spreads. Hricko et al. (2003) indicate that default is linked to the performance of the local economy, whereas Aretz and Pope (2013) reveal that changes in firms' default risk depend more strongly on global than on country effects. Along the same line, but regarding sovereign credit risk, Longstaff et al. (2011) conclude that the majority of defaults can be linked to global factors, thus confirming the strong relationship between sovereign CDS spreads and the global risk premium. Other authors, however, document that the state of a country's domestic financial system, and since the beginning of the crisis the state of the world's financial system, has strong explanatory power for the behaviour of CDS spreads (i.e. Dieckmann and Plank, 2012). Groba, Lafuente and Serrano (2013) not only suggest that sovereign CDS spreads are partially explained by global and local macroeconomic factors but also conclude that peripheral risk plays a key role in explaining CDS increments for the other EU members until the approval of the European Financial Stabilization Mechanism (EFSM) in May 2010. However, with respect to sovereign CDS, Ang and Longstaff (2013) note that systemic sovereign credit risk is closely related to financial market variables such as stock returns, supporting the view that this risk is rooted in financial markets rather than in macroeconomic fundamentals. Similarly, Diaz, Groba and Serrano (2013) also find a link between movements in risk premia and market variables (stock prices, exchange rates), albeit in the corporate CDS area. Nevertheless, Naifar (2011)

finds that during the last financial crisis, CDS indices become more sensitive to both stock market conditions and macroeconomic variables.

Regarding this link between market variables and CDS, Dullmann and Sosinska (2007) have already explored the usefulness of credit default swap prices as market indicators, concluding that equity prices and CDS premia should be considered together not only to fully exploit their information content but also to mitigate their respective drawbacks.

In relation to fiscal items, Demirgüç-Kunt and Huizinga (2013) consider that bank CDS spreads are positively related to the fiscal cost relative to GDP of resolving any previous banking crisis; however, Alper, Forni and Gerard (2013) find that variables related to fiscal sustainability can explain only a limited share of the variation of sovereign CDS spreads, which are more responsive to financial or purely global variables.

To return to the subject of corporate CDS, many authors find that interest rates influence credit default rates. For Hricko et al. (2003), US interest rates influence all CDS spread, although outside the US the local slope of the yield curve is more significant than the US slope. For Chen et al. (2006), together with default probability and recovery, interest rates are the major source of credit risk; for Fabozzi, Cheng and Chen (2007) interest-rate, rating, sector, and liquidity factors do affect the CDS spread. On the other hand, Das and Hanouna's (2006) literature review notes the negative relationship between spreads and risk-free interest rates, as do Chen, Cheng, and Wu (2012) while concluding both that the deterioration of the credit condition (widening of credit spreads) tends to lead to future easing in monetary policy (lowering of the current forward interest-rate curve) and that positive shocks to the short-term interest rate narrow the credit spread at long maturities.

With respect to liquidity factors, authors such as Longstaff, Mithal and Neis (2005) have already observed that a large proportion of corporate bond spreads are determined by liquidity factors that do not necessarily reflect the default risk of the underlying asset. However, it is in recent years that researchers such as Dunbar (2008) have illustrated the

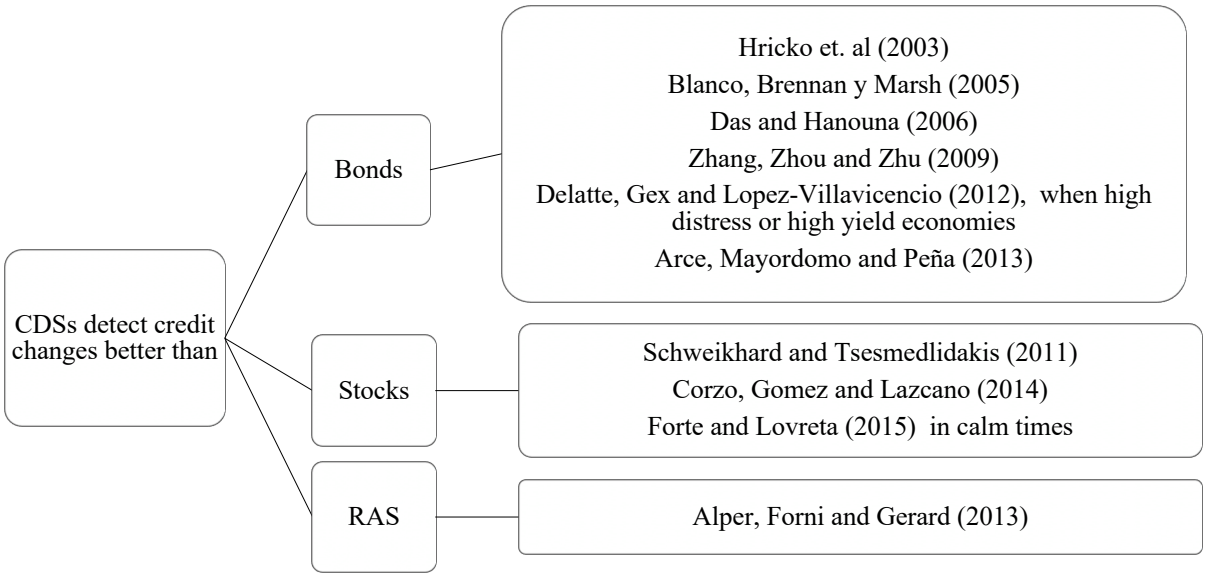
importance of liquidity in the CDS valuation process because it indirectly affects credit risks through credit quality. Along the same line, papers such as the previously mentioned Fabozzi, Cheng and Chen (2007) study also support this idea and suggest that CDS spreads imply high liquidity risk instead of high default risk. This argument is backed by other authors, who find that because of institutional frictions and liquidity effects, fluctuations in prices in credit markets are sometimes unrelated to changes in equity markets (Acharya, Schaefer and Zhang, 2015), and those who infer that these liquidity risk premiums increase during certain periods can limit the value of CDS spreads as market indicators (Düllmann and Sosinska, 2007). Thus, following all of these studies, authors such as Nashikkar, Subrahmanyam and Mahanti (2011) underscore that the CDS spread does not fully account for the effect of credit risk on bond prices, whereas authors such as Badaoui, Cathcart and El-Jahel (2013), who also support the idea that sovereign CDS spreads are highly impacted by liquidity risk, conclude that sovereign bond spreads represent a better proxy for sovereign default risk.

Finally, while explaining the corporate CDS premium, Zhang, Zhou and Zhu (2009) identify the volatility and jump risks of individual firms and conclude that equity volatility and jumps are the most significant factors—even more significant than the rating. For their part, Tang and Yan (2010) document that firm-level cash flow volatility increases credit spreads. Likewise, in the context of a study on sovereign CDS, Ang and Longstaff (2013) find that US systemic credit risk is significantly negatively related to changes in the VIX index.

In summary, we can infer that credit risk is not homogenous amongst corporations/sovereigns and that ratings, interest rates, equity volatility, fiscal items and liquidity factors do affect the CDS spread. Nevertheless, it seems that it is still unclear whether CDS spreads are mostly explained by global/local factors (or both) or by macroeconomic/financial variables (or both).

3.3. *Role of CDSs in the Price Discovery Process*

Figure 6: Literature regarding the price discovery process classified according to the established comparison.



The initial empirical research on the CDS market focused on comparisons of the CDS spread and the spread of the corresponding cash market bond. The price discovery was assessed, in the sense of the efficient and timely incorporation of the information implicit in investor trading into market prices (Lehmann, 2002).

In a first stage, authors confirm the parity between CDS and bond markets in the long run (Blanco, Brennan and Marsh, 2005) while stating that the CDS market leads the discovery process because it does not suffer from the limitations of bond spreads as a measure of credit risk (Hricko et al, 2003) for reasons related to the liquidity and taxes effects (Das and Hanouna, 2006) and the absence of funding and short-sale restrictions in the derivatives market in the short run (Blanco, Brennan y Marsh, 2005). Thus, authors such as Zhang, Zhou and Zhu (2009) find that CDS spreads provide relatively pure pricing of the underlying entity's default risk.

Researchers became then aware of liquidity effects in the CDS spreads (as explained in the previous section), the persistent deviations in the theoretical parity relation between the sovereign CDS and bond markets (Arce, Mayordomo and Peña, 2013) and the dependency of

the price discovery process on market distress (Arce, Mayordomo and Peña, 2013; Delatte, Gex and Lopez-Villavicencio, 2012). Delatte, Gex and Lopez-Villavicencio (2012) find that the bond market plays a dominant role in the price discovery process only in the less-risky countries during calm periods, that the higher the distress, the more the CDS market dominates the information transmission and that in the high-yield economies, the CDS market dominates all regimes.

