A circular model for credit risk contagion*

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Abstract

In waterfall models of credit risk contagion, sovereign credit risk spills over to the private sector. This paper introduces a circular model for credit risk contagion in which there are feedback loops from the financial and non-financial corporate sectors to the sovereign. We first study the causal relationships between corporate and sovereign CDS and find convincing evidence for bidirectional causality. Second, we model sovereign CDS returns and find that lagged financial and non-financial corporate CDS changes are strong predictors for sovereign CDS changes. Our findings have important implications for the modeling of sovereign credit risk because we show that corporate risk factors are good predictors of sovereign credit risk.

Keywords: Sovereign credit rating, financial development, banking sector, bond market, foreign capital inflows, emerging markets
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1. Introduction

Recent shocks in global debt markets and repeated debt crises in emerging economies have raised concerns over the persistent rise in sovereign credit risk. Consequently, many researchers have investigated its determinants, focusing on macroeconomic fundamentals such as debt exposures, fiscal indicators, international reserves, economic growth, and political risk measures (Aizenman et al., 2013, Bekaert et al., 2016, Hilscher and Nosbusch, 2010).

Early studies that explain sovereign credit risk mainly focused on country specific factors such as inflation, GDP growth and government debt to GDP (Cantor and Packer, 1996, Kamin and Von-Kleist, 1999). With globalization and the growing interconnectedness between financial markets, there is a general consensus in the literature that sovereign risk models that only focus on domestic macroeconomic fundamentals under-perform. Sovereign credit risk is also influenced by global factors such as global investors' appetite for credit risk, financial market linkages and commonalities between sovereigns.[1] Commonalities can result from correlated investor sentiment (Beetsma et al., 2013) or from common dealers (Antón et al., 2018). Bernoth and Erdogan (2012) show that there is important cyclical variation in the determinants of sovereign credit spreads: during certain periods, yield spreads depend mostly on macroeconomic fundamentals, while during other periods spread changes are due to variations in risk pricing. While most authors focus on the levels of macroeconomic fundamentals to explain sovereign credit risk, Hilscher and Nosbusch (2010) show that their volatility provides a significant explanation for the variation in sovereign yield spreads. In particular, they find that a one standard deviation increase in the volatility in terms of trade is associated with an increase of 164bps in the credit spread of emerging market sovereign debt.[2]

The use of macroeconomic variables to explain sovereign credit risk is essentially a top-down approach which treats the sovereign as an independent entity characterized by its macroeconomic fundamentals. Instead, we argue that corporate credit data can also be useful to explain and predict sovereign credit risk. This view is based on three arguments. First, the financial strength

[1] Amongst others Ang and Longstaff (2013), Beirne and Fratzscher (2013), Pan and Singleton (2008), Wu et al. (2016), Liu and Spencer (2013), Kalbaska and Gatkowski (2012), Antón et al. (2018), Broto and Pérez-Quirós (2015), Caporin et al. (2018).

[2] Terms of trade is calculated as the price of a country's exports relative to its imports.

of companies and banks can be aggregated into the country's economic figures. If we consider a country as a business entity, which has corporations as subsidiaries, there would be a direct relationship between credit risk at the corporate level (in particular the banking sector) and at the country level. Second, corporate financial data is typically far more detailed and available at higher frequency than country level data. Most macro data is available at quarterly frequency at best, which implies that information at the country level cannot be reflected in a timely manner if we disregard information at the corporate level. Third, many stock market crashes tend to precede sovereign distress, not the other way around. The main research idea of this paper is illustrated in Figure 1. The traditional view on credit risk contagion is based on a waterfall model, where sovereign credit risk spills over to financial institutions and then to the corporate sector. Since the European debt crisis, several studies have identified a feedback loop from the financial sector to the sovereign level, as illustrated by the lighter arrow in the left panel of Figure 1. We argue that credit risk contagion follows a circular pattern, with feedback mechanisms from each level to the other. A good example of the waterfall model for credit risk contagion is the concept of the sovereign rating ceiling, which means that a corporate bond rating cannot be higher than the country rating of the issuer. The sovereign ceiling implies that rating agencies take sovereign credit risk into account when evaluating a corporate issuer, but not necessarily the other way around.

