CENTER FOR FINANCIAL STUDIES

CFS Working Paper Series

No. 540

Patrick Augustin, Valeri Sokolovski,
Marti G. Subrahmanyam

Why Do Investors Buy Sovereign Default Insurance?

Center for Financial Studies | Goethe University | Theodor-W.-Adorno-Platz 3 | 60323 Frankfurt am Main | Germany
Phone +49 69 798 30050 | Fax +49 69 798 30077 | info@ifk-cfs.de | www.ifk-cfs.de

Center for Financial Studies | Goethe University | Theodor-W.-Adorno-Platz 3 | 60323 Frankfurt am Main | Germany
Phone +49 69 798 30050 | Fax +49 69 798 30077 | info@ifk-cfs.de | www.ifk-cfs.de

Why Do Investors Buy Sovereign Default Insurance? *

Patrick Augustin, *McGill University - Desautels Faculty of Management*†
Valeri Sokolovski, *Stockholm School of Economics and Swedish House of Finance*‡
Marti G. Subrahmanyam, *New York University - Leonard N. Stern School of Business*§

March 14, 2016

Abstract

We provide a comprehensive analysis of the determinants of trading in the sovereign credit default swaps (CDS) market, using weekly data for single-name sovereign CDS from October 2008 to September 2015. We describe the anatomy of the sovereign CDS market, derive a law of motion for gross positions and their components, and identify the key factors that drive the cross-sectional and time-series properties of trading volume and net notional amounts outstanding. While a single principal component accounts for 54 percent of the variation in sovereign CDS spreads, the largest common factor explains only 7 percent of the variation in sovereign CDS net notional amounts outstanding. Moreover, unlike for CDS spreads, common global factors explain very little of the variation in sovereign CDS trading and net notional amounts outstanding, suggesting that it is driven primarily by idiosyncratic country risk. We analyze several local and regional channels that may explain the trading in sovereign CDS: (a) country-specific credit risk shocks, including changes in a country's credit rating and related outlook changes, (b) the announcement and issuance of domestic and international debt, (c) macroeconomic sentiment derived from conventional and unconventional monetary policy, macro-economic news and shocks, and (d) regulatory channels, such as changes in bank capital adequacy requirements. All our findings suggest that sovereign CDS are more likely used for hedging than for speculative purposes.

Keywords: Banking Regulation, Basel III, Contagion, Credit Default Swaps, OTC, Sovereign Credit Risk, Systemic Risk

JEL Classification: C1, C5, C68, G12, G13, G15, F34

---

*We thank Fitch Ratings for making the credit rating data freely available to us. This project benefitted from financial support from the Nasdaq-OMX Nordic Foundation, and the Montreal Institute of Structured Finance and Derivatives (IFSID). Augustin acknowledges financial support from McGill University and the Institute of Financial Mathematics of Montreal (IFM2). Subrahmanyam thanks the Volkswagen Foundation, the Anneliese Maier Research Award of the Alexander von Humboldt Foundation, and the Center for Global Economy and Business at NYU Stern for their generous support.

†McGill University - Desautels Faculty of Management. Email: Patrick.Augustin@mcgill.ca.

‡Stockholm School of Economics and Swedish House of Finance. Email: valeri.sokolovski@hhs.se.

§New York University - Leonard N. Stern School of Business. Email: msubrahm@stern.nyu.edu.

1 Introduction

There is a vast academic literature on asset pricing, which is concerned with the determinants of financial asset prices and returns. There is, however, significantly less research on what explains asset *trading*, which underlies the price formation process. While this disparity has been noted in the equity market (Wang, 2002; Lo and Wang, 2010), it is even starker in the case of credit default swaps (CDS). Since quantities are as important as prices in determining market equilibrium outcomes, our objective in this paper is to address this imbalance, and focus on the determinants and implications of sovereign CDS trading.

We focus on sovereign CDS trading since recent developments in the Eurozone economies have, once again, brought sovereign credit risk to the forefront of global economic policy debates. Sovereign CDS are private, bilateral insurance-type contracts, which offer buyers protection against default by sovereign debtors, and are traded over-the-counter by financial institutions. However, they remain controversial, with strong opinions being expressed at both ends of the spectrum, as to their efficacy and deleterious consequences.[1] More recently, especially since the Eurozone sovereign debt crisis, politicians and policy makers have blamed speculators with "naked" positions in sovereign CDS for rising public borrowing costs.[2] This strong position ultimately led to a ban on naked sovereign CDS positions, initially by Germany, and later by the European Union (EU), as a whole.[3] The empirical

[1]Former Federal Reserve Chairman Alan Greenspan argued that "these increasingly complex financial instruments have contributed, especially over the recent stressful period, to the development of a far more flexible, efficient, and hence resilient financial system than existed just a quarter-century ago." (See "Economic Flexibility," Alan Greenspan, Speech given to Her Majesty's Treasury Enterprise Conference, London, January 26, 2004.) In striking contrast, Warren Buffett, the much-acclaimed investor, weighed against derivatives, in general, by describing them as "time bombs, for the parties that deal in them and the economic system" and went on to conclude that "in my view, derivatives are financial weapons of mass destruction, carrying dangers that, while now latent, are potentially lethal." (See the Berkshire Hathaway Annual Report for 2002.)

[2]See "Call for ban on CDS Speculation" in The Financial Times on March 10, 2010. A "naked" position refers to a position that is unhedged. In the case of CDS, this arises when investors purchase credit insurance for protection against government default without owning the underlying bonds.

[3]See, for example, the "EU Ban on 'Naked' CDS to Become Permanent" in The Financial Times on October 19, 2011.

basis for this argument largely rests on the relationship between government bond yields and sovereign CDS spreads.[4] We believe that the evidence for such a causal link is weak, especially without an understanding of the trading behavior in the sovereign CDS market. Even in the backdrop of the ban of naked sovereign CDS trading, banking regulations prescribe and encourage the use of sovereign CDS as an efficient vehicle to reduce capital requirements based on sovereign counterparty risk exposures.[5] Overall, sovereign CDS trading remains contentious, under-researched, and fraught with important policy implications. In light of the current regulatory debate around sovereign CDS trading, we aim to improve our understanding of the determinants of the trading and their implications. In particular, we attempt to examine whether sovereign CDS are more likely to be used for hedging than for speculative purposes.

Although there are reasons to believe that sovereign CDS trading is partially determined by country-specific considerations, it stands to reason that the concentrated oligopolistic structure of the CDS market, and the documented evidence of a tight factor structure in sovereign CDS spreads, may lead to more global determinants of trading. Indeed, the market for CDS trading is heavily concentrated among the major US broker-dealers, as the top 10 counterparties (all broker/dealers) accounted for about 89% of the total protection sold (Giglio, 2014), and reporting dealers had a market share of 71.13% in 2012, according to statistics by the Bank for International Settlements (Augustin, 2014). This has led Longstaff et al. (2011), among many others, to hypothesize a role for US risk factors in explaining the variation in sovereign risk premia and default probabilities. Given this backdrop, our first contribution is to describe the anatomy of trading in the CDS market in great detail, and to derive a law of motion for the stock of gross notional amounts of CDS outstanding. Trading in the sovereign insurance market is affected by many individual components, which makes it necessary to understand the institutional background of the

[4]See, for example, Portes (2010) and references therein.
[5]See also AFME et al. (2011).

market.

Next, we examine the factor structure in CDS traded *quantities* and compare it to that in CDS *prices*, i.e., CDS spreads. Surprisingly, in contrast to the well-known evidence of a strong factor structure in sovereign CDS spreads, we find little evidence of a common factor in the trading of sovereign CDS. Quantitatively, the first (three) principal component(s) is (are) able to explain about 54% (68%) of the common variation in sovereign CDS spread changes, while it (they) can only explain 7% (16%) of the common variation in changes in net notional amounts outstanding. We further discover important market microstructure effects, including mechanical quarterly changes in net notional amounts outstanding on the standard contract roll dates on March 20, June 20, September 20, and December 20 of each year. In addition, some of the variation can be closely linked to the depreciation of the US dollar against a basket of global currencies, given that the Derivatives Clearing and Trading Corporation (DTCC) data are reported in USD equivalents.

We further study the cross-sectional and time-series determinants of the level and percentage changes in net and gross notional amounts outstanding. In the cross-section, the primary determinant of the level of net notional amounts is the amount of total and international general government debt outstanding. Total debt, international debt, and the size of an economy (GDP) are sufficient to explain 75% of the cross-sectional variation in net quantities of insured sovereign credit risk. The economic magnitudes are also meaningful, as a ten percent increase in total debt outstanding leads to an increase in net notional amount outstanding of 3 percent. Although international debt, which is the underlying reference obligation for the standard sovereign CDS contract, is more relevant for emerging economies, both international and total debt capture different dimensions of a country's credit risk and are important predictors of net notional amounts outstanding.

In the time-series, the single most important predictors of the percentage changes in net notional amount outstanding are the idiosyncratic risk of the country's stock market index in relation to global factors, and uncertainty about a country's credit risk. Both dimensions of uncertainty are negatively associated with net insured interest. On the other hand, country-specific credit risk and equity volatility positively predict gross notional amounts outstanding and CDS volumes. This suggests that, at the margin, greater uncertainty leads investors to initiate more trades that are used to close out existing positions, rather than to speculate. Global risk factors add little additional explanatory power to the time-series variation in net quantities. This is better illustrated in country-by-country regressions. For each country, we use the adjusted R^2 statistics from a restricted regression with only domestic country-specific variables, and a full regression with both domestic and global risk factors, and construct their ratios as a proxy for the relative explanatory power of idiosyncratic sources of risk, i.e., the local ratio. The median (average) local ratio is 94% (97%), suggesting that most of the variation in net sovereign CDS exposures is explained by country-specific risk factors.

Based on the first part of the paper, which characterizes the anatomy of the sovereign CDS market, we postulate three new stylized facts: (i) sovereign CDS quantities (prices) exhibit little (strong) commonality, characterized by low (high) explanatory power of the first principal component; (ii) both total and international debt are two key determinants of net and gross notional amounts of CDS outstanding, with international (total) debt being more important for emerging (developed) economies; (iii) the dynamics of sovereign CDS trading are better explained by country-specific than by global risk factors. Due to these findings, we examine various country-specific shocks to the most important determinants in the second part of the paper, in order to tease out the role of precise economic channels that may lead to trading in the sovereign credit insurance market.

First, we examine shocks to a country's credit risk using changes to a country's credit rating and credit rating outlooks. We examine specifically the regulatory rating changes, i.e., those that would lead to a change in bank capital adequacy requirements, according to the standardized framework in the Basel banking regulation. We find that negative shocks to credit rating outlooks are associated with an *increase* in net insured quantities, while a rating downgrade results in a *decrease* of a similar magnitude. A difference-in-differences test comparing the impact of rating and outlook changes on net notional CDS outstanding to that in a matched sample confirms the robustness of our findings. Similarly, rating upgrades are negatively associated with net notional amounts of CDS outstanding, while lagged positive outlook changes are not significant. Contemporaneous downgrades do not affect changes in gross sovereign CDS positions. Overall, these findings are more closely aligned with the interpretation of a hedging, rather than a speculative motive.

Second, due to the significant role of total and international debt in explaining the cross-sectional dispersion leads us to investigate the role of the announcement of sovereign debt issuance on sovereign CDS trading. We find that the issuance of international debt leads to a significant increase in net and gross notional amounts of CDS outstanding, and the effect increases in new issue size, as a fraction of total debt outstanding. An additional one percent increase in international debt relative to total debt leads to a 0.3% increase in net insured interest. Moreover, these effects are greater if the debt-issuance is short-term, and lower if a government issues higher quality long-term debt. The *announcement* of government debt issuance does not affect sovereign CDS trading, nor does the issuance of *domestic* debt. Thus, actual shocks to the stock of government debt do affect the dynamics of aggregate insurance in the sovereign debt market.

Finally, we provide some preliminary evidence on two additional channels through which trading in the sovereign CDS market occurs. First, we explore the regulatory channels for capital requirements based on the Basel framework, and the naked sovereign CDS ban implemented temporarily by Germany in 2010, and permanently by the European Union in 2012. The anecdotal evidence suggests that the practice, by banks, of hedging uncollateralized sovereign and quasi-sovereign counterparty risk exposures with sovereign CDS, is influenced by the Basel framework, which prescribes sovereign CDS as valid hedging instruments. Second, we exploit the time-variation in major geopolitical events that have increased country-specific economic and political uncertainty across countries, and over time. Examples of such events include the elimination of the Swiss currency peg in January 2015, the death of Nelson Mandela in December 2013, the Fukushima earthquake in April 2011, and the Russian invasion of Ukraine in March 2014.

Oehmke and Zawadowski (2014a) study the determinants of *corporate* CDS trading volume and conclude that that *corporate* CDS markets emerge as alternative trading venues for hedging and speculation as a result of bond market fragmentation, a prediction made in Oehmke and Zawadowski (2014b). Our research is complementary to their work since we focus on the *sovereign* CDS market and attempt to answer similar questions. There are several characteristics that make sovereign CDS unique and warrant a separate analysis. For one, sovereign CDS are the most heavily traded single-name CDS contracts, as they provide a convenient avenue for hedging country risk, and consequently, CDS spreads (prices) are deemed efficient, real-time metrics, for gauging the credit health of a country. For certain investors such as multinational corporations or large fund managers who may need to hedge country risk, sovereign CDS spreads may be invaluable financial metrics. For another, sovereign credit is quite a different asset class from corporate credit, with very different historical default probabilities and recovery rates, especially if judged based on the long-term default rates published by the major rating agencies. Moreover, at a technical level, there is no formal bankruptcy court for sovereign defaults, with different credit events eligible for triggering an insurance payout under the CDS contract. Finally, the underlying sovereign bonds are typically more liquid and less fragmented than their corporate counterparts. In particular, there are regulatory incentives for banks to hold government bonds in most countries, introducing a wedge between sovereign and corporate credit. This justifies a separate analysis for sovereign CDS trading.

Berg and Streitz (2012), whose work is extended in Roelkens (2013), use the sovereign CDS trading data of 57 countries from 2008 to 2010 provided by DTCC to study how standardized measures of net notional amounts outstanding and turnover are related to country-specific characteristics. These studies, however, are silent on the economic channels that may lead to trading in the sovereign CDS market, and are based, unfortunately, on a very short sample period, throwing doubt on the general validity of their findings. In contrast, our sample extends to the year 2015, and hence, we are able to include a plethora of important events in the sovereign credit market that help us pin down the economic and regulatory channels underlying sovereign CDS trading, i.e., the Argentina and Greece sovereign defaults, the EU sovereign debt crisis and the subsequent naked CDS ban, the near shut down of the US government, and the Ukrainian crisis. A series of recent papers in the literature examines transaction level data of CDS provided by the DTCC. However, these references focus on questions related to liquidity (Shachar, 2012; Biswas et al., 2015), risk-bearing capacity (Siriwardane, 2014), or counterparty risk (Du et al., 2015), but none of them focuses on the determination of traded *quantities*.[6] More importantly, they all examine *corporate* CDS, and none of them studies *sovereign* CDS, the subject of this paper.

We also attempt to place the dynamics of sovereign CDS trading in the context of the bank capital requirements, which propose sovereign CDS as hedging vehicles for credit counterparty risk, in particular for sovereign and quasi-sovereign counterparty exposures. These issues are briefly discussed in Bilal and Singh (2012a) and in the conclusion of Kallestrup et al. (2014), while Lando and Klingler (2015) develop a theoretical model that characterizes the impact of the regulatory channel on sovereign CDS *prices*, but not on

[6] Tang and Yan (2013) use transactions data from the GFI Group to document liquidity risk in the corporate CDS market.

quantities. As part of our analysis, we examine the naked sovereign CDS ban, a particular regulatory development. Hence, our work also relates to the literature that examines the impact of the naked sovereign CDS ban on liquidity (Sambalaibat (2013), Pu and Zhang (2012), Duffie (April 29 2010a), Duffie (2010b), Criado et al. (2010)).

While we attempt to shed light on the economic channels that may affect trading in the sovereign CDS market, we also directly relate to the rapidly growing literature on the dynamics of sovereign CDS spreads.[7] Pan and Singleton (2008) and Longstaff et al. (2011) focus on the strong co-movement in sovereign credit spreads, and emphasize the importance of global risk factors, mostly US financial market variables, for both risk premia and default probabilities.[8] During the 2007-2008 global financial crisis, another strand of literature emerged that stresses the relationship between sovereign credit risk and the domestic financial sector (see Acharya et al. (2014), Gennaioli et al. (2012), and Kallestrup et al. (2014), among many others). Augustin (2013) emphasizes the time-varying dynamics of global and local sources of risk as important for the time variation in sovereign CDS spreads, and argues that the relative importance of each source of risk can be identified in real time through the shape of the term structure of CDS spreads. Global factors matter relatively more in good times when the slope is positive, while local factors are relatively more important for the CDS dynamics in crisis times, when the term structure is inverted. While the role of global risk factors has some intuitive appeal for the determination of prices through the risk premium channel, it is less clear, ex-ante, if and how common factors should relate to quantities. Improving our understanding of the drivers of variation in sovereign trading activity is one of the main goals of this paper.

The paper features two parts. In the first part, we describe the anatomy of the sovereign CDS market. In Section 2.1, we derive a law of motion for CDS quantities. We discuss

[7] We refer to Augustin (2014) and Augustin et al. (2014) for a survey.

[8] See also Augustin and Tédongap (2015). Anton et al. (2013) argue that commonality in dealer quotes for sovereign CDS spreads is a powerful predictor of cross-sectional CDS return correlations.

the data in Section 2.2. In Section 2.3, we examine the factor structure of CDS trading, while in Section 2.4, we examine the determinants of net and gross notional amounts of sovereign CDS outstanding, in the cross-section, in the time-series, and country by country. In the second part, we examine micro-level evidence on the economic channels of sovereign insurance trading. We discuss the rating channel in Section 3.1, the debt issuance channel in Section 3.2, and the macroeconomic news channel in Section 3.3. The regulatory channel is discussed in Section 3.4. We conclude in Section 4.

2 The Anatomy of the Sovereign CDS Market

2.1 A Law of Motion for CDS Trading Volumes

Statistics on traded quantities in credit derivatives involve many different components, such as gross and net notional amounts outstanding, novations/assignments, terminations, and market risk transfer activity, in contrast to trading in exchange-traded derivatives such as equity options, which are adequately summarized by *volume* and *open interest*,. While some of these terms are widely known among market professionals, it is not entirely clear how they are related to each other. Further, the exact definitions of these terms, which are essential for the analysis of the trading data, are generally lacking. This section briefly describes and illustrates each of these components, made available in the Trade Information Warehouse ("TIW") of the Depository Trust and Clearing Corporation (DTCC), with a more detailed discussion provided in the Appendix section A-II. We also develop a simple accounting identity to reconcile and relate these different terms with one another.

For credit default swaps, the *gross notional amount outstanding*, G, refers to the par amount of credit protection bought or sold, across multiple agreements for the same name and maturity, and is used as the underlying reference amount to derive the insurance premium payments and the recovery amounts in the event of a default. In other words, the gross notional amount represents the *cumulative* total of past transactions. The *net notional amount outstanding*, N, with respect to any single reference entity and maturity is the sum of the net protection bought by net buyers (or equivalently net protection sold by net sellers).[9] The difference between gross and net notional amount outstanding is best illustrated by adapting the examples from Oehmke and Zawadowski (2014a), for our purpose here. Suppose, for example, that counterparty A has purchased \$20 million in gross notional CDS outstanding from counterparty B. Panel A in Table 1 shows that, in this scenario, both gross and net notional outstanding are equal to \$20 million. If, in addition to buying \$20 million from counterparty B, counterparty A also sells \$20 million to counterparty C, while B sells \$20 million to A and C buys \$20 million from A, then the total gross notional amount outstanding is equal to \$40 million, while the total net notional amount outstanding is only equal to \$20 million, as is depicted in Panel B of Table 1. Finally, we show in Panel C that, if the previous scenario is slightly amended with counterparty C also selling \$20 million to B, then the total gross amount outstanding inflates to \$60 million, while the net notional amount outstanding shrinks to \$0 million. The net notional position generally represents the *maximum* possible transfer of funds between net sellers and net buyers of protection that could be required upon the occurrence of a credit event (as long as there is a non-negative recovery rate on the underlying debt instruments, the net transfer of funds would be lower). [10] Hence, the net notional amount outstanding is often considered to be the economically more meaningful measure (Oehmke and Zawadowski, 2014a). These simple examples illustrate that the net notional amount outstanding can never be greater than the gross notional amount outstanding, and that it

[9]The clearing platforms of the Chicago Mercantile Exchange (CME) and the New York Stock Exchange (NYSE) for OTC derivatives use the term *open interest*, defined as the sum of the net notional amount outstanding per contract, which is thus consistent with the net notional amount outstanding, reported by DTCC.

[10]Of course, the net notional amount outstanding represents the maximum possible transfer of funds only under the assumption of zero counterparty risk.

is proportional to gross notional amount outstanding by a factor, $0 \leq \alpha \leq 1$, such that

$$N_t = \alpha_t G_t, \tag{1}$$

which allows us to define a measure of trading intensity $\gamma_t = 1/\alpha_t$. This factor, $0 \leq \alpha \leq 1$, represents a summary statistic of trading activity and will be used in our analysis.

The gross notional amount outstanding may be affected by the practice of *novation*, which is also sometimes called *assignment*. Novation, which may be partial, refers to the process by which one counterparty (transferor) agrees to transfer to a third party (transferee) its obligations under an existing transaction they have with another counterparty (remaining party). DTCC states that, since an assignment transaction is the transfer of a pre-existing TIW position to another party, it does not affect the gross notional amounts or the number of contracts. Thus, although not explicitly explained by DTCC, there should be no effect on *aggregate* net notional amounts outstanding either.[11] Duffie et al. (2011) provide a simple example of novation, which we adapt in Panels D.1 and D.2 of Table 1. Suppose that counterparty A buys $20 million from counterparty B (such that B sells $20 million to A). The gross and net notional are both $20 million. If B wants to exit its trade position with A and agrees to pass on the position to C, then B (the step-out party) assigns the trade to C (the step-in party). Counterparty A needs to be informed and consent to the novation. A new trade relationship exists between A and C, but the gross and net notional amounts outstanding remain unchanged.

Should we have a notation for novation, or ignore it, since it does not affect the calculations? Participants in the CDS market may also unwind their contracts in the TIW by entering into a contract *termination*, which is often called a *cancellation*, C. This could potentially be done through *portfolio compression*, which is the process by which

[11]It goes without saying that there would be, however, an effect on individual counterparty net notional amounts outstanding.

two counterparties maintain the same risk profile, but reduce the number of contracts and gross notional amounts outstanding held by participants. Dongyoup (2011) and Duffie et al. (2011) provide examples of portfolio compression, which we also depict in Panels E.1 and E.2 of Table 1. In this example, counterparty A bought \$5 million from counterparty C and sold \$10 million to counterparty B. B bought \$10 million from A and sold \$10 million to C. Finally, C bought \$10 million from B and sold \$5 million to A. The total gross and net notional amounts outstanding reported by DTCC would then be \$25 million and \$5 million, respectively (Panel E.1). If the regulators call for a trade compression for reasons of credit risk mitigation, then the trade compression process would, for example, reduce the gross notional amount outstanding from \$25 million to \$5 million, while the net notional amount outstanding would remain unchanged, as is illustrated in Panel E.2. This would effectively happen by terminating the two trades B has with A and C, while replacing the trades between A and C with a new transaction that preserves the previous risk profile between these two counterparties.

Gross and net notional amounts outstanding can also be affected through termination or upon reaching maturity. Thus, *matured contracts*, M, arise when contracts have reached their scheduled termination date. A similar effect on gross and net notional amount outstanding arises through *exits*, E, which arise when bilateral counterparties mutually agree to remove contracts from the TIW. We illustrate this in Panel F of Table 1. Consider the example in Panel B, in which A has bought (sold to) \$20 million from B (C), B has sold \$20 million to C, and C has bought \$20 million from A, resulting in a total gross (net) notional amount outstanding of \$40 (\$20) million. Suppose that the \$20 million C bought from A were purchased in three separate transactions on 5 year CDS contracts: \$10 million were bought at $t-5$, \$5 million were bought at $t-2$, and another \$5 million were bought at $t-1$. In this case, even though there is no contemporaneous transaction at time t, the gross notional amount outstanding shrinks to \$30 million, while the net notional amount outstanding remains flat at \$20 million. The illustration of a trade exit would be identical. Finally, gross notional amounts outstanding may also be altered by *backloads*, B, which refers to previously registered and non-electronically confirmed trades that the TIW registers at a later date than when the contract was actually signed. Thus, to summarize, gross notional outstanding is increasing in new transactions (T) and backloads, and decreasing in matured contracts, compressions and exits. The net notional amount outstanding may be increasing or decreasing in new transactions, increasing in backloads and decreasing in matured contracts and compressions. Novations should, in principle, have no effect on the *aggregate* gross and net notional amounts outstanding. We characterize this law of motion for CDS trading, in terms of the change in the gross notional amount outstanding, as follows:

$$G_{t+1} = G_t + T_{t+1} - M_{t+1} - C_{t+1} - E_{t+1} + \sum_{j=1}^{J} B_{t-j}, \tag{2}$$

where the new transactions, T, are contemporaneous trades that effectively transfer risks between counterparties.[12] DTCC also refers to *market risk transfer activity*, a quantity that we will subsequently refer to as *volume*, V. Volume relates to all activities that result in risk transfer between two counterparties and, therefore, changes the composition of risk across counterparties, but not necessarily in the aggregate. As such, it includes new trades, terminations, and assignments, but excludes portfolio compressions and matured transactions.[13]

[12]To be precise, total reductions in the gross notional amount outstanding are also affected by *post-trade event* (PTE) in-flight, referring to transactions that become uncertain (but were certain in the previous week) after a PTE like an assignment or a novation. Similarly, total increases in gross notional are affected by PTE completed, i.e., uncertain transactions that become certain after a PTE. Thus, PTE completed (PTE in-flight) needs to be added to (subtracted from) equation (1) to completely reconcile DTCC's summary statistics. We abstract here from these components for simplicity.

[13]A slightly different definition of volume is used by the clearing platforms of the Chicago Mercantile Exchange (CME) and the New York Stock Exchange (NYSE) for OTC derivatives. They define volume as the sum of the notional amounts for trades where both the buyer and seller agree to clearing the transaction.

2.2 Data

2.2.1 CDS Trading Data

We present a novel dataset of traded quantities for sovereign CDS contracts for a sample of 61 countries from October 2008 until September 2015. The Depository Trust and Clearing Corporation (DTCC), a company specializing in the clearing and settlement of OTC derivatives and other financial instruments, commenced the publication of detailed weekly reports on the gross and net notional amounts and volumes of CDS trading on October 31, 2008. These weekly reports are based on the information available in the Trade Information Warehouse (TIW), a centralized global trade repository that consolidates trade reporting, post-trade processing, payment calculation, credit event processing, and central settlement. The information is updated every Tuesday after 5 p.m. eastern time. According to the DTCC, the TIW captures more than 95% of the global OTC credit derivatives market. More specifically, the TIW posts weekly gross and net notional amounts outstanding in US dollar equivalents, and the number of traded contracts in aggregate, and for the 1,000 most heavily traded reference entities. We focus on sovereign single name contracts and obtain an unbalanced panel of 64 countries from all major geographical regions from October 2008 until September 2015, spanning 358 weeks of data. We disregard three countries due to the limited amount of data availability.[14] Thus, we have a total of 20,716 weekly observations for 61 countries, among which 47 countries have continuous information on net notional amounts outstanding throughout the sample period. Overall, our sample represents all the major geographical regions. Figure 1 confirms that our sample of sovereign issuers, which is restricted to those listed among the 1,000 most liquid single-name reference entities, is highly representative of the global sovereign CDS market, as we capture between 92% and

[14]We exclude Hong Kong, Ecuador, and Morocco, as these countries have only 1, 12, and 35 weeks of data, respectively. We note that we also eliminate three duplicate entries for Hungary on March 30, 2012, April 6, 2012, and April 13, 2012.