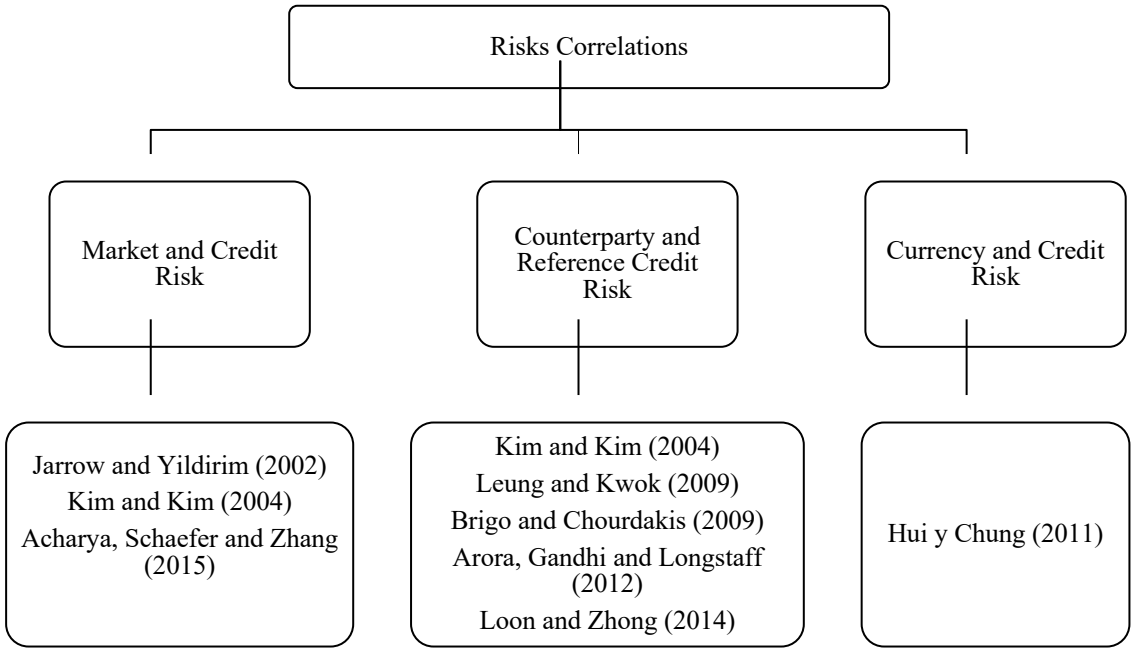
This has also been the conclusion when studying the price discovery process between CDS and stock markets: Schweikhard and Tsesmedlidakis (2011) suggest that in most cases, CDS and stock markets are strongly cointegrated and that CDS leads the timely incorporation of credit-sensitive information. Along this line, Corzo, Gomez and Lazcano (2014) note that CDSs play a stronger role than equity markets in economies with higher perceived credit risk. In contrast, for Forte and Lovreta (2015), who analyze this relationship during 2002-2008, the CDS market's contribution to price discovery is equal to or greater than that of the stock market.

Finally, Alper, Forni and Gerard's (2013) abovementioned analysis of CDS and relative asset swap (RAS) spreads[5] finds that CDS spreads anticipate changes in RAS and lead the process of pricing sovereign credit risk.

3.4.CDSs and Financial Risk Correlations

Figure 7: Literature on risk correlations using CDS data

[5] According to Alper, Forni and Gerard (2013) a RAS spread measures the difference between a benchmark government bond yield and the fixed rate arm of an interest rate swap in the domestic currency with the same maturity. RAS spreads allow for meaningful comparisons across countries or economic regions using different currencies, and they can be deemed a more restrictive indicator of the sovereign default risk than bond spreads.



The first studies of risks correlation using CDS refer to market and credit risk. In this sense, Jarrow and Yildirim (2002) use default swap quotes to provide a simple analytic formula for valuing default swaps when market and credit risk are correlated, whereas Kim and Kim (2004) suggest a methodology for valuing credit default swaps that considers counterparty default risk, correlated market and credit risk. In contrast, Acharya, Schaefer and Zhang (2015), by studying the General Motors and Ford downgrades of May 2005, estimate that price fluctuations in credit markets are unrelated to changes in equity markets, at least some of the time, and that institutional frictions and liquidity effects are responsible for such segmentation.

Kim and Kim (2004) also state that pricing error in credit default swaps can be substantial when ignoring the correlation between market risk and credit risk, along with between-counterparty credit risk and reference credit risk. Because the sensitivity of basket credit default swap rates to market risk increases with the number of reference entities, the valuation error can be more substantial in pricing basket credit default swaps. Within the scope of the correlation between the protection seller and the underlying reference entity,

Leung and Kwok (2009) support the idea that the impact of that correlation on fair CDS rates can be quite substantial under a high arrival rate of the external shock and the subsequent high proportional jumps in the default intensities of the various parties.

Conversely, Brigo and Chourdakis (2009) find that counterparty/reference entity correlations and credit-spread volatility are quite significant in valuing counterparty risk.

In recent years, Arora, Gandhi and Longstaff (2012) examine the extent to which the credit risk of a dealer offering to sell credit protection is reflected in the prices at which the dealer can sell it, finding strong evidence that counterparty credit risk is priced in the market, that is, the higher the dealer's credit risk, the lower the price at which the dealer can sell credit protection in the market, although the magnitude of the effect is fairly small. However, Loon and Zhong (2014), while examining the impact of central clearing on the CDS market, find that the relation between CDS spreads and dealer credit risk weakens after central clearing begins, suggesting a lowering of systemic risk.

Other authors such as Hui and Chung (2011) study the correlation between currency and credit risk. They analyze the crash risk of the Euro in the sovereign debt crisis of 2009-2010 and find evidence of information flow from the sovereign CDS market to the currency option market. They suggest that a country's economic-political instability, which is closely tied to its credit risk, often leads to depreciation and heightened volatility in its currency.

3.5. CDS and Financial Risks Contagion

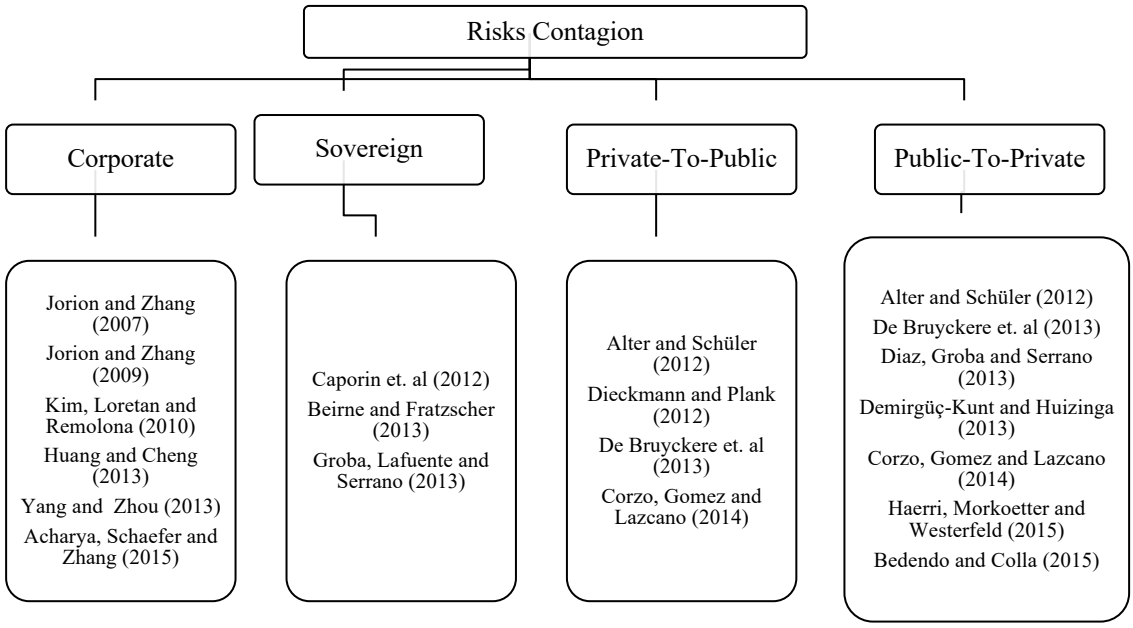
Various definitions have been given to the term contagion over the years, and as noted by Caporin et al (2012), Europe's sovereign debt crisis, which began in late 2009, has reignited the literature on contagion.