Figure 1

We empirically test this hypothesis by analyzing a dataset of sovereign and corporate CDS spreads spanning from 2004 to 2018. In this paper, we rely on sovereign and corporate CDS spreads as our primary measures of credit risk. A key advantage of CDS data over sovereign bond data is the higher liquidity of the CDS market, which provides more accurate estimates of credit spreads and returns (Longstaff et al., 2011). To explore the dynamic interaction between corporate and sovereign risk, we focus on the extent to which changes in corporate CDS spreads help explain movements in sovereign CDS spreads.

Our empirical strategy consists of two key steps. First, we conduct Granger causality tests to assess whether corporate CDS spreads predict sovereign CDS spreads, and vice versa. Second, we estimate dynamic panel regressions and employ a two-stage least squares (2SLS) instrumental variable approach to evaluate whether lagged corporate CDS spreads improve the forecasting power of sovereign CDS spreads. In doing so, we control for global and regional market factors, macroeconomic fundamentals, and bond market liquidity.

Our findings reveal a significant feedback loop from the corporate to the sovereign level in terms of credit risk contagion, suggesting that sovereign credit risk models would benefit from incorporating bottom-up elements. While the transmission of sovereign credit risk to the corporate sector is well documented, this paper shifts attention to the reverse channel—highlighting how corporate credit deterioration can contribute to sovereign risk. These results challenge the traditional top-down view of sovereign risk modeling and underscore the relevance of firm-level credit conditions for sovereign creditworthiness.

This paper makes several important contributions to the literature on credit risk spillovers between sovereign and corporate sectors.

First, we provide robust evidence of a bidirectional causality between sovereign and corporate credit risk, highlighting a feedback mechanism that reinforces the transmission of credit risk from the sovereign level to the corporate level and vice versa. While previous studies primarily documented the sovereign-to-corporate risk channel during the Eurozone crisis (Augustin et al., 2018, Bedendo and Colla, 2015), our findings extend the understanding of the sovereign-corporate nexus by showing that corporate credit risk also significantly predicts future sovereign risk, forming a two-way causal relationship.

Second, through the application of a 2SLS instrumental variable model and a dynamic panel framework, we demonstrate that lagged financial and non-financial sector CDS returns significantly enhance the explanatory power of models predicting sovereign CDS returns. This result underscores the predictive value of corporate credit risk for sovereign creditworthiness, further emphasizing the interconnectedness between the private and public sectors. This finding builds on the work of Augustin et al. (2018) and Bedendo and Colla (2015) but goes beyond by demonstrating that corporate risk can act as an early warning signal for sovereign distress.

Third, we contribute to the sovereign ceiling literature by showing that corporate CDS returns provide predictive insights into sovereign risk, challenging the traditional view that corporate creditworthiness is primarily constrained by the sovereign rating (To et al., 2022, Hasan et al., 2023). While previous research highlighted the adverse impact of sovereign downgrades on corporate performance, our study shows that corporate risk itself plays a crucial role in shaping sovereign credit conditions.

Finally, our findings have practical implications for policymakers, rating agencies, and market participants. They suggest that sovereign credit scoring models should incorporate corporate risk indicators to better capture the dynamic interplay between public and private sector risks. This insight is particularly relevant for countries with fragile sovereign ratings, where early detection of corporate sector stress can facilitate more proactive risk management.

In sum, by establishing the bidirectional causality and demonstrating the predictive power of corporate credit risk for sovereign risk, this paper advances the understanding of the sovereign-corporate credit nexus, offering novel insights into how financial and non-financial sector dynamics shape sovereign creditworthiness.

The remainder of the paper is structured as follows. In Section 2.1, we outline the potential transmission channels that underpin the feedback loop between sovereign and corporate credit risk. Section 3 describes the dataset and key variables used in the analysis. In Section 4, we first present the results of Granger causality tests between sovereign and corporate CDS spreads, and then estimate a model of sovereign CDS returns using lagged corporate CDS returns. Section 5 concludes.

2. Theoretical Background and Motivation

Understanding the relationship between financial intermediaries, corporations, and sovereign CDS spreads requires a clear understanding of the factors driving default and liquidity risk premia in corporate CDS markets. Prior research demonstrates that changes in corporate CDS premia explain a significant portion of the variation in default risk, with Longstaff et al. (2005) finding that CDS spread changes account for 83% of the variation in defaults among the highest-rated firms and 56% among the lowest-rated firms. These findings suggest that corporate CDS spreads encapsulate valuable information about underlying credit risk, potentially extending to sovereign risk channels.