97% of the total sovereign gross notional amount outstanding at all times throughout our sample period.[15]

Since July 16, 2010, DTCC has also published weekly market risk transfer activity, a quantity we loosely refer to as volume. Volume includes newly initiated trades between two counterparties, the termination of an existing transaction and the assignment of an existing transaction to a third party, but excludes portfolio compressions. DTCC has retroactively posted more granular information on the individual components of gross notional amounts outstanding, as described in equation (1), going back to March 20, 2009. In particular, the TIW reports the gross notional amount outstanding in USD equivalents and the number of traded contracts for new trades, full and partial assignments, backloads, PTE-completed and PTE in-flight, full and partial terminations, exits, and matured contracts. These quantities have, to the best of our knowledge, previously not been used in an empirical analysis. We will exploit the additional information with regard to these additional variables in our empirical analysis to better tease out supply and demand effects in the trading of sovereign CDS.

The summary statistics in Table 2 underscore substantial cross-sectional and time-series variation for the 61 countries in our unbalanced sample. For 47 countries, we have continuous information on net notional amounts outstanding, each week for 358 weeks, corresponding to approximately 6.4 years of data. Among the other countries, Switzerland and Cyprus have the lowest number of observations with 65 and 177 weeks of data, i.e., a bit more than three years. The average USD equivalent in gross notional amount outstanding is equal to $39 billion. The most active market is Italy, which leads the list with an average of $314.8 billion, while the country with the lowest average gross notional of $1.8

[15] If we also account for sovereign states and state-governed entities, the coverage ratio ranges between 96% and 100%. This suggests that analyses of sovereign entities do not need to correct for censored reporting, in contrast to similar examinations of corporate CDS trading data (Oehmke and Zawadowski, 2014a).

billion is Tunisia. The average standard deviation of the gross notional amount is equal to $10.2 billion, an economically significant number.[16] Net notional amounts outstanding are significantly smaller, and represent, on average, only 8.63% ($3.4 billion) of the gross notional amounts outstanding, although these numbers range, on average, between 3.22% ($1.1 billion) for Ukraine and 35.89% ($508 million) for Switzerland. The distribution is plotted in Figure 3, which also highlights the ranking of the top 10 and 25 countries, respectively. Investors exhibit heterogeneity in the net notional amount traded per contract. The average net notional amount outstanding per contract is $1.54 million, whereas Germany and the United States trade with high net notional exposures per contract, on average $5.26 million and $4.75 million, respectively. To put the traded quantities of sovereign credit risk in perspective, we also report the average quarterly debt-to-GDP ratio for each country. The average debt-to-GDP ratio across this globally representative sample is 62.90%. In contrast, the two least indebted countries are Saudia Arabia and Estonia, with debt-to-GDP ratios of 2.6% and 10.5%, while the two most indebted countries in the sample are Japan and Greece, with debt-to-GDP ratios of 228.2% and 181.6%, respectively.

Throughout the analysis, we will focus explicitly on two measures of CDS trading, i.e., the net notional amount outstanding and the trading intensity α_t, which we defined in equation 1. The average trading intensity in our sample period is 12.65, ranging from a minimum of 2.79 (Switzerland) to 34.29 (Ukraine). Figure 4 shows that the distribution of the trading intensity is significantly skewed to the right, and the interquartile range, plotted in the upper panel, underscores the time series variation in the cross-sectional distribution. Thus, using a ratio of 10 to characterize the relationship between gross and net CDS trading as a rule of thumb is a convenient approximation, but it overshadows the underlying cross-sectional and time-series variation. Finally, it may be interesting to note that the time-series average reached its bottom (7.9) on October 31, 2008, shortly after the

[16] The two figures in the left panel of Figure 2, which plot the time series of the aggregate, average, and the interquartile range of gross notional amount outstanding further highlight the fluctuations over time.

Lehman Brothers bankruptcy, while the maximum (16.7) was recorded on July 12, 2013.

2.2.2 Other Data

In addition to sovereign CDS trading data, we collect information on CDS spreads, general government debt statistics, as well as various other country characteristics and macroeconomic fundamentals. We report summary statistics on general government debt from the new quarterly debt data reported by the Bank for International Settlements (BIS). In light of the large discrepancies in government debt statistics across publicly available data sources, the BIS has built up a new database on general government debt that is relatively homogenous with a broad country coverage. The primary goal of the BIS database is to facilitate cross-country comparisons. We use debt from the general government sector, comprising central, state and local governments, and social security funds. All data are reported in billion USD. Given that the conventional sovereign CDS contract is written on foreign long-term debt, we are careful in distinguishing between international ("euro bonds" or foreign denominated bonds) and domestic debt. Thus, we collect data on both international and domestic debt securities as reported by the BIS, as well as on total general government debt.[17] Table 3 highlights some remarkable differences across countries in terms of the type of debt they issue. Whereas the U.S. is the most indebted country in terms of total nominal debt ($12.770 trillion), it has only about $3.93 billion of international debt. On the other hand, Estonia is the least indebted country in nominal amounts outstanding ($1.87 billion), with an international component of ????. In general, the greater the amount of total debt, the lower the fraction that is international. The cross-sectional ranking and time series evolution of the aggregate debt amounts are further visualized in

[17] The BIS defines international debt securities as those issued in a market other than the local market of the country in which the borrower resides. Domestic debt securities are defined as debt securities issued in the local market of the country in which the borrower resides, regardless of the currency in which the security is denominated. While international debt is available for all countries, total and domestic debt are not. Hence we fill missing information with annual frequency debt data from the IMF IFS data.

Figure 5.

In Table 4, we provide additional summary statistics (on a quarterly basis) for the various control variables, including CDS spreads, CDS returns, CDS volatility, and CDS liquidity, computed using information from Markit, a leading data provider of CDS spread information. The average level of sovereign CDS spread is 258 basis points (bps) in our sample, while the average return is 23 bps, which is reflective of a period of increasing sovereign CDS spreads given the European debt crisis.[18] Country averages range from just 23 bps for Norway to 17.86% for Greece, which defaulted during our sample period. Regarding liquidity, the statistics suggest that the average country is covered by 6.54 dealers, with a country-specific high and low average of 2.07 and 9.06, respectively. Other metrics relate to idiosyncratic country returns and their volatilities, based on information from the MSCI country stock market indices, and to country-specific foreign exchange rate returns and volatility, based on information from Thomson Reuters Datastream. The average quarterly country return and volatility are 10 bps and 113 bps, respectively, while the average quarterly foreign exchange rate return and volatility are 110 bps and 38 bps. The last column reports each country's average long term foreign debt rating, which we receive from Fitch Ratings. The average country in our sample has a credit standing equivalent to a A- rating.[19]

2.3 Commonalities and Idiosyncracies in Sovereign CDS Trading

Given the novelty of our dataset, we begin by examining the factor structure in traded CDS quantities and compare it to that in CDS prices. It is well documented that sovereign CDS

[18]The return on a CDS contract is defined as.. although the measure is based on regarding the CDS spread as a "price. Although this is not precisely correct, it can be regarded as a reasonable approximation, as pointed out by

[19]We classify a country based on the latest available credit rating in a fiven month by mapping the alphabetical ratings into a numerical scale, such that AAA = 1, AA+ = 2, AA = 3, AA- = 4, ... 17 = CCC, 18 = CC, up to 19 = D (DEFAULT).

spreads co-move significantly over time, as a single factor is typically able to explain as much as 96% of the spread variation at the daily level, and between 60% to 70% at the monthly frequency (Pan and Singleton, 2008; Longstaff et al., 2011; Augustin, 2013). We confirm these findings at the weekly frequency for the 47 countries for which we have a continuous time series of net and gross notional amount outstanding throughout the sample period, with the results reported in Table 6. Panel A shows that the first principal component of the correlation matrix of changes in average weekly CDS spreads explains about 54% of the total time series variation, a number that increases to roughly 68% for the first three principal components. These numbers increase further if we separate all countries into 30 emerging (EM) and 17 developed (DM) markets, as the first common factor explains 56% and 65% of the variation for the DM and EM sub-samples, respectively.

In contrast to the strong factor structure in CDS spread changes, we find a much weaker factor structure in quantities, as can be seen in Panel B of Table 6. Performing the same exercise on the correlation matrix of weekly changes in gross notional amounts of CDS outstanding, we find that the first principal component explains only about 24% of the time series variation. There is, however, a stark gap between DM and EM countries. In fact, the magnitude of the explanatory power of the first principal component for changes in gross notional is 55% for DM countries, similar to what is explained by the first component extracted from changes in spreads. For EM, instead, the explanatory power of the first factor is almost half of that, i.e. 30%.[20] This points towards a structural difference between both groups of countries, for which we are going to examine the economic underpinnings.

In Panel C of Table 6, we repeat the exercise on the correlation matrix of weekly changes in net notional amounts of CDS outstanding. The explanatory power of the first principal

[20]We emphasize that the DM group is primarily made up of countries from Europe. Thus, we suspect a linkage with the regulatory framework for capital requirements in Europe, where banks used to benefit from an implicit subsidy through zero capital requirements for holdings of sovereign government bonds of Eurozone member countries (Korte and Steffen, 2015).

component for the time series variation reduces further to 10%, and the first five factors explain no more than 25%. More importantly, we show that part of the variation explained by the first factor can be associated with the institutional structure of CDS trading and the presence of seasonal patterns in the data.[21] The conventional single-name CDS contract has standardized pre-specified quarterly coupon payment dates. Every three months, the conventional contract will thus expire and a new on-the-run single-name CDS contract will "roll" on to a new standard maturity date. Each calendar year, single-name CDS contracts roll on March 20, June 20, September 20, and December 20. The primary reason for this practice is the desire of market participants to enhance the liquidity of their CDS positions, because the "on-the-run" five-year contract is usually the most liquid. For that reason, we formally check for seasonality in CDS trading by projecting weekly changes in sovereign CDS net notional data for each country i, ($\Delta\,\mathrm{NN}_{i,t}$), on country fixed effects, γ_i, and the dates when the on-the-run contract expires and "rolls" on to a new on-the-run CDS contract. More specifically, we run the following regression:

$$\Delta\,\mathrm{NN}_{i,t} = c + \gamma_i + b_1\,\mathrm{March20Roll} + b_2\,\mathrm{June20Roll} + b_3\,\mathrm{Sep20Roll} + b_4\,\mathrm{Dec20Roll} + \epsilon_{i,t}, \quad (3)$$

where March20Roll, June20Roll, Sep20Roll, and Dec20Roll refer to the quarterly roll date indicators, which take on the value of one during the week of the roll, and zero otherwise.[22] The results, which are reported in Table 7, clearly attribute an important role to the roll dates, which are all statistically significant at the 1% significance level, and which can explain between 2%-3% of the time series variation, depending on whether we use the full sample of 61 countries, or the sub-sample of 47 countries, for which we have uninterrupted information on net notional amounts outstanding.[23] To get a better appreciation for the

[21] In fact, the patterns in the time-series of aggregate sovereign CDS net notional amount outstanding in Figure 2 are suggestive of such seasonal patterns in the data.

[22] In our data, there are seven instances of March and June rolls, and six for September and December.

[23] Results for regressions using changes in gross notional amounts outstanding are similar, although the adjusted R^2 is 4.1%, slightly higher.

institutional factors that drive the common factor structure, we collect the residuals $\epsilon_{i,t}$ from the regression in equation (3), and perform a principal component analysis on the correlation matrix of their weekly changes. Panel C in Table 6 indicates that the fraction explained by the first common factor is reduced by an amount that is roughly equal to the explanatory power of the roll date indicators in the panel regression with net notional amounts outstanding.

A second important feature of CDS contracts that influences our analysis is that DTCC reports all their information on CDS trading in USD equivalents, even when contracts trade in other currency denominations. For sovereign contracts, not surprisingly, the USD and the EUR are the most common denominations. Indeed, in unreported results, we find that the Friday-to-Friday EUR/USD exchange rate has a negative correlation of -0.43% with residuals from the regression (3), and stripping the net notional amounts outstanding in each country further off the EUR/USD exchange rate effects reduces the variation explained by the first principal component to 5.88%. These findings have two important implications. From an economic perspective, we document that CDS spreads, which incorporate time-varying risk premia (Pan and Singleton, 2008; Augustin and Tédongap, 2015), contain a tight factor structure with a limited number of common components. On the other hand, economic quantities, in particular net notional amounts of CDS outstanding, have little common variation across countries, as the first principal component explains only about 7% of the time series variation, after we account for institutional mechanisms, such as the quarterly roll dates and the DTCC reporting in USD. From a methodological perspective, the above findings imply that we will need to carefully control for the quarterly roll dates and the EUR/USD exchange rate appreciation in the time series analysis. Failing to do so will result in biased regression coefficients that are difficult to interpret in an economically meaningful way. We end by stating the first stylized fact about sovereign CDS quantities:

- F1: *Sovereign CDS quantities (prices) exhibit little (strong) commonality, characterized by low (high) explanatory power of the first principal component.*

2.4 Determinants of Sovereign CDS Trading

We examine the determinants of sovereign CDS trading in three steps. First, we focus on country-specific characteristics in explaining cross-sectional differences in CDS trading across countries. Second, we examine the role of both country-specific and common factors in explaining the time series variation in the trading of sovereign default insurance. Third, we study each country individually to better gauge the relative importance of domestic and global risk factors in explaining the dynamics of traded quantities.

2.4.1 Cross-Sectional Determinants of Sovereign CDS Trading

There is no guidance in the empirical literature as to the determinants of trading in sovereign default insurance. Thus, we need to be careful in selecting the variables for such a regression. To the extent possible, we investigate determinants that are theoretically motivated for trading in *corporate* credit default insurance (Oehmke and Zawadowski, 2014b). We also examine several country-specific characteristics that could potentially explain traded quantities based on economic intuition.

Since we are interested in understanding why and when investors trade sovereign default insurance, the natural starting point is a country's indebtedness. To explain the levels in the net notional amount of CDS outstanding, we use total general government debt as well as total international debt, which are available from the BIS at a quarterly frequency. We emphasize that it is essential to examine both total and international debt. While most standard sovereign CDS contracts reference foreign debt, many developed economies tend to issue predominantly domestic debt. The correlation matrix reported in Table 5 also shows that both quantities are only weakly correlated, with a Pearson correlation coefficient of 0.02, and thus it is important to control for both the total and international components of debt. We report both debt quantities in billion USD. Given our objective of studying the levels of net notional CDS outstanding, we also need to control for the size of each economy, which we do by including a country's gross domestic product (GDP). In addition, we conjecture that trading in sovereign default insurance is intimately linked to a country's financial health and its default risk. We include the level of foreign exchange rate reserves, measured in billion USD. Furthermore, we include each country's CDS spread as a direct measure of the sovereign's credit risk. To capture potential non-linearities, and, motivated by the importance of volatility in structural credit risk models, we also include a proxy for country-specific credit risk volatility, computed as the quarterly sum of the daily squared percentage changes in CDS spreads. Moreover, market participation may depend on the underlying liquidity of the CDS market (Oehmke and Zawadowski, 2014b; Sambalaibat, 2013), which we proxy for using CDS depth, i.e., the number of dealer quotes used in the computation of the mid-market spread (Qiu and Yu, 2012).

A sovereign's financial health may also be influenced by future risk contingencies. The European sovereign debt crisis has highlighted the fragility of public balance sheets following the bailouts of domestic banks (Acharya et al., 2014). The crisis has also focused attention on the intricate relationship between the financial health of governments and that of their financial sectors. In addition, investors may possibly use sovereign default insurance as a "proxy hedge" for country equity risk exposure, or to speculate using a less capital-intensive synthetic exposure than simply a position in the sovereign debt. We are interested in capturing the relationship between the trading quantities and true idiosyncratic risk. Thus, we use the idiosyncratic component of the market-model regression of each country's return on the return on the MSCI stock market index. In other words, we compute the idiosyncratic country equity return as the average quarterly return that is orthogonal to the return on the MSCI world stock market index. We also include the domestic stock market return volatility, computed as the sum of daily squared idiosyncratic stock market returns over the quarter. Finally, we control for the return and volatility of the exchange rate relative to the USD, given that sovereign distress episodes are positively correlated with a depreciation of the local currency (Reinhart and Rogoff, 2008). We specify the following benchmark panel regression[24]:

$$\begin{aligned}\ln(\text{NN})_{i,t} = c + \gamma_t + b_1 \ln(\text{Total Debt})_{i,t} + b_2 \ln(\text{Int Debt})_{i,t} + b_3 \ln(\text{GDP})_{i,t} + b_4 \ln(\text{FX Reserves})_{i,t} \\ + b_5 \,\text{CDS Spread}_{i,t} + b_6 \,\text{CDS iVol}_{i,t} + b_7 \ln(\text{CDS Liquidity})_{i,t} + b_8 \,\text{Equity iReturn}_{i,t} \\ + b_9 \,\text{Equity iVol}_{i,t} + b_{10} \,\text{FX Return} + b_{11} \,\text{FX Volatility} + \epsilon_{i,t},\end{aligned} \tag{4}$$

where all variables are aggregated at the quarterly frequency, and are used in a natural logarithmic transformation (except returns) to improve the distributional behavior of the sample.[25] We use time-fixed effects, γ_t, to account for the influence of observable (and unobservable) common macroeconomic and financial factors, and occasionally include a dummy variable for the United States to account for the influence of the extreme total debt level relative to all other countries. We report all results in Table 8, with standard errors that are clustered by country. In unreported results, we verify that all results are robust for double clustering by country and quarter.

The univariate regression in column (1) indicates a statistically significant and economically meaningful relationship between the quarterly net notional sovereign CDS amount

[24]We omit Tunisia from this regression because of sparse debt data. Thus, the cross-sectional regressions include 60 countries.

[25]Note that we treat Dubai and Abu Dhabi as separate reference entities, even though they are separate Emirates within the United Arab Emirates and their debts are reported separately. We transform each variable x into variable $y = \ln(1 + x)$, given the existence of countries with zero international debt or foreign exchange rate reserves.

outstanding and the total amount of general government debt, which individually accounts for 60% of the cross-sectional differences in net notional outstanding (*without* time fixed effects). A 10% increase in total debt is associated with an almost 3% increase in net notional amount outstanding. In other words, greater total debt implies more insured interest. In column (2), we compare the impact of total general government debt to that of total international debt, which is the debt referenced by the standard sovereign CDS contract. Both measures are statistically significant, and the economic magnitude of the coefficient on international debt suggests that a 10% increase leads to a 2% increase in net notional. Together, these two variables explain 69% of the cross-sectional dispersion in net insured interest. Column (3), which controls for the size of the economy, using the GDP, illustrates that total debt partially proxies for the size of the economy, as the coefficient for total debt is divided by two, that for GDP is positive and statistically significant with a similar magnitude of 0.219, and the magnitude of the coefficient for international debt hardly changes in magnitude. Thus, these three variables manage to explain as much as 75% of the cross-country dispersion on net notional outstanding. We emphasize the strong fit of this model by reporting a plot of the predicted versus the actual net notional quantities in Figure 6. This graph delivers a strong message in the sense that, after controlling for the size of an economy and aggregate economic fluctuations, both total and international debt alone, i.e., country leverage, can explain about three quarters of the cross-country dispersion in net notional amount of CDS outstanding.

In column four (4), we add the aggregate amount of foreign exchange reserves, which is economically significant and has the expected negative sign. The greater the buffer of a country, the lower the need to hedge a country's default risk. The magnitude of 0.084 suggests that a ten percent increase in foreign exchange rate reserves is associated with a decrease in net notional amount of CDS outstanding of approximately 1%. Column (5) further controls for CDS spreads, CDS volatility and CDS liquidity. CDS liquidity is highly significant and positively correlated with net notional CDS outstanding. The coefficient of 0.489 translates into a 9.3% increase in net insured interest for a 20% increase in liquidity. Given that the average country is covered by six to seven broker dealers, this implies that net insured interest is on average almost ten percent higher if a country gets covered by one additional dealer. This regression does nevertheless not address the endogeneity issue that a country may be covered by more dealers and therefore more liquid because it has more net notional amounts of CDS outstanding. Countries with more credit risk, on average, have lower net notional amounts of CDS outstanding, as suggested by the negative coefficient on CDS Spread. Similarly, higher credit risk volatility suggests less net insured interest in sovereign credit risk. These variables are, however, not statistically significant, in line with Darrell Duffie's testimony that highlighted a weak relationship between the level of CDS spreads and net sovereign insurance purchased (Duffie, April 29 2010a). In column (6), we introduce additional market-based risk factors, such as the country-specific equity and foreign exchange rate returns and volatility. The regression coefficient on country-specific stock market returns is negative (although not significant), suggesting that improvements in the local stock market index are associated with lower net notional amounts outstanding. The relationship between changes in the net notional amount outstanding and stock market volatility is positive, with an economic magnitude that is not meaningful compared to levels of debt. The positive coefficient of 0.005 translates into a 0.05% increase in net notional CDS outstanding for a ten percent increase in domestic stock market volatility. Both foreign exchange rate returns and volatility are not statistically significant. Importantly, none of the debt coefficients changes their magnitude.

Finally, we split the results for developed and emerging economies in columns (7) and (8) respectively. These results point to a very similar picture. Both total and international debt are important predictors of net notional amounts of CDS outstanding. A F-test for the equality of their regression coefficients confirms that they are statistically different form each other. While foreign debt is economically more important, on average, total debt plays a more meaningful role for DM economies. Interestingly, CDS liquidity is statistically significant only in the sub-sample of EM countries. Overall, these regressions yield adjusted R^2s of 75% to 85%. We report results for the projection of gross notional amount of CDS outstanding on the same set of explanatory variables in Table 9. All interpretations remain qualitatively the same, i.e., both total and international debt are key determinants of the cross-sectional variation in gross notional amounts outstanding. While the economic impact of foreign debt is, on average, larger, total debt matters comparatively more for developed economies.[26] Based on these observations, we formulate a second stylized fact about sovereign CDS trading:

- F2: *Both total and international debt are two key determinants of net and gross notional amounts of CDS outstanding, with international (total) debt being more important for emerging (developed) economies.*

2.4.2 Time-Series Determinants

After an examination of the cross-sectional relationship between changes in the net notional amount of sovereign CDS outstanding and country-specific characteristics, we now proceed to an examination of the time-series determinants of sovereign CDS trading. We project weekly percentage changes in the sovereign CDS net notional amounts outstanding on a set of country-specific and common risk factors, together with country fixed effects, and indicator variables for the roll dates on March 20, June 20, September 20, and December 20 of each year. In addition, we also account for residual global and regional influences.

With respect to domestic risk factors, we use the same variables that we relied on in the

[26]The regression coefficient on total debt in column (8) is statistically insignificant only because of the outlier Estonia. Controlling for the impact of Estonia in the regression will re-establish statistical significance. Detailed results are available upon request.

analysis of the cross-sectional variation in net and gross notional amounts of CDS outstanding. Due to space constraints, we omit the reporting of the lower frequency fundamental variables, such as total and international debt, GDP, and foreign exchange reserves. We nevertheless report all the regression coefficients for the higher frequency domestic risk factors, such as the weekly percentage changes in a country's credit risk, CDS volatility and liquidity, country specific stock market returns and their volatilities, as well as foreign exchange rate returns relative to the USD and their volatilities.

We use several common risk factors to capture the global equity, credit, foreign exchange, and interest rate risk environment. In particular, we use the US dollar factor, the weekly value-weighted return on all NYSE, AMEX and NASDAQ stocks from CRSP in excess of the weekly-Treasury-bill return from Ibbotson Associates, the weekly changes in investment-grade and high-yield spreads, defined as the differences between the Bank of America/Merrill Lynch US BBB and AAA corporate bond yields, and between the BB and BBB yields, respectively, and weekly changes in the 5-year constant maturity Treasury spread.[27] In addition, we proxy global hedging demand and risk aversion/bearing capacity with weekly changes in the CBOE VIX implied volatility index, based on S&P500 option prices, and weekly changes in the price of Brent crude oil. Global funding illiquidity is measured using the weekly changes in the TED spread. Finally, we proxy global risk premia with monthly percentage changes in the cyclically adjusted price-earnings ratio of the S&P500 index.

Finally, we attempt to capture any residual influence and spillover effects through global and regional CDS spreads. The global (regional) CDS spread for each country is defined as the average sovereign CDS spread of all other countries in the world (region). We then use only the true residual component of the spread by projecting that global CDS (regional)

[27] The dollar factor represents an average exchange rate against the USD rate across a large basket of countries (Lustig et al., 2011).

spread on all other explanatory variables, both global and country-specific, and then using the residual as the global (regional) spread. For the regional spreads, we group all countries into four regions, i.e., Europe, Middle East and Africa, Asia-Pacific, and Americas.

The weekly panel regression results with standard errors clustered at the country level are reported in Table 11. A key observation to be made here is that global variables add little explanatory power in explaining the time-series dynamics of net notional amounts of sovereign CDS outstanding. The adjusted R^2s attain a maximum of 3.9 percent in column (6), while a score of 3.7 percent is already obtained with just country-specific risk factors in column (3). This is very consistent with the findings of a weak factor structure among CDS traded quantities, which we previously emphasized. It is, nevertheless surprising, in light of the important evidence on the role of global risk factors in explaining sovereign CDS *prices*. This seems to suggest that common factors help explain CDS spreads because they embed time-varying risk premia that compensate investors for non-diversifiable risk exposures. On the other hand, the evidence suggests that economic quantities are primarily determined by country-specific risks.

The most important domestic risk factors in explaining the time-series variation in the net notional amount outstanding are the volatility of the domestic stock market and that of a country's credit risk. Increases in stock market volatility are associated with decreases in net notional amounts outstanding. A ten percent increase in the domestic stock market volatility leads to an approximate decrease of 3% in net notional outstanding. Credit risk uncertainty, proxied by the weekly standard deviation of daily CDS returns, has similarly a negative, and highly statistically significant relationship with net notional CDS outstanding. The economic magnitude is much smaller than that for equity volatility, though, a ten percent increase being associated with a 0.7% decrease in net notional amounts outstanding. This effect has, however, a greater magnitude of a 1.1 percent change for a ten percent increase in emerging economies, for which we report the results separately in column (8).

The effect is not significant in developed economies in column (7).

Interestingly, the sign of the regression coefficient on domestic stock market volatility is positive for the regression using percentage changes in *gross* notional amounts of CDS outstanding, as reported in Table 12. This is highly suggestive of the fact that investors exit the market when uncertainty increases, by entering into new contracts, thereby increasing the gross notional outstanding, but taking offsetting positions to reduce the net notional amount outstanding. We further validate this conjecture in Table 13, in which we use market risk transfer activity, i.e., CDS volume, as the dependent variable. We confirm a highly significant and economically meaningful relationship between country-specific stock market volatility and sovereign CDS trading volume, as a one percent increase in stock market uncertainty is associated with a 7 percent increase in volume. In the regressions with CDS volume, also credit uncertainty is a significant positive predictor of trading. The coefficient of 8.11 in column (2) suggests that the economic impact is even greater than that for stock market volatility. A separate (unreported) examination of the individual components of gross notional amounts outstanding further suggests that the CDS volatility significantly predicts contract terminations and exits, but not new trades.

Similar to the results from the cross-sectional regressions, an improvement in domestic stock market performance is associated with a reduction in net notional amount of CDS outstanding. The coefficient is, however, not statistically significant. Changes in country credit risk are also significant predictors of changes in net and gross notional amounts outstanding, although the economic magnitude is weaker, as a ten percent increase in a country's spread leads to an increase of approximately 0.1% in net notional amounts outstanding. As in the cross-sectional regressions, increases in the debt levels lead to increases in net notional amounts outstanding, but we do not report these coefficients for the sake of brevity. Changes in CDS liquidity and FX volatility are not statistically significant. Although changes in CDS liquidity are not significant determinants of net insured positions, they are, however, positively and significantly related to CDS trading volumes and gross notional amounts outstanding. This indicates that it is easier to transfer risk when the underlying asset liquidity is high, although it has no meaningful impact on the dynamics of net notional amounts of CDS outstanding, which reflects the economically more meaningful quantity of aggregate insured interest.

The local currency depreciation relative to the USD is negatively related to net notional amounts of CDS outstanding, which could simply reflect a mechanical valuation effects for the positions reported in USD equivalents. For that reason, in all our time-series regressions, we include a global US dollar factor, which captures the average appreciation of the dollar relative to all other countries. This variable is significant and negatively related to the net notional amounts outstanding. This highlights important valuation effects in the reporting of the data by DTCC, which posts all CDS trading quantities in USD equivalents. The stronger the individual foreign currencies become relative to the USD (i.e., a lower US dollar factor), the higher the USD equivalent of foreign currency CDS contracts.