In this paper, we adopt the literature's usual contagion definition: the change in how countries' own fundamentals or other factors are priced during a crisis period, i.e., a change in the reaction of financial markets in response to either observable or unobservable factors

(e.g., Beirne and Fratzscher, 2013). There is an excess correlation over and above what is explained by common factors (e.g., De Bruyckere et al., 2013).

Although the first papers about contagion that used CDSs were focused on corporate contagion, the European sovereign crisis marked the beginning of sovereign contagion studies, opening the door to the study of risk transfers between the private and the public sectors.

Figure 8: Literature regarding risks contagion classified according to corporate/sovereign scope and the flow between the private and public sectors.



Jorion and Zhang (2007) examine the information transfer effect of credit events across the industry as captured in the CDS and stock markets over the period from 2001 to 2004 to empirically measure the credit contagion created by counterparty risk, finding strong evidence of the dominant contagion effect for Chapter 11 bankruptcies and the competition effect for Chapter 7 bankruptcies. They suggest that a purely unanticipated event leads to the strongest evidence of credit contagion across the industry. Also with respect to the effects in

the industry, the previously mentioned paper by Acharya, Schaefer and Zhang (2015) on General Motors and Ford documents a substantial increase in the co-movement between innovations in the CDS spreads of both those two firms and those of firms in all other industries, showing that a measure of the liquidity risk experienced by corporate bond market-makers explains a significant portion of this excess co-movement.

In 2009, Jorion and Zhang studied the effect of bankruptcy announcements on creditors, finding negative stock price responses and increases in CDS spreads and determining that the distress effects are stronger for industrials than those for financials, concluding that the excess clustering observed in defaults can be potentially explained by counterparty risk.

Studying Asia after the turmoil of 2007-2009, where direct exposure to problem mortgages was minimal, Kim, Loretan and Remolona (2010) argue that contagion was part of an amplification mechanism driven by valuation losses stemming from a global repricing of credit risks. They suggest that there is an important global component to risk aversion and an rise in such risk aversion would naturally be a source of contagion.

Caporin et al. (2012) were interested in understanding how much potential contagion exists within the European sovereign debt market, finding no change in the intensity of the transmission of shocks among European countries during the onset of the current fiscal crisis. In contrast, Groba, Lafuente and Serrano (2013) find a significant risk transmission from peripheral to central EU economies as a reaction to some common global shocks during the period from 2008-2010. They find that peripheral risk plays a key role in explaining CDS increments for the other EU members until the approval of the European Financial Stabilization Mechanism (EFSM) in May 2010. Along the same line, Beirne and Fratzscher (2013) find that a deterioration in countries' fundamentals and fundamentals contagion—or

"wake-up call" contagion[6]—are the main explanations for the global increase in sovereign yield spreads and CDS spreads during the European sovereign debt crisis.

Finally, Huang and Cheng (2013) demonstrate a positive relationship between information risk and the credit contagion effect and find that firms with higher information risk suffer a greater contagion effect that occurs in advance of credit default events. Similarly, Yang and Zhou (2013) find that financial institutions that are prime senders of credit-risk information and institutions that are exchange centres for credit-risk information might be systemically important financial institutions (SIFIs), that leverage ratios and certain aspect of corporate governance may be significant determinants of different roles of financial institutions in credit risk transfer and that there is little evidence that other factors (including size, liquidity and write-downs) can explain the differences of the role of credit-risk transfers among these financial institutions.

The study of the contagion of default risk between sovereigns and companies became important after some financial firms' bailouts and the Greek default.

Many articles provide insights into risk-transmission channels from the perspective of the credit derivative market. Dieckmann and Plank (2012) for instance, suggest a private-to-public risk transfer through which market participants incorporate their expectations of financial industry bailouts and the potential burden of government intervention. Other authors, including De Bruyckere et al. (2013), merely analyze the risk spillovers between banks and countries and vice versa, identifying significant interactions that drive bank/country contagion and confirming a home bias: a stronger contagion between banks and their home countries (although the lower the bank's proportion of short-term funding in total debt, the lower the intensity of risk spillovers, and the higher the debt-to-GDP ratios, the higher the degree of bank/sovereign contagion, which is more notable in the presence of

[6] "Fundamentals contagion" or "wake-up call" contagion is explained by the authors as a sharp increase in the sensitivity of financial markets to fundamentals, unlike "regional contagion," which results from an intensification of spillovers of sovereign risk across countries, and "herding contagion," which results from a temporary overreaction of financial markets that is clustered across countries.

higher sovereign CDS spreads). In this two-way spillover, Alter and Schüler (2012) distinguish the period preceding government interventions from the following period, noting that during the first period, the contagion from domestic bank credit spreads disperses into the Eurozone sovereign CDS market (which is seen as evidence for the systemic feature of the recent financial crisis), whereas after government intervention, government CDS spreads become an important determinant of banks' CDS series. They explain that the interdependence of government and bank credit risk is heterogeneous across countries, but homogeneous within the same country. In this sense, Corzo, Gomez and Lazcano (2014) also suggest a private-to-public risk transfer during the subprime crisis and a reversal to a public-to-private risk transfer during the sovereign debt crisis because they find evidence that the 2008-2009 equity markets led the process of incorporation of new risk information but that during 2010, this role was assumed by sovereign CDS markets.

That said, Diaz, Groba and Serrano (2013) find a public-to-private risk transfer between the sovereign CDS spreads and corporate risk premia in Europe during the 2006-2010 period. Demirgüç-Kunt and Huizinga (2013) conclude that although government finance variables do not materially affect bank CDS spreads over the 2001-2008 sample period, the increase in bank CDS spreads between 2007 and 2008 is significantly related to the deterioration of the public deficit.

More recent works such as Haerri, Morkoetter and Westerfeld (2015) find that sovereign risk overlaps the pricing of corporate debt instruments, not only for banks but also for companies in other sectors, in the European market from January 2009 to December 2011, and that this impact is the highest in the peripheral Eurozone countries, increasing for the entire sample with the intensification of the sovereign debt crisis in 2010/11. They also suggest that the impact of sovereign risk increases with a home bias in favour of the local market; however, they find no significant empirical evidence that the link between sovereign risk and corporate credit risk is driven by access to local bank financing. Similarly, Bedendo and Colla (2015)

explore CDS spreads on sovereigns and corporations from January 2008 to December 2011 for 8 countries in the Eurozone, finding that the translation of the increase in sovereign risk into a significant increase in corporate credit risk is significantly higher for firms that enjoy government guarantees, place most of their output on the domestic market, or rely heavily on bank financing. They also suggest that investors' concerns about a country's debt problems translate into higher funding costs for domestic non-financial corporate issuers and therefore, strict fiscal discipline improves sovereign creditworthiness and reduces firms' borrowing costs.

3.6.Systemic and Systematic Default Risks

Our literature review shows that although many papers have discussed the various methods that some institutions use to transfer risk in the financial system, they do not distinguish between "systemic" and "systematic" risk. After studying these articles, we assume both that "systematic" is taken as the default risk premium component that is not idiosyncratic and that the term "systemic" is used as an equivalent to a wide movement affecting several institutions and countries (related to contagion). Thus, we have found that some authors split total default risk premia into an idiosyncratic and a systematic component (see Chan-Lau (2006), Berndt and Obreja (2007), Feldhütter and Nielsen (2012)), whereas others search for a systemic risk indicator (Rodríguez-Moreno and Peña (2013) Chen et al. (2014)) or warn about systemic risk increase caused by the use of CDS (Nijskens and Wagner (2011), Kress (2011), Markose, Giansante and Shaghaghi (2012)).

In this paper, we support the idea of systemic risk as the potential for multiple, simultaneous defaults of major financial institutions (i.e. Chen et al. (2014)) and review the related (in one way or another) literature.

Chan-Lau (2006) finds that although the simplest proxy for systemic default risk is the spread of a credit derivatives index, such an index also reacts to idiosyncratic default risk changes.

Therefore, he proposes a new measure of the risk of default using price information about single tranche collateralized debt obligations. Using this tool, the systematic component of default risk can be separated from the idiosyncratic component in the corporate sector and the cross-section of returns for firms can be explained. Following this path, Feldhütter and Nielsen (2012) note that the systematic default risk is explosive but has low volatility, given that its relative contribution is small for short maturities but of increasing importance as maturity increases, whereas idiosyncratic risk is more volatile and less explosive. Also along the line of the components of default risk premia, Berndt and Obreja (2007) find that during the 2003-2006 time period, most European liquid firms show one component associated with systematic risk (which captures 21% of the time variation in the returns of defaultable assets) and another component associated with a new common credit market factor that captures the asset returns' tendency toward extreme events (63% of this time variation). They also document a "flight to quality" effect in the European corporate bond markets. Pu and Zhao (2012) confirm the existence of a systematic component while understanding that there is an economically significant co-movement in CDS spreads caused by unobservable risk factor(s) that remain unexplained.