The advent of CDS trading on corporate debt was expected to alleviate firms' capital supply constraints by enhancing their access to credit markets. However, empirical evidence on this hypothesis remains mixed. On the one hand, Ashcraft and Santos (2009) find that the introduction of CDS trading had a negligible effect on the cost of debt financing, with only a marginal reduction in bond and loan spreads for firms considered safe and transparent. On the other hand, studies such as Saretto and Tookes (2013) highlight that CDS contracts enabled firms to increase leverage and extend debt maturity, which may explain why spreads did not decline as initially anticipated. In contrast, riskier firms did experience a reduction in bond spreads following the introduction of CDS contracts (Blanco et al., 2005, Kim, 2016).

Beyond default risk, liquidity conditions play a crucial role in shaping CDS spreads. Several studies, including Acharya and Pedersen (2005), Borensztein and Panizza (2008), Bühler and Trapp (2008), Chen et al. (2007), and Tang and Yan (2007), demonstrate that liquidity components significantly affect CDS pricing. As market illiquidity rises, derivative sellers demand higher premiums, resulting in wider CDS spreads. Conversely, improved liquidity reduces bond yield spreads, particularly for junk-rated bonds (Chen et al., 2007). Similarly, Tang and Yan (2007) find that CDS spreads decrease when large quantities of securities can be traded without adversely affecting their prices. However, with the proliferation of CDS trading, corporate bond market liquidity has paradoxically declined. Das et al. (2014) attribute this decline to large institutional traders shifting their trading activity from bonds to CDS markets.

The relative importance of credit and liquidity risk in CDS pricing also varies over time. Acharya and Johnson (2007) and Corò et al. (2013) find that credit risk becomes less salient during economic expansions but gains prominence during crisis periods, as the market demands higher credit risk premiums amid heightened uncertainty. This pattern mirrors the procyclical behavior of credit rating analysts, who tend to assign more favorable ratings during booms and tighten assessments during downturns. Notably, liquidity risk remains a significant pricing factor across both tranquil and distressed periods (Corò et al., 2013), likely reflecting the market's persistent sensitivity to the risk of illiquidity.

Taken together, these findings underscore the dual role of default and liquidity risk in shaping corporate CDS spreads. Given the interconnectedness of corporate and sovereign credit markets, it is plausible that corporate CDS spreads not only reflect firm-specific risk but also serve as leading indicators of sovereign credit conditions. The following sections explore the transmission channels through which corporate credit risk may propagate to the sovereign level, offering novel insights into this underexplored feedback loop.

2.1. *How corporate credit risk can be transmitted to the sovereign level*

Several studies investigate the relationship between sovereign and corporate credit risk. The focus of these studies is on how sovereign credit risk spills over to the corporate segment (Augustin et al., 2018, Bedendo and Colla, 2015, Bai and Wei, 2012). Sovereign credit risk is transmitted to the corporate level via different channels such as government aid, domestic demand, credit squeeze, exposure to risky countries and business ties between corporations and the government. We expect that there is a feedback mechanism instead of an uni-directional flow of risk from the sovereign to the corporate level. This feedback mechanism should be stronger the more the government is involved in the corporate sector.

Figure 2 shows the 90-days rolling correlation between financial (top) and non-financial (bottom) corporate CDS premia and sovereign CDS premia for U.S. dollar denominated CDS. The comovement in sovereign and corporate euro-denominated CDS is similar, therefore this figure is provided in the appendix. In general, the 90-days rolling correlations fluctuate considerably over time and across regions, but with the some exceptions, the correlation between sovereign and corporate credit risk is positive.

Figure 2

In the following subsections we discuss the potential transmission channels from corporate to sovereign credit risk.