Several global factors are positively associated with net notional amounts of CDS outstanding. The regression results in column (8) suggest that the net sovereign exposures increase in emerging economies when the excess U.S. equity return exhibits a positive performance, and for all countries when the Brent crude oil price increases. Both variables suggest an increase of approximately 0.3% to 0.5% in net notional amount of CDS outstanding for a ten percent increase in each risk factor, respectively. US equity risk premia, proxied by changes in the cyclically adjusted price-earnings ratio of the S&P500 index, are also statistically significant only for emerging markets. The separation for developed economies in column (7), and emerging economies in column (8), suggests, however, that the effect is conditional on the degree of country development. Risk premia are negatively related to net notional amounts outstanding in developed countries, and positively in emerging countries. The coefficients of the changes in the high-yield and junk-grade corporate bond indices, the VIX index, as well as changes in the 5-year constant maturity Treasury spreads, are weakly or not statistically significant. The TED spread is only significant for developed economies. Similarly, the dynamics of global and regional credit risk appear to bear little relationship to the aggregate positions in net and gross notional amounts outstanding.

In Table 12, we verify the relationship between the domestic and global risk factors and the weekly percentage changes in the gross notional amount of CDS outstanding. The results largely echo the relationship we found for net notional amount outstanding. Positive shocks to domestic stock markets (volatility) lead to less (more) gross CDS notional amounts outstanding, and increases in domestic credit risk lead to greater amounts of gross notional CDS outstanding. There are, however, also several noticeable differences. As we already mentioned, the opposing signs of the coefficients for stock market volatility suggest that higher uncertainty leads investors to trade more, but these trades are initiated to reduce the net amounts of insured interest. The results for gross notional amounts of CDS outstanding further suggest that an increase in funding illiquidity, i.e., the TED spread, an increase in interest rates, and an increase in the high-yield bond spreads, decrease gross notional amounts outstanding. On the other hand, positive changes in the VIX index reduce the amount of gross notional amounts of CDS outstanding. However, the relationships with regional and global credit risk are not statistically significant.

Overall, these dynamics are suggestive of the conclusion that when the level of risk increases, investors insure more sovereign credit risk. However, when uncertainty increases, investors appear to exit the market, which increases trading volumes. Thus, equity and credit risk volatility are also very significantly (at the 1% level) related to CDS market risk transfer activity, which includes novations and CDS assignments. Thus, when uncertainty increases, investors have a greater tendency to "pass around the hot potato". Importantly, though, country-specific risk factors paint a more detailed picture about the dynamics of sovereign CDS trading. Thus, it seems that sovereign insurance trading is better determined by country-specific risk factors than by aggregate macroeconomic fundamentals. While it may be intuitive to think that the trading of insurance is primarily linked to country-specific idiosyncratic risks, this is not at all obvious ex ante, for two primary reasons. First, trading in CDS contracts is heavily concentrated among the large U.S. broker-dealers acting as the main trading facilitators (Giglio, 2014; Augustin, 2014). Hence, since these broker-dealers represent the main operators in this market, it is plausible that traded quantities are influenced by aggregate risk aversion and global risk factors specific to them. Second, there is a large literature documenting a significant influence of global risk factors on sovereign CDS spreads, and that U.S. financial risk is better in explaining sovereign default probabilities (Longstaff et al., 2011). The latter argument, especially, may suggest that sovereign insurance quantities are also likely to be better explained by the same global risk factors. We further examine these findings through country by country regressions in the following sub-section.

2.4.3 Country Regressions

We have provided evidence that the trading of sovereign default insurance is primarily determined by country-specific risk factors. In order to better gauge the relative importance of local vs. global risk, we now analyze country-specific effects and run the time series regressions separately for each country.

For each sovereign, we report in Table 14 the local ratio, defined as the ratio of the adjusted R^2 from a restricted regression with only the country-specific risk factors to the adjusted R^2 from the full regression. This ratio is a proxy measure for the fraction of the explained variation that is captured by country-specific factors relative to global risk factors. Even though there is some cross-sectional variation in local ratios, the distribution suggests that, for most countries, the greatest fraction of the explained variation comes from domestic risk. The average (median) local ratio statistic is 97% (94%). This is surprising, especially as the sovereign CDS market is strongly concentrated, with the large broker-dealers acting as the main trading facilitators, as pointed out earlier (Giglio, 2014; Augustin, 2014). These results lead us to formulate a third stylized fact about sovereign CDS trading:

- F3: *The dynamics of sovereign CDS trading are better explained by country-specific than by global risk factors*

Another observation is that even though domestic risks represent the dominant fraction of the explained variation, there is still a substantial amount of variation that is left unexplained. In order to better understand the underlying sources of trading, we therefore explore more granular evidence on several economic channels that are suggested by the previous regression analysis and by the institutional framework in CDS markets. First, given the tight relationship between net or gross notional amounts of CDS outstanding and both country-specific credit risk and stock market performance, we will examine the impact of potentially unexpected shocks to domestic credit risk on sovereign CDS trading. We study the impact of the sovereign credit rating and credit outlook changes, as well as the result of tail risks in sovereign credit risk. Second, we have shown that greater sovereign debt leads to more CDS quantities outstanding. Hence, we exploit the heterogeneity in the timing and intensity of bond issuance by different governments to relate CDS trading to the dynamics of general government debt. Third, given the importance of credit and equity uncertainty in explaining the dynamics of sovereign CDS quantities, we explore their relationship with macroeconomic news and sentiment. Fourth, we explore two specific regulatory channels that could have a significant impact on the trading of sovereign CDS. Given the zero risk weights imposed by European regulators on the capital requirements for domestic currency denominated government debt, hedging of excessive sovereign debt exposure may lead to sovereign CDS trading. Furthermore, given the prescription by the Basel regulatory framework for banks to use sovereign CDS as a tool to offset regulatory capital charges for uncollateralized "wrong-way risk of sovereign and quasi-sovereign counterparties, this risk may partially be, at least partially, responsible for trading in sovereign CDS.

3 Economic Channels of Sovereign CDS Trading

In the second part of this paper, we examine several specific channels that may explain the dynamics of sovereign CDS trading. Our investigations are motivated by the empirical findings in the previous sections that describe the anatomy of the sovereign CDS market.

3.1 Shocks to Credit Risk

We have shown that country-specific credit risk and bond yield volatility are important determinants of the cross-sectional and time-series variation of both net and gross notional amounts of CDS outstanding. In addition, the health of the domestic stock market, which may exhibit feedback effects with domestic sovereign credit risk, is a statistically significant predictor. We therefore conjecture that shocks to a country's credit risk, in the form of changes to a country's credit rating and credit rating outlooks, may lead to changes in the total quantity of insured credit risk. In particular, we investigate the *regulatory rating channel* by focusing on rating changes that would result in a change in capital requirements for holding the underlying government debt, according to the standardized approach in the Basel regulatory framework for bank capital.[28] If sovereign CDS are primarily hedging vehicles, then only credit rating changes that cross a threshold should impact sovereign

[28]In the Basel II framework, for the standardized approach, the risk weights associated with sovereign credit ratings are 0% for AAA to AA-, 20% for A+ to A-, 50% for BBB+ to BBB-, 100% for BB+ to B-, 150% for ratings below B-, and 100% unrated countries.

CDS trading due to adjustments in the hedging demand. This leads us to formulate the first testable hypothesis.

- H1: *There is more (less) sovereign insured interest, i.e., net notional amount outstanding, when there is a credit rating downgrade (upgrade).*

In line with the standardized approach for credit risk capital charges in the Basel framework, we define the indicator variable *Upgrade* to take the value one during the week a country's credit rating changes from (i) below B- to B- or higher, (ii) below BBB- to BBB- or higher, (iii) below A- to A- or higher, (v) below AA- to AA- or higher, and zero otherwise. We define the indicator variable *Downgrade* to take the value during the week a country's credit rating changes from (i) B- or higher to below B-, (ii) BBB- or higher to below BBB-, (iii) A- or higher to below A-, (iv) AA- or higher to below AA-, zero otherwise. In addition, we examine credit rating outlook changes and define *Pos* Δ *Outlook* as an indicator variable that is equal to one, if the rating outlook changes from negative to neutral, from negative to positive outlook, or from neutral to positive, and zero otherwise. *Neg* Δ *Outlook* is an indicator variable that is equal to one, if the rating outlook changes from positive to neutral, from neutral to negative, or from positive to negative, and zero, otherwise. The focus is again on those outlook changes that are consistent with regulatory thresholds, resulting in effective changes in capital requirements if the outlook materialized. We examine the contemporaneous and lagged credit rating (outlook) and the changes in these variables. According to this definition, the sample contains 27 downgrades, 15 upgrades, 15 negative outlook changes, and 8 positive outlook changes. We specify the following empirical model for weekly percentage changes in net notional amount of CDS outstanding:

$$\Delta NN_{i,t+1} = a + \sum_{k=0}^{1} b_k^1 (Pos\ \Delta\ Outlook)_{t-k} + \sum_{k=0}^{1} c_k^1 (Neg\ \Delta\ Outlook)_{t-k}$$
$$+ \sum_{k=0}^{1} d_k^1 (Upgrade)_{t-k} + \sum_{k=0}^{1} e_k^1 (Downgrade)_{t-k} + \delta X_{i,t} + \gamma Y_t + \alpha_i + \xi_t + \varepsilon_{i,t}, \qquad (5)$$

where $X_{i,t}$ and Y_t define the vectors of country-specific and common global control variables, respectively, and α_i and ξ_t define the country and monthly time fixed effects. Table 15 documents our findings, using standard errors clustered at the country level. The first column indicates a statistically significant and negative relationship between changes in net notional amounts of CDS outstanding and regulatory credit rating downgrades. On average, a downgrade reduces the net quantity of insured credit risk by two percent. The coefficient on upgrades is also significantly negative, with a magnitude of 2.8 percent. Contemporaneous outlook changes are not significant. Column (2) augments the model with lagged variables. Interestingly, the lagged coefficient for negative outlook changes is *positive* and statistically significant, and of the same magnitude as the contemporaneous impact from downgrades. On the other hand, lagged positive outlook changes are not significant. This is highly suggestive that sovereign CDS are used for hedging rather than for speculative purposes. A negative credit rating outlook increases the need to hedge existing credit risk exposures. Once a sovereign gets downgraded to a category that requires higher regulatory capital, investors, at the margin, dispose of the debt, which reduces the hedging need, implying a reduction in net notional insured credit risk. Similarly, following an upgrade, there is a reduction in regulatory capital requirements, but there is no need to hedge if the positive outlook change is announced with a lag. Columns (3) and (4) show that this effect is robust, and that the magnitude of the coefficients does not change in a meaningful way, when we control for country-specific and common risk factors.

We point out that we achieve statistical significance despite a limited number of 27 downgrades and 15 negative outlook changes. We compare this in column (7) with the larger sample of *all* ratings (outlooks) and their changes, and not just those associated with a change in regulatory capital requirements, which generates a total of 79 downgrades, 40 upgrades, 42 negative watch lists, and 25 positive watch lists. Using this "richer" alternative of rating changes yields much weaker statistical significance in our regression framework, and, more importantly, a lower economic magnitude. The coefficients on lagged outlook changes and downgrades reduce by 50 percent. In column (8), we reexamine the effect of rating actions on the dynamics of net notional amounts of CDS outstanding, using all actions that do not result in changes in regulatory capital requirements. All coefficients become insignificant, except for lagged rating downgrades, but the economic magnitude of the coefficient is only 0.006, i.e., very small.

We also examine the impact of fallen angels (downgrades from investment-grade to junk status) and knighted devils (upgrade from junk to investment-grade status), but such specifications are not significant. Thus, it is truly the regulatory rating channel that is responsible for increasing net notional amounts of CDS outstanding in the presence of negative credit rating outlook changes, followed by a reduction of two percent if the country gets subsequently downgraded. This raises a particular question relating to other research. Korte and Steffen (2015) discuss the "zero-risk subsidy" relating to the dispensation that banks are not required to hold any regulatory capital against their holdings of domestic currency denominated bonds. Thus, we should observe a stronger effect for the group of non-EU members, who do not get the EU reprieve on regulatory capital requirements. In unreported regressions, we do confirm that the impact of downgrades on net notional amounts outstanding is stronger for non-EU countries, as the magnitude of the coefficient increases to 0.032, and it is statistically significant. On the other hand, it is not significant for EU-member countries, for which CDS contracts do not offer such a regulatory concession. While these findings confirm the hedging motive, we cannot rule out the possibility that the lack of significance for EU-member countries may be due to a lack of statistical power, given the more modest subsample size.

In column (5), we repeat the analysis for weekly percentage changes in gross notional amounts outstanding. Similar to the regression for net notional amount outstanding, a negative credit rating outlook change in the previous week increases gross notional mounts of CDS outstanding. Nevertheless, contemporaneous downgrades do not affect changes in gross sovereign CDS positions. This is reassuring for the interpretation of the hedging motive we propose. Gross notional amounts outstanding contain CDS contract novations and assignments, which are part of CDS trading volume, i.e., market risk transfer activity. Thus, downgrades reduce the net economic quantities of sovereign insured interest, but not the gross positions. Overall, these results are more in line with the view that sovereign CDS are used for hedging, rather than for speculative purposes.

To assure ourselves of the robustness of our results, we compare the impact of lagged negative outlook changes and contemporaneous rating downgrades in the sample of treated countries to that in a matched control sample. Column 6 reports results for a matched sample, where we match with replacement countries from the same geographical region, using the first best match based on the Mahalanobis distance between the vector of observed covariates across treated and non-treated countries. The match is based on the CDS spread level, the credit rating, and the ratio of net notional to debt outstanding in the quarter immediately preceding the rating or outlook action.[29] Table 16, which reports summary statistics for the treatment and matched control samples, confirms the quality of the match. The summary statistics between the treated and matched samples are statistically indistinguishable for the match based on negative outlook changes (Panel B), despite the limited

[29]We closely follow Abadie and Imbens (2011) for the matching procedure. We alternatively matched using only the CDS spread level and the credit rating, and using the the CDS spread level, the credit rating, and total debt to GDP. All results remain unchanged.

number of countries available for the matching procedure. Debt-to-GDP is statistically different in both samples if we match ahead of the rating downgrades, although the last two columns in Panel A highlight that this difference is due to the impact of Greece, whose debt levels have swollen during the Eurozone sovereign debt crisis. The matching is coarser for the CDS spread level and the nominal amount of gross notional CDS outstanding, as these statistics are significantly different in both subsamples. Table 17 provides a detailed list of the itemized matches for each event.

The findings in column (6) confirm that the documented effect of rating actions and lagged negative outlook changes is not due to a common factor that jointly affects the treated and matched control groups. The coefficients for downgrades and outlook changes are insignificant. The difference-in-differences estimators, i.e., the average treatment effects, reported at the bottom of the table, are statistically significant at the 5 percent level, and of roughly equal economic magnitude to the average treatment effect on the treated. This mitigates endogeneity concerns and points towards a robust impact of regulatory rating actions on net notional amounts of CDS outstanding.

3.2 Government bond issuance and the debt channel

In the first part of the paper, we show that total and international government debt are two primary determinants of the cross-sectional dispersion in net and gross notional amounts of CDS outstanding, as they jointly explain about 60% of the cross-sectional variation. Thus, we explore whether shocks to a country's debt stock significantly impact the net and gross economic quantities of CDS outstanding. We examine both the timing of the announcement of a debt issue and the actual issuance date. If CDS are really used for hedging purposes, then we should observe an increase in net notional amounts outstanding following a debt issue, but not following an announcement. In addition, given that the underlying debt instrument for sovereign CDS contracts is foreign denominated debt, we expect to see greater effects for international debt issues. We thus postulate a second hypothesis.

- H2: *Net notional amounts of CDS outstanding are increasing, following the issuance of international government debt.*

We manually download the information on debt issuance and debt issuance announcement dates from Bloomberg. We use all sovereign bond issuances with maturities above one year, as short-term bills are often mechanical debt roll-overs, especially in the United States. We classify a bond issuance as international if the Bloomberg description contains the terms “International Bond,” “International,” or “Foreign Bond,” or if it is denominated in a currency other than the home/local currency of the issuer. Otherwise, we classify each event as a domestic bond issuance. We manually verify all bond prospectuses for accuracy.[30]

In total, we have 558 international bond issuances and 2,461 domestic bond issuances. For each event, we have both the announcement and the effective issuance date. As our dependent variables is measured at the weekly frequency, we aggregate several bond issues of the same country within the same week and compute the average issuance weighted by the size of the debt issue. The average value-weighted maturity for international issues is 10.8 years, and ranges from a minimum of two years to a maximum of 100 years (Mexico). The average value-weighted maturity for domestic issues is 8.7 years, slightly lower, and ranges from a minimum of two years to a maximum of 53 years. The average international bond issue by a country corresponds to about 2.5% of its total outstanding debt, while the average domestic bond issue corresponds to about 1.7% of its total outstanding debt. To test our hypothesis, we examine the following regression specification:

[30]Note that Saudi Arabia and Estonia did not issue any bonds during the sample period. In fact, Saudi Arabia, like China, has never issued an international bond.

$$\ln(NN_{i,t+1}/NN_{i,t}) = a + [b^1 + b^2(D\_Issue_{1b}(\%)) + b^3T_1 + b^4(T_1 \cdot D\_Issue_{1b}(\%))](I_1)_{t-k} + \delta X_{i,t} + \gamma Y_t + \alpha_i + \varepsilon_{i,t}, \tag{6}$$

where I_1 is an indicator variable that takes on the value one, in the week of a debt issue, $D\_Issue_{1b}(\%)$ is the amount of issued debt as a fraction of total outstanding debt, T_1 denotes the value-weighted average maturity of the debt issuance, $X_{i,t}$ and Y_t are the vector of country-specific and global control variables we used earlier. We use country fixed effects in all regressions and cluster all standard errors by country.

All results are reported In Table 18 (19) for net (gross) notional amounts of CDS outstanding. A first important take-away is that actual issuance dates matter, but not the announcements. The coefficients for the predictors related to domestic debt issuance are insignificant, both for net and gross notional amounts outstanding. These results correspond to the coefficients reported below the dashed line in both tables. In addition, we show, in unreported regressions, that none of the coefficients for domestic debt issuances are significant. Thus, it is truly an increase in outstanding debt amounts that matter for sovereign CDS trading. The findings otherwise suggest that the greater the amount of international debt issued as a fraction of total outstanding debt, the greater the increase in net notional amounts outstanding. A one percent increase in debt issuance is associated with 0.3% increase in net insured interest. The regression coefficients in columns (6) and (7) have very similar magnitudes, but the coefficient is not significant for developed economies, which is likely due to a lack of power. In fact, the results for gross notional amounts outstanding in Table 19 show that the effect is statistically significant at the 1% level. The coefficient on the maturity coefficient interacted with the amount issued is negative and significant, but the magnitude of the coefficient is much smaller than for the the amount of debt issued. Thus, while the average effect is positive, it is greater for the issuance of riskier short-term debt.

Column (8) reports the results for a similar regression using one specific component of gross notional amounts of CDS outstanding, i.e., new trades. This specification strongly confirms the previous findings. When international debt gets issued, there is an increase in the initiation of new trades, and the effect is stronger for short-term debt issues.

3.3 Macroeconomic News and Sentiment

In this section, we analyze several country-specific shocks that increased economic and political uncertainty to quantify the impact of unexpected announcements on the trading of sovereign CDS. Some of these events include the elimination of the Swiss currency peg in January 2015, the death of Nelson Mandela in December 2013, the Fukushima earthquake in April 2011, and the invasion of Russia in Ukraine in March 2014. Figure 7 illustrates how the peaks in sovereign CDS trading volumes can be clearly linked to weeks that are associated with major geopolitical events.

3.4 Regulatory Channel

To provide some preliminary insights, we relate the dynamics of sovereign CDS trading to bank capital adequacy requirements, which encourage the use of sovereign CDS to hedge sovereign counterparty exposures. While these issues are briefly discussed in Bilal and Singh (2012b) and in the conclusion of Kallestrup et al. (2014), we are not aware of any study of how bank regulation may affect the market for sovereign CDS. Thus, we believe that this study may be of significant interest to bank regulators and the wider banking community. Lando and Klingler (2015) develop a theoretical model that characterizes the impact of the regulatory channel on sovereign CDS *prices*, but not on quantities. This model may also be directly testable in our framework.

We collect data on some direct measures of bank sovereign credit exposure. Ideally, one would like to have the net sovereign exposure for each individual bank; however, such data would be very difficult to obtain. For the U.S. banks it is possible to get off-balance sheet data on the U.S. banks' use of derivatives hedging purposes from the "CALL Reports," as we show in Table A-2.[31] In Europe, bank stress test results, published by the European Banking Authority for 2010 and 2011, contain relevant data. During the percival of these stress tests, banks were required to provide full disclosure of their sovereign exposures, with a degree of detail that would allow market participants to also calculate the impact of adverse developments with alternative methodologies and scenarios. We, thus, collect relevant data from these reports in order to provide a snapshot of banks' sovereign exposures, and for us to use it as a robustness test against our constructed measures.

4 Conclusion

Sovereign credit default swaps remain a controversial, under-researched topic, especially with regard to trading activity. We believe that the results of this research provide a valuable perspective on the dynamics of the sovereign CDS market. This is particularly relevant in light of current regulatory discussions around the naked CDS ban, and the Basel capital requirements that prescribe sovereign CDS as hedging tools against sovereign and quasi-sovereign counterparty risk. Overall, our findings suggest that sovereign CDS are more likely to be used for hedging than for speculative purposes.

An examination of traded quantities in the sovereign credit insurance market reveals

[31] All U.S. banks are required to file the quarterly Consolidated Report of Condition and Income, generally referred to as the CALL Report. One of the schedules of the CALL Reports, which is important for our purposes, are the "Derivatives and Off-Balance Sheet Items."

that trading is primarily determined by country-specific risk factors, rather than by aggregate common financial risk. Total and international general government debt are jointly able to explain 60% of the cross-sectional differences in net economic insured interest. Both credit risk and stock market uncertainty lower net notional amounts outstanding, while they increase trading volume and gross positions. Similarly, negative shocks to credit rating outlook increase net insured interest, while downgrades that result in an increase in regulatory capital lower net positions by an equal amount. Debt issuance dates are also shocks that increase net amounts of sovereign CDS outstanding. We further examine the role macroeconomic shocks and various regulatory channels. All our findings point towards investors using sovereign CDS as hedging vehicles, at the margin. Hence, these findings cast doubt on the validity of allegations that speculators drive up sovereign borrowing costs by buying naked insurance on sovereign default.

References

Abadie, A. and Imbens, G. (2011). Bias-corrected matching estimators for average treatment effects, *Journal of Business & Economic Statistics* **29**(1–11).

Acharya, V. V., Drechsler, I. and Schnabl, P. (2014). A pyrrhic victory? - bank bailouts and sovereign credit risk, *The Journal of Finance* **69**(6): 2689–2739.

AFME, ICMA and ISDA (2011). The impact of derivative collateral policies of european sovereigns and resulting basel iii capital issues.
URL: *http://www2.isda.org/news/afme-icma-and-isda-publish-paper-analyzing-the-impact-of-european-sovereigns-collateral-policies*

Anton, M., Mayordomo, S. and Rodriguez-Moreno, M. (2013). Dealing with dealers: Sovereign cds comovements in europe, *Working Paper* .

Augustin, P. (2013). The term structure of cds spreads and sovereign credit risk, *Working Paper* .

Augustin, P. (2014). Sovereign credit default swap premia, *Journal of Investment Management* **12**(2): 65–102.

Augustin, P., Subrahmanyam, M. G., Tang, D. Y. and Wang, S. Q. (2014). Credit default swaps: A survey, *Foundations and Trends in Finance* **9**(1–2): 1–196.

Augustin, P. and Tédongap, R. (2015). Real economic shocks and sovereign credit risk, *Journal of Financial and Quantitative Analysis* **forthcoming**.

Berg, T. and Streitz, D. (2012). The determinants of the sovereign cds volume, *Working Paper* .

Bilal, M. and Singh, M. (2012a). Cds spreads in european periphery - some technical issues to consider, *Working Paper IMF No 12/77* .

Bilal, M. and Singh, M. (2012b). Cds spreads in european periphery - some technical issues to consider, *Working Paper IMF No 12/77* .

Biswas, G., Nikolova, S. and Stahel, C. W. (2015). The transaction costs of trading corporate credit, *Working Paper* .

Criado, S., Degabriel, L., Lewandowska, M., Linden, S. and Ritter, P. (2010). Sovereign cds report, *Official Report DG COMP, DG ECFIN and DG MARKT* .
URL: *http://www.ft.com/intl/cdsreport*

Dongyoup, L. (2011). The information in credit default swap volume, *Working Paper Columbia University* .

Du, W., Gordy, M. B., Gadgil, S. and Vega, C. (2015). Counterparty risk and counterparty choice in the credit default swap market, *Working Paper Federal Reserve Board* .

Duffie, D. (2010b). Is there a case for banning short speculation in sovereign bond markets?, *Banque de France Financial Stability Review - Derivatives, Financial innovation and stability* **No. 14**.

Duffie, D. (April 29 2010a). Credit default swaps on government debt: potential implications of the greek debt crisis, *Testimony to the United States House of Representatives, Subcommittee on Capital Markets, Insurance, and Government Sponsored Enterprises* .

Duffie, D., Li, A. and Lubke, T. (2011). Policy perspectives on otc derivatives market infrastructure, *Federal Reserve Bank of New York, Staff Report no. 424* .

Gennaioli, N., Martin, A. and Rossi, S. (2012). Sovereign default, domestic banks, and financial institutions, *The Journal of Finance* **69**(2): 819–866.

Giglio, S. (2014). Credit default swap spreads and systemic financial risk, *Working Paper* .

Kallestrup, R., Lando, D. and Murgoci, A. (2014). Financial sector linkages and the dynamics of bank and sovereign credit spreads, *Working Paper* .

Korte, J. and Steffen, S. (2015). Zero risk contagion - banks' sovereign exposure and sovereign risk spillovers, *Working Paper* .

Lando, D. and Klingler, S. (2015). Safe-haven cds premia, *Working Paper* .

Lo, A. W. and Wang, J. (2010). *Stock Market Trading Volume*, Vol. 2 of *The Handbook of Financial Econometrics, eds. Yacine Ait-Sahalia and Lars P. Hansen*, North-Holland.

Longstaff, F. A., Pan, J., Pedersen, L. H. and Singleton, K. J. (2011). How sovereign is sovereign credit risk?, *American Economic Journal: Macroeconomics* **3**(2): 75–103.

Lustig, H., Roussanov, N. and Verdelhan, A. (2011). Common risk factors in currency markets, *Review of Financial Studies* .

Oehmke, M. and Zawadowski, A. (2014a). The anatomy of the cds market, *Working Paper* .

Oehmke, M. and Zawadowski, A. (2014b). Synthetic or real? the equilibrium effects of credit default swaps on bond markets, *Working Paper* .

Pan, J. and Singleton, K. J. (2008). Default and recovery implicit in the term structure of sovereign cds spreads, *The Journal of Finance* **63**(5): 2345–2384.

Portes, R. (2010). Ban naked cds, *Euro Intelligence* .

Pu, X. and Zhang, J. (2012). Sovereign cds spreads, volatility, and liquidity: Evidence from 2010 german short sale ban, *Financial Review* **47**(1): 171–197.

Qiu, J. and Yu, F. (2012). Endogenous liquidity in credit derivatives, *Journal of Financial Economics* **103**(3): 611–631.

Reinhart, C. M. and Rogoff, K. S. (2008). This time is different: A panoramic view of eight centuries of financial crises, *NBER Working Papers 13882*, National Bureau of Economic Research, Inc.

Roelkens, F. (2013). Determinants of the sovereign credit default swap market, *Master Thesis in Financem Stockholm School of Economics* .

Sambalaibat, B. (2013). Cds and sovereign bond market liquidity, *Working Paper* .

Shachar, O. (2012). Exposing the exposed: Intermediation capacity in the credit default swap market, *Working Paper* .

Siriwardane, E. (2014). Concentrated capital losses and the pricing of corporate credit risk, Working Paper.