Adopting a different approach, Nijskens and Wagner (2011) study the systematic risk of banks before the crisis to explain that after using CDS and collateralized loan obligations (CLOs),[7] the share price beta of these banks increases significantly because of an increase in banks' correlations, suggesting that the market anticipated the risks of using these two products long before the crisis and concluding that although banks may have shed their individual credit risks, they have created a greater systemic risk. In this sense, and after the last financial crisis, many researchers have analyzed the role played by the CDS market and how the excessive use of the CDS product has helped to generate or increase systemic risk.

[7] CLOs are securities backed by a portfolio of debt, often low-rated corporate loans. Investors receive scheduled debt payments from the underlying but in return they assume most of the risks in case of borrowers default.

For instance, Kress (2011) highlights that CDS increases interconnections in the financial system, creating systemic risks. Similarly, Markose, Giansante and Shaghaghi (2012) investigate the systemic risk caused by the concentration in CDS exposures between a few, highly connected US banks, suggesting that the size of CDS markets far exceeds their capacity to internalize the potential losses that follow from the failure of highly connected financial intermediaries. Given the increased awareness of this new reality (what we will call, as do many authors, the paradox of CDS), researchers consider the role of a clearing house and thus, Kress (2011) concludes that CDS clearinghouses must have access to central bank liquidity to alleviate the systemic, concentrated risks caused by the attempt to reduce the interconnections in the financial system that are increased by CDSs. In the same sense, Sharma (2013) finds that CDS clearing houses will help bring greater transparency and standardisation to the CDS and other derivatives markets. Loon and Zhong (2014) suggest that the relation between CDS spreads and dealer credit risk weakens after central clearing begins, suggesting a decrease in systemic risk.

Rodríguez-Moreno and Peña (2013) investigate European and US banks from January 2004 to November 2009, finding that regulators searching for reliable systemic risk indicators should stick to simple, robust indicators based on credit derivatives and market data interest rates. Along this line, Chen et al. (2014) use CDS spreads and stock prices to create a robust systemic risk measure for the insurance sector that investigates the interconnectedness between the banking and insurance industries during the financial crisis. These authors find evidence of significant bidirectional causality, although they state that the impact of banks on insurers is stronger and of longer duration and that although the core activities of insurers are not a significant source of systemic risk, banking functions such as derivatives trading are.

Conversely, the Alter and Schüler (2012) study on the contagion from bank credit spreads into the sovereign CDS market confirms, according to the authors, the systemic feature of the recent financial crisis. Along this line related to systemic sovereign risk, Ang and Longstaff

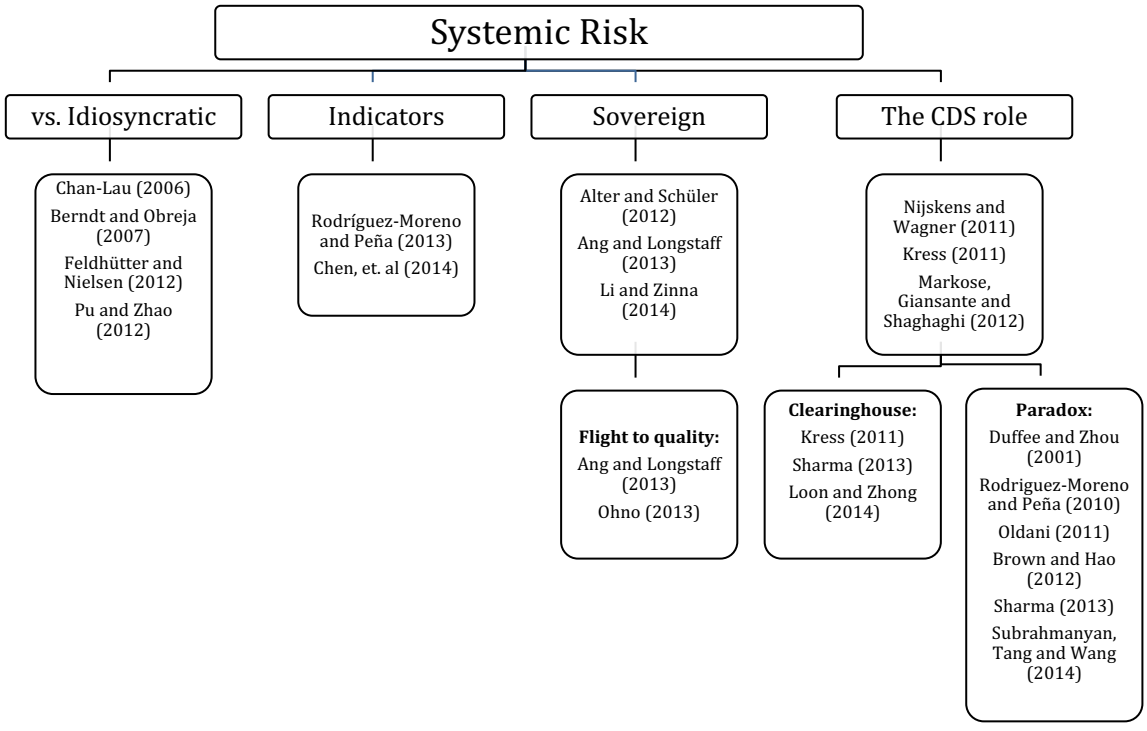
(2013) find that the US's systemic sovereign credit risk is highly correlated with Europe's systemic credit risk, given that systemic sovereign risk is rooted in financial markets rather than in macroeconomic fundamentals. Li and Zinna (2014) study the Eurozone in the 2008-2013 time period to find not only that sovereign systemic credit risk reaches its peak in late 2011 and European banks are exposed to both systemic and country-specific sovereign risk, but also that Spanish banks display the highest exposures to systemic sovereign risk, although Spanish and Italian banks display lower exposures to systemic risk than their respective sovereigns, highlighting the sovereign nature of the crisis. They also note French and German banks' significant exposures to systemic sovereign risk because of their large international exposures, concluding that the fraction of banks' credit risk caused by exposure to systemic/country-specific sovereign credit risk co-moves with their holdings in Eurozone/domestic sovereign debt.

Along the same line as Berndt and Obreja's (2007) documentation of a "flight to quality" effect in the European corporate bond markets, Ang and Longstaff (2013) also find that US systemic credit risk is significantly negatively related to changes in the VIX index, suggesting that the US's financial position improves as flights to quality occur in turbulent periods. The same path is followed by Ohno (2013) when using Eurozone CDS premiums in the period 2007-201 to note that the knock-on effects of sovereign risk on the CDS of German financial institutions were light because of the "flight-to-quality" phenomenon, which had the effect of lowering the German sovereign's CDS premiums.

Finally, while studying the banking system, Calice, Ioannidis and Williams (2012) conclude that banks' equity volatility associated with significant stress in the CDS market is significant and that observing shifts in asset volatility regimes can be helpful in detecting the degree to which the financial system is suffering a systemic event. Suh, Jang and Ahn (2013) find that

systemic risk contributions, as the extent to which a default by a particular institution influences systemic risk, is more likely to increase during the crisis period than during the pre-crisis period and that systemic risk contributions (defined as the extent to which a systemic risk event influences the level of credit risk for a particular institution) are closely related to the realized risk represented by equity returns during the crisis period. Battistini, Pagano and Simonelli (2014) find that in most of the Euro zone, when systemic risk increases, all banks tend to increase the home bias of their portfolios, further segmenting the Euro-zone sovereign market.

Figure 9: CDS literature ranging from systemic risk to the paradox of credit derivatives, including indicators and sovereign systemic risk.



3.7. The CDS Paradox

After the last financial crisis and coinciding with the arguments of those who warn about systemic risk increase caused by the use of CDS, researchers began to find that the use of

these instruments increased the fragility of the financial system, rather than contributing to better risk diversification. Empirical evidence on this point is unambiguous and CDSs have been found guilty.

In 2001, Duffee and Zhou noted that theory alone cannot determine whether a market for credit derivatives will help banks better manage their loan credit risks because that market can cause other markets for loan risk-sharing to break down. More recently, Rodriguez-Moreno and Peña (2010) have suggested that in an environment of mild economic conditions, although financial institutions have taken advantage of many financial innovations such as CDS, these products show unexpected downside effects in scenarios of financial distress.