2.2. *Transfer of credit and liquidity risk*

The potential transfer of credit risk from the corporate level to the sovereign level seems self-evident for the financial sector. Several studies have provided empirical evidence for credit risk contagion from banks to the country level (amongst others Acharya et al. (2014), Leonello (2018), Kirschenmann et al. (2017)). The numerous government bailouts during the global financial crisis of 2008 led to an increase in government debt and a deterioration in sovereign credit quality. Especially large banks are a source of credit risk contagion because a failure of a large bank is an incidence of systemic risk. Well-known examples are Washington Mutual ($ 327.9 billion in assets) and Lehman Brothers ($ 691 billion in assets) in the U.S., and Fortis ($ 16.3 billion rescue package) and UBS ($ 60 billion rescue package) in Europe. Government bailouts are not necessarily limited to the banking sector. Examples are the Auto Supplier Support Program and the Automotive Industry Financing Program which costed the U.S. government USD 85 million in 2009 (U.S. Department of the Treasury). In 2017, EU member states spent EUR 116.2 billion on state aid to the private sector, which corresponds to 0.76% of EU GDP (EU State Aid Scorecard 2018). Two types of non-financial corporations can be a source of credit risk spillover to the country. The first type is state-owned firms. Because of the participation of the government in the companies' ownership, a failure of a state-owned firm has a natural connection with the fate of the state. The second type are large companies, especially when they are active in key industries such as oil and gas. An example is Enron, that filed for bankruptcy in 2001 with an asset size of $ 65.5 billion.

Another example of risk spillover from the corporate to the sovereign level is the Asian crisis in 1997 which had its roots in the real estate sector. As a result of a persistently strong Japanese Yen and the elimination of foreign exchange restrictions in the region, South-East Asia benefited from large capital inflows during the nineties. Japanese corporations were in a horse race for cheap production sites, while investors from the West were attracted by the high interest rates and double digit GDP growth rates. Instead of investing into productive sectors such as agriculture or manufacturing, the influx of capital was channeled to the stock market and real estate, which fueled asset inflation and an oversupply in the real estate and housing sector. According to Bullard et al. (1998), the supply of high-rise residential and commercial buildings exceeded demand by about 211% and 142%, respectively. As soon as investors realised that this situation was unsustainable, fear for a currency devaluation rose triggering a massive capital flight. Countries in South-East Asia like Thailand had been running a current account deficit for years so the capital outflows resulted in an inevitable devaluation of the currency and the government defaulting on its - mainly foreign currency denominated - debt obligations.

A credit risk contagion effect from high-risk to low-risk debt has been demonstrated in a recent study by Ngene et al. (2019). The authors study the causal inference between AAA-rated bond returns and speculative grade bond returns using linear and nonlinear causality tests. Based on simple Granger causality tests, Ngene et al. (2019) find a bidirectional link between high rated and low rated bond returns, but the causal link from speculative grade bond returns to AAA-rated bond returns is the strongest. When applying the more sophisticated Mackey-Glass nonlinear causality test, the link between the two bond market segments even turns out to be unidirectional: there is a strong nonlinear feedback mechanism running from speculative grade rated bonds to AAA-rated bonds. In addition, the strength of the causal relationship is highly dependent on market conditions. During normal market conditions, there is a bidirectional transmission of volatility shocks, while high-risk bonds unidirectionally cause low-risk bond returns in bear markets. In general, the authors show that high-risk bonds induce more destabilizing effects on low-risk bonds than vice versa.

2.3. Corporate tax channel

An increase in corporate income taxes affects corporate credit risk in two ways. First, it may be a source of overindebtedness and increase borrowing costs. Private companies rely on equity and debt financing, but only the interests on their debts are tax deductible. With the increase in corporate tax rates, companies have the incentive to switch to debt financing. Arin et al. (2009) find that with this switch more corporate bonds are issued and bond yields increase. Second, several studies have shown that the tax rate plays a role in endogenous bankruptcy and strategic default (Anderson and Sundaresan, 1996, Leland and Toft, 1996, Mella-Barral and Perraudin, 1997). While an increase in corporate income taxes is initiated by the government and impacts corporate credit risk directly, there is a feedback mechanism to the country level. A hike in corporate taxes has an adverse effect on future economic growth of the home country (Peren and Faik, 2005, Kneller et al., 1999, Lee and Gordon, 2005). More specifically, Lee and Gordon (2005) find that an increase in corporate tax rates by 10 percentage points decreases annual GDP growth rates by one to two percentage points. Because declining GDP growth numbers provide an incentive to the government to increase spending, this may ultimately lead to an increased debt burden and deteriorated sovereign credit quality.