Tang, D. and Yan, H. (2013). What moves cds spreads?, *Working Paper* .

Wang, J. (2002). Trading volume and asset prices, *Annals of Economics and Finance* **3**: 299–359.

Figure 1: DTCC Sovereign Coverage Ratio

This figure shows how much of the overall single name sovereign CDS trading volume is accounted for by the sovereign reference entities listed among the 1,000 most heavily traded reference entities in the DTCC Trade Information Warehouse over the time period November 2008 to September 2015. The observation frequency is weekly. The lines indicate the fraction of the total sovereign CDS trading volume of the sovereign reference entities in the top 1,000 list. *All Sovereigns* refers to sovereign countries, sovereign states and state bodies. *Sovereign Countries* refers to sovereign countries only. Source: DTCC.

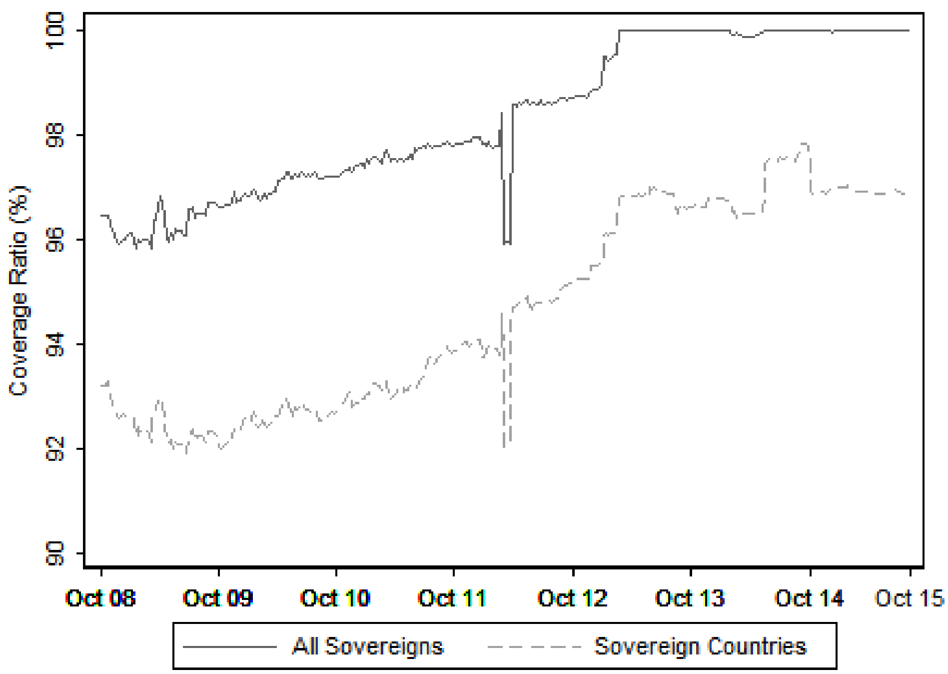

Figure 2: CDS Gross and Net Notional Amounts Outstanding

This figure reports total and average gross and net notional amounts of CDS outstanding in billion USD equivalents. The top panels of the figure present the total weekly sovereign CDS gross and net notional outstanding. The bottom panels present the average weekly sovereign CDS gross and net notional outstanding. The shaded area represents the inter-quartile range. The sample period is October 2008 to September 2015. Source: DTCC.

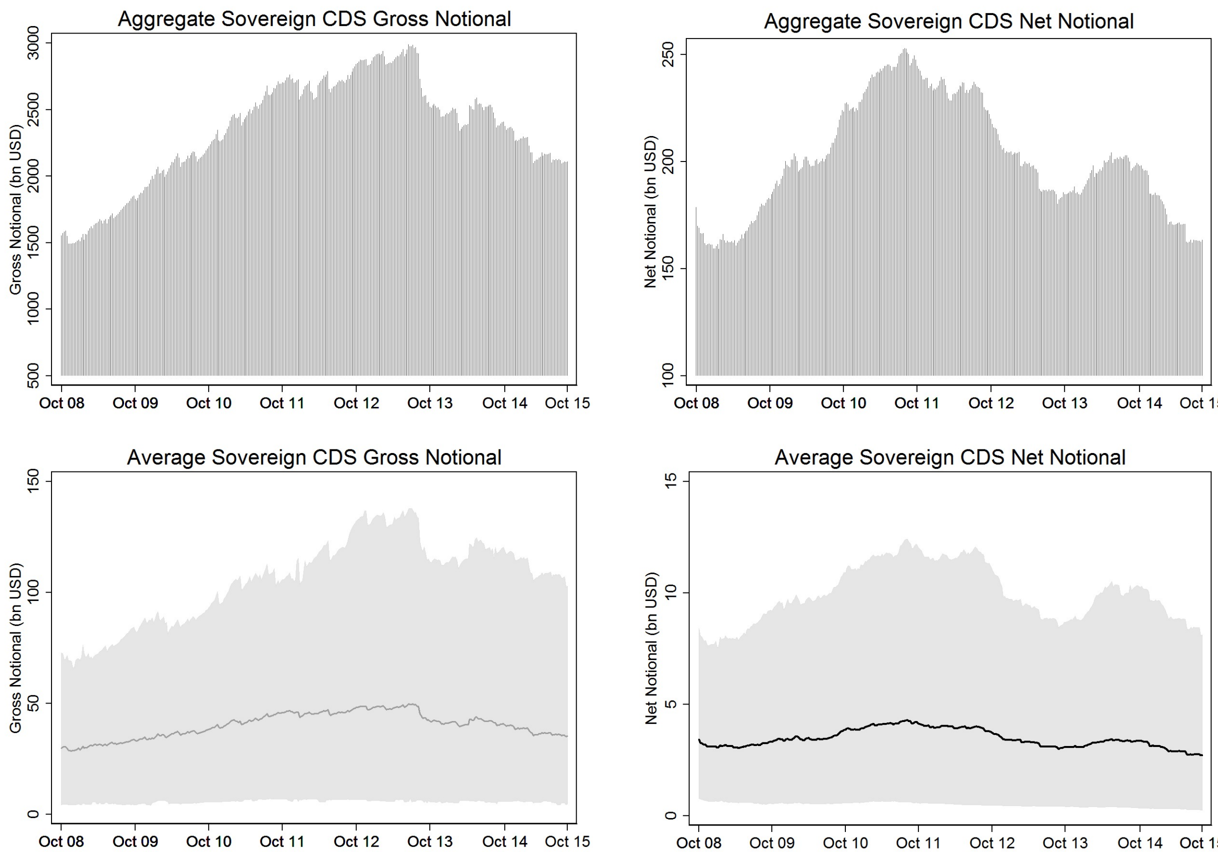

Figure 3: Sovereign CDS Net Notional Amounts Outstanding

This table reports country averages of net notional amounts of CDS outstanding in billion USD equivalents. The top panel displays the cross section of the average net notional outstanding in the full sample of countries. The box, in the top panel, reports the 10 countries with the highest average CDS net notional outstanding during our sample period. The bottom panel displays the cross section of the average net notional outstanding in the 25 countries with the highest average CDS net notional outstanding during our sample period. The net notional is measured in billion USD. The sample period is October 2008 to September 2015. Source: DTCC.

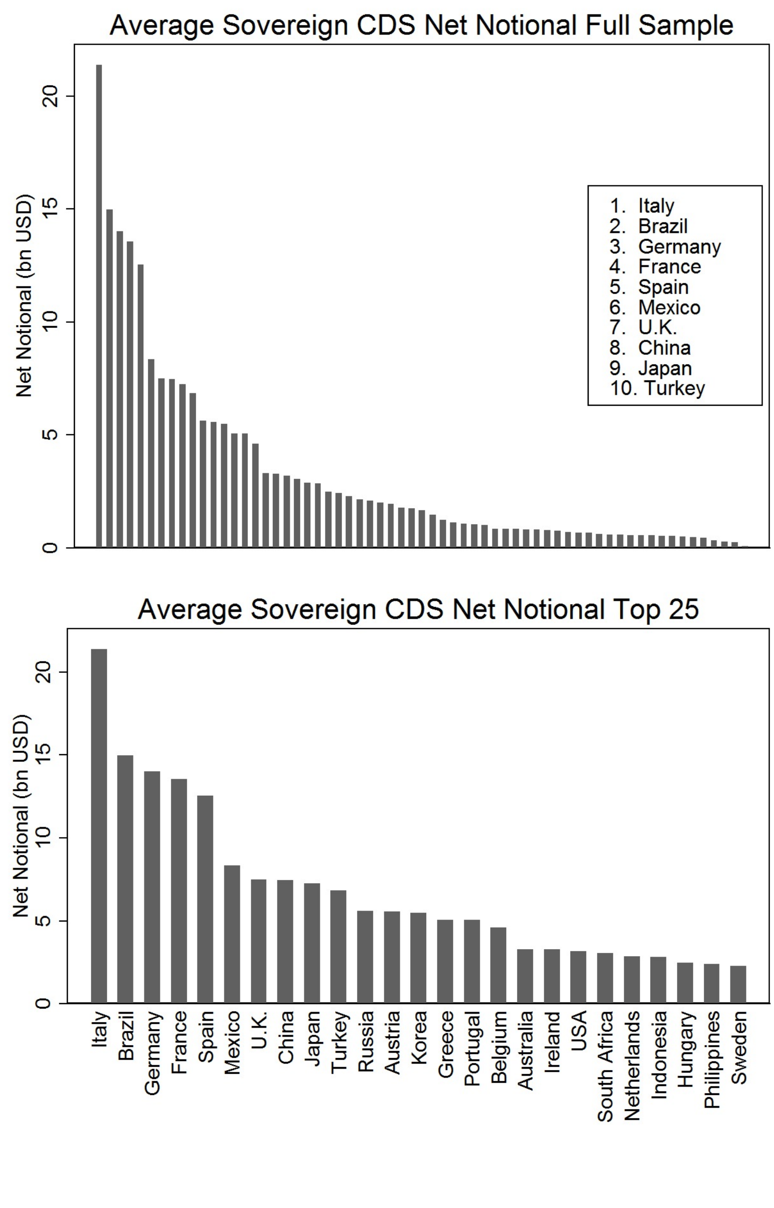

Figure 4: CDS Trading Intensity

The upper panel in this figure presents both the average and interquartile time series variation of the trading intensity measure, defined as the ratio of total CDS gross notional amount outstanding to total CDS net notional amount outstanding, both measured in billion USD equivalents. The lower panel presents a histogram of the trading intensity measure. The sample period is October 2008 to September 2015. Source: DTCC.

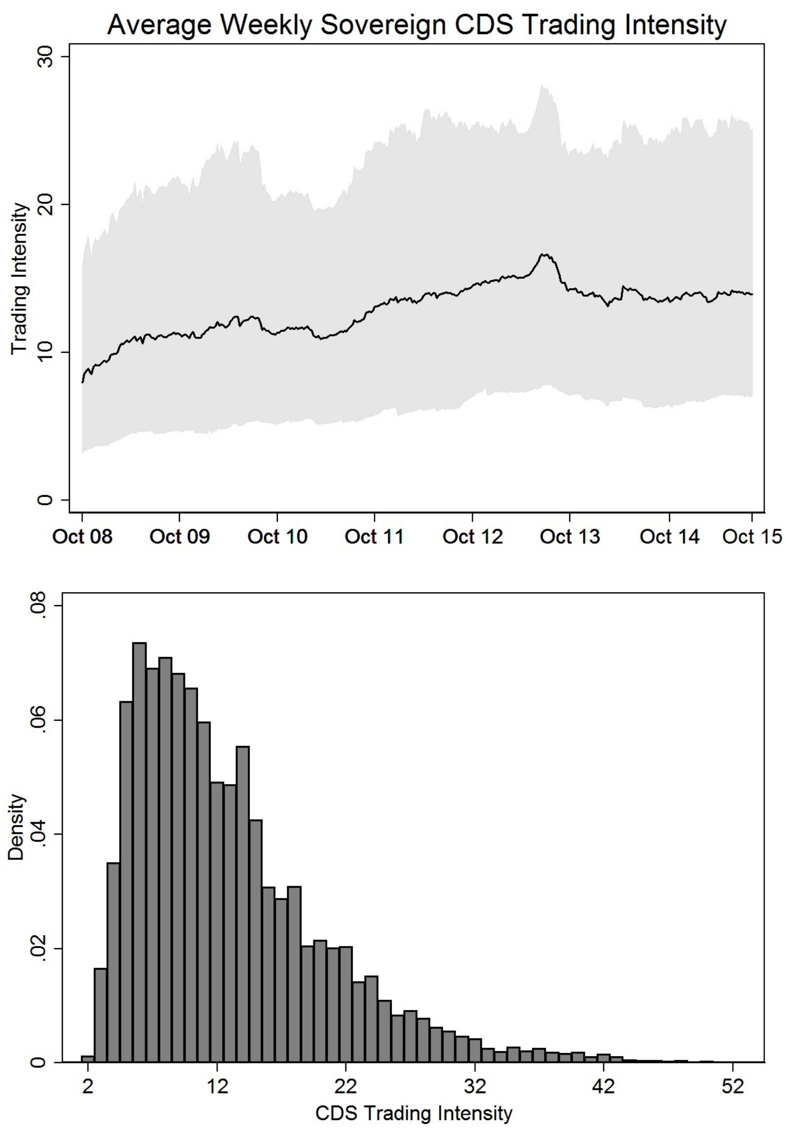

Figure 5: International General Government Debt

The top left (right) panel of the figure presents the aggregate quarterly international (total, i.e., domestic and international) general government debt outstanding in billion USD. The dotted line in the top figures represents the share of the aggregate (international or total, respectively) debt outstanding represented by the debt of the 20 OECD countries. The bottom left (right) panel presents the average quarterly international (total, i.e., domestic and international) general government debt outstanding in billion USD for each country in our sample. The legend of the bottom figures lists the top ten countries by international debt outstanding. The sample period is the second quarter 2008 to the second quarter 2015. Source: Bank for International Settlements (BIS).

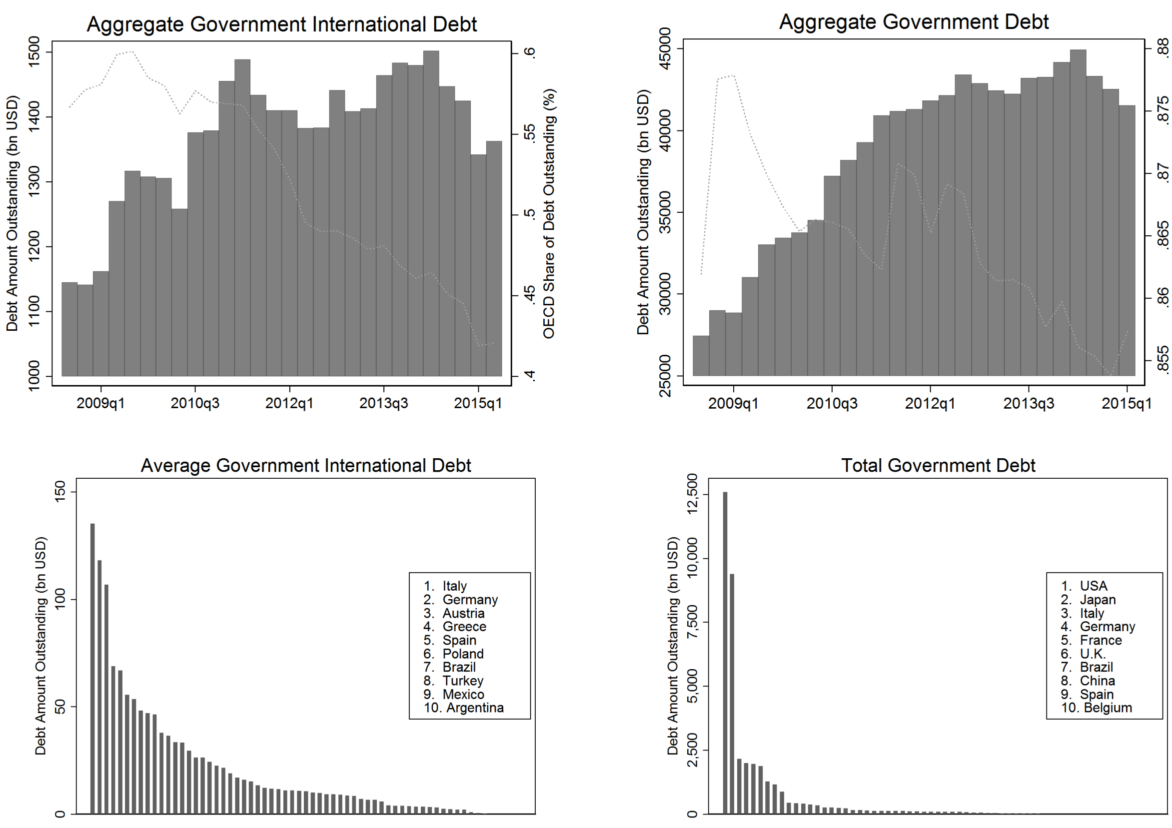

Figure 6: Predicted vs. Actual Net Notional Amount of CDS Outstanding

This figure plots the predicted net notional amount of CDS outstanding against the actual net notional amount of CDS outstanding using the empirical model

$$\ln(\hat{\text{NN}})_{i,t} = c + \gamma_t + b_1 \ln(\text{Total Debt})_{i,t} + b_2 \ln(\text{Int Debt})_{i,t} + b_3 \ln(\text{GDP})_{i,t} + b_4\,\text{USA},$$

controlling for time fixed effects γ_t, total general government debt, total international general government debt, GDP, and an indicator variable that takes on the value one for the United States and zero otherwise. The fitted regression line excludes the United States. The sample period is the second quarter 2008 to the second quarter 2015. Source: Bank for International Settlements (BIS).

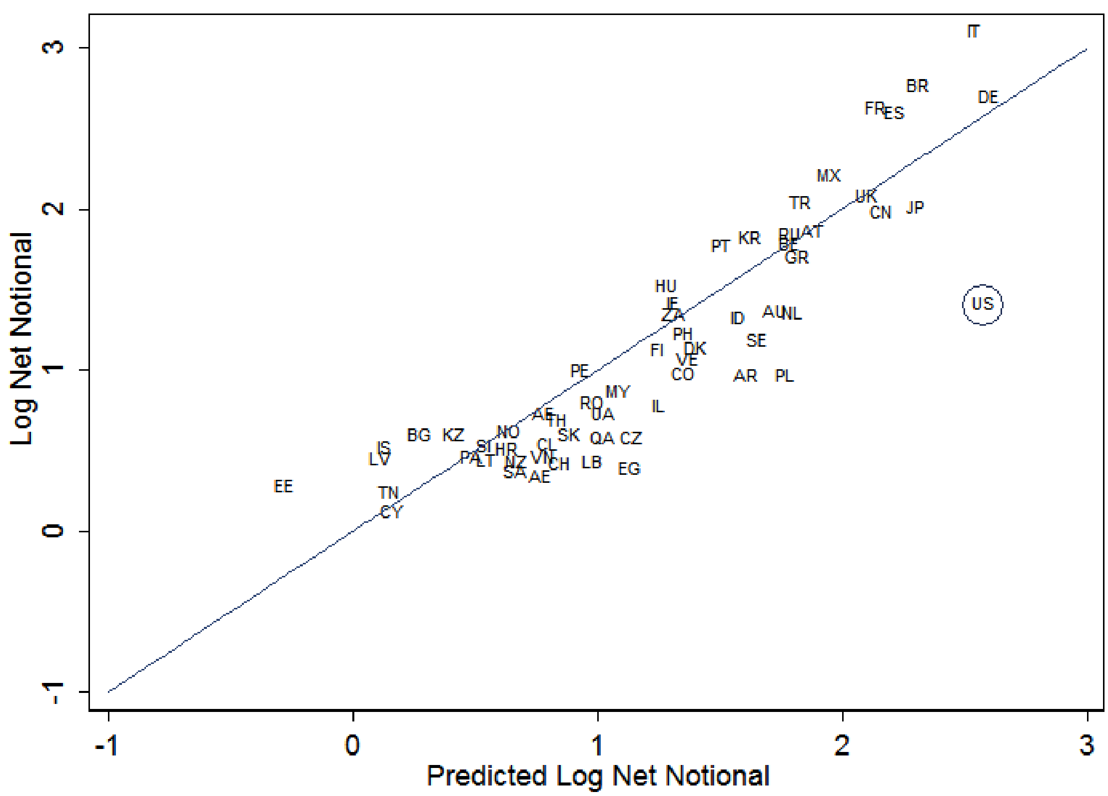

Figure 7: CDS Trading Volume around Macro-Announcements

This figure shows the CDS trading volume for Russia, Japan, Argentina, and Germany from January 2011 until January 2015. Source: DTCC.

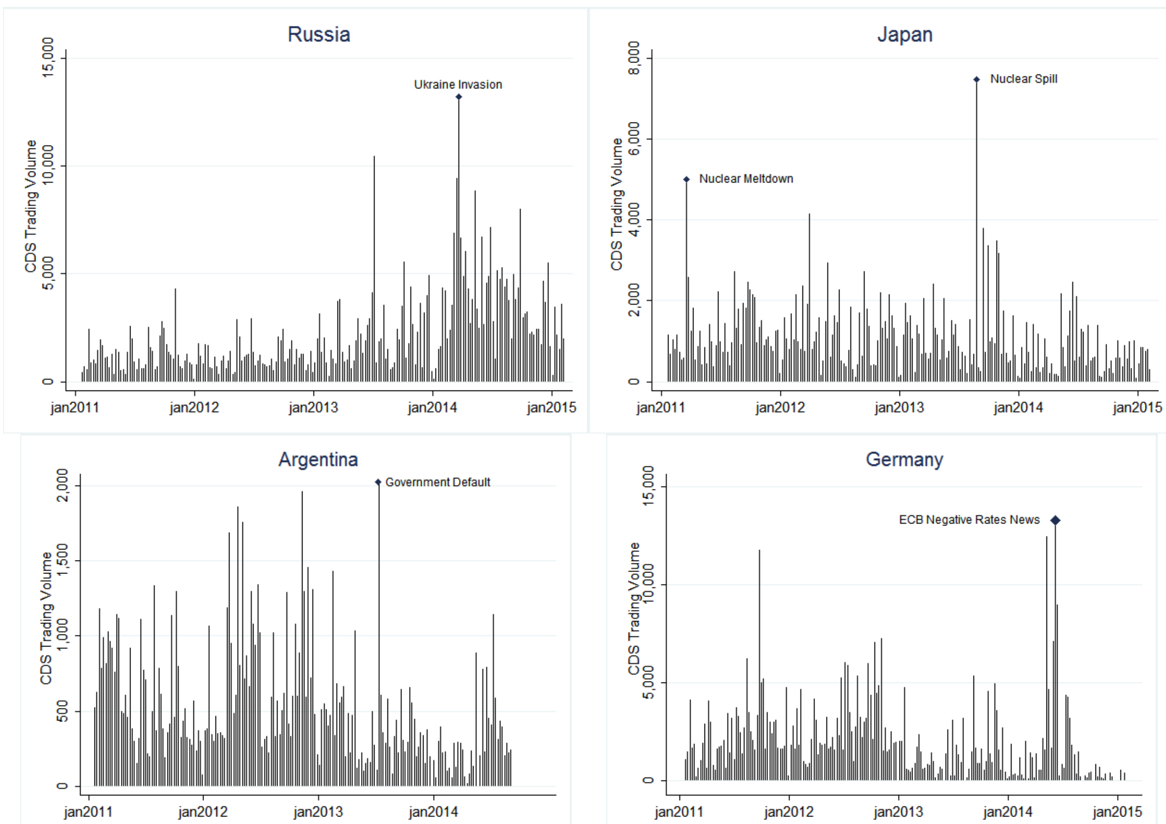

Table 1: Descriptive Examples of CDS Trading Components

This table provides illustrates examples of how trading in credit default swaps generates gross and net notional amounts outstanding (Panels A, B, and C), and how these quantities are affected by novations (Panels D.1 and D.2), portfolio compressions (Panels E.1 and E.2), as well as by matured contracts and exits (Panel F). In each panel, we indicate the number of counterparties, *CP*, labeled A, B, and C. The last row in each panel reports the quantities as registered in the Depository Trust and Clearing Corproation (DTCC) data repository. Source: Authors' illustration.

A: Gross and Net Notional, 2 CP, no Netting

	Bought from			Sold CDS to			Total gross		Net position
	A	B	C	A	B	C	bought	sold	
Counterparty A	-	20	0	-	0	0	20	0	0
Counterparty B	0	-	0	-20	-	0	0	-20	-20
Counterparty C	0	0	-	0	0	-	0	0	0
DTCC DATA							20		20

B: Gross and Net Notional, 3 CP, Netting

	Bought from			Sold CDS to			Total gross		Net position
	A	B	C	A	B	C	bought	sold	
Counterparty A	-	20	0	-	0	-20	20	-20	0
Counterparty B	0	-	0	-20	-	0	0	-20	-20
Counterparty C	20	0	-	0	0	-	20	0	20
DTCC DATA							40		20

C: Gross and Net Notional, 3 CP, Netting

	Bought from			Sold CDS to			Total gross		Net position
	A	B	C	A	B	C	bought	sold	
Counterparty A	-	20	0	-	0	-20	20	-20	0
Counterparty B	0	-	20	-20	-	0	20	-20	0
Counterparty C	20	0	-	0	-20	-	20	-20	0
DTCC DATA							60		0

D.1: Novation, 3 CP

	Bought from			Sold CDS to			Total gross		Net position
	A	B	C	A	B	C	bought	sold	
Counterparty A	-	20	0	-	0	0	20	0	20
Counterparty B	0	-	0	-20	-	0	0	-20	-20
Counterparty C	0	0	-	0	0	-	0	0	0
DTCC DATA							20		20

D.2: Novation, 3 CP

	Bought from			Sold CDS to			Total gross		Net position
	A	B	C	A	B	C	bought	sold	
Counterparty A	-	20	0	-	0	0	20	0	20
Counterparty B	0	-	0	0	-	0	0	0	0
Counterparty C	0	0	-	-20	0	-	0	-20	-20
DTCC DATA							20		20

E.1: Portfolio compression, 3 CP

	Bought from			Sold CDS to			Total gross		Net position
	A	B	C	A	B	C	bought	sold	
Counterparty A	-	0	5	-	-10	0	5	-10	-5
Counterparty B	10	-	0	0	-	-10	10	-10	0
Counterparty C	0	10	-	-5	0	-	10	-5	5
DTCC DATA							25		5

E.2: Portfolio compression, 3 CP

	Bought from			Sold CDS to			Total gross		Net position
	A	B	C	A	B	C	bought	sold	
Counterparty A	-	0	0	-	0	-5	0	-5	-5
Counterparty B	0	-	0	0	-	0	0	0	0
Counterparty C	5	0	-	0	0	-	5	0	5
DTCC DATA							5		5

F: Gross and Net Notional, 3 CP, Matured Contracts and existing positions

	Bought from			Sold CDS to			Total gross		Net position
	A	B	C	A	B	C	bought	sold	
Counterparty A	-	0	0	-	0	0	20	-10	10
Counterparty B	0	-	0	0	-	0	0	-20	-20
Counterparty C	0	0	-	0	0	-	10	0	10
DTCC DATA							40(t-1)$\mapsto$30		20(t-1)$\mapsto$20

Table 2: Trade Information Warehouse Data

This table reports summary statistics on CDS trading measures for the 61 sovereign reference entities (*Country*) in our sample which rank among the 1,000 most heavily traded contracts, and which are grouped into 5 ISDA Determination Committee regions (*DC Region*). We report the number of observations (*Obs*), the average (*Mean*) and standard deviation (*SD*) for the gross (*Gross Notional*) and net (*Net Notional*) notional amount (in million USD) on CDS contracts outstanding in USD equivalents (using the prevailing foreign exchange rates). We also report the average and standard deviation of contracts (*Contracts*) live in the Depository Trust & Clearing Corporation's (DTCC) Trade Information Warehouse (Warehouse), of the trading intensity (*Trad. Intensity*) defined as the ratio of gross to net notional amount outstanding, and of the average ratio of net notional amount outstanding to the number of outstanding contracts (*NN/Contract*). The last column reports the average debt-to-DGP ratio. All countries are ranked in alphabetical order. The countries are grouped into five regions: Americas, Asia ex-Japan, Australia and New Zealand, Europe/Middle East and Africa (EMEA) and Japan. Emerging market countries are marked with a star*. The sample period is October 31, 2008 through June 26, 2015. Source: DTCC.