Oldani (2011) goes further to suggest that although the relevant exposure of European banks in the bond market to Greece's default risk supports the need for hedging tools such as CDS, there was evidence of the mispricing of the CDS market on Greek sovereign bonds. Moreover, although the use of financial derivatives, including CDS, has smoothed the cost of debt and/or hedge, CDS on sovereign bonds represent a small, but dangerous threat to financial stability because of mispricing, opacity, non-uniformly distributed liquidity and the absence of a compensation system. On this last issue, Sharma (2013) finds that derivative contracts provide benefits such as risk sharing and price discovery, although efforts should be made to improve their regulation and supervision.

Along this same line, Brown and Hao (2012) highlight that the CDS use enables individual money managers to safely increase leverage while causing a system-wide buildup of leverage and financial fragility.

With respect to US life and property/casualty insurance companies, Fung, Wen and Zhang (2012) find that CDS utilization increases the risks of both, leading to lower firm value caused by the higher cost of capital.

Recently, Subrahmanyan, Tang and Wang (2014) have gone further, stating "CDS played a prominent role in the bankruptcy of Lehman Brothers, the collapse of AIG, and the sovereign debt crisis of Greece." While analyzing the CDS trading of North American corporate issuers between 1997 and 2009, they have found that the number of creditors increases after CDS trading begins, exacerbating creditor coordination's failure to resolve financial distress, and more than doubling the likelihood of bankruptcy. This bankruptcy risk decreases when CDS contracts expire: CDS's effect on bankruptcy risk is more pronounced when CDS payments do not cover restructuring.

3.8. CDSs and "Too Big to Fail" Institutions

Systemic risk is often triggered by financial institutions that are either "too big to fail" or "too interconnected to fail" (Chen et al., 2014) and in relation to the issue of the paradox discussed in the previous section, Markose, Giansante and Shaghaghi (2012) warn about the size of CDS markets that far exceed their capacity to internalize the potential losses caused by the failure of highly connected financial intermediaries.

Concerning this issue, Schweikhard and Tsesmedlidakis's (2011) work on the impact of government guarantees on the pricing of default risk provides positive evidence of the "too big to fail" hypothesis. Nonetheless, after the recent failure of several large, complex financial institutions, Calice, Ioannidis and Williams (2012) illustrate that the "too big to

fail" paradigm predominant in the analysis of financial stability of large mainstream commercial and investment banks is no longer valid.

From an approach more closely related to the contagion issue, as mentioned above, Yang and Zhou (2013) study the role of credit-risk transfers among financial institutions that might be considered "too big to fail," finding that financial institutions that are prime senders or exchange centres of credit-risk information might be systemically important financial institutions (SIFIs); they design and deploy macro-prudential regulation by identifying SIFIs and their connectedness with other financial institutions.

Finally, Demirgüç-Kunt and Huizinga (2013) study systemically large banks, finding that their stock prices are more positively related, and their CDS spreads are more negatively related, to bank risk, suggesting that a marginal increase in bank risk increases the implicit subsidy from the financial safety net relatively more for systemically large banks, leading us back to the conclusion that systemically large banks are too large to fail.

3.9. Does it matter if a country is member of a monetary union?

According to Dieckmann and Plank (2012), it does matter whether a country is a member of the Economic and Monetary Union of the European Union (EMU): member countries' sensitivities to the health of the financial system are higher than those of non-EMU members. Along the same lines, Ghosh, Ostry and Qureshi (2013) find that in quiet times, both CDS and bond rates were lower for Eurozone members than would be expected given their fiscal space (a bonus of currency union membership) but these rates rose more sharply for Eurozone members than would be predicted when the crisis erupted (sharper penalties for sovereigns that belong to a currency union).

Groba, Lafuente and Serrano (2013) find a significant risk transmission from peripheral to central EU economies as a reaction to some common global shocks during the period from 2008-2010, concluding that peripheral risk plays a key role in explaining CDS increments for other EU members. Nevertheless, Ang and Longstaff (2013) find that systemic represents a much smaller fraction of total credit risk for US states than for members of the EMU, suggesting that systemic risk is not primarily an artefact of common macroeconomic fundamentals and thus leaving our question open.

Janus, Jinjarak and Uruyos (2013) explain how economies with similar fundamentals can experience different prices for default risk caused by heterogeneous investor beliefs and overconfidence.

3.10. CDSs and Bailouts and Rescue Packages. European Financial Stabilization Mechanism and Quantitative Easing

The 2007-2009 financial distress led public authorities of major economies to intervene in markets through capital injections, debt guarantees, and purchases/guarantees of toxic assets. Some researchers questioned the effect of these interventions on the assessment of default risk. Studies such as Schweikhard and Tsesmedlidakis (2011) investigate the impact of government guarantees on the pricing of default risk in credit and stock markets. Their results provide evidence of the asymmetric treatment of debt and equity in rescue measures to favour creditors, suggesting that interventions were successful in that they prevented a further escalation of the distrust prevailing in markets at the peak of the crisis.

However, Ejsing and Lemke (2011) show that the rescue packages announced by governments in the fall of 2008 induced a decrease in risk spreads for banks at the expense of

a marked increase in risk spreads for governments, increasing the sensitivity of sovereign risk spreads to any further aggravation of the crisis, whereas the sensitivity of bank credit risk premia declined and became more sovereign-like. Along this same line, and as seen above, Alter and Schüler (2012) conclude that the bailout programs changed the composition of both banks' and sovereigns' balance sheets and affected the link between the default risk of governments and those of their local banks.

In line with the public/private and vice versa risk spillover seen above, Acharya, Drechsler and Schnabl (2014) show that bailouts triggered increased sovereign credit risk in 2008 and that post-bailout changes in sovereign CDSs explain changes in bank CDSs. Based on the viewpoint of Li and Zinna's (2014) study about the Eurozone in the 2008-2013 time period, the higher the expected level of government support, the higher the probability that the banks default as a country-specific sovereign shock arrives.

At the country level, Ghosh, Ostry and Qureshi (2013) suggest that sovereign bailouts did not occur with the hoped-for alacrity in Euro-crisis countries, generating more serious penalties for sovereigns that belong to a currency union. In greater detail, Bedendo and Colla (2015) find that the translation of the increase in sovereign risk into a significant increase in corporate credit risk is significantly higher for firms that enjoy government guarantees, place most of their output on the domestic market, or rely heavily on bank financing.

In the context of these financial benefits, the European Financial Stability Facility (EFSF) was created as a temporary crisis-resolution mechanism by the Eurozone Member States in June 2010. The EFSF has provided financial assistance funded by the issuance of bonds and other debt instruments on capital markets. From November 2008 until March 2010, the US Fed conducted the first round of liquidity known as QE1 (Quantitative Easing 1), injecting 600 billion dollars. From November 2010 until June 2011, QE2 was developed, injecting

another 600 billion dollars. In September 2012, the Fed launched the third round of liquidity, QE3, 85 billion dollars per month.

Regarding these measures, Groba, Lafuente and Serrano's (2013) study of risk transmission from peripheral to central EU economies finds that this impact of peripheral risk vanishes after the approval of the EFSM in 2010. However, Ohno (2013) finds that since the foundation of the EFSM, the knock-on effects among the Eurozone's core countries have been dramatically heightened, suggesting that these knock-on effects have been amplified by concerns about the instability of the financial system. The said, Hammoudeh, Bhar and Liu (2013) confirm that QE1 reduced the CDS risk of banks and insurance companies, corporate default risks, and the bank risk premium, but increased inflationary expectations.

3.11. A New Approach to Sovereign Default Risk: Contingent Claim Analysis and Real Government Guarantees out of Balance.

As we have noted, recent studies show evidence of the mispricing of the CDS market for sovereign bonds after the recent crisis, (i.e. Oldani, 2011). It has become obvious to some researchers that under normal market conditions, CDS spreads are a very useful source of information about country risk; however, they might lead to some under/overpricing of fundamentals in the event of excessively low or excessively high risk aversion (i.e. Revoltella, Mucci and Mihaljek, 2010). In this context, alternative measures of country risk have been developed in recent years. Remolona, Scatigna and Wu (2008), for instance, construct a measure of ratings-implied expected loss from sovereign defaults using sovereign credit ratings and historical default rates provided by credit rating agencies. They compare that information with stand-alone credit ratings and examine its relationship with CDS spreads, showing that their measure is more informative about price sovereign risk. Conversely, Revoltella, Mucci and Mihaljek (2010) also develop a measure of country risk premium based on a long-term relationship between CDS spreads and external ratings,

showing that adverse market sentiment was a key driver of the sharp increase in the sovereign CDS spreads of Central and Eastern European (CEE) countries during the most serious phase of the crisis.