In a study on Italian banks, Gambacorta et al. (2017) find that banks endogenously respond to decreased tax rates by reducing their deposit liabilities and leverage. Perhaps this is because factors that influence leverage and liability structure are different for financial and non-financial sectors. The authors also find that credit spreads of banks decrease with a reduction of tax rates. Banks are the main source of credit providers to non-financial institutions. If banks are overly exposed to corporate debt, banks are more likely to hold a large amount of non-performing loans on their balance sheet, which reduces revenues from the loan portfolio. This becomes worse during stressed periods as it is combined with workers layoff, an increase in unemployment benefits and the burden of a potential bailout. Consequently, this worsens the fiscal position of the government and deteriorates the sovereign health.

The relationship between corporate taxes and government revenue follows an inverted U-shape, known as the Laffer Curve. Thus, the impact of a change in corporate taxes on the financial strength of the government depends on the initial tax rate. If corporate taxes are low, a tax rate increase will lead to increased government revenue. If taxes are too high, a further increase in the rate will discourage the taxed activities such as work and investments, and may lead to strategic bankruptcies or companies to relocate their activities abroad. The tax rate increase will then lower the revenue from taxes and deteriorate the government's credit quality (Laffer, 2004). Thus, a government has the nontrivial task to find the optimal tax rate for which revenues are maximal.

2.4. Cross-border credit risk contagion

Defaulting companies in geographical proximity, may induce a shock that propagates to other corporations that are somehow connected with the initial defaulters. This may further lead to a domino effect causing a credit crisis at the country level. This spillover is not necessary limited to the country level, but may also originate from cross-border corporate sector linkages. This connectedness results from information networks, financial exposure or both. Studies on cross-border linkages in the financial sector have gained momentum after the global financial crisis and the euro debt crisis. We briefly enumerate the key works and explain how regional banking risk transmits to sovereign risk. Studies focusing on spillover from foreign non-financial sectors to sovereign risk are scarce.

Studies that measure spillover effects via financial exposure focus on equity price (Gropp and Moerman, 2004, Hartmann et al., 2005, Tarazi et al., 2007) and interbank lending or foreign claims (Degryse and Nguyen, 2004, Degryse et al., 2010). The common finding of these studies is that contagion is widespread in geographical proximity. Furthermore, domestic bank risk is amplified with bank exposure to sovereign bonds of stressed countries (Kirschenmann et al., 2017) and this increases the CDS premia of the government (Brutti and Sauré, 2015).

Niepmann and Schmidt-Eisenlohr (2013) develop a theoretical model of banking crisis with international risk spillovers. Ballester et al. (2016) test this theoretical framework empirically and find that cross-border linkages in the financial sector are the nexus of shock transmission. The poor performance of banks in one state signal the deterioration of commonalities influencing their loan returns. Acharya and Yourlmazer (2008) show theoretically that poor performance results in information spillover to banks located in other states causing an increase in their cost of borrowing. Although the interconnectedness of the financial sector increases systemic risk and the spillover of shocks, an integrated banking sector helps to stabilize the economy as banks diversify their capital against shocks (Morgan et al., 2004).[3] Therefore, we conclude that cross-border linkages in the financial sector may have both positive and negative effects for sovereign credit risk evaluation.

Cao et al. (2018) find that liquidity shocks in the banking sector transmit to banks located in non-stressed countries that have ownership ties with the stressed countries' banks. However, large or more profitable subisidiary banks are resilient to the shock (Cao et al., 2018). Breckenfelder and Schwaab (2018) find that banks in stressed countries do not have sufficient fiscal capacity to absorb shocks, so that this risk spills over across borders. Groba et al. (2013) test the existence of a cross-border volatility effect between core and peripheral EU countries. Both Breckenfelder and Schwaab (2018) and Groba et al. (2013) prove empirically that a decline in equity of banks in stressed countries is linked to an increase in sovereign CDS spreads in non-stressed countries. This can be explained by the fact that financial sectors in the Eurozone are linked by a joint monetary policy transmission mechanism, the Eurosystem collateral framework and a default risk sharing mechanism via EFSF and ESM.

The studies described above provide convincing evidence that foreign banking risk transmits to the domestic banking sector which further spills over to the sovereign level. Note that the risk is transmitted in two phases. First, risk flows from foreign banks to domestic banks. Then, domestic bank risks are transmitted to the sovereign level. A similar argument can be put forward for the non-financial corporate sector. Companies trade most within their sector in the region, which creates cross-border linkages, and thereby foreign non-financial corporate sector risks may spill over to the home country.