			Gross Notional		**Net Notional**		**Contracts**		**Trad. Intensity**		**NN/Contract**		**Debt/GDP**
Country	DC Region	Obs	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean
Abu Dhabi*	EMEA	319	7,509	2,617	1,072	278	1,210	382	6.96	1.81	0.93	0.18	11.4
Argentina*	Americas	308	43,112	12,373	1,766	606	4,531	1,226	25.07	4.20	0.39	0.09	37.3
Australia	Austr/NZ	333	22,419	11,885	3,300	1,591	1,906	1,254	6.73	1.84	1.97	0.61	41.5
Austria	EMEA	358	48,409	11,506	5,571	1,743	2,142	515	9.71	3.94	2.93	1.57	85.1
Belgium	EMEA	358	46,057	16,628	4,605	1,314	2,398	1,013	11.12	5.63	2.74	2.13	106.2
Brazil*	Americas	358	145,834	19,225	14,964	2,819	10,293	1,079	9.96	1.44	1.47	0.30	63.0
Bulgaria*	EMEA	358	15,781	3,785	830	379	1,622	415	21.85	7.54	0.52	0.21	21.9
Chile*	Americas	358	5,919	2,282	748	268	609	213	7.95	1.35	1.25	0.26	13.7
China*	Asia X-Jap	358	56,754	22,876	7,469	3,936	5,797	2,436	8.58	2.44	1.24	0.29	16.5
Colombia*	Americas	358	28,030	3,375	1,998	309	2,896	287	14.47	3.30	0.70	0.13	32.6
Croatia*	EMEA	358	9,659	2,911	679	141	1,114	224	14.71	5.16	0.64	0.19	76.9
Cyprus*	EMEA	177	1,854	187	238	65	269	44	8.38	2.32	0.93	0.41	119.2
Czech Rep.*	EMEA	358	10,731	2,620	779	261	900	220	15.91	6.85	0.96	0.55	42.7
Denmark	EMEA	358	14,934	4,769	2,146	475	1,106	574	7.20	2.68	2.72	1.73	54.6
Dubai*	EMEA	358	6,885	1,932	567	137	882	330	13.23	5.38	0.85	0.68	11.4
Egypt*	EMEA	289	3,495	845	476	254	803	248	9.16	4.04	0.64	0.40	93.8
Estonia*	EMEA	358	2,580	692	323	149	347	87	9.50	3.45	0.89	0.33	10.5
Finland	EMEA	358	14,870	4,665	2,075	344	640	230	7.11	2.09	4.06	2.65	58.9
France	EMEA	358	110,137	49,560	13,568	5,551	4,792	2,351	8.48	3.88	3.82	2.32	124.3

Continued on next page

Table 2 – *Continued from previous page*

			Gross Notional		Net Notional		Contracts		Trad. Intensity		NN/Contract		Debt/GDP
Country	DC Region	Obs	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean
Germany	EMEA	358	102,911	35,693	14,011	3,243	3,305	1,502	7.48	2.71	5.26	2.61	63.7
Greece*	EMEA	237	50,524	31,387	5,073	2,987	2,683	1,713	9.38	6.27	2.30	1.76	181.6
Hungary*	EMEA	353	54,145	13,227	2,487	1,199	4,805	1,226	27.23	11.77	0.55	0.32	79.0
Iceland	EMEA	358	6,399	1,848	694	226	913	240	9.39	1.07	0.76	0.11	94.0
Indonesia*	Asia X-Jap	358	36,055	4,190	2,848	732	4,581	583	13.42	3.25	0.62	0.16	28.0
Ireland	EMEA	358	39,517	9,225	3,280	1,434	2,390	870	16.41	10.50	1.89	1.70	120.6
Israel	EMEA	358	10,337	2,842	1,230	455	1,156	352	8.88	1.50	1.04	0.13	67.4
Italy	EMEA	358	314,802	85,023	21,371	2,913	9,733	3,718	15.17	5.16	2.72	1.43	143.4
Japan	Japan	358	51,918	24,785	7,247	2,979	4,556	2,528	6.87	1.07	2.02	1.01	228.2
Kazakhstan*	EMEA	358	16,604	6,163	843	383	1,558	484	20.15	4.90	0.54	0.13	16.8
Korea*	Asia X-Jap	358	67,430	11,285	5,496	1,454	6,536	1,401	12.85	2.70	0.88	0.32	37.6
Latvia*	EMEA	358	8,556	1,283	571	167	1,002	176	16.26	4.68	0.57	0.16	41.1
Lebanon*	EMEA	298	2,032	120	545	89	346	33	3.82	0.62	1.58	0.25	145.1
Lithuania*	EMEA	358	5,980	1,214	548	178	701	147	12.63	5.50	0.84	0.39	39.0
Malaysia*	Asia X-Jap	358	18,224	1,886	1,458	363	2,248	344	13.39	3.81	0.68	0.26	53.9
Mexico*	Americas	358	106,154	15,452	8,349	2,069	8,237	1,103	13.33	2.85	1.04	0.35	46.7
Netherlands	EMEA	358	23,863	8,819	2,886	540	1,243	531	8.25	2.90	3.09	2.04	82.3
New Zealand	Austr/NZ	298	3,210	602	523	52	339	78	6.14	1.02	1.62	0.40	36.7
Norway	EMEA	356	7,400	2,560	848	231	393	183	9.28	4.22	3.27	2.66	37.2
Panama*	Americas	358	6,565	978	589	133	956	120	11.55	2.56	0.62	0.13	37.2
Peru*	Americas	358	20,914	4,023	1,735	238	2,187	382	12.15	2.22	0.81	0.13	18.9
Philippines*	Asia X-Jap	358	49,781	14,813	2,424	331	5,640	1,934	20.36	5.18	0.48	0.17	46.1
Poland*	EMEA	358	31,802	8,846	1,653	542	2,897	848	21.11	7.47	0.60	0.25	49.6
Portugal	EMEA	358	62,746	13,372	5,072	2,173	3,527	1,238	15.58	8.39	1.96	1.63	137.4
Qatar*	EMEA	358	7,743	1,980	816	338	988	314	10.50	2.75	0.82	0.22	25.5
Romania*	EMEA	358	14,990	3,044	1,046	241	1,598	343	14.72	2.88	0.67	0.17	38.5
Russia*	EMEA	358	112,451	14,079	5,620	1,623	8,794	1,827	21.14	4.59	0.64	0.15	13.4
Saudia Arabia*	EMEA	233	2,680	302	442	47	283	28	6.15	1.02	1.58	0.24	2.6
Slovakia*	EMEA	358	9,929	1,856	803	194	801	147	13.30	4.17	1.06	0.42	53.9
Slovenia*	EMEA	345	6,079	2,077	686	176	556	218	9.97	5.32	1.53	0.83	78.3
South Africa*	EMEA	358	45,423	7,807	3,060	1,111	4,858	720	15.94	3.52	0.62	0.18	43.6
Spain	EMEA	358	147,248	45,145	12,536	3,278	6,439	2,455	12.73	5.37	2.45	1.54	110.9
Sweden	EMEA	358	17,968	5,129	2,276	768	1,003	305	9.06	4.23	2.65	1.54	46.1
Switzerland	EMEA	65	1,415	34	508	6	94	4	2.79	0.09	5.44	0.28	33.3

Continued on next page

Table 2 – *Continued from previous page*

			Gross Notional		**Net Notional**		**Contracts**		**Trad. Intensity**		**NN/Contract**		**Debt/GDP**
Country	DC Region	Obs	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean
Thailand*	Asia X-Jap	358	15,012	3,761	1,000	201	2,074	513	15.10	3.25	0.50	0.10	43.2
Tunisia*	EMEA	279	1,833	293	263	35	300	42	7.01	1.03	0.89	0.13	47.2
Turkey*	EMEA	358	142,132	15,435	6,843	1,417	9,582	1,332	22.00	6.24	0.74	0.21	38.0
Ukraine*	EMEA	358	35,016	12,397	1,127	613	3,238	704	34.29	8.10	0.33	0.12	67.6
U.S.	Americas	358	18,580	7,233	3,195	1,196	790	389	5.81	1.16	4.75	2.03	122.1
U.K.	EMEA	358	52,571	18,122	7,489	3,294	3,175	1,394	7.50	2.30	2.61	0.90	88.2
Venezuela*	Americas	358	46,292	7,848	1,941	292	4,331	839	23.98	3.21	0.46	0.09	77.0
Vietnam*	Asia X-Jap	358	7,305	1,827	580	126	1,060	284	12.73	2.54	0.57	0.14	54.8

Table 3: General Government Debt Data

This table reports summary statistics on quarterly general government debt data for the 61 sovereign reference entities (*Country*) in our sample which rank among the 1,000 most heavily traded contracts in the DTCC Trade Information Warehouse, and which are grouped into 5 ISDA Determination Committee regions (*DC Region*). We report the average quarterly nominal amount of domestic debt (*Dom. Debt*), the average quarterly nominal amount of international debt (*Int. Debt*), the average quarterly nominal amount of total debt (*Tot. Debt*), and the average quarterly ratio of international to total debt in percentage terms (*ID/TD (%)*). We also report the gross domestic product in billion USD (*GDP*), and the ratio of total debt to GDP (*Debt/GDP*). In the last column, we report the total foreign exchange reserves in billion USD (*FX Res.*). All countries are ranked in alphabetical order. The countries are grouped into five regions: Americas, Asia ex-Japan, Australia and New Zealand, Europe/Middle East and Africa (EMEA) and Japan. Emerging market countries are marked with a star*. Domestic, international, and total debt statistics are reported in billion USD. The sample period is Q4 2008 through Q2 2015. Source: Bank for International Settlements (BIS) and International Monetary Fund International Finance Statistics (IMF IFS).

Country	DC Region	DD	ID	TD	ID/TD	GDP	Debt/GDP	FX Res.
Abu Dhabi*	EMEA	.	4.10	28.32	14.37	171.78	17.16	23.28
Argentina*	Americas	53.50	44.81	98.31	46.09	522.14	19.31	40.90
Australia	Austr/NZ	442.56	9.59	458.10	2.38	1385.16	32.59	43.85
Austria	EMEA	154.88	107.53	262.42	41.44	414.52	63.22	10.83
Belgium	EMEA	418.00	36.04	454.04	7.99	508.69	89.25	16.53
Brazil*	Americas	1242.18	53.89	1296.08	4.25	2237.66	58.06	315.92
Bulgaria*	EMEA	.	2.09	9.59	21.82	52.94	18.02	16.60
Chile*	Americas	24.33	3.68	28.01	13.44	238.04	11.40	34.56
China*	Asia X-Jap	1172.53	9.30	1176.09	0.74	7776.31	15.19	3120.50
Colombia*	Americas	78.59	19.67	98.26	20.24	328.37	30.00	33.59
Croatia*	EMEA	13.38	7.60	21.42	33.97	59.35	36.63	14.85
Cyprus*	EMEA	7.12	3.66	10.78	34.47	23.67	45.36	0.38
Czech Rep.*	EMEA	57.27	12.65	69.92	17.87	210.04	33.40	44.18
Denmark	EMEA	130.43	17.70	147.16	12.18	329.62	44.63	77.99
Dubai*	EMEA	.	4.10	28.32	14.37	171.78	17.16	23.28
Egypt*	EMEA	.	4.56	212.03	2.18	256.40	82.06	18.16
Estonia*	EMEA	0.16	0.08	1.87	4.56	22.68	8.12	1.41
Finland	EMEA	89.24	15.75	104.99	14.29	261.65	40.10	8.38
France	EMEA	1965.40	12.02	1977.42	0.61	2755.67	71.75	49.04
Germany	EMEA	1904.90	114.00	2018.90	5.74	3617.89	55.77	62.38
Greece*	EMEA	239.33	81.47	320.80	29.29	292.28	106.77	1.31
Hungary*	EMEA	53.90	24.19	77.70	31.30	134.63	57.81	44.72
Iceland	EMEA	6.37	3.25	9.62	34.27	14.74	64.91	4.77
Indonesia*	Asia X-Jap	95.04	25.66	120.70	21.06	816.78	14.85	91.31
Ireland	EMEA	105.01	19.53	124.55	17.06	233.14	53.65	1.51
Israel	EMEA	113.20	11.57	133.72	8.63	258.39	51.75	72.09
Italy	EMEA	2032.72	132.84	2165.56	6.15	2157.87	100.56	47.61
Japan	Japan	9481.28	3.50	9484.08	0.04	5260.22	180.59	1148.01
Kazakhstan*	EMEA	.	0.24	22.36	0.72	182.03	11.95	22.73
Korea*	Asia X-Jap	379.12	6.81	385.92	1.83	1192.68	32.06	302.77
Latvia*	EMEA	1.78	2.82	4.60	55.03	28.64	15.76	5.92
Lebanon*	EMEA	34.21	28.35	62.56	44.97	44.03	141.70	35.22

Continued on next page

Country	DC Region	DD	ID	TD	ID/TD	GDP	Debt/GDP	FX Res.
Lithuania*	EMEA	.	10.27	15.37	66.57	42.82	35.79	6.77
Malaysia*	Asia X-Jap	125.75	3.58	128.77	2.79	280.61	45.49	116.94
Mexico*	Americas	298.90	48.00	346.90	14.28	1143.42	29.97	140.77
Netherlands	EMEA	395.69	23.81	419.50	5.72	855.05	49.11	19.31
New Zealand	Austr/NZ	48.79	0.98	49.77	1.99	171.52	28.85	17.96
Norway	EMEA	89.68	0.00	91.27	0.00	471.71	19.47	54.75
Panama*	Americas	.	9.21	14.92	63.83	33.89	44.05	2.56
Peru*	Americas	10.60	12.96	23.55	55.29	171.76	13.67	49.74
Philippines*	Asia X-Jap	69.51	27.13	96.65	28.53	233.82	41.59	59.74
Poland*	EMEA	162.82	59.68	222.50	26.82	501.87	44.38	90.78
Portugal	EMEA	130.91	38.44	169.35	22.72	233.20	72.81	2.88
Qatar*	EMEA	.	14.03	54.91	24.59	165.28	33.26	27.52
Romania*	EMEA	.	9.54	61.47	14.39	182.40	33.54	41.73
Russia*	EMEA	91.16	34.77	124.69	28.42	1740.51	7.16	436.60
Saud Arab.*	EMEA	27.38	0.00	27.38	0.00	720.59	3.85	641.80
Slovakia*	EMEA	25.58	12.11	37.69	31.23	94.18	39.83	1.55
Slovenia*	EMEA	16.42	6.11	22.53	25.12	48.69	46.44	0.86
Sth Africa*	EMEA	118.23	10.54	128.78	8.40	362.46	35.33	40.61
Spain	EMEA	822.83	70.53	893.37	8.34	1432.02	62.95	27.68
Sweden	EMEA	129.63	42.44	161.17	25.63	526.93	30.60	47.92
Switzerland	EMEA	111.10	0.00	111.10	0.00	686.91	16.18	482.97
Thailand*	Asia X-Jap	89.54	0.41	90.37	0.51	341.54	26.33	155.34
Tunisia*	EMEA	.	0.05	20.47	0.21	46.02	44.41	7.98
Turkey*	EMEA	204.37	50.10	252.71	19.96	755.09	33.72	89.21
Ukraine*	EMEA	.	12.94	64.35	19.37	150.04	44.53	24.58
U.S.	Americas	12765.92	3.93	12769.85	0.03	15917.23	79.74	122.13
U.K.	EMEA	1902.22	15.94	1918.16	0.76	2613.67	72.69	77.32
Venezuela*	Americas	.	31.78	104.71	31.54	252.70	41.67	12.11
Vietnam*	Asia X-Jap	.	2.33	73.88	3.41	144.13	50.27	22.29
Average	Global	837.19	23.00	687.84	0.18	1062.00	137.98	0.45

Table 4: Additional Summary Statistics

This table reports summary statistics (at the quarterly frequency) of the explanatory variables in the cross-sectional regressions for the 61 sovereign reference entities (*Country*) in our sample which rank among the 1,000 most heavily traded contracts in the DTCC Trade Information Warehouse, and which are grouped into 5 ISDA Determination Committee regions (*DC Region*). We report the average quarterly CDS Spread in % (*CDS Spread*), the average quarterly percentage change in CDS spreads (%Δ *CDS*), the average quarterly sum of daily squared CDS returns (*CDS iVol*), average quarterly idiosyncratic country return, measured as the average quarterly percentage change in the MSCI country return that is orthogonal to the return on the MSCI World Index (*Equity iRet*), the average quarterly sum of squared percentage changes in idiosyncratic country returns (*Equity iVol*), the average quarterly foreign exchange rate relative to the USD log return (*FX Ret*), the average quarterly sum of daily foreign exchange rate returns (*FX Vol*), CDS liquidity defined as the number of dealer quotes used in the computation of the 5-year mid-market CDS spread (*CDS Liquidity*), and the average foreign long-term credit rating as reported by Fitch Ratings. All countries are ranked in alphabetical order. The countries are grouped into five regions: Americas, Asia ex-Japan, Australia and New Zealand, Europe/Middle East and Africa (EMEA) and Japan. Emerging market countries are marked with a star*. The sample period is Q4 2008 through Q2 2015. Source: Markit, Datastream, FitchRatings.

Country	DC Region	CDS Spread	%Δ CDS	CDS iVol	Equity iRet	Equity iVol	FX Ret	FX Vol	CDS Liquidity	Credit Rating
Abu Dhabi*	EMEA	0.94	-2.81	3.84	1.58	0.59	0.00	0.00	5.39	AA
Argentina*	Americas	16.68	0.54	13.64	1.43	1.71	4.13	0.10	6.99	CC
Australia	Austr/NZ	0.51	-1.95	8.08	0.84	0.46	-0.39	0.38	6.06	AAA
Austria	EMEA	0.80	-0.67	9.08	-0.17	0.95	1.05	0.30	7.15	AAA
Belgium	EMEA	1.10	3.54	8.84	0.14	0.45	1.05	0.30	6.69	AA
Brazil*	Americas	1.63	0.30	8.54	0.07	1.00	1.99	0.81	8.87	BBB
Bulgaria*	EMEA	2.39	-1.67	6.15	0.04	0.28	1.07	0.30	6.88	BBB-
Chile*	Americas	0.98	-0.91	8.71	0.43	1.22	0.47	0.31	7.07	A+
China*	Asia X-Jap	0.97	0.09	9.62	0.13	0.55	-0.38	0.01	8.39	A+
Colombia*	Americas	1.50	-1.37	8.27	-0.29	0.76	0.66	0.33	8.75	BBB-
Croatia*	EMEA	3.18	0.56	5.70	-0.85	5.57	1.33	0.32	6.37	BBB-
Cyprus*	EMEA	8.14	-7.51	5.70	0.39	0.39	1.82	0.16	4.86	B
Czech Rep.*	EMEA	0.94	-2.08	8.27	0.15	0.70	1.50	0.56	5.02	A+
Denmark	EMEA	0.52	0.71	7.28	0.15	0.70	1.06	0.30	6.08	AAA
Dubai*	EMEA	3.56	-2.95	4.80	-0.20	2.14	0.00	0.00	5.19	AA
Egypt*	EMEA	4.24	2.86	2.90	1.36	1.44	1.57	0.01	6.22	B+
Estonia*	EMEA	1.49	-6.16	4.56	0.11	0.90	1.05	0.29	4.86	A
Finland	EMEA	0.37	1.54	7.87	0.20	0.60	1.05	0.30	6.16	AAA
France	EMEA	0.81	4.60	9.71	-0.06	0.49	1.05	0.30	6.67	AAA
Germany	EMEA	0.43	1.58	8.94	0.39	0.45	1.05	0.30	6.05	AAA
Greece*	EMEA	17.86	42.54	23.10	-5.21	3.07	1.76	0.39	5.86	BB+
Hungary*	EMEA	3.42	5.67	7.89	-0.29	2.02	2.69	1.30	8.72	BBB
Iceland	EMEA	3.36	-5.84	2.42	-1.15	5.69	1.00	0.84	4.54	BBB-
Indonesia*	Asia X-Jap	2.20	-4.09	9.10	0.87	1.09	1.26	0.16	7.34	BB+
Ireland	EMEA	3.04	0.43	7.29	-0.28	0.87	1.05	0.30	7.35	A
Israel	EMEA	1.33	-2.43	3.83	0.27	0.70	0.53	0.18	6.08	A
Italy	EMEA	2.13	3.95	11.08	-0.18	0.90	1.05	0.30	7.54	A
Japan	Japan	0.71	3.31	8.34	0.14	1.52	0.48	0.32	7.44	AA-

Continued on next page

Country	DC Region	CDS Spread	%Δ CDS	CDS iVol	Equity iRet	Equity iVol	FX Ret	FX Vol	CDS Liquidity	Credit Rating
Kazakhstan*	EMEA	2.75	-0.07	7.40	-0.67	2.54	1.69	0.27	6.61	BBB
Korea*	Asia X-Jap	1.19	-5.18	10.83	0.02	0.96	-0.33	0.49	8.15	A+
Latvia*	EMEA	3.07	-6.85	3.29	-1.15	1.18	1.02	0.35	6.19	BBB
Lebanon*	EMEA	3.75	1.78	1.07	0.60	0.15	0.04	0.01	3.80	B
Lithuania*	EMEA	2.47	-5.10	4.27	0.15	0.84	1.03	0.29	5.78	BBB+
Malaysia*	Asia X-Jap	1.14	-0.20	9.86	0.39	0.25	0.28	0.12	7.03	A-
Mexico*	Americas	1.41	-2.74	9.64	-0.08	0.46	1.29	0.50	8.27	BBB
Netherlands	EMEA	0.54	1.36	7.73	0.11	0.43	1.05	0.30	5.78	AAA
New Zealand	Austr/NZ	0.56	-0.31	8.77	0.40	0.19	-0.14	0.39	5.99	AA
Norway	EMEA	0.23	0.90	14.93	-0.03	0.68	1.22	0.52	4.78	AAA
Panama*	Americas	1.43	-2.19	7.65	1.03	0.41	0.00	0.00	8.06	BBB-
Peru*	Americas	1.48	-2.41	8.55	0.39	1.09	0.14	0.08	8.45	BBB
Philippines*	Asia X-Jap	1.62	-4.98	8.29	0.64	0.97	-0.22	0.10	7.11	BB+
Poland*	EMEA	1.40	-2.55	9.42	0.19	0.67	1.76	0.84	6.93	A-
Portugal	EMEA	4.23	8.58	11.92	0.10	0.75	1.05	0.30	7.75	BBB+
Qatar*	EMEA	1.06	-2.08	4.79	0.21	1.05	0.00	0.00	5.26	AA
Romania*	EMEA	2.87	-4.31	5.36	-0.18	1.75	1.67	0.44	6.57	BBB-
Russia*	EMEA	2.48	1.67	10.78	-0.28	2.57	3.15	0.68	8.42	BBB
Saud Arab.*	EMEA	0.85	-1.75	3.03	1.46	0.68	0.00	0.00	4.36	AA-
Slovakia*	EMEA	1.12	-0.37	7.11	-0.77	1.04	1.05	0.30	5.80	A+
Slovenia*	EMEA	1.90	3.42	6.75	1.85	1.94	1.06	0.26	5.32	A+
Sth Africa*	EMEA	1.89	-1.57	8.06	-0.02	0.55	1.47	0.88	9.06	BBB+
Spain	EMEA	2.16	3.48	11.20	0.15	0.80	1.05	0.30	6.82	A+
Sweden	EMEA	0.39	-3.68	8.54	0.31	0.47	0.85	0.56	5.74	AAA
Switzerland	EMEA	0.38	-8.95	3.72	1.32	0.25	-1.01	0.16	3.17	AAA
Thailand*	Asia X-Jap	1.31	-1.53	8.68	0.42	0.94	-0.15	0.05	8.14	BBB
Tunisia*	EMEA	2.22	6.16	14.65	0.53	0.20	1.63	0.14	2.07	BB+
Turkey*	EMEA	2.16	-1.71	7.71	0.15	1.33	2.73	0.48	8.51	BB+
Ukraine*	EMEA	13.66	18.83	11.30	0.86	2.78	5.89	2.34	5.77	B-
U.K.	Americas	0.37	-1.14	9.40	-0.03	0.24	0.00	0.00	3.70	AAA
U.S.	EMEA	0.58	-2.76	6.16	0.11	0.34	0.71	0.26	6.05	AAA
Venezuela*	Americas	13.93	8.78	6.75	-1.49	1.36	4.13	2.41	7.91	B+
Vietnam*	Asia X-Jap	2.89	-2.89	5.01	-0.28	1.34	1.00	0.06	5.94	B+
Average	Global	2.58	0.23	8.00	0.10	1.13	1.10	0.38	6.54	A-

Table 5: Cross-correlation Table

This table presents pairwise pearson correlation coefficients between the key explanatory variables used in the study: total general government debt (*Total Debt*), total nominal amount of international debt (*Total Int Debt*), gross domestic product (*GDP*), total foreign exchange reserves (*FX Reserves*), the CDS Spread (*CDS Spread*), CDS volatility measured as the sum of daily squared CDS returns (*CDS iVol*), CDS liquidity (*CDS Liquidity*), the idiosyncratic country return, measured as the average quarterly percentage change in the MSCI country return that is orthogonal to the return on the MSCI World Index (*Equity iRet*), the average quarterly sum of squared percentage changes in idiosyncratic country returns (*Equity iVol*), the average quarterly foreign exchange rate relative to the USD log return (*FX Ret*), the average quarterly sum of daily foreign exchange rate returns (*FX Vol*). All variables are measured/aggregated at the quarterly frequency. The sample period is Q4-2008 until Q2-2015.

Variables	Total Debt	Total Int Debt	GDP	FX Reserves	CDS Spread	CDS iVol	CDS Liquidity	Equity iReturn	Equity iVOL	FX Ret	FX VOL
Total Debt	1.00										
Total Int Debt	0.02	1.00									
GDP	0.87	0.05	1.00								
FX Reserves	0.23	-0.08	0.47	1.00							
CDS Spread	-0.10	0.08	-0.12	-0.08	1.00						
CDS iVol	0.01	0.08	0.03	-0.00	0.28	1.00					
CDS Liquidity	-0.09	0.17	-0.06	0.15	0.02	0.18	1.00				
Equity iReturn	-0.00	-0.02	-0.01	-0.01	-0.05	-0.19	-0.03	1.00			
Equity iVOL	-0.04	-0.03	-0.05	-0.02	0.14	0.19	0.09	-0.43	1.00		
FX Ret	-0.03	0.02	-0.03	-0.03	0.14	0.22	0.04	-0.16	0.13	1.00	
FX VOL	-0.03	0.02	-0.04	-0.03	0.21	0.21	0.07	-0.14	0.25	0.47	1.00

Table 6: Principal Component Analysis

The table reports summary statistics for the principal component analysis of the correlation matrix of weekly sovereign CDS spread changes (Panel A), the correlation matrix of weekly changes of gross (Panel B) and net (Panel C) notional CDS outstanding, and the correlation matrix of weekly changes of net notional CDS outstanding that has been corrected for seasonality effects due to the quarterly on-the-run roll effects on March 20, June 20, September 20, and December 20 (Panel C). The correlation matrices are based on the 47 countries for which we have continuous information on CDS net notional with 349 weeks of data. The sample period is October 31, 2008 to July 3, 2015. Source: DTCC and Markit.