Gapen et al. (2008) develop a comprehensive new framework to measure and analyze sovereign risk by applying contingent claims analysis (CCA) to the balance sheet of the combined government and monetary authorities and testing their model with spreads on sovereign CDS, among other financial instruments. Their results evidence that their risk indicators can be examined in individual country cases to evaluate whether market expectations of sovereign vulnerabilities are increasing or decreasing not only over time but also across countries to rank relative risk.

It is useful to note that this CCA approach has been used in the corporate sector beginning in the 1970s and recently, it has become an interesting tool to measure risk at the sovereign level. In this context, Merton et al. (2013) use the CDS prices to determine sovereigns' expected loss ratio. They suggest that the degrees of connectedness across various types of entities (household, corporate, financial and government sector) change over time and financial models that capture this dynamic are needed to monitor the connectedness of the system. Meanwhile, in the sphere of the financial sector, Calice, Ioannidis and Williams (2012) use a CCA to track the evolution of default risk for a sample of 16 large complex financial institutions (LCFIs) and find that systemically important financial institutions are exposed simultaneously to systematic CDs shocks and that the US government re-capitalization programmes underestimated the necessary capital injections for the US LCFIs, probably because its model does not reflect any explicit or implicit government guarantees for the institutions' total debt liabilities.

Finally, we find that Bertoni and Lugo (2014) also show (quite different) evidence of the effect of guarantees on the corporate CDS spread; their study analyzes a sample of 371

Sovereign Wealth Fund (SWF)[8] investments between 2003 and 2010 and concludes that their impact is to reduce credit risk by implicitly guaranteeing financial support in the event of short-term distress.

3.12. Accounting-based versus Market-based Models

In recent years, the use of accounting variables in the modelling of default has been challenged by both the use of option pricing methods (structural models) and the use of models that explicitly define debt value as a function of default intensity, enabling the latter to be extracted from calibration using bond prices (reduced-form models). However, empirical evidence indicates that a conjunction of accounting-based and market-based models is a better path to measure default risk (Das, Hanouna and Sarin, 2009, Trujillo-Ponce, Samaniego-Medina and Cardone-Riportella, 2014). In this domain, CDSs have prevailed as the best proxy for credit risk and consequently, as the benchmark to explain.

4. Concluding Remarks

Occasionally, a powerful financial innovation appears. But it is not easy to find a financial innovation as versatile, as diverse, and, above all, as meaningful as the CDSs.

Through the literature on financial risks that uses CDSs during the 2000-2015 period, we can follow the concerns of researchers, regulators and financial-market participants; we can follow the financial history of the early 21st century, which has already experienced

[8] A commonly accepted definition of SWF was set out by the IWG (2008): SWFs are special-purpose investment funds or arrangements created by the general government for macroeconomic purposes and those hold, manage, or administer assets to achieve financial objectives, employing a set of investment strategies that includes investing in foreign financial assets. Essentially, SWFs combine some of the features of hedge funds and some of the features of pension funds (Bertoni and Lugo, 2014).

remarkable fluctuations.

Using a systematic bibliometric approach, trendsetting papers on CDS and financial risks were identified and a polyhedral financial instrument emerged. We find an instrument with several permutations (faces); in itself, each permutation constitutes a polygon with sides, angles and twists, relating permutations to one another and building an interconnected piece.

To help unwind these facets, we draw a conceptual map, primarily motivated by the chronological appearance of the various permutations of CDSs, and then grouped the breakthrough literature into different clusters.

We have noted how the credit derivative contract has evolved from being the perfect product to manage credit risks in times of volatility and uncertainty to playing a prominent role in increasing the fragility of the financial system, in addition to providing a useful price for several kinds of financial risk. Contagion, risk spillover and systemic risk are also areas that have inspired remarkable literary productivity between 2011 and 2015, that is, after the fall of Lehman Brothers, the subprime crisis, and the sovereign debt crisis.

Foremost, we validate the versatility of this financial contract, confirming the use of CDSs as a guide to disentangle the field of financial risks. Our study also points to current financial dangers that are numerous and largely unsolved, for example, contagion and systemic risk.

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Appendix A: Different Impact Indices

The JCR Impact Factor (ISI Web of Knowledge) is the average number of times articles from the journal published in the past two years have been cited in the JCR year. It is calculated by dividing the number of citations in the JCR year by the total number of articles published in the two previous years.

SJR (Scopus) is a measure of scientific influence of scholarly journals that accounts for both the number of citations received by a journal and the importance or prestige of the journals where such citations come from. It is a size-independent indicator and it ranks journals by their 'average prestige per article'.

SNIP (Scopus) Source Normalized Impact per Paper (SNIP) measures contextual citation impact by weighting citations based on the total number of citations in a subject field. The impact of a single citation is given higher value in subject areas where citations are less likely, and vice versa. It is defined as the ratio of a journal's citation count per paper and the citation potential in its subject field.

AJG (Association of Business Schools) classifies journals into 4 categories (4: journals that publish the most original and best-executed research. 1: journals that publish research of a recognised but more modest standard in their field) plus a Journal of Distinction category (4*), which recognises the quality of those journals ranked as a top class journal in at least 3 out of 5 international listings consulted.

H5 index (Google Scholar) is the h-index (an index that attempts to measure both the productivity and citation impact of the work of a scientist or journal) for articles published in

the last 5 complete years. It is the largest number h such that h articles published in 2010-2014 have at least h citations each.

Appendix B: identifying top papers:

WoS:

Title	"Risk*"
and Topic	"Credit default swap*" OR "CDS"
Timespan	2000-2015
Domain	Social Sciences
Research Areas	Business, Economics
Found	164 documents

Scopus

title-abs-key	"Risk*"
and title-abs-key	"Credit default swap*" OR "CDS"
pub year	2000-2015
subject area	Economics, Econometrics and Finance
Found	477 documents

EBSCO:

Title	"Risk*"
and abstract	"Credit default swap*" OR "CDS"
Timespan	2000-2015
Limited to	Peer-reviewed articles
Found	582 documents

DIALNET:

Documents search	"Risk*" AND ("CDS" OR "Credit default swap*")
Document type	Journal article

Timespan	2000-2015
Found	38 documents

Updated to December 31st, 2015

Appendix C: Selected articles

					JOURNAL					ARTICLE	
	AUTHOR	**Titulo**	**YEAR**	**JOURNAL**	**JCR 2014**	**SJR 2014**	**SNIP 2014**	**AJG 2015**	**H5-index GS 2015**	**No citations WoS**	**No citations Scopus**
1	Acharya, V. V., Schaefer, S. M., & Zhang, Y.	Liquidity risk and correlation risk: A clinical study of the general motors and ford downgrade of may 2005	2015	QUARTERLY JOURNAL OF FINANCE							
2	Acharya, V., Drechsler, I., & Schnabl, P.	A pyrrhic victory? bank bailouts and sovereign credit risk.	2014	JOURNAL OF FINANCE	5.424	17.138	5.609	4*	108	11	19
3	Alper, CE., Forni, L. & Gerard, M.	Pricing of sovereign credit risk: Evidence from advanced economies during the financial crisis.	2013	INTERNATIONAL FINANCE	0.697	0.383	0.593			0	0
4	Alter, A., & Schüler, Y. S.	Credit spread interdependencies of european states and banks during the financial crisis.	2012	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	32	23
5	Ang, A., & Longstaff, F. A.	Systemic sovereign credit risk: Lessons from the US and europe	2013	JOURNAL OF MONETARY ECONOMICS	1.726	4.779	1.952	4	50	17	17
6	Arce, O., Mayordomo, S., & Peña, J. I.	Credit-risk valuation in the sovereign CDS and bonds markets: Evidence from the euro area crisis	2013	JOURNAL OF INTERNATIONAL MONEY AND FINANCE	2.117	1.114	1.418	3	45	4	8
7	Aretz, K., & Pope, P. F.	Common factors in default risk across countries and industries.	2013	EUROPEAN FINANCIAL MANAGEMENT	1.158	0.926	1.746	3	30	4	5
8	Arora, N., Gandhi, P., & Longstaff, F. A.	Counterparty credit risk and the credit default swap market.	2012	JOURNAL OF FINANCIAL ECONOMICS	4.047	10.116	4.200	4*	113	20	25
9	Badaoui, S., Cathcart, L., & El-Jahel, L.	Do sovereign credit default swaps represent a clean measure of sovereign default risk? A factor model approach.	2013	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	7	6
10	Battistini, N., Pagano, M. & Simonelli, S.	Systemic risk, sovereign yields and bank exposures in the euro crisis	2014	ECONOMIC POLICY	2.485	3.768	2.819			5	8
11	Bedendo, M. & Colla. P.	Sovereign and corporate credit risk: Evidence from the Eurozone	2015	JOURNAL OF CORPORATE FINANCE	1.193	1.516	1.528	4	46	0	0
12	Beirne, J., &	The pricing of sovereign risk and	2013	JOURNAL OF	2.117	1.114	1.418	3	45	34	40