Theoretical work by Acharya et al. (2014) and Leonello (2018) stipulates that an adverse shock to the banks increases the credit risk of the sovereign which further increases the banks' credit risk - a doom loop. When the domestic financial sector is distressed, sovereign credit quality

[3] The study by Morgan et al. (2004) is limited to banks located in different states of the USA.

deteriorates as well. This reduces the value of government guarantees for the banking sector and further increases the borrowing costs of domestic banks. We test this bidirectional feedback loop by running Granger causality tests in the next section.

3. Data and Methodology

In this section, we explain how we handle different data sources for single-name CDS to combine them into sector-level CDS spreads. Next, we describe the variables used in the study as well provide the methodological framework.

3.1. Aggregation of the single-name CDS into sector CDS

We collect daily single-name CDS premia from January 2004 to December 2018 from Thomson Reuters Eikon database (TRE), and classify each CDS as financial, non-financial, or sovereign. Financial sectors are comprised of institutions that are listed in the database as banks, financials or insurance. Non-financial sectors include corporations active in one of the following industries: aerospace, aluminum, beverages, broadcasting, chemicals, coatings, conglomerate, containers, cosmetics, data processing, drugs, electronics, entertainment, horeca, investment, manufacturing, mining, petroleum, securities, service, telecommunication, textile, tobacco, transport and utilities. Our sample consists of single-name 5-year CDS on bonds issued in US Dollar or Euro. Each single name CDS may have different data providers. To avoid double counting the same firm, we take the median value for each single name CDS across providers. This way, we have a time series of CDS premia for each firm j in sector s. Next, we construct sector CDS series by taking the median value of all available firms in sector s. We construct separate data sets for dollar and euro denominated corporate CDS. A similar process is followed for the sovereign CDS, where the country CDS are single-name CDS, which are aggregated into regions. The countries in our sample are classified into five regions, notably Africa, the Americas, Asia, Europe and Oceania. Each region is further divided into subregions. We use country CDS for the causality tests. The sub-regional location of a country is used in Section 4 to test for cross-border spillover effects in the CDS market.

Table 1

Descriptive statistics for the CDS series in U.S. dollar are provided in Table 1, descriptives for the euro series are in the Appendix. In the online appendix, we provide a list that contains the company names for each sector from each country with the respective data contributors. In total, the dollar sample consists of 562 financial corporations and 1017 non-financial corporations from 45 countries. The euro sample consists of 424 financial institutions and 690 non-financial corporations from 31 countries.

3.2. Time series aggregation of daily data to monthly data

In Section 4, daily CDS premia are used to construct a series at monthly frequency using the 30-days average of daily data for each month. For the regressions in Section 4 the dollar (euro) sample consists of 29 countries covering monthly data from March 2004 to October 2017 (April 2008 to October 2017).[4] The ratio of commercial banks foreign currency liabilities to GDP, credit provided to the private sector and the corporate borrowing rate are converted from quarterly observations to a monthly frequency using Denton-Cholette interpolation. The Denton-Cholette method preserves the general movement of a series.[5] The corporate tax rate is constant throughout the year but varies from year to year.

3.3. Variables associated with sovereign credit default swaps

We classify the candidate variables to explain the variation in sovereign CDS returns into four categories: *(i)* global and regional risk factors, *(ii)* domestic macroeconomic fundamentals, *(iii)* bond market liquidity, and *(iv)* corporate credit risk. We describe the explanatory variables for sovereign CDS price changes in the sections below. Table A.9 in the Appendix contains the summary statistics.

3.3.1. Global and regional risk factors

The first group consists of variables that are the primary source of time-varying commonality in sovereign CDS spreads, primarily during global shocks caused by credit or liquidity shocks in the dominant financial market. We consider the U.S. as the dominant market because of its market size and the central role played by the U.S. dollar in global financial markets.

[4] For the regression analysis, our sample stops at 2017 due to missing data for control variables in 2018.

[5] See Denton (1971), Dagum and Cholette (2006) and Sax and Steiner (2013) for a detailed description of Denton-Cholette interpolation.