	Full Sample		Developed		Emerging	
Principal Component	Percent Explained	Total	Percent Explained	Total	Percent Explained	Total
Panel A Δ *Spread*						
First	53.65	53.65	56.33	56.33	64.53	64.53
Second	10.43	64.09	10.83	67.16	7.22	71.75
Third	4.27	68.36	6.01	73.17	4.62	76.37
Fourth	3.56	71.92	5.06	78.24	3.99	80.36
Fifth	2.90	74.81	4.31	82.54	2.80	83.16
Panel B Δ *Gross Notional*						
First	23.88	23.88	54.76	54.76	29.73	29.73
Second	16.38	40.26	10.17	64.93	19.25	48.98
Third	12.29	52.55	6.65	71.59	11.57	60.54
Fourth	7.37	59.92	5.49	77.07	5.58	66.13
Fifth	3.78	63.70	5.17	82.24	4.17	70.29
Panel C Δ *Net Notional*						
First	9.51	9.51	17.35	17.35	11.20	11.20
Second	4.91	14.42	9.04	26.40	5.73	16.92
Third	4.14	18.56	7.59	33.98	5.32	22.25
Fourth	3.52	22.08	7.11	41.10	4.86	27.10
Fifth	3.33	25.41	6.17	47.27	4.58	31.68
Δ *Net Notional De-Seasonalized*						
First	6.69	6.69	15.25	15.25	8.00	8.00
Second	4.85	11.55	9.39	24.64	5.84	13.84
Third	4.28	15.82	7.63	32.27	5.54	19.38

Table 7: Sovereign CDS Net Notional Seasonality Regression

This table reports the estimated coefficients from the seasonality panel regression for weekly percentage changes of sovereign CDS net notional, which are projected on the dates when the on-the-run contract expires and "rolls over" to a new on-the-run CDS contract. The CDS roll indicator for each of the quarterly roll dates takes on the value of one during the week of the roll, and zero otherwise. Each calendar year, single-name CDS roll on March 20, June 20, September 20, and December 20. Source: DTCC.

	(1) Δ NN %	(2) Δ NN %	(3) Δ NN %	(4) Δ NN %
Mar20Roll	-2.084***	-2.084***	-2.283***	-2.283***
	(0.176)	(0.176)	(0.193)	(0.193)
Jun20Roll	-2.410***	-2.410***	-2.525***	-2.525***
	(0.176)	(0.176)	(0.193)	(0.193)
Sep20Roll	-1.422***	-1.423***	-1.471***	-1.471***
	(0.189)	(0.189)	(0.208)	(0.208)
Dec20Roll	-1.781***	-1.780***	-1.981***	-1.981***
	(0.177)	(0.177)	(0.193)	(0.193)
Constant	0.112***	0.113***	0.123***	0.123***
	(0.032)	(0.025)	(0.034)	(0.028)
Observations	20,650	20,650	16,779	16,779
R-squared	0.0218	0.0220	0.0218	0.0260
Fixed Effect	No	Yes	No	Yes
# Sovereigns	61	61	47	47

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Cross-Sectional Determinants of Net CDS Trading

This table reports the estimated coefficients from the cross-sectional regression analysis. All information is aggregated at a quarterly frequency. We project quarterly levels of sovereign CDS net notional (in billion USD) on a set of country-specific variables and time fixed effects. The explanatory variables are total general government debt outstanding in billion USD (*Total Debt*), total international government debt outstanding in billion USD (*Int Debt*), the gross domestic product in billion USD (*GDP*), the total amount of foreign exchange rate reserves in billion USD (*FX Reserves*), the country's CDS spread (*CDS Spread*), CDS volatility, defined as the quarterly sum of daily squared CDS percentage changes (*CDS iVol*), CDS liquidity defined as the number of dealers providing quotes for the computation of the mid market spread, (*CDS Liquidity*), the component of the country MSCI stock market return that is orthogonal to the return on the MSCI world stock market index (*Equity iReturn*), the domestic stock market return volatility, defined as the sum of daily squared idiosyncratic stock market returns over the quarter (*Equity iVol*), the percentage foreign exchange rate return relative to the USD (*FX Ret*), and foreign exchange rate volatility, measured as the quarterly sum of the squared foreign exchange rate returns (*FX Vol*). We report the adjusted R^2 of the regression, and some specifications include a dummy variable that is equal to one for the United States and zero otherwise. Column (7) and (8) separate the results for developed and emerging economies, respectively. All regressions include time fixed effects and standard errors are clustered by country. Variables other than returns and volatility are transformed using a natural logarithmic transformation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	log NN	log NN	log NN	log NN	log NN	log NN	log NN	log NN
log Total Debt	0.282***	0.227***	0.118***	0.106***	0.110***	0.111***	0.441***	0.094**
	(0.037)	(0.033)	(0.040)	(0.038)	(0.036)	(0.036)	(0.125)	(0.040)
log Int Debt		0.190***	0.184***	0.160***	0.144***	0.144***	0.179***	0.110**
		(0.047)	(0.038)	(0.040)	(0.037)	(0.037)	(0.046)	(0.053)
log GDP			0.219***	0.310***	0.291***	0.292***	0.008	0.249***
			(0.053)	(0.073)	(0.070)	(0.070)	(0.148)	(0.061)
log FX Reserves				-0.084**	-0.094**	-0.094**	-0.144**	-0.042
				(0.039)	(0.037)	(0.037)	(0.061)	(0.041)
CDS Spread					-0.004	-0.005	0.052	-0.003
					(0.007)	(0.007)	(0.041)	(0.007)
CDS iVol					-0.000	-0.000	0.002	-0.002
					(0.002)	(0.002)	(0.002)	(0.002)
log CDS Liquidity					0.489***	0.483***	-0.213	0.541***
					(0.115)	(0.115)	(0.220)	(0.145)
Equity iReturn						-0.000	0.002	-0.001
						(0.001)	(0.003)	(0.001)
Equity iVOL						0.005**	-0.007	0.010
						(0.003)	(0.019)	(0.010)
FX Ret						0.002	0.011*	-0.001
						(0.003)	(0.006)	(0.003)
FX VOL						-0.001	0.130	0.007
						(0.009)	(0.179)	(0.010)
Constant	-0.080	-0.203	-0.987***	-1.125***	-2.044***	-2.093***	-1.020	-1.920***
	(0.143)	(0.165)	(0.237)	(0.253)	(0.412)	(0.407)	(0.660)	(0.381)
Observations	1,474	1,474	1,474	1,471	1,471	1,471	520	951
R-squared	0.600	0.687	0.754	0.765	0.783	0.784	0.844	0.745
Time FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	No	No	No	No	No	No
USA	No	No	Yes	Yes	Yes	Yes	Yes	No
# Sovereigns	60	60	60	60	60	60	21	39

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Cross-Sectional Determinants of Gross CDS Trading

This table reports the estimated coefficients from the cross-sectional regression analysis. All information is aggregated at a quarterly frequency. We project quarterly levels of sovereign CDS gross notional (in billion USD) on a set of country-specific variables and time fixed effects. The explanatory variables are total general government debt outstanding in billion USD (*Total Debt*), total international government debt outstanding in billion USD (*Int Debt*), the gross domestic product in billion USD (*GDP*), the total amount of foreign exchange rate reserves in billion USD (*FX Reserves*), the country's CDS spread (*CDS Spread*), CDS volatility, defined as the quarterly sum of daily squared CDS percentage changes (*CDS iVol*), CDS liquidity defined as the number of dealers providing quotes for the computation of the mid market spread, (*CDS Liquidity*), the component of the country MSCI stock market return that is orthogonal to the return on the MSCI world stock market index (*Equity iReturn*), the domestic stock market return volatility, defined as the sum of daily squared idiosyncratic stock market returns over the quarter (*Equity iVol*), the percentage foreign exchange rate return relative to the USD (*FX Ret*), and foreign exchange rate volatility, measured as the quarterly sum of the squared foreign exchange rate returns (*FX Vol*). We report the adjusted R^2 of the regression, and some specifications include a dummy variable that is equal to one for the United States and zero otherwise. Column (7) and (8) separate the results for developed and emerging economies, respectively. All regressions include time fixed effects and standard errors are clustered by country. Variables other than returns and volatility are transformed using a natural logarithmic transformation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	log GN	log GN	log GN	log GN	log GN	log GN	log GN	log GN
log Total Debt	0.349***	0.229***	0.014	0.010	0.050	0.053	0.682***	0.018
	(0.061)	(0.050)	(0.092)	(0.096)	(0.082)	(0.081)	(0.154)	(0.087)
log Int Debt		0.406***	0.412***	0.401***	0.314***	0.312***	0.265***	0.316***
		(0.077)	(0.063)	(0.069)	(0.057)	(0.056)	(0.068)	(0.084)
log GDP			0.401***	0.438**	0.365**	0.366**	-0.089	0.344*
			(0.125)	(0.185)	(0.148)	(0.147)	(0.190)	(0.181)
log FX Reserves				-0.035	-0.057	-0.058	-0.274***	0.005
				(0.085)	(0.064)	(0.064)	(0.063)	(0.091)
CDS Spread					0.024**	0.022**	0.120*	0.018
					(0.010)	(0.010)	(0.065)	(0.011)
CDS iVol					-0.002	-0.002	0.002	-0.002
					(0.003)	(0.003)	(0.003)	(0.004)
log CDS Liquidity					1.680***	1.670***	0.032	1.659***
					(0.239)	(0.236)	(0.301)	(0.304)
Equity iReturn						0.002	0.002	0.001
						(0.002)	(0.003)	(0.002)
Equity iVOL						0.010*	0.001	0.018
						(0.006)	(0.015)	(0.018)
FX Ret						0.008*	0.019***	0.002
						(0.004)	(0.006)	(0.004)
FX VOL						0.004	0.070	0.019
						(0.013)	(0.143)	(0.014)
Constant	1.543***	0.929***	-0.492	-0.547	-3.859***	-3.909***	-0.972	-3.705***
	(0.263)	(0.277)	(0.424)	(0.507)	(0.777)	(0.771)	(0.711)	(0.895)
Observations	1,474	1,474	1,474	1,471	1,471	1,471	520	951
R-squared	0.410	0.573	0.658	0.658	0.752	0.755	0.888	0.742
Time FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	No	No	No	No	No	No
USA	No	No	Yes	Yes	Yes	Yes	Yes	No
Sovereigns	60	60	60	60	60	60	21	39

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Cross-correlation Table - Global Risk Factors

This table presents pairwise pearson correlation coefficients between the global risk factors used in the study: the US dollar factor, the weekly value-weighted return on all NYSE, AMEX and NASDAQ stocks from CRSP in excess of the weekly-Treasury-bill return from Ibbotson Associates (*UsRet*), monthly changes in the cyclically adjusted S&P500 Price-Earnings Ratio as a proxy for equity risk premia (Δ *PE Ratio*), weekly changes in the CBOE Vix index (Δ *VIX*), weekly changes in the TED spread (Δ *TED*), weekly changes in investment-grade and high-yield yield spreads, defined as the differences between the Bank of America/Merrill Lynch US High Corporate BBB and AAA and between BB and BBB, respectively (Δ *BBB-AAA*, Δ *BB-BBB*), weekly changes in the 5-year constant maturity Treasury spread (Δ *5y CMT*), and weekly changes in the price of Brent crude oil Prices, which is measured in USD per barrels and not seasinally adjusted (Δ *Oil Price*). In addition, there is a global (Δ *GlobalCDS*) and a regional spread (Δ *RegCDS*), for each country defined as the average sovereign CDS spread of all other countries in the world or the same region respectively. We use the residual component orthogonal to all other explanatory variables. All variables are measured/aggregated at the weekly frequency, except for changes in the price-earnings ratio. The sample period is October 2008 until June 2015.

Variables	Δ Global CDS	Δ Reg CDS	*UsRet*	Δ PE Ratio	Δ VIX	Δ TED	Δ BBB-AAA	Δ BB-BBB	Δ 5y CMT	Δ Oil Price
Δ Global CDS	1.00									
Δ Reg CDS	0.59	1.00								
UsRet	-0.28	-0.32	1.00							
Δ PE Ratio	-0.11	-0.13	0.24	1.00						
Δ VIX	0.25	0.30	-0.59	-0.15	1.00					
Δ TED	0.05	0.07	0.03	-0.06	0.24	1.00				
Δ BBB-AAA	0.03	0.02	0.07	-0.07	0.03	-0.04	1.00			
Δ BB-BBB	0.18	0.22	-0.32	-0.29	0.51	0.20	0.14	1.00		
Δ 5y CMT	-0.11	-0.12	0.34	0.23	-0.35	0.09	-0.19	-0.43	1.00	
Δ Oil Price	-0.16	-0.18	0.32	0.18	-0.37	0.01	-0.17	-0.44	0.32	1.00

Table 11: Time-Series Determinants of Net CDS Trading

The time-series regressions project weekly percentage changes of sovereign CDS net notional on a set of country-specific and common risk factors, and country fixed effects. The country-specific explanatory variables are percentage changes in total general government debt outstanding in billion USD (Δ *Total Debt*), in total international government debt outstanding in billion USD (Δ *Int Debt*), in the gross domestic product in billion USD (Δ *GDP*), the total amount of foreign exchange rate reserves in billion USD (Δ *FX Reserves*), in the country's CDS spread (Δ *Local CDS*), in CDS volatility, defined as the quarterly sum of daily squared CDS percentage changes (Δ *CDS iVol*), in CDS liquidity defined as the number of dealers providing quotes for the computation of the mid market spread, (Δ *CDS Liq*), the component of the country MSCI stock market return that is orthogonal to the return on the MSCI world stock market index (*Equity iRet*), percentage changes in the domestic stock market return volatility, defined as the sum of daily squared idiosyncratic stock market returns over the quarter (Δ *Equity iVol*), the percentage foreign exchange rate return relative to the USD (*FX Ret*), and foreign exchange rate volatility, measured as the quarterly sum of the squared foreign exchange rate returns (Δ *FX Vol*). The common factors are percentage changes in the US dollar factor, the weekly value-weighted return on all NYSE, AMEX and NASDAQ stocks from CRSP in excess of the weekly-Treasury-bill return from Ibbotson Associates (*UsRet*), in the CBOE Vix index (Δ *VIX*), in the cyclically adjusted price-earnings ratio (Δ *PE Ratio*), in the TED spread (Δ *TED*), in investment-grade and high-yield yield spreads, defined as the differences between the Bank of America/Merrill Lynch US High Corporate BBB and AAA and between BB and BBB, respectively (Δ *BBB-AAA*, Δ *BB-BBB*), in the 5-year constant maturity Treasury spread (Δ *5y CMT*), and in the Brent crude oil price (Δ *Oil Price*). In addition, there is a global (Δ *GlobalCDS*) and a regional spread (Δ *RegCDS*), for each country defined as the average sovereign CDS spread of all other countries in the world or the same region respectively. We use the residual component orthogonal to all other explanatory variables. All regressions include country fixed effects and contract roll dummies. (Unreported) standard errors are clustered at the country level. We also do not report the quarterly fundamental variables due to space constraints (total and international debt, GDP, FX reserves).

VARIABLES	(1) Δ NN %	(2) Δ NN %	(3) Δ NN %	(4) Δ NN %	(5) Δ NN %	(6) Δ NN %	(7) Δ NN %	(8) Δ NN %
USDollar	-0.300***	-0.324***	-0.272***	-0.285***	-0.254***	-0.243***	-0.417**	-0.187***
Δ Local CDS		0.009*	0.009*	0.008	0.010*	0.010*	0.017**	0.006
Δ CDS iVOL		-0.077**	-0.072**	-0.071**	-0.071**	-0.073**	-0.030	-0.113**
Δ CDS Liq		0.001	0.001	0.001	0.001	0.001	0.003	0.000
Equity iRet			-0.014	-0.013	-0.014	-0.016	-0.003	-0.016
Δ Equity iVol			-0.296***	-0.295***	-0.292***	-0.293***	0.274**	-0.353***
FX Ret			-0.052**	-0.051**	-0.052**	-0.052**	0.002	-0.047
Δ FX Vol			-0.010	-0.011	-0.011	-0.016	1.800	-0.026
Δ Global CDS				0.006	0.006	0.006*	-0.001	0.009***
Δ Reg CDS				-0.001	-0.000	-0.000	0.007**	-0.003
UsRet					0.020	0.019	-0.029	0.045**
Δ PE Ratio					0.043	0.045	-0.087	0.105**
Δ VIX					-0.002	0.004	-0.013	0.014
Δ TED					-0.007	-0.011	-0.032*	0.001
Δ BBB-AAA						-0.002	0.003	-0.005
Δ BB-BBB						0.004*	0.007**	0.002
Δ 5y CMT						-0.003	0.001	-0.004
Δ Oil Price						0.037***	0.040***	0.033***
Constant	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***	0.002***
Observations	18,515	18,456	18,456	18,456	18,456	18,456	6,635	11,821
R-squared	0.032	0.035	0.037	0.037	0.037	0.039	0.057	0.037
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Roll Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sovereigns	61	61	61	61	61	61	21	40

Table 12: Time-Series Determinants of Gross CDS Trading

The time-series regressions project weekly percentage changes of sovereign CDS gross notional on a set of country-specific and common risk factors, and country fixed effects. The country-specific explanatory variables are percentage changes in total general government debt outstanding in billion USD (Δ *Total Debt*), in total international government debt outstanding in billion USD (Δ *Int Debt*), in the gross domestic product in billion USD (Δ *GDP*), the total amount of foreign exchange rate reserves in billion USD (Δ *FX Reserves*), in the country's CDS spread (Δ *Local CDS*), in CDS volatility, defined as the quarterly sum of daily squared CDS percentage changes (Δ *CDS iVol*), in CDS liquidity defined as the number of dealers providing quotes for the computation of the mid market spread, (Δ *CDS Liq*), the component of the country MSCI stock market return that is orthogonal to the return on the MSCI world stock market index (*Equity iRet*), percentage changes in the domestic stock market return volatility, defined as the sum of daily squared idiosyncratic stock market returns over the quarter (Δ *Equity iVol*), the percentage foreign exchange rate return relative to the USD (*FX Ret*), and foreign exchange rate volatility, measured as the quarterly sum of the squared foreign exchange rate returns (Δ *FX Vol*). The common factors are percentage changes in the US dollar factor, the weekly value-weighted return on all NYSE, AMEX and NASDAQ stocks from CRSP in excess of the weekly-Treasury-bill return from Ibbotson Associates (*UsRet*), in the CBOE Vix index (Δ *VIX*), in the cyclically adjusted price-earnings ratio (Δ *PE Ratio*), in the TED spread (Δ *TED*), in investment-grade and high-yield yield spreads, defined as the differences between the Bank of America/Merrill Lynch US High Corporate BBB and AAA and between BB and BBB, respectively (Δ *BBB-AAA*, Δ *BB-BBB*), in the 5-year constant maturity Treasury spread (Δ *5y CMT*), and in the Brent crude oil price (Δ *Oil Price*). In addition, there is a global (Δ *GlobalCDS*) and a regional spread (Δ *RegCDS*), for each country defined as the average sovereign CDS spread of all other countries in the world or the same region respectively. We use the residual component orthogonal to all other explanatory variables. All regressions include country fixed effects and contract roll dummies. (Unreported) standard errors are clustered at the country level. We also do not report the quarterly fundamental variables due to space constraints (total and international debt, GDP, FX reserves).

VARIABLES	(1) Δ GN %	(2) Δ GN %	(3) Δ GN %	(4) Δ GN %	(5) Δ GN %	(6) Δ GN %	(7) Δ GN %	(8) Δ GN %
USDollar	-0.046	-0.087**	-0.104**	-0.098**	-0.090*	-0.064	-0.258	-0.039*
Δ Local CDS		0.012***	0.011***	0.012***	0.012***	0.012***	0.020***	0.005
Δ CDS iVOL		-0.010	-0.011	-0.012	-0.009	-0.014	-0.024	0.001
Δ CDS Liq		0.003***	0.003***	0.003***	0.004***	0.003***	0.004***	0.003**
Equity iRet			-0.013*	-0.014*	-0.015*	-0.017**	0.002	-0.023**
Δ Equity iVol			0.065**	0.064**	0.075**	0.075**	0.160***	0.084**
FX Ret			0.020	0.020	0.020	0.021	0.175**	-0.015
Δ FX Vol			0.022	0.023	0.023	0.014	0.686	0.053***
Δ Global CDS				-0.000	-0.001	-0.000	0.001	-0.000
Δ Reg CDS				-0.003	-0.003	-0.003	-0.010**	0.004*
UsRet					-0.024***	-0.026***	0.016	-0.052***
Δ PE Ratio					-0.052**	-0.044**	-0.106***	-0.019
Δ VIX					-0.020**	-0.017*	-0.005	-0.020
Δ TED					-0.030***	-0.034***	-0.044***	-0.026***
Δ BBB-AAA						0.002	0.002	0.002
Δ BB-BBB						0.004**	0.009***	0.001
Δ 5y CMT						-0.007***	-0.009**	-0.005**
Δ Oil Price						0.053***	0.067***	0.044***
Constant	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.007***	0.005***
Observations	18,515	18,456	18,456	18,456	18,456	18,456	6,635	11,821
R-squared	0.036	0.037	0.038	0.038	0.041	0.046	0.045	0.056
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Roll Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sovereigns	61	61	61	61	61	61	21	40

Table 13: Time-Series Determinants of CDS Trading Volume

The time-series regressions project weekly percentage changes of sovereign CDS trading volume (market risk transfer activity) on a set of country-specific and common risk factors, and country fixed effects. The country-specific explanatory variables are percentage changes in total general government debt outstanding in billion USD (Δ *Total Debt*), in total international government debt outstanding in billion USD (Δ *Int Debt*), in the gross domestic product in billion USD (Δ *GDP*), the total amount of foreign exchange rate reserves in billion USD (Δ *FX Reserves*), in the country's CDS spread (Δ *Local CDS*), in CDS volatility, defined as the quarterly sum of daily squared CDS percentage changes (Δ *CDS iVol*), in CDS liquidity defined as the number of dealers providing quotes for the computation of the mid market spread, (Δ *CDS Liq*), the component of the country MSCI stock market return that is orthogonal to the return on the MSCI world stock market index (*Equity iRet*), percentage changes in the domestic stock market return volatility, defined as the sum of daily squared idiosyncratic stock market returns over the quarter (Δ *Equity iVol*), the percentage foreign exchange rate return relative to the USD (*FX Ret*), and foreign exchange rate volatility, measured as the quarterly sum of the squared foreign exchange rate returns (Δ *FX Vol*). The common factors are percentage changes in the US dollar factor, the weekly value-weighted return on all NYSE, AMEX and NASDAQ stocks from CRSP in excess of the weekly-Treasury-bill return from Ibbotson Associates (*UsRet*), in the CBOE Vix index (Δ *VIX*), in the cyclically adjusted price-earnings ratio (Δ *PE Ratio*), in the TED spread (Δ *TED*), in investment-grade and high-yield yield spreads, defined as the differences between the Bank of America/Merrill Lynch US High Corporate BBB and AAA and between BB and BBB, respectively (Δ *BBB-AAA*, Δ *BB-BBB*), in the 5-year constant maturity Treasury spread (Δ *5y CMT*), and in the Brent crude oil price (Δ *Oil Price*). In addition, there is a global (Δ *GlobalCDS*) and a regional spread (Δ *RegCDS*), for each country defined as the average sovereign CDS spread of all other countries in the world or the same region respectively. We use the residual component orthogonal to all other explanatory variables. All regressions include country fixed effects and contract roll dummies. (Unreported) standard errors are clustered at the country level. We also do not report the quarterly fundamental variables due to space constraints (total and international debt, GDP, FX reserves).

VARIABLES	(1) Δ Vol	(2) Δ Vol	(3) Δ Vol	(4) Δ Vol	(5) Δ Vol	(6) Δ Vol	(7) Δ Vol	(8) Δ Vol
USDollar	4.751***	3.863**	3.550*	3.566*	3.214	2.410	2.393	1.537
Δ Local CDS		0.289	0.239	0.153	0.113	0.184	-0.000	0.302
Δ CDS iVOL		8.811***	8.581***	8.648***	8.670***	8.626***	18.193***	6.491***
Δ CDS Liq		0.639***	0.634***	0.632***	0.644***	0.642***	0.695***	0.591***
Equity iRet			-0.389	-0.376	-0.401	-0.416	-1.566	-0.227
Δ Equity iVol			7.595***	7.687***	7.724***	7.562***	-22.902	7.579***
FX Ret			0.516	0.530	0.532	0.532	2.864	-0.357
Δ FX Vol			-1.029	-0.996	-0.826	-0.265	426.350***	-0.439
Δ Global CDS				-0.361**	-0.380***	-0.340**	-1.159***	-0.169
Δ Reg CDS				0.450***	0.439***	0.464***	1.183***	0.307*
UsRet					-0.656	0.058	0.134	-0.059
Δ PE Ratio					-3.683***	-4.014***	-5.057**	-4.225**
Δ VIX					-0.376	-0.126	-1.837**	0.689
Δ TED					-1.839***	-1.336**	-2.332**	-0.776
Δ BBB-AAA						-0.981***	-0.969***	-0.869**
Δ BB-BBB						-0.177	0.155	-0.382**
Δ 5y CMT						-0.163	0.007	-0.145
Δ Oil Price						-2.452***	-2.532***	-2.593***
Constant	-0.007	-0.004	-0.004	-0.002	0.003	-0.008	-0.013	-0.008
Observations	11,749	11,747	11,747	11,747	11,747	11,747	4,223	7,524
R-squared	0.005	0.015	0.015	0.016	0.017	0.020	0.037	0.019
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Roll Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sovereigns	61	61	61	61	61	61	21	40

Table 14: Country Regressions

The time-series regressions project weekly percentage changes of sovereign CDS gross notional on a set of country-specific and common risk factors, and country fixed effects. The country-specific explanatory variables are percentage changes in total general government debt outstanding in billion USD (Δ *Total Debt*), in total international government debt outstanding in billion USD (Δ *Int Debt*), in the gross domestic product in billion USD (Δ *GDP*), the total amount of foreign exchange rate reserves in billion USD (Δ *FX Reserves*), in the country's CDS spread (Δ *Local CDS*), in CDS volatility, defined as the quarterly sum of daily squared CDS percentage changes (Δ *CDS iVol*), in CDS liquidity defined as the number of dealers providing quotes for the computation of the mid market spread, (Δ *CDS Liq*), the component of the country MSCI stock market return that is orthogonal to the return on the MSCI world stock market index (*Equity iRet*), percentage changes in the domestic stock market return volatility, defined as the sum of daily squared idiosyncratic stock market returns over the quarter (Δ *Equity iVol*), the percentage foreign exchange rate return relative to the USD (*FX Ret*), and foreign exchange rate volatility, measured as the quarterly sum of the squared foreign exchange rate returns (Δ *FX Vol*). The common factors are percentage changes in the US dollar factor, the weekly value-weighted return on all NYSE, AMEX and NASDAQ stocks from CRSP in excess of the weekly-Treasury-bill return from Ibbotson Associates (*UsRet*), in the CBOE Vix index (Δ *VIX*), in the cyclically adjusted price-earnings ratio (Δ *PE Ratio*), in the TED spread (Δ *TED*), in investment-grade and high-yield yield spreads, defined as the differences between the Bank of America/Merrill Lynch US High Corporate BBB and AAA and between BB and BBB, respectively (Δ *BBB-AAA*, Δ *BB-BBB*), in the 5-year constant maturity Treasury spread (Δ *5y CMT*), and in the Brent crude oil price (Δ *Oil Price*). In addition, there is a global (Δ *GlobalCDS*) and a regional spread (Δ *RegCDS*), for each country defined as the average sovereign CDS spread of all other countries in the world or the same region respectively. We use the residual component orthogonal to all other explanatory variables. All regressions include country fixed effects and contract roll dummies. (Unreported) standard errors are clustered at the country level. We also do not report the quarterly fundamental variables due to space constraints (total and international debt, GDP, FX reserves). We report t-statistics, statistical significance at the 1% (∗), 5% (+), and 10% (*o*), respectively. The last three columns report the adjusted R2 of the full regression, the local ratio defined as the ratio of adjusted R2s from the restricted (to domestic factors) and unrestricted regressions, and the number of observations (*N*). The last two rows report the number of statistically significant t-statistics at the 1% and both the 1% and 5% respectively. For the last three columns, the last two rows correspond to the mean and median values.