	Fratzscher, M.	contagion during the european sovereign debt crisis.		INTERNATIONAL MONEY AND FINANCE							
13	Berndt, A. & Obreja, I.	The pricing of risk in european credit and corporate bond markets	2007	ECB WORKING PAPER					57		
14	Bertoni, F. & Lugo, S	The effect of sovereign wealth funds on the credit risk of their portfolio companies	2014	JOURNAL OF CORPORATE FINANCE	1.193	1.516	1.528	4	46	2	3
15	Blanco, R., Brennan, S., & Marsh, I. W.	An empirical analysis of the dynamic relation between investment-grade bonds and credit default swaps.	2005	JOURNAL OF FINANCE	5.424	17.138	5.609	4*	108	183	232
16	Brigo, D. & Chourdakis, K.	Counterparty risk for credit default swaps: Impact of spread volatility and default correlation	2009	INTERNATIONAL JOURNAL OF THEORETICAL AND APPLIED FINANCE		0.715	0.815		20		37
17	Brown, C. & Hao, C.	Treating Uncertainty as Risk: The Credit Default Swap and the Paradox of Derivatives.	2012	JOURNAL OF ECONOMIC ISSUES	0.573	0.431	0.663	2		5	5
18	Calice, G., Ioannidis, C., & Williams, J.	Credit derivatives and the default risk of large complex financial institutions.	2012	JOURNAL OF FINANCIAL SERVICES RESEARCH	1.200	0.874	1.153	3	19	2	2
19	Caporin, M., Pelizzon, L., Ravazzolo, F. & Rigobon, R.	Measuring sovereign contagion in Europe	2012	CAMP WORKING PAPER							
20	Chan-Lau, J. A.	Is systematic default risk priced in equity returns? A cross-sectional analysis using credit derivatives prices	2006	IMF WORKING PAPER							
21	Chen, H., Cummins, J. D., Viswanathan, K. S., & Weiss, M. A.	Systemic risk and the interconnectedness between banks and insurers: An econometric analysis.	2014	JOURNAL OF RISK AND INSURANCE	1.075	1.465	1.540	3	27	3	10
22	Chen, R., Cheng, X., & Wu, L.	Dynamic interactions between interest-rate and credit risk: Theory and evidence on the credit default swap term structure.	2012	REVIEW OF FINANCE	2.012	3.796	1.620	4	40	6	6
23	Chen, R.,	Sources of Credit Risk: Evidence	2006	THE JOURNAL OF FIXED		0,321	0,505				

	Fabozzi,F., Pan,G. & Sverdlove, R.	from Credit Default Swaps		INCOME							
24	Cook, Fu & Tang	The effect of liquidity and solvency risk on the inclusion of bond covenants	2014	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	0	0
25	Corzo, T., Gómez, J. & Lazcano, L.	Financial crises and the transfer of risk between the private and public sectors: Evidence from European financial markets	2014	SPANISH REVIEW OF FINANCIAL ECONOMICS		0.228	0.302				0
26	Coudert, V. & Mignon, V.	The “forward premium puzzle” and the sovereign default risk	2013	JOURNAL OF INTERNATIONAL MONEY AND FINANCE	2.117	1.114	1.418	3	45	10	9
27	Das, S. R., & Hanouna, P.	Credit default swap spreads.	2006	JOURNAL OF INVESTMENT MANAGEMENT							
28	Das, S. R., Hanouna, P., & Sarin, A.	Accounting-based versus market-based cross-sectional models of CDS spreads.	2009	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	24	33
29	De Bruyckere, V., Gerhardt, M., Schepens, G., & Vander Vennet, R.	Bank/sovereign risk spillovers in the european debt crisis.	2013	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	13	13
30	Delatte, Gex & Lopez-Villavicencio	Has the CDS market influenced the borrowing cost of european countries during the sovereign crisis?	2012	JOURNAL OF INTERNATIONAL MONEY AND FINANCE	2.117	1.114	1.418	3	45	13	18
31	Demirgüç-Kunt, A., & Huizinga, H.	Are banks too big to fail or too big to save? International evidence from equity prices and CDS spreads.	2013	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	19	19
32	Díaz, A., Groba, J., & Serrano, P.	What drives corporate default risk premia? evidence from the CDS market.	2013	JOURNAL OF INTERNATIONAL MONEY AND FINANCE	2.117	1.114	1.418	3	45	1	2
33	Dieckmann, S., & Plank, T.	Default risk of advanced economies: An empirical analysis of credit default swaps during the financial crisis.	2012	REVIEW OF FINANCE	2.012	3.796	1.620	4	40	21	23
34	Draghi, M., Giavazzi, F., &	Transparency, risk management and international financial fragility	2003	NBER WORKING PAPER					163		

	Merton, R. C.										
35	Duffee, G. R., & Zhou, C.	Credit derivatives in banking: Useful tools for managing risk?	2001	JOURNAL OF MONETARY ECONOMICS	1.726	4.779	1.952	4	50	42	52
36	Düllmann, K., & Sosinska, A.	Credit default swap prices as risk indicators of listed german banks.	2007	FINANCIAL MARKETS AND PORTFOLIO MANAGEMENT		0.478	0.600		12		7
37	Dunbar, K	US Corporate Default Swap Valuation: The Market Liquidity Hypothesis and Autonomous Credit Risk	2008	QUANTITATIVE FINANCE	0.653	0.608	0.968	3	33	3	4
38	Ejsing, J., & Lemke, W.	The janus-headed salvation: Sovereign and bank credit risk premia during 2008–2009.	2011	ECONOMICS LETTERS	0.510	0.660	0.686		38	26	25
39	Fabozzi,F., Cheng, X. & Chen, R.	Exploring the components of credit risk in credit default swaps.	2007	FINANCE RESEARCH LETTERS	0.646	0.415	0.848		13		11
40	Feldhütter, P., & Nielsen, M. S.	Systematic and idiosyncratic default risk in synthetic credit markets.	2012	JOURNAL OF FINANCIAL ECONOMETRICS	1.302	1.607	1.219	3	23	4	5
41	Forte, S., & Lovreta, L.	Time- varying credit risk discovery in the stock and CDS markets: Evidence from quiet and crisis times.	2015	EUROPEAN FINANCIAL MANAGEMENT	1.158	0.926	1.746	3	30	0	0
42	Fung, H., Wen, M., & Zhang, G.	How does the use of credit default swaps affect firm risk and value? evidence from US life and Property/Casualty insurance companies.	2012	FINANCIAL MANAGEMENT	1.000	1.123	0.976	3	30	2	4
43	Gapen, M. T., Xiao, Y., Gray, D. F., & Lim, C. H.	Measuring and analyzing sovereign risk with contingent claims	2008	IMF WORKING PAPER / IMF STAFF Papers						7	8
44	Ghosh, A. R., Ostry, J. D., & Qureshi, M. S.	Fiscal space and sovereign risk pricing in a currency union.	2013	JOURNAL OF INTERNATIONAL MONEY AND FINANCE	2.117	1.114	1.418	3	45	4	7
45	Groba, J., Lafuente, J. A., & Serrano, P.	The impact of distressed economies on the EU sovereign market.	2013	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	8	8
46	Haerri, M., Morkoetter, S.	Sovereign risk and the pricing of corporate credit default swaps	2015	JOURNAL OF CREDIT RISK	0.312			1		0	