Following the literature on sovereign spreads since the Lehman Brothers' failure, we conjecture that if there is any uncertainty in the U.S. corporate bond markets this will increase the insurance premium (CDS price) of the sovereign bonds outside the United States (Longstaff et al., 2011). We measure this by the spread between BBB-rated corporate bond yields and the Overnight Indexed Swap rate $(BBB - OIS)$.[6]

Several studies have demonstrated the impact of global market sentiment on asset prices (Pan and Singleton, 2008, Miranda-Agrippino and Rey, 2015, Roll, 1988). We measure global event risk by the change in the VIX index and control for equity market shocks by including the return of the S&P 500 index. To capture the signal of credit market disruptions, we include the TED spread, which is the spread between interbank lending on eurodollar deposits and the interest rate on 3-months treasury bills. The TED spread captures the counterparty risk in unsecured interbank lending. We also control for the change in the 5-year U.S. treasury yield as a source of global commonality (*Treasury*). Another proxy for global risk is introduced by a global shock dummy (*GFC*), which is equal to one between mid 2007 and mid 2009, covering the period of the global financial crisis. To control for regional commonalities, we include the average sovereign CDS return of the neighboring countries located in the same geographical region ($\overline{SCDS}_{r-i}$).

3.3.2. Domestic macroeconomic fundamentals

We select domestic macroeconomic fundamentals based on the work of DeMoor et al. (2018), Bekaert et al. (2016) and Hilscher and Nosbusch (2010). To measure the overall macroeconomic, financial and political strength of a country, we use the economic, financial and political risk ratings of the International Country Risk Guide provided by the PRS Group.[7] The economic risk indicator is comprised of GDP per capita, real GDP growth, inflation, budget balance to GDP and current account balance to GDP. The financial risk rating is an aggregate measure on the ability of the economy to finance their official, commercial and trade obligations. Its components are external debt to GDP, debt service to exports, current account balance to exports, reserves to imports and the depreciation of the currency relative to the dollar. The economic and financial ratings risk range from zero (high risk) to 50 (very low risk). We aggregate the two ratings into

[6] For the euro-denominated CDS, we compute this as the spread between BBB-rated corporate bond yields in euro and the Overnight Indexed Swap rate of the Western Europe.

[7] See ICRG methodology for detailed descriptions on the estimation of risk ratings.

one measure (*EconFin*) that captures the economic and financial strength of a country and ranges from 0 (weak fundamentals) to 100 (strong fundamentals).

The political risk variable captures the political stability of the country based on its government stability, socio-economic conditions, investment profile, internal conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability and bureaucracy quality. The variable ranges from 0 (high risk) to 50 (low risk), and therefore we interpret it as political strength rather than risk (*Poli*).

Apart from macroeconomic fundamentals, a country's own default history is also a useful predictor for future defaults (Borensztein and Panizza, 2008, Eichengreen and Portes, 1985). We control for recent defaults by introducing an exponential decay variable that equals unity at time t if the country defaulted on its debt obligations and decreases exponentially at a rate of 10% until year $t+4$ (*Prev.Default*). A country is considered to default if it fails to meet the debt obligations or if it is in a debt restructuring program supervised by the Paris Club. Taking into account a default history of only $t+4$ years may appear short, but this approach is consistent with Borensztein and Panizza (2008) and Eichengreen and Portes (1985) who find that the market has a short memory. Recent defaults result in a steep increase in bond yields and CDS spreads, but the effect CDS spreads is short-lived.

3.3.3. *Bond market liquidity*

Liquidity components are widely used in asset pricing models for stocks (Amihud et al., 2005). For the CDS market, a rise in illiquidity induces the derivative seller to demand a higher premium, whereas improved liquidity narrows the spreads (Acharya and Pedersen, 2005, Borensztein and Panizza, 2008, Bühler and Trapp, 2008, Tang and Yan, 2007). We proxy the liquidity risk of the sovereign CDS market by change in the 30-days rolling average of bid-ask spread relative to the CDS mid price and pick up end of the month value ($\Delta \mathtt{Sov.\ Bid\ Ask\ spreads}$).

3.3.4. *Corporate credit risk*

Global risk and regional risk factors, domestic macroeconomic fundamentals and liquidity risk all explain sovereign credit risk based on a top-down approach. We claim that this overlooks an aspect of sovereign credit risk, notably the role of the corporate sector and its interaction with the government. To control for the role of corporate credit risk, we include the following variables: (*i*) the ratio of commercial banks' foreign currency liabilities to GDP ($\mathtt{FCY\ Liab./GDP}$), (*ii*) credit provided to the private sector to GDP ($\mathtt{Pvt.NonFin.Sect./GDP}$), (*iii*) changes in the average corporate borrowing rate ($\mathtt{Corp.\ borrowing\ rate}$), (*iv*) changes in the average corporate tax rate ($\mathtt{Corp.\ tax\ rate}$), and (*iv*) the change in the financial or non-financial corporate CDS spread ($\Delta\mathtt{CCDS}$).