Country	Δ CDS	Δ Vol	Equity iRet	Δ Equity iVol	FX Ret	FX Vol	Δ Glob CDS	Δ Reg CDS	US Ret	US RP	Δ VIX	Δ TED	Δ BBB-AAA BBB	Δ BB-CMT	Δ 5y	Δ Oil	adj *R2*	Loc Rat	N Obs.
AbuDhab	1.46^{o}	0.08	0.38	0.57	-1.22	0.90	-1.55^{o}	-0.98	1.24	1.04	1.01	0.03	-1.05	-0.42	-1.15	0.50	0.06	1.10	307
Argentina	-1.14	-1.53^{o}	-0.94	-0.60	1.50^{o}	-1.42^{o}	-0.27	-1.38^{o}	0.67	2.40^{*}	0.69	1.08	0.67	0.22	-1.52^{o}	1.34^{o}	0.17	0.84	299
Australia	1.55^{o}	-1.23	-0.30	-0.82	0.15	2.53^{*}	-1.01	-0.30	0.97	-0.58	0.44	0.65	0.65	0.51	1.56^{o}	0.87	0.15	1.06	308
Austria	1.59^{o}	0.95	-0.73	1.31^{o}	-1.95^{+}	-0.56	-0.07	0.33	0.95	-2.08^{+}	0.57	-1.11	-1.81^{+}	-0.61	-0.79	0.82	0.15	0.94	333
Belgium	1.50^{o}	0.38	0.84	-1.22	0.84	-1.23	0.83	-0.76	1.07	-0.73	0.75	-0.63	0.27	0.71	1.06	1.26	0.09	1.12	333
Brazil	-0.49	-1.25	0.34	-0.54	-1.35^{o}	-0.43	0.18	0.21	-0.96	0.82	-1.16	2.11^{+}	-0.27	0.02	-0.47	0.98	0.19	1.04	333
Bulgaria	0.45	-0.11	-1.51^{o}	-1.23	1.07	-2.82^{*}	1.42^{o}	-1.15	-0.30	0.19	0.24	-0.37	-0.93	0.24	-0.65	2.16^{+}	0.05	1.01	346
Chile	0.90	-1.52^{o}	-2.11^{+}	-0.56	-1.32^{o}	-1.25	-0.19	1.68^{+}	0.83	2.09^{+}	-0.03	-0.74	-1.08	0.71	0.73	0.00	0.09	0.84	333
China	-1.20	-0.86	-2.47^{*}	-0.52	-1.13	1.48^{o}	0.08	0.61	0.92	-0.27	-0.07	-1.39^{o}	-0.17	1.71^{+}	-1.14	1.33^{o}	0.16	0.81	333
Colombia	-1.63^{o}	1.33^{o}	1.24	-1.21	1.97^{+}	0.06	-0.30	1.83^{+}	0.16	0.28	-0.81	-0.59	-1.30^{o}	-0.77	-1.01	-0.16	0.06	1.15	333

Continued on next page

Country	Δ CDS	Δ Vol	Equity iRet	Δ Equity iVol	FX Ret	FX Vol	Δ Glob CDS	Δ Reg CDS	US Ret	US RP	Δ VIX	Δ TED	Δ BBB-AAA	Δ BB-BBB	Δ 5y CMT	Δ Oil	adj $R2$	Loc Rat	N Obs.
Croatia	1.06	-1.18	-2.07^{+}	-1.77^{+}	1.16	-1.70^{+}	0.68	-0.20	1.70^{+}	0.87	0.35	-0.23	1.12	0.64	0.49	-0.40	0.05	1.12	333
Cyprus	0.29	-0.72	-0.53	1.90^{+}	-0.23	-1.72^{+}	0.61	-0.81	0.15	-1.15	-0.89	-0.61	1.21	0.45	-0.18	1.90^{+}	-0.04	0.15	152
CzechRep.	2.04^{+}	0.15	0.09	-2.30^{+}	-1.49^{o}	-1.40^{o}	0.24	-0.88	0.10	0.87	-0.22	-0.87	1.48^{o}	-0.39	-1.71^{+}	1.04	0.04	1.06	333
Denmark	1.95^{+}	-1.68^{+}	1.33^{o}	0.96	-1.57^{o}	1.35^{o}	0.52	-0.87	0.31	-1.63^{o}	1.88^{+}	-1.68^{+}	-0.46	0.49	0.63	2.15^{+}	0.12	0.74	333
Dubai	0.10	-1.37^{o}	1.29^{o}	-1.35^{o}	0.79	0.87	-0.08	0.57	1.65^{+}	-1.79^{+}	1.35^{o}	0.36	0.38	0.24	-0.43	2.35^{*}	0.03	0.94	346
Egypt	0.53	0.13	0.89	0.58	0.84	0.18	1.72^{+}	1.85^{+}	1.84^{+}	-0.81	0.70	-0.78	-0.47	0.05	-0.10	1.69^{+}	0.01	-0.47	276
Estonia	0.80	1.59^{o}	-2.12^{+}	0.70	-0.66	0.82	0.60	-0.30	-0.42	0.84	-1.48^{o}	-0.39	0.18	0.82	-0.25	0.04	0.03	1.57	333
Finland	-1.05	-2.23^{+}	-0.01	-1.83^{+}	-0.93	0.39	0.50	-0.42	0.90	-0.08	-2.01^{+}	-0.69	0.32	-0.19	-2.04^{+}	1.36^{o}	0.13	0.92	333
France	0.57	-0.48	-0.71	0.94	2.24^{+}	-0.13	1.03	-0.93	0.42	-0.36	1.95^{+}	-1.61^{o}	0.54	-0.47	0.49	1.00	0.01	1.36	333
Germany	-0.08	-0.61	-1.67^{+}	0.40	1.35^{o}	-0.06	0.84	-0.52	-0.31	-0.80	0.67	0.52	-0.29	1.34^{o}	-0.42	1.46^{o}	0.05	1.07	333
Greece	-0.58	-0.30	0.40	0.13	-0.34	0.09	-1.03	0.46	-0.25	-0.51	0.45	-0.47	0.46	0.18	0.23	0.77	0.04	1.89	208
Hungary	0.07	-2.82^{*}	0.54	0.15	0.32	-0.34	-0.03	0.21	0.82	0.22	-0.56	-1.41^{o}	-1.43^{o}	0.95	0.19	-1.45^{o}	0.00	6.59	164
Iceland	-0.30	0.48	0.68	0.08	-0.44	-0.51	-0.70	0.73	-0.94	-0.90	0.13	0.95	0.15	-0.98	0.33	-0.76	0.13	1.13	333
Indonesia	0.13	-2.17^{+}	-1.18	1.39^{o}	-0.10	-1.36^{o}	0.56	-1.07	-0.15	-0.19	1.60^{o}	0.94	-0.60	-1.54^{o}	0.86	-1.51^{o}	0.13	1.04	333
Ireland	0.59	3.94^{*}	1.29^{o}	0.84	-0.02	-1.04	2.52^{*}	-1.99^{+}	-0.49	-1.31^{o}	-1.05	-1.76^{+}	1.58^{o}	1.02	1.99^{+}	1.89^{+}	0.16	0.72	333
Israel	2.23^{+}	0.50	-0.48	-0.91	-0.19	0.90	1.11	-0.49	-0.40	1.03	-1.16	2.71^{*}	1.28	1.36^{o}	1.55^{o}	0.32	0.09	0.43	333
Italy	-1.41^{o}	-1.04	-0.14	0.84	-0.33	-1.83^{+}	-0.54	0.89	-1.01	-0.84	-1.65^{+}	-2.54^{*}	1.47^{o}	-0.01	-1.90^{+}	0.52	0.16	0.85	333
Japan	-0.26	-0.98	-1.39^{o}	0.11	-0.69	-1.32^{o}	0.82	-0.77	0.66	2.52^{*}	0.74	-1.74^{+}	-1.81^{+}	2.25^{+}	-0.79	1.26	0.09	0.80	333
Kazakhst	-0.35	0.39	0.64	0.32	1.50^{o}	0.03	-0.28	-0.29	-2.57^{*}	-0.66	-0.39	1.57^{o}	1.48^{o}	-0.60	0.36	0.64	0.02	0.72	333
Korea	-0.33	0.22	-0.29	-0.97	1.23	0.64	-0.35	-0.17	1.42^{o}	1.00	0.61	0.50	-1.07	1.05	2.00^{+}	-0.59	0.16	0.79	333
Latvia	1.75^{+}	1.33^{o}	-0.02	-1.38^{o}	1.24	-2.77^{*}	1.62^{o}	-1.53^{o}	0.95	0.94	-0.32	0.64	1.15	0.85	0.05	0.90	0.05	1.22	333
Lebanon	0.93	-0.73	0.67	1.40^{o}	-0.64	1.03	-0.70	-0.25	1.81^{+}	-0.57	1.57^{o}	1.68^{+}	-0.78	-1.64^{o}	0.48	0.82	0.00	-2.90	273
Lithuania	-0.31	-1.94^{+}	0.66	-1.29^{o}	0.16	1.72^{+}	-0.66	0.73	0.74	-1.19	0.76	-1.32^{o}	-0.63	0.74	0.14	0.30	0.05	1.26	346
Malaysia	1.71^{+}	-0.96	-1.98^{+}	-0.43	-0.66	0.76	2.59^{*}	-2.60^{*}	1.44^{o}	-0.85	2.25^{+}	0.37	-0.60	0.03	-1.09	0.95	0.17	0.92	333
Mexico	-1.36^{o}	-0.69	0.43	-3.20^{*}	1.01	0.19	-1.08	-1.04	-0.93	0.66	0.99	0.29	-0.14	0.07	-0.98	2.78^{*}	0.06	0.75	333
Netherl.	-0.05	-0.36	1.07	0.63	-2.91^{*}	-1.00	-0.52	0.37	1.59^{o}	-0.27	-0.65	0.13	3.90^{*}	0.40	-1.62^{o}	-0.19	0.15	0.64	333
NewZealand	0.46	0.67	0.28	-0.29	0.29	-0.10	-0.74	0.71	0.72	-0.64	0.05	-0.11	-0.82	2.02^{+}	0.32	1.06	0.04	1.32	273
Norway	-1.01	-0.65	-1.15	0.24	-0.77	2.25^{+}	0.78	-0.51	-0.87	0.22	-0.85	-1.53^{o}	-0.44	1.10	0.71	-0.28	0.07	0.92	330
Panama	0.11	0.00	0.02	-1.29^{o}			1.57^{o}	-1.29^{o}	-0.76	0.74	0.42	2.48^{*}	0.87	-0.43	0.67	0.06	0.07	0.89	320
Peru	-1.12	-0.09	0.36	0.42	-0.17	0.70	-0.70	-0.30	-1.39^{o}	0.92	-0.90	2.37^{*}	-2.13^{+}	-1.58^{o}	-1.19	0.00	0.03	0.74	333
Philip	0.89	-0.47	0.45	-0.90	0.17	1.62^{o}	1.11	-0.64	0.91	-0.08	0.01	-2.05^{+}	-2.02^{+}	-0.57	-1.45^{o}	-1.01	0.17	0.95	333
Poland	1.03	-1.69^{+}	2.90^{*}	1.33^{o}	-1.21	-1.14	-0.03	0.03	0.82	0.34	0.27	-0.69	0.12	1.05	0.37	0.88	0.03	1.68	333
Portugal	0.76	-0.62	0.25	-0.73	-1.56^{o}	-0.53	0.08	0.03	-1.54^{o}	0.82	-2.10^{+}	-0.22	1.30^{o}	0.34	-0.48	0.71	0.17	1.01	333
Qatar	1.24	-0.22	0.61	-1.17	1.17	-0.28	-1.47^{o}	-0.37	0.01	1.36^{o}	-0.03	-0.36	-1.68^{+}	0.65	0.49	1.55^{o}	0.03	0.84	333
Romania	-0.94	-1.06	-0.79	-0.82	0.91	-1.05	-0.55	0.35	0.07	-0.49	2.06^{+}	1.75^{+}	1.39^{o}	-1.36^{o}	1.03	0.23	-0.01	1.87	346
Russia	1.52^{o}	0.74	1.80^{+}	-0.39	2.21^{+}	0.58	0.57	-0.65	0.59	-0.94	-1.60^{o}	1.10	-0.88	-0.94	-0.05	-0.77	0.12	1.05	333
Saud.Arab.	2.20^{+}	-0.58	-1.61^{o}	-1.50^{o}	-1.08	1.45^{o}	3.05^{*}	-2.04^{+}	-0.55	0.12	-0.05	-0.69	-1.46^{o}	-1.19	0.21	-1.52^{o}	0.05	0.73	208
Slovakia	0.61	1.11	-0.16	-1.21	-0.93	-1.29^{o}	1.16	-0.77	-1.97^{+}	1.34^{o}	-1.71^{+}	-0.90	3.08^{*}	0.59	-0.71	1.18	0.12	0.52	333
Slovenia	-0.36	-0.11	-1.17	-1.01	0.29	0.73	0.69	-0.66	0.60	-1.30^{o}	-0.54	-2.23^{+}	-0.31	0.10	0.74	-0.16	0.02	1.13	320
SthAfrica	2.02^{+}	0.89	-1.44^{o}	-0.39	-0.04	-2.08^{+}	-0.02	-1.34^{o}	-1.00	-0.61	-1.75^{+}	0.69	-3.01^{*}	-0.04	-0.25	0.99	0.12	0.84	333
Spain	-0.57	-0.47	-0.07	0.16	-0.29	-0.54	0.95	-0.91	-1.19	-0.46	0.04	0.46	0.34	-0.29	-0.69	1.91^{+}	0.11	1.02	333
Sweden	2.51^{*}	-0.46	0.32	0.15	-1.90^{+}	0.59	1.14	-0.89	-1.71^{+}	-0.34	-2.51^{*}	-1.34^{o}	-0.35	2.08^{+}	0.66	1.19	0.19	0.81	333
Switzerland	0.53	-1.43^{o}	-0.72	-1.53^{o}	-1.15	-1.01	0.69	-0.67	-1.43^{o}	0.32	0.05	-0.31	-1.25	-0.44	2.17^{+}	0.39	0.68	1.02	63
Thailand	1.20	-0.11	-0.69	0.21	-0.22	0.87	2.08^{+}	-0.60	-0.01	-0.25	0.95	-2.20^{+}	-0.57	0.36	1.04	1.19	0.02	1.17	333
Tunisia	-1.62^{o}	2.77^{*}	1.48^{o}	1.64^{o}	-1.67^{+}	1.04	-0.90	0.77	-0.37	-1.63^{o}	-0.20	0.36	-1.14	0.15	1.42^{o}	0.46	0.05	1.27	227
Turkey	-0.85	0.07	-0.36	-0.73	0.74	-1.85^{+}	-0.44	1.25	0.63	-0.99	-1.01	1.61^{o}	-1.21	-0.17	1.09	-1.01	0.11	0.87	333
Ukraine	-0.16	-0.32	-0.31	1.04	-0.66	-0.32	2.49^{*}	-2.02^{+}	-0.48	-0.70	-0.45	0.02	1.00	-0.59	-0.06	0.54	0.11	0.93	346
U.S.	1.05	0.37	1.58^{o}	1.33^{o}			-0.24	0.52	-2.23^{+}	-1.26	0.01	-1.73^{+}	-2.10^{+}	-0.53	0.13	1.37^{o}	0.14	0.70	333
U.K.	1.83^{+}	1.79^{+}	-1.39^{o}	-2.38^{*}	1.02	1.54^{o}	-0.56	0.57	-0.98	0.27	-1.57^{o}	1.12	0.84	1.00	-1.38^{o}	0.46	0.14	1.01	333
Venezuela	-1.15	-0.35	0.18	-0.02	-1.05	-1.47^{o}	-1.02	0.63	1.41^{o}	0.93	1.33^{o}	0.20	-0.50	-1.01	-1.50^{o}	1.86^{+}	0.05	0.74	307
Vietnam	-0.17	0.53	-0.84	-0.70	-0.68	0.68	-1.10	-0.44	-0.15	0.68	0.65	-0.56	0.96	0.39	1.42^{o}	0.16	-0.02	0.22	333

Table 15: Credit Risk Channel

This table reports the regression results from the weekly percentage changes of net (columns 1 to 4) and gross (column 5) notional amounts of sovereign CDS outstanding on credit risk shocks due to contemporaneous and lagged credit rating and credit rating outlook changes. We define the indicator variable *Upgrade* that takes on the value one during the week a country's credit rating rating changes from (i) below B- to B- or higher, (ii) below BBB- to BBB- or higher, (iii) below A- to A- or higher, (v) below AA- to AA- or higher, and zero otherwise. We define the indicator variable *Downgrade* that takes on the value one during the week a country's credit rating rating changes from (i) B- or higher to below B-, (ii) BBB- or higher to below BBB-, (iii) A- or higher to below A-, (iv) AA- or higher to below AA-, zero otherwise. *Pos Δ Outlook* is an indicator variable that is equal to one if the rating outlook changes from negative to neutral, *or* from negative to positive outlook, *or* from neutral to positive, and zero otherwise. *Neg Δ Outlook* is an indicator variable that is equal to one if the rating outlook changes from positive to neutral, *or* from neutral to negative, *or* from positive to negative, and zero otherwise. Column 6 reports results for a matched sample, where we match with replacement countries from the same geographical region using the first best match based on the Mahalanobis distance between the vector of observed covariates across treated and non-treated countries. The match is based on the CDS spread level, the credit rating, and the ratio of net notional to debt outstanding in the quarter immediately preceding the rating or outlook action. Column 7 adjusts the definition of rating and outlook changes to account for all credit rating and outlook changes, as opposed to those that result in changes of regulatory capital requirements according to the Basel II Standardized framework. Column 8 uses all rating and outlook changes that do not result in a change of regulatory capital requirements. We use all country-specific and common global control variables as defined in Part I of the manuscript. All regressions include roll dummies that are equal to one in the week of the conventional roll dates, and monthly time fixed effects. Standard errors are clustered at the country level.

VARIABLES	(1) Δ NN %	(2) Δ NN %	(3) Δ NN %	Regulatory Ratings (4) Δ NN %	Regulatory Ratings (5) Δ GN %	Matched Sample (6) Δ NN %	All Ratings (7) Δ NN %	Non-Reg Ratings (8) Δ NN %
Pos Δ Outlook	-0.020*	-0.020*	-0.020*	-0.020*	-0.002	-0.020*	-0.011	-0.008
	(0.011)	(0.011)	(0.011)	(0.011)	(0.008)	(0.011)	(0.008)	(0.010)
Neg Δ Outlook	-0.004	-0.004	-0.003	-0.005	0.004	-0.004	0.001	0.003
	(0.010)	(0.010)	(0.010)	(0.010)	(0.005)	(0.008)	(0.006)	(0.008)
Upgrade	-0.028**	-0.028**	-0.028**	-0.028**	0.013	-0.028**	-0.004	0.006
	(0.014)	(0.014)	(0.014)	(0.014)	(0.012)	(0.014)	(0.008)	(0.007)
Downgrade	-0.020**	-0.021**	-0.021**	-0.021**	0.002	-0.004	-0.009*	-0.002
	(0.008)	(0.008)	(0.008)	(0.008)	(0.002)	(0.003)	(0.005)	(0.004)
Lag Pos Δ Outlook		0.004	0.004	0.004	-0.008	0.004	0.003	0.002
		(0.009)	(0.010)	(0.010)	(0.011)	(0.010)	(0.004)	(0.005)
Lag Neg Δ Outlook		0.023**	0.023**	0.022**	0.017***	0.002	0.009**	0.001
		(0.009)	(0.009)	(0.009)	(0.005)	(0.006)	(0.004)	(0.006)
Lag Upgrade		-0.003	-0.003	-0.003	0.000	-0.003	-0.004	-0.001
		(0.007)	(0.007)	(0.007)	(0.003)	(0.007)	(0.004)	(0.004)
Lag Downgrade		-0.001	-0.000	-0.000	-0.014	-0.003	0.003	0.005*
		(0.005)	(0.005)	(0.005)	(0.009)	(0.005)	(0.003)	(0.003)
Constant	-0.009*	0.004	0.003	0.003	0.008***	0.003	0.003	0.003
	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)	(0.004)
Observations	20,069	20,008	20,008	19,962	19,962	19,962	19,962	19,962
R-squared	0.052	0.052	0.053	0.054	0.102	0.054	0.054	0.053
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Roll Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Global Controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Local Controls	No	No	No	Yes	Yes	Yes	Yes	Yes
Time FE (Monhtly)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sovereigns	61	61	61	61	61	61	61	61
Diff Coeff. Downgrade (4) & (6)						-0.017**		
Diff Coeff. Lag Neg Δ Outlook (4) & (6)						0.02**		

*** p<0.01, ** p<0.05, * p<0.1

Table 16: Credit Risk Channel - Summary Statistics Treatment and Matched Samples

This table reports summary statistics for treatment and matched control samples from the tests that examine the impact of credit risk shocks on CDS trading. We match with replacement countries from the same geographical region using the first best match based on the Mahalanobis distance between the vector of observed covariates across treated and non-treated countries. The match is based on the CDS spread level, the credit rating, and the ratio of net notional to debt outstanding in the quarter immediately preceding the rating or outlook action. We perform a match for downgrades (Panel A) and lagged negative rating outlook changes (Panel B). In the statistics, we report the average and either the standard deviation or the range, as well as a t-test for the differences in means. The last two rows in Panel A report the t-test for the differences in means excluding Greece. The reported variables are the number of countries (# Sovereigns), the CDS spread level (CDS), the credit rating by FitchRatings (Rating), the net notional amount of CDS outstanding as a fraction of total public debt outstanding (Net Notional), the gross notional amount of CDS outstanding as a fraction of total public debt outstanding (Gross Notional), and the total amount of debt outstanding as a fraction of GDP (Debt/GDP).

	Actual		Matched		Difference			
							Ex Greece	
	Mean	Std. Dev. Range	Mean	Std. Dev. Range	Diff	t-stat	Diff	t-stat
Panel A								
Downgrade								
Sovereigns	19		16					
CDS	71.50	59.45	48.39	27.94	23.11	6.17***	16.87	4.60***
Rating	BBB	[B- AA]	BBB	[B- AA]	-0.09	0.30	-0.55	1.83*
NN/Debt	12.23	41.67	4.48	6.93	7.76	3.21***	9.80	3.73***
GS/Debt	82.43	205.64	49.36	63.42	33.07	2.69***	46.10	3.47***
Net Notional	4.97	[0.23 21.40]	5.83	[0.17 22.24]	-0.86	1.75*	0.04	1.76*
Gross Notional	61.46	[1.61 411.65]	82.75	[1.54 425.59]	-21.29	2.73***	-19.91	2.35**
Debt/GDP	0.65	0.42	0.56	0.24	0.09	3.26***	0.01	0.25
CDS Vol	0.82	1.56	0.51	0.75	0.31	3.10***	0.29	2.77***
CDS Liq	6.41	1.72	7.03	1.62	-0.62	4.63***	-0.32	2.34**
Equity Ret	-0.40	3.67	-0.33	4.21	-0.07	0.23	0.02	0.06
Equity Vol	0.23	1.82	0.15	0.28	0.08	0.74	0.07	0.61
Panel B								
Neg Δ Outlook								
Sovereigns	13		12					
CDS	42.07	26.83	41.26	27.20	0.81	0.29		
Rating	BBB-	[B AA]	BBB-	[B- AA+]	-0.14	0.41		
NN/Debt	2.74	3.95	2.84	2.12	1.51	2.47**		
GS/Debt	34.05	47.78	34.74	30.13	10.35	2.56**		
Net Notional	0.45	[0.24 14.33]	2.21	[0.21 10.16]	0.52	1.65		
Gross Notional	34.05	[1.85 128.78]	29.87	[1.65 136.44]	4.17	1.12		
Debt/GDP	0.45	0.32	0.42	0.23	0.02	0.79		
CDS Vol	0.70	1.47	0.54	0.85	0.16	1.30		
CDS Liq	0.27	1.80	6.72	1.73	-0.01	0.05		
Equity Ret	0.00	5.26	0.13	5.44	-0.24	0.43		
Equity Vol	0.00	0.60	0.25	0.47	0.02	0.41		

Table 17: Credit Risk Channel - List of Treatment and Matched Samples

This table reports the list of treatment and matched control samples from the tests that examine the impact of credit risk shocks on CDS trading. We match with replacement countries from the same geographical region using the first best match based on the Mahalanobis distance between the vector of observed covariates across treated and non-treated countries. The match is based on the CDS spread level, the credit rating, and the ratio of net notional to debt outstanding in the quarter immediately preceding the rating or outlook action. We perform a match for downgrades (Panel A) and lagged negative rating outlook changes (Panel B). In the statistics, we report the treatment date, the names of the treated and matched countries, and the rating immediately prior to the rating action.

Panel A: Downgrades

N	Date	Treated Country	Rating	Matched Country
1	9 Nov 08	Romania	BBB	Russia
2	22 Dec 08	Lithuania	A-	Hungary
3	8 Apr 09	Estonia	BBB-	Iceland
4	8 Apr 09	Latvia	A-	Iceland
5	8 Dec 09	Greece	A	Poland
6	5 Jan 10	Iceland	BB+	Latvia
7	6 Oct 10	Ireland	AA-	Portugal
8	9 Dec 10	Ireland	AA-	Portugal
9	23 Dec 10	Portugal	AA-	Ireland
10	14 Jan 11	Greece	BBB-	Ireland
11	1 Apr 11	Portugal	BBB-	Ireland
12	13 Jul 11	Greece	B+	Portugal
13	24 Nov 11	Portugal	BBB-	Ireland
14	6 Jan 12	Hungary	BB+	Croatia
15	27 Jan 12	Slovenia	AA-	Slovakia
16	27 Jan 12	Spain	AA-	Italy
17	22 May 2012	Japan	AA	New Zeal
18	7 Jun 12	Spain	A	Italy
19	25 Jun 12	Cyprus	BBB-	Portugal
20	27 Nov 12	Argentina	B	Venezuela
21	12 Dec 12	Tunisia	BBB-	Turkey
22	8 Mar 13	Italy	A-	Slovenia
23	17 May 13	Slovenia	A-	Italy
24	20 Sep 13	Croatia	BBB-	Hungary
25	7 Feb 14	Ukraine	B-	Cyprus
26	18 Dec 14	Venezuela	B	Colombia
27	27 Mar 15	Greece	B	Cyprus

Panel B: Negative Outlook Changes

N	Date	Treated Country	Rating	Matched Country
1	2 Mar 2009	Hungary	BBB	Croatia
2	30 Apr 2009	Bulgaria	BBB-	Russia
3	21 May 2009	Croatia	BBB-	Romania
4	14 Jan 2011	Tunisia	BBB	Sth Africa
5	28 Sep 2011	Slovenia	AA-	Belgium
6	11 Nov 2011	Hungary	BBB-	Croatia
7	30 Oct 2012	Argentina	B	Venezuela
8	29 Nov 2012	Croatia	BBB-	Romania
9	28 Jun 2013	Ukraine	B	Cyprus
10	30 Jul 2013	Malaysia	A-	Thailand
11	19 Dec 2013	Lebanon	B	Egypt
12	21 Mar 2014	Russia	BBB	Iceland
13	13 Jun 2014	Sth Africa	BBB	Turkey
14	16 Jan 2015	Greece	B	Cyprus
15	9 Apr 2015	Brazil	BBB	Panama

Table 18: International Debt Issuance Channel - Net Notional CDS Outstanding

This table reports the regression results from the weekly percentage changes of net and gross notional amounts of sovereign CDS outstanding on the announcement of debt issuance and debt issuance dates. We define the indicator variable $IDIss$ ($IDAnn$) that takes on the value one during the week of an international debt issue (gets announced), and zero otherwise. $IDMaturityIss$ defines the value-weighted average maturity of an international debt issuance. $IDAmount\%Iss$ defines the size if the international debt issue as a fraction of total outstanding debt. We use all country-specific and common global control variables as define in Part I of the manuscript. All regressions include roll dummies that are equal to one in the week of the conventional roll dates. Standard errors are clustered at the country level. Column (6) restricts the sample to developed economies, while column (7) restricts the sample to emerging economies. Column (8) uses new trades as the dependent variable.