	& Westerfeld, S.										
47	Hammoudeh, S., Bhar, R. & Liu, T.	Relationships between Financial Sectors' CDS Spreads and Other Gauges of Risk: Did the Great Recession Change Them?	2013	FINANCIAL REVIEW		0.318	0.573	3	18		
48	Hricko, T., Cossin, D., Aunon-Nerin, D., & Huang, Z.	Analyzing credit risk in default swap transaction data: Is fixed-income markets' information sufficient to evaluate credit risk?	2003	NCCRFVRM WORKING PAPER							
49	Huang, A. Y., & Cheng, C	Information risk and credit contagion.	2013	FINANCE RESEARCH LETTERS	0.646	0.415	0.848		13	0	0
50	Hui, C., & Chung, T.	Crash risk of the euro in the sovereign debt crisis of 2009–2010.	2011	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	16	18
51	Janus, T., Jinjarak, Y., & Uruyos, M.	Sovereign default risk, overconfident investors and diverse beliefs: Theory and evidence from a new dataset on outstanding credit default swaps.	2013	JOURNAL OF FINANCIAL STABILITY	1.506	1.370	1.852	3	32	1	1
52	Jarrow, R. A., & Yildirim, Y.	Valuing default swaps under market and credit risk correlation.	2002	THE JOURNAL OF FIXED INCOME		0,321	0,505				
53	JORION, P., & ZHANG, G.	Credit contagion from counterparty risk.	2009	JOURNAL OF FINANCE	5.424	17.138	5.609	4*	108	60	76
54	Jorion, P., & Zhang, G.	Good and bad credit contagion: Evidence from credit default swaps.	2007	JOURNAL OF FINANCIAL ECONOMICS	4.047	10.116	4.200	4*	113	79	109
55	Kim, D., Loretan, M. & Remolona, E	Contagion and risk premia in the amplification of crisis: Evidence from Asian names in the global CDS market	2010	JOURNAL OF ASIAN ECONOMICS		0.400	0.827	1	25		7
56	Kim, M. A., & Kim, T. S.	Credit default swap valuation with counterparty default risk and market risk.	2004	JOURNAL OF RISK	0.303				12		
57	Kress, J.	Credit default swaps, clearinghouses, and systemic risk: why centralized counterparties must have access to central bank liquidity	2011	HARVARD JOURNAL ON LEGISLATION	0.519	0.441	0.354			12	10
58	Leung, KS & Kwok, YK	Counterparty risk for credit default swaps: Markov chain interacting	2009	ASIA-PACIFIC FINANCIAL MARKETS		0.208	0.405	2			14

		intensities model with stochastic intensity									
59	Li, J., & Zinna, G.	How Much of Bank Credit Risk is Sovereign Risk? Evidence from the Eurozone	2014	BANCA D´ITALIA, EUROSISTEMA WORKING PAPERS							
60	Longstaff, F. A., Mithal, S., & Neis, E.	Corporate yield spreads: Default risk or liquidity? new evidence from the credit default swap market.	2005	JOURNAL OF FINANCE	5.424	17.138	5.609	4*	108	284	348
61	Longstaff, F. A., Pan, J., Pedersen, L. H., & Singleton, K. J.	How Sovereign is Sovereign Credit Risk?	2011	AMERICAN ECONOMIC JOURNAL-MACROECONOMICS	3.780	7.675	3.554		50	93	125
62	Loon, Y. C., & Zhong, Z. K.	The impact of central clearing on counterparty risk, liquidity, and trading: Evidence from the credit default swap market.	2014	JOURNAL OF FINANCIAL ECONOMICS	4.047	10.116	4.200	4*	113	1	2
63	Markose, S., Giansante, S., & Shaghaghi, A. R.	'Too interconnected to fail'financial network of US CDS market: Topological fragility and systemic risk.	2012	JOURNAL OF ECONOMIC BEHAVIOR & ORGANIZATION	1.297	1.032	1.080		46	13	21
64	Merton, R. C., Billio, M., Getmansky, M., Gray, D., Lo, A. W., & Pelizzon, L.	On a new approach for analyzing and managing macrofinancial risks.	2013	FINANCIAL ANALYSTS JOURNAL	1.548	2.116	1.429	3	26	2	5
65	Naifar, N	What explains default risk premium during the financial crisis? Evidence from Japan	2011	JOURNAL OF ECONOMICS AND BUSINESS		0.319	0.822	1	18		4
66	Nashikkar, A., Subrahmanyam, M. G., & Mahanti, S.	Liquidity and arbitrage in the market for credit risk.	2011	JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS	1.566	3.355	1.948	4	51	6	8
67	Nijskens, R., & Wagner, W.	Credit risk transfer activities and systemic risk: How banks became less risky individually but posed greater risks to the financial system at the same time.	2011	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	16	21

68	Ohno, S	European Sovereign Risk: The Knock-on Effects of Default Risk across the Public and Financial Sectors	2013	PUBLIC POLICY REVIEW					9		
69	Oldani, C.	The management of greek sovereign risk.	2011	THE IUP JOURNAL OF FINANCIAL RISK MANAGEMENT							
70	Pu, X., & Zhao, X.	Correlation in credit risk changes.	2012	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	5	6
71	Remolona, E. M., Scatigna, M., & Wu, E.	A ratings-based approach to measuring sovereign risk.	2008	INTERNATIONAL JOURNAL OF FINANCE & ECONOMICS	0.837	0.511	0.862		19	2	6
72	Revoltella, D., Mucci, F. & Mihaljek, D	Properly pricing country risk: a model for pricing long-term fundamental risk applied to central and eastern european countries	2010	FINANCIAL THEORY AND PRACTICE					9		
73	Rodríguez-Moreno, M., & Peña, J. I.	Systemic risk measures: The simpler the better?	2013	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	10	16
74	Schweikhard, F. & Tsesmedlidakis, Z.	The impact of government interventions on cds and equity markets	2011	FINANCE MEETING EUROFIDAI - AFFI, Paris. Availabe: SSRN (Social Science Research Network)							
75	Sharma, SD	Credit default swaps: risk hedge or financial weapon of mass destruction?	2013	ECONOMIC AFFAIRS		0.252	0.505		10		0
76	Subrahmanyam, M. G., Tang, D. Y., & Wang, S. Q.	Does the tail wag the dog?: The effect of credit default swaps on credit risk.	2014	REVIEW OF FINANCIAL STUDIES	3.174	10.726	3.299	4*	101	6	6
77	Suh, S., Jang, I., & Ahn, M.	A simple method for measuring systemic risk using credit default swap market data.	2013	JOURNAL OF ECONOMIC DEVELOPMENT						0	
78	Tang, D. Y., & Yan, H.	Market conditions, default risk and credit spreads.	2010	JOURNAL OF BANKING & FINANCE	1.299	1.059	1.587	3	73	38	42
79	Trujillo-Ponce, A., Samaniego-Medina, R. & Cardone-	Examining what best explains corporate credit risk: accounting-based versus market-based models	2014	JOURNAL OF BUSINESS ECONOMICS AND MANAGEMENT	0.723	0.411	0.728		19	1	3

	Riportella, C										
80	Yang, J. & Zhou, Y.	Credit risk spillovers among financial institutions around the global credit crisis: Firm-level evidence.	2013	MANAGEMENT SCIENCE	2.482	3.393	2.392		67	3	4
81	Zhang, BY., Zhou, H., & Zhu, HB.	Explaining credit default swap spreads with the equity volatility and jump risks of individual firms.	2009	REVIEW OF FINANCIAL STUDIES	3.174	10.726	3.299	4*	101	67	84

[16:33:48] ioannis paraskevopoulos: Banks: they get money from deposits, then the give out loans, and get the payments back gradually

[16:34:31] ioannis paraskevopoulos: as they give out loans, their capital is depleted, and until don't have they money back would be impossible to do new loans

[16:34:38] ioannis paraskevopoulos: that's one

[16:34:47] ioannis paraskevopoulos: the other thing is:

[16:34:53] ioannis paraskevopoulos: they have all the risk

[16:35:04] ioannis paraskevopoulos: if the loans fallen lo comes solitos

[16:35:29] ioannis paraskevopoulos: credit derivatives came to give a solution the above problem

[16:36:53] ioannis paraskevopoulos: making a basket of loans and you structures a bond that has its payments matched with payments. First x% of the losses were yours, and the rest the bond investors would bare the risk

[16:37:26] ioannis paraskevopoulos: cds, saw a growth, massive growth because of this

[16:37:51] ioannis paraskevopoulos: as this x% you would hedge it with cds

[16:38:09] ioannis paraskevopoulos: and the investors would hedge bigger names with cds too

[16:38:38] ioannis paraskevopoulos: and the exponential growth of cds came because of the Leverage banks did

[16:39:22] ioannis paraskevopoulos: they have done the above description 70 times, meaning they have betted 70 times the Initial Capital

[16:39:47] ioannis paraskevopoulos: this is the way the risk moved out of the balance sheet Capital charges are heavy and business stopping