VARIABLES	(1) Δ NN %	(2) Δ NN %	(3) Δ NN %	(4) Δ NN %	(5) Δ NN %	(6) Δ NN %	(7) Δ NN %	(8) New Trades
ID Iss	0.007**	0.003	0.002	0.002	0.002	0.004	-0.002	0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)
ID Maturity Iss	-0.000*	-0.000*	-0.000	-0.000	-0.000	-0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ID Amount % Iss		0.120	0.258*	0.257*	0.261*	0.358	0.296*	0.213**
		(0.118)	(0.150)	(0.151)	(0.151)	(0.216)	(0.167)	(0.086)
ID Mat x Amount Iss			-0.013*	-0.013*	-0.013*	-0.022	-0.017**	-0.021***
			(0.007)	(0.007)	(0.007)	(0.019)	(0.008)	(0.008)
ID Announ	-0.003	-0.003	-0.003	-0.003	-0.003	-0.001	-0.006*	0.000
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.005)
ID Maturity Iss	0.000	0.000	0.000	0.000	0.000	-0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ID Amount % Iss		0.020	-0.005	-0.007	-0.006	-0.049	0.029	0.295**
		(0.055)	(0.079)	(0.079)	(0.079)	(0.329)	(0.078)	(0.131)
ID Mat x Amount Ann			0.002	0.003	0.003	0.007	-0.000	-0.031***
			(0.007)	(0.007)	(0.007)	(0.028)	(0.007)	(0.012)
Constant	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.003***	0.023***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	19,424	19,424	19,424	19,375	19,139	6,673	12,466	10,584
R-squared	0.032	0.033	0.033	0.037	0.038	0.056	0.035	0.087
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Roll Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Global Controls	No	No	No	Yes	Yes	Yes	Yes	Yes
Local Controls	No	No	No	No	Yes	Yes	Yes	Yes
Sovereigns	61	61	61	61	61	21	40	61

*** p<0.01, ** p<0.05, * p<0.1

Table 19: International Debt Issuance Channel - Gross Notional CDS Outstanding

This table reports the regression results from the weekly percentage changes of net notional amounts of sovereign CDS outstanding on the announcement of debt issuance and debt issuance dates. We define the indicator variable $IDIss$ ($IDAnn$) that takes on the value one during the week of an international debt issue (gets announced), and zero otherwise. $IDMaturityIss$ defines the value-weighted average maturity of an international debt issuance. $IDAmount\%Iss$ defines the size if the international debt issue as a fraction of total outstanding debt. We use all country-specific and common global control variables as define in Part I of the manuscript. All regressions include roll dummies that are equal to one in the week of the conventional roll dates. Standard errors are clustered at the country level. Column (6) restricts the sample to developed economies, while column (7) restricts the sample to emerging economies.

VARIABLES	(1) Δ GN %	(2) Δ GN %	(3) Δ GN %	(4) Δ GN %	(5) Δ GN %	(6) Δ GN %	(7) Δ GN %
ID Iss	-0.001	-0.001	-0.001	-0.001	-0.001	-0.007	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
ID Maturity Iss	0.000	0.000	0.000	0.000	0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ID Amount % Iss		0.024	0.011	0.011	0.012	0.650***	-0.020
		(0.018)	(0.033)	(0.031)	(0.033)	(0.191)	(0.029)
ID Mat x Amount Iss			0.001	0.001	0.001	-0.083**	0.003
			(0.003)	(0.002)	(0.003)	(0.034)	(0.002)
ID Announ	0.002	0.001	0.001	0.002	0.002	0.004	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
ID Maturity Ann	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ID Amount % Ann		0.022	0.009	0.004	0.006	-0.215	0.035
		(0.023)	(0.039)	(0.040)	(0.043)	(0.217)	(0.040)
ID Mat x Amount Ann			0.001	0.002	0.002	0.029	-0.003
			(0.004)	(0.004)	(0.004)	(0.021)	(0.002)
Constant	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.005***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	19,424	19,424	19,424	19,375	19,139	6,673	12,466
R-squared	0.037	0.038	0.038	0.046	0.048	0.040	0.059
Country Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Roll Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Global Controls	No	No	No	Yes	Yes	Yes	Yes
Local Controls	No	No	No	No	Yes	Yes	Yes
Sovereigns	61	61	61	61	61	21	40

*** p<0.01, ** p<0.05, * p<0.1

Internet Appendix

Why Do Investors Buy Sovereign Default Insurance?

Patrick Augustin, *McGill University - Desautels Faculty of Management*
Valeri Sokolovski, *Stockholm School of Economics and Swedish House of Finance*
Marti G. Subrahmanyam, *New York University - Leonard N. Stern School of Business*

A-I Data Description

This appendix describes in detail the data sources and definitions used for the empirical regression analysis.

A-II CDS Trading Terminology

A-II.A Gross Notional CDS Outstanding

According to the Derivatives Consulting Group Glossary, *Gross* refers to "A derivative or asset position expressed without netting bought and sold trades," and *Notional Amount* refers to "The amount of principal underlying the derivative contract, to which interest rates are applied in order to calculate periodic payment obligations."[1] In other words, for credit default swaps, notional amount refers to the par amount of credit protection bought or sold, equivalent to debt or bond amounts, and is used to derive the premium payment calculations for each payment period and the recovery amounts in the event of a default. The Depository Trust & Clearing Corporation's ("DTCC") Trade Information Warehouse ("Warehouse") reports aggregate gross notional amounts outstanding on a weekly basis. According to their definition, "*Gross Notional Values are the sum of CDS contracts bought (or equivalently sold) for all Warehouse contracts* in aggregate, by sector or for single reference entities displayed. Aggregate gross notional value and contract data provided are calculated on a per-trade basis. For example, a transaction of $10 million notional between buyer and seller of protection is reported as one contract and $10 million gross notional, as opposed to two contracts worth $20 million. It is interesting to note that according to ISDA interpretations, "notional amount most certainly overstates the level of new activity because it represents a cumulative total of past transactions, many of which were used by dealers to make their daily adjustments to their risk positions."[2] In addition, they state that "given the increasing awareness that notional amount outstanding is not a useful measure of risk, there are efforts to provide more meaningful data." Also, the Bank for International Settlements ("BIS") reports that "[gross notional] amounts are generally not those truly at risk."[3]

[1] http://www.isda.org/c_and_a/oper_commit-dcg-glossary.html#g
[2] http://www.isdacdsmarketplace.com/market_statistics/understanding_notional_amount
[3] http://www.bis.org/publ/otc_hy1111.pdf

Table A-1: Data Appendix

This table reports the definitions and data sources of all variables used in the analysis. The sources are the Depository Trust and Clearing Corporation (DTCC), Markit CDS (Markit), Thomson Reuters Datastream (Datastream), the Bank for International Settlement (BIS), the International Monetary Fund International Financial Statistics (IMF).

Variable	**Label**	**Source**	**Definition**
Net Notional	NN	DTCC	Aggregate net notional amount of CDS outstanding defined as the sum of the net protection bought by net buyers (or equivalently net protection sold by net sellers), expressed in million US dollar equivalents using the prevailing foreign exchange rates.
Gross Notional	GN	DTCC	Aggregate gross notional amount of CDS outstanding defined as the sum of CDS contracts bought (or equivalently sold) for all Warehouse contracts, expressed in million US dollar equivalents using the prevailing foreign exchange rates.
Total Debt	TD	BIS	Total general government debt in billion USD.
International Debt	ID	BIS	Total international general government debt in billion USD. International debt comprises debt securities issued in a market other than the local market of the country where the borrower resides. This captures debt conventionally known as eurobonds and foreign bonds.
Domestic Debt	DD	BIS	Total domestic general government debt in billion USD. Domestic debt comprises debt securities issued in the local market of the country where the borrower resides, regardless of the currency in which the security is denominated.
Gross Domestic Product	GDP	IMF	Gross domestic product (current prices) in billion USD.
Foreign Exchange Reserves	FX Reserves	IMF	Total foreign exchange reserves in billion USD.
Credit Default Swap Spread	CDS Spread	Markit	Five-year senior unsecured sovereign CDS spread with full restructuring credit event clause, expressed in percent, i.e. 100 basis points.
Credit Default Swap Spread Volatility	CDS iVol	Markit	Squared OLS residuals from the regression of CDS spread changes of country i on changes of the global CDS spread, defined as the mean spread of all other countries $j \neq i$, expressed in percentages.
Credit Default Swaps Liquidity	CDS Liquidity	Markit	CDS liquidity or depth, defined as the number of dealer quotes used in the computation of the 5-year mid-market CDS spread.
Idiosyncratic stock market return	Equity iReturn	Thomson Reuters Datastream	OLS residuals from the regression of local benchmark equity index returns of country i on the MSCI World return index, expressed in percentages.
Idiosyncratic Equity Volatility	Equity iVOL	Thomson Reuters Datastream	Squared OLS residuals from the regression of local benchmark equity index returns of country i on the MSCI World return index, expressed in percentages.
Foreign exchange rate return	FX Ret	Thomson Reuters Datastream	Log percentage changes in the exchange rate vis-`-vis the USD, expressed in percentages.
Foreign exchange rate volatility	FX Vol	Thomson Reuters Datastream	Squared percentage changes in the exchange rate vis-`-vis the USD, expressed in percentages.

Note that gross notional amount outstanding should not be confused with *gross (positive and negative) market values*, which are reported by the Bank for International Settlements (BIS). According to the BIS, "*gross market values are defined as the sums of the absolute values of all open contracts with either positive or negative replacement values evaluated at market prices prevailing on the reporting date.*" Thus, the gross positive market value of a dealer's outstanding contracts is the sum of the replacement values of all contracts that are in a current gain position to the reporter at current market prices (and therefore, if they were settled immediately, would represent claims on counterparties). The gross negative market value is the sum of the values of all contracts that have a negative value on the reporting date (i.e., those that are in a current loss position and therefore, if they were settled immediately, would represent liabilities of the dealer to its counterparties). The term "gross" indicates that contracts with positive and negative replacement values with the same counterparty are not netted.

Finally, the BIS also reports statistics on *gross credit exposures and liabilities*. According to the BIS, "*gross credit exposure represents the gross value of contracts that have a positive market value after taking account of legally enforceable bilateral netting agreements.*" Similarly, liabilities arising from OTC derivatives contracts represent the gross value of contracts that have a negative market value taking account of legally enforceable bilateral netting agreements.

A-II.B Net Notional CDS outstanding

One section of the 2002 ISDA Master Agreement allows counterparties to proceed to the netting of payments. Payment netting takes place during the normal business of a solvent firm, and involves combining offsetting cash flow obligations between two parties on a given day in a given currency into a single net payable or receivable.[4] Another form of netting guided buy Section 6 of the Master Agreement is close-out netting, which applies to transactions between a defaulting firm and a non-defaulting firm. Close-out netting refers to a process involving termination of obligations under a contract with a defaulting party and subsequent combining of positive and negative replacement values into a single net payable or receivable. Hence, the DTCC reports, in addition to gross notional amounts outstanding, net notional amounts outstanding of CDS. Following their definition, "*net notional values with respect to any single reference entity is the sum of the net protection bought by net*

[4] http://www.isda.org/researchnotes/pdf/Netting-ISDAResearchNotes-1-2010.pdf

buyers (or equivalently net protection sold by net sellers). The aggregate net notional data provided is calculated based on counterparty family. A counterparty family will typically include all of the accounts of a particular asset manager or corporate affiliates rolled up to the holding company level. Aggregate net notional data reported is the sum of net protection bought (or equivalently sold) across all counterparty families.[5] Given that net notional positions generally represent the maximum possible net funds transfers between net sellers of protection and net buyers of protection that could be required upon the occurrence of a credit event relating to particular reference entities (actual net funds transfers are dependent on the recovery rate for the underlying bonds or other debt instruments), net notional is often considered to be an economically more meaningful measure (Oehmke and Zawadowski, 2014a).

A-II.C Novation/Assignment

If a counterparty would like to reduce its credit exposure towards an individual reference entity, she would usually enter a new trade by doing the same trade in the opposite direction, thereby offsetting its exposure. In contrast to exchange traded derivatives, for which the sale of the contract would effectively erase the deal from the trading book, in the presence of OTC derivative transactions, both deals stay "alive" until expiration of the contracts. Although this would reduce the *net* credit exposure, it doesn't reduce counterparty risk. There is however a procedure, which allows to completely eliminate transactions from the trading book. Such a procedure is called *Novation* or, equivalently, *Assignment*. Following the Derivatives Consulting Group Gloassary, an Assignement or Novation refers to "*the process by which one counterparty (transferor) agrees to transfer to a third party (transferee) its obligations under an existing transaction they have with another counterparty (remaining party).*" Thus, the transferee is *stepping in*, and the transferor is *stepping out*. It refers to the process by which one of the original parties exits a transaction, and instead of terminating, a third party steps in upon identical terms and assumes the rights and obligations of the party that is stepping out.

Contractually, the *2004 ISDA Novation Definitions* are intended to facilitate the documentation of the novation of transactions under the ISDA Master Agreement and the *2005 ISDA Novation Protocol* provides an outline of the duties of each of the parties to a novation when completing a novation pursuant to the terms of the 2005 ISDA Novation Protocol.

[5] http://www.dtcc.com/downloads/products/derivserv/tiw_data_explanation.pdf

The *August 2010 Additional Provisions for Consent to, and Confirmation of, Transfer by Novation of OTC Derivative Transactions* were prepared to facilitate the launch of the Consent (i.e., Confirmation project) for Credit Derivatives Transactions. They are designed for incorporation into the documentation governing use of a Novation Consent Platform to set out the legal effect of a novation consent request processed through that platform. It is intended to apply to users of the relevant platform via the users' agreement to be governed by the platform's rules, and to ensure that consistent legal provisions apply to novation consent requests processed through different platforms.[6]

DTCC states that *since an assignment transaction is the transfer of a pre-existing Warehouse position to another party, it does not affect Gross Notional Value or Contract totals.* For the purpose of aggregated *net* notional amounts, the fact that certain trades may be novated has no effect either. This would be different, however, if the purpose was to study the net exposure of individual counterparties at the micro level. Note that there may also be *partial* assignments/novations.

A-II.D Cancellations/Terminations and Compressions

Terminations or Cancellation of trades refers to the unwinding of a certain contracts in the Warehouse. This may reduce both the gross and net notional amount outstanding, but more likely the gross amount. The practice of termination has become more common since the call by regulators for increased credit risk mitigation. As a consequence, the industry engages in *trade compression* cycles on a periodic basis for single name reference entities and indices. *The objective of a trade compression is to maintain the same risk profile but reduce the number of contracts and Gross Notional value held by participants.* Compression cycles involve both Full Terminations and New Trades. According to ISDA explanations, "Portfolio compression reduces the overall notional size and number of outstanding contracts in credit derivative portfolios. Importantly, it does so without changing the overall risk profiles of these portfolios. This is achieved by terminating existing trades on single name reference entities and on indices and replacing them with a smaller number of new trades, but with substantially smaller notionals that carry the same risk profile and cash flows as the initial portfolio."[7] Trade compression has the effect of reducing gross (and

[6] See also http://www.isda.org/isdanovationprotII/isdanovationprotII.html, and http://www.isda.org/isdanovationprotII/novprotII_opin.html for an opinion by Allen & Overy under New York law and English law regarding the enforceability of the ISDA Novation Protocol II.

[7] http://www.isdacdsmarketplace.com/market_statistics/portfolio_compression

sometimes net) notional amounts outstanding.

A-II.E Matured Transactions, Backloads, and Exits

Another mechanism, by which gross and net notional outstanding (in DTCC), as well as open interest (CME and NYSE) may be influenced is *matured transactions*, which occurs when contracts have reached the end of the contract (referred to as the scheduled Termination Date). A small source of error for weekly data are *backloads* and *exits*. Backloads refer to the fact that the Warehouse allows participants to register contracts previously executed and confirmed non-electronically. These transactions impact both gross notional value and contract totals, but are not indicative of new trade activity. Exits, in contrast, represent contracts that have been removed from the Warehouse bilaterally by participants. Exits are most commonly processed at the conclusion of a single name credit event, succession event, or upon other activity typically confirmed outside the Warehouse (e.g. bankruptcy close out procedures).

A-II.F Volume and Open Interest

The CME and NYSE (through Intercontinental Exchange (NYSE: ICE)) both provide clearing platforms for OTC credit derivatives.[8] They report on their websites information on *open interest* and daily *volume*. In a footnote, they define "*open interest as the sum of the net notional outstanding per contract*." This should thus be in line with the definitions of net notional amounts outstanding reported bt DTCC. Moreover, "*Volume is defined as the sum of the notional for trades where both the buyer and seller agree to clearing the transaction*." The values are said to be one sided and volume is calculated daily. Open interest may therefore be affected by trade compressions, but not by novations. Volume should not be affected at all.

A-III Links to the Basel Accords

The Basel Accords refer to the banking supervision Accords (recommendations on banking regulations, Basel I, Basel II and Basel III, issued by the Basel Committee on Banking

[8] See http://www.cmegroup.com/trading/cds/index.html and https://www.theice.com/homepage.jhtml

Supervision (BCBS). We provide an overview of the relevant sections of the three accords that deal with OTC derivative counterparty risk exposure.[9]

A-III.A Basel I

The original Basel Capital Accord (Basel I) was published in July 1988 by the Basel Committee on Banking Supervision. The document presented the prescriptions on capital adequacy of international banks, and these suggestions became legally enforceable in 1992 by the "Group of Ten".[10] Although these regulations have been enacted before the introduction of the CDS market, it still remains important for the purpose of this paper to ascertain that the bank regulation dealing with capital provisions for counterparty OTC risk has been in place since 1992.

Recognising that, at the time, there was only limited experience in assessing the risks in some of the off-balance sheet activities, the document, nevertheless, makes some prescriptions with regard to such engagements (Subsection VI, Paragraphs 42-43 on pages 12-13 of the main text of the document as well as Annex III that describes the "credit conversion factors for off-balance-sheet items"). Subsequently, two amendments are made regarding specifically the treatment of the off-balance sheet items (the July 1994 "*Basel Capital Accord: the treatment of the credit risk associated with certain off-balance-sheet items*" and April 1995: "*Basel Capital Accord: Treatment of potential exposure for off-balance-sheet items*").

Paragraph 42 of the 1988 accord states: *"[t]he Committee believes that it is of great importance that all off-balance-sheet activity should be caught within the capital adequacy framework."* (1988, page 12).

The paragraph goes on to say that "*all categories of off-balance-sheet engagements, including recent innovations* [(such as forwards, swaps, OTC purchased options and similar derivative contracts)] *will be converted to credit risk equivalents by multiplying the nominal principal amounts by a credit conversion factor, the resulting amounts then being weighted according to the nature of the counterparty.*"

[9] Complete texts of the different Basel accords are available on the website of the BIS, http://www.bis.org/publ/bcbs04a.htm (Basel I), http://www.bis.org/publ/bcbs128.htm (Basel II), http://www.bis.org/publ/bcbs189.htm (Basel III).

[10] The "Group of Ten" includes Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, United Kingdom and the United States.

However, the document notes that special treatment of counterparty credit risk may be needed when dealing with derivative contracts. The text in the April 1995 amendment sums it up: "*the treatment of forwards, swaps, purchased options and similar derivative contracts needs special attention because banks are not exposed to credit risk for the full face value of their contracts, but only to the potential cost of replacing the cash flow (on contracts showing positive value) if the counterparty defaults.*" Thus, the banks and national regulators were given a choice of calculating the credit equivalent amounts according to the "current exposure method" (sum of the net mark-to-market replacement cost, if positive, plus an add-on based on the notional underlying principal) or the "original exposure method" (an application of conversion factors from a prescribed set to the notional principal amounts of each instrument according to the nature of the instrument and its maturity). Finally, the credit equivalent amounts are weighted according to the category of counterparty in the same way as in the main framework, including concessionary weighting in respect of exposures backed by eligible guarantees and collateral.

In sum, Basel I sets the foundation for the later accords with issuing instructions for the banks regarding the capital adjustments for counter-party credit risk when dealing with OTC derivatives.

A-III.B Basel II

Basel II, the second of the Basel Accords, was first published in June 2004 and the comprehensive version was made available in July 2006. In contrast to the original accord, Basel II makes explicit prescriptions regarding "OTC derivatives that expose a bank to counterparty credit risk" (2006, page 19) and devotes Annex 4 (titled "*Treatment of Counterparty Credit Risk and Cross-Product Netting*") to it. Counterparty credit risk is also explicitly defined:

"*The counterparty credit risk is defined as the risk that the counterparty to a transaction could default before the final settlement of the transactions cash flows. An economic loss would occur if the transactions or portfolio of transactions with the counterparty has a positive economic value at the time of default. Unlike a firms exposure to credit risk through a loan, where the exposure to credit risk is unilateral and only the lending bank faces the risk of loss, the counterparty credit risk creates a bilateral risk of loss: the market value of the transaction can be positive or negative to either counterparty to the transaction. The market value is uncertain and can vary over time with the movement of underlying market* *factors.*" (2006, page 19)

The Annex 4 of Basel II presents a fairly comprehensive overview of "permissible methods for estimating the Exposure at Default (EAD) or the exposure amount for instruments with counterparty credit risk (CCR)" (2006, page 254). Essentially, the Annex to the document offers guidelines on the models available to banks in appropriately calculating their counterparty risk exposures (credit equivalent amounts) due to various transactions including OTC derivatives.

The banks are however given some leeway in choosing the appropriate model. The bank may receive approval to use an internal model method for calculating the appropriate counterparty credit risk exposure in its OTC derivative dealings (provided the model meets certain standards set forth in the Annex), alternatively "for all OTC derivative transactions and for all long settlement transactions for which a bank has not received approval from its supervisor to use the internal models method, the bank must use either the standardised method or the current exposure method."(2006, page 260).

Given the theme of this paper there are two important issues. Firstly the Basel II accord states that collateral may be used to mitigate risk exposure and indeed the prescribed models subtract the market value of collateral (in one way or another) before calculating the final exposure. Secondly, credit default swaps are mentioned explicitly as viable hedging instruments to offset the regulatory capital charge associated with counter-party credit risk exposure:

"*Under all of the three methods identified in this Annex, when a bank purchases **credit derivative protection** against a banking book exposure, or against a counterparty credit risk exposure, it will determine its capital requirement for the hedged exposure subject to the criteria and general rules for the recognition of credit derivatives, i.e. substitution or double default rules as appropriate. Where these rules apply, the exposure amount or EAD for **counterparty credit risk** from such instruments is **zero**.*" (2006, page 258)

Basel II had built on the foundation of Basel I offering detailed prescriptions on the appropriate regulatory capital adjustments for OTC derivative counterparty risk exposure, but still offered substantial flexibility to the banks in their choice of model as well as opportunities to reduce exposure through collateral and/or purchasing CDS protection on the counterparty.

A-III.C Basel III

The latest accord, Basel III, is a global, voluntary regulatory standard on bank capital adequacy, stress testing and market liquidity risk. The first Basel III guide was released on December 2010 and the current, revised version of the document was released in June 2011.[11] Essentially, Basel III keeps most of the wording of the Basel II (including the section on OTC derivative counterparty risks), but tightens and expands certain prescriptions.

An important theme in Basel III is enhanced counterparty credit risk management. The reforms to the counterparty risk management were to become effective on January 1, 2013. The new feature of Basel III are the prescriptions regarding the capitalisation of the risk of CVA losses. Banks are required to hold capital against marked-to-market losses arising from a decline in counterparty creditworthiness, which is called credit value adjustment (CVA).

As we mention above the new feature of Basel III is an addition of a capital charge linked to CVA, including CVA associated with exposure to sovereigns. In other words, if for example a sovereign with whom a bank has a swap agreement gets downgraded, that results in marked-to-market losses on that swap position and requires for the bank to set aside additional capital as a buffer. The Basel Commitee requires the banks to calculate the CVA capital charge at least on a monthly basis. The exact calculation is performed in one of two ways. First, using a standard approach, a probability of default derived from a counterparty's rating is calculated for annual calendar points and a loss given default assumed. The resulting small percentage is then applied to expected exposure and discounted to the present. The sum of these amounts is then a form of expected losses and is the CVA risk-weighted asset amount. Under a modelling approach, dealer firms use CDS spreads to calculate probabilities of default and to adjust the capital accordingly. The management of counterparty risk under the Basel rules becomes especially relevant for sovereign credit default swaps, as banks usually turn to those to manage their sovereign exposure.

An important, additional provision in Basel III is that capital relief can only be provided if positions are hedged with single name CDS. Hence, no CVA capital charge needs to be incurred if the bank hedges any changes to counterparty exposure using a CDS. Actually, the Basel III rules are very strict in the definition of **eligible hedges** and only hedges

[11] The CVA guidelines were added in June 2011. However CVA was first defined in the Basel II documentation.

used for the explicit purpose of mitigating CVA risk, and managed as such, are eligible to be included in the VaR model used to calculate CVA capital charges. Many dealers actively hedge uncollateralized OTC derivatives exposure through the CDS, interest rate swaps and foreign exchange markets; however under Basel III only the CDS carries the regulatory capital relief.[12]

In sum Basel III simply strenghtens the Basel II prescriptions regarding counterparty risk, but the additional CVA capital charges coupled with limited hedging options prescribed by the Basel III regulation promises to put added pressure on the sovereign CDS market.

[12] "The only eligible hedges that can be included in the calculation of the CVA risk capital charge under paragraphs 98 or 104 are single-name CDSs, single-name contingent CDSs, other equivalent hedging instruments referencing the counterparty directly, and index CDSs"(BIS, 2010 p. 34).

Table A-2: Schedule RC-L - Derivatives and Off-Balance Sheet Items

This table reports item 16 of Schedule RC-L - Derivatives and Off-Balance Sheet Items of Consolidated Reports of Condition and Income for A Bank With Domestic and Foreign Offices - FFIEC 031, for Goldman Sachs Bank USA at Quarter End Date 3/31/2013. The document RSSD-ID 2182786 has last been updated on 4/30/2013. Source: Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, Office of the Comptroller of the Currency.

Dollar amounts in thousands	(Column A) Banks and Securities Firms	(Column B) Monoline Financial Guarantors	(Column C) Hedge Funds	(Column D) Sovereign Governments	(Column E) Corporations and All Other Counterparties
16. Over-the counter derivatives:					
	RCFDG418	RCFDG419	RCFDG420	RCFDG421	RCFDG422
a. Net current credit exposure	58,469,000	0	52,000	**811,000**	10,107,000
b. Fair value of collateral					
	RCFDG423	RCFDG424	RCFDG425	RCFDG426	RCFDG427
1. Cash - U.S. dollar	33,637,000	0	122,000	19,000	4,028,000
	RCFDG428	RCFDG429	RCFDG430	RCFDG431	RCFDG432
2. Cash - Other currencies	12,415,000	0	2,000	0	107,000
	RCFDG433	RCFDG434	RCFDG435	RCFDG436	RCFDG4237
3. U.S. Treasury securities	2,519,000	0	1,000	0	582,000
	RCFDG438	RCFDG439	RCFDG440	RCFDG441	RCFDG442
4. U.S. Government agency and U.S. Government-sponsored agency debt securities	5,473,000	0	0	0	94,000
	RCFDG443	RCFDG444	RCFDG445	RCFDG446	RCFDG447
5. Corporate bonds	279,000	0	0	0	232,000
	RCFDG448	RCFDG449	RCFDG450	RCFDG451	RCFDG452
6. Equity securities	0	0	0	0	0
	RCFDG453	RCFDG454	RCFDG455	RCFDG456	RCFDG457
7. All other collateral	9,724,000	0	0	0	61,000
	RCFDG458	RCFDG459	RCFDG460	RCFDG461	RCFDG462
8. Total fair value of collateral (sum of items 16.b.(1) through (7))	64,047,000	0	125,000	**19,000**	5,104,000

CENTER FOR FINANCIAL STUDIES

CFS Working Paper Series

Recent Issues

All CFS Working Papers are available at *www.ifk-cfs.de*.

No.	Authors	Title
539	Carlo Altavilla, Marco Pagano, and Saverio Simonelli	*Bank Exposures and Sovereign Stress Transmission*
538	Volker Brühl	*How to define a Systemically Important Financial Institution (SIFI) – a new perspective*
537	Markus K. Brunnermeier, Sam Langfield, Marco Pagano, Ricardo Reis, Stijn Van Nieuwerburgh, Dimitri Vayanos	*ESBies: Safety in the tranches*
536	Günter W. Beck, Hans-Helmut Kotz, Natalia Zabelina	*Prices and consumer purchasing preferences at the border: evidence from a multi-country household scanner data set*
535	Christian Rühl	*Size and welfare costs of price differences across European countries*
534	Günter Beck, Sarah M. Lein	*Microeconometric evidence on demand-side real rigidity and implications for monetary nonneutrality*
533	Söhnke M. Bartram, Gregory Brown, and René M. Stulz	*Why does idiosyncratic risk increase with market risk?*
532	Ludger Schuknecht	*The supply of "safe" assets and fiscal policy*