The main interest in this study is to identify the contribution of the corporate CDS returns to explain the variation in sovereign CDS returns. The high comovement in the CDS returns (see Figure 2) and the overall support for bidirectional causality between private sector and sovereign CDS indicate the existence of hidden dynamics and a feedback loop between sovereign and corporate risk.

3.4. Model framework

Sovereign CDS data can be analysed in a similar way as sovereign bond yields spreads. Sovereign CDS and bonds spreads comove in the long run and they have a log-linear relationship with local market risk (Ammer and Cai, 2011, Edwards, 1984, Zhu, 2006). Sovereign CDS spreads reflect the default risk premium which is dependent on the default probability of the sovereign debt issue. Following Edwards (1984), we assume that default probability has a logistic distribution. Thus, we can write the change in the logarithm of sovereign CDS premia as a linear function of the determinants of default risk probability. Our baseline regression takes the form:

$$
\begin{aligned}
\Delta SCDS_{i,t} = \alpha \\
& + c_1 \Delta CCDS_{i,t-1} \\
& + c_2 FCY\ Liab./GDP_{i,t-1} + c_3 Pvt.NonFin.Sect./GDP_{i,t-1} \\
& + c_4 \Delta Crp\ borrowing\ rate_{i,t-1} + c_5 \Delta Crp\ tax\ rate_{i,t-1} \\
& + \beta_1 \Delta VIX_{t-1} + \beta_2 \Delta (BBB - OIS)_{t-1} + \beta_3 \Delta S\&P500_{t-1} \\
& + \beta_4 \Delta TED_{t-1} + \beta_5 \Delta Treasury_{US,t-1} + \beta_6 GFC_{t-1} \\
& + \beta_7 \Delta \overline{SCDS}_{t-1,r-i} \\
& + \gamma_1 \Delta EconFin_{i,t-1} + \gamma_2 \Delta Poli_{i,t-1} + \gamma_3 Prev.Default_{i,t-1} \\
& + \lambda_1 \Delta Sov.\ Bid\ Ask\ sprd_{i,t-1} \\
& + w_i + \tau_t + \epsilon_{i,t}
\end{aligned}
\tag{1}
$$

In Equation 1, $\Delta SCDS_{i,t}$ is the logarithmic change in sovereign CDS premia of country i from period $t-1$ to t. The effect of the corporate credit risk factors on sovereign credit risk are measured by coefficients c_1 to c_5. These are the coefficient estimates for the log return of corporate CDS, foreign liabilities of the banking sector, credit provided to private sectors, the change in the corporate borrowing rate and the change in the corporate tax rate, respectively. β_1 to β_7 are the coefficient estimates for the global and regional risk commonalities, notably the log change in VIX (β_1), the spread changes between BBB corporate bonds yields and the overnight indexed swap rate (β_2), S&P 500 return (β_3), the change in TED spread (β_4), the change in the 5-year treasury yield (β_5), the dummy for the global financial crisis (β_6), and average of the neighboring countries' sovereign CDS spread changes (β_7). For the country level variables, γ_1 and γ_2 are the coefficients for macroeconomic and financial strength, and political strength of the country, respectively. γ_3 measures the impact of the historical defaults. The market liquidity effect is measured by the percentage change in bid-ask spread which is captured by λ_1. We control for country fixed effects (w_i) and time fixed effects (τ_t).

Bidirectional causality between sovereign and corporate CDS implies modeling a feedback loop which is sensitive to spurious correlation and endogeneity. We minimize the risk for spurious correlation by ensuring that all our series are stationary.[8] To solve potential endogeneity issues, we model the endogenous effect of corporate sector CDS returns in Equation 1 using two different methods, instrumental variable two stage least squares (2SLS) and an AR(1) dynamic panel method. Both methods are explained in the following paragraphs.

We instrument the change in log corporate CDS ($\Delta CCDS_{i,t}$) by the change in the average log corporate CDS of neighboring countries located in the same sub-region ($\Delta\overline{CCDS}_{t,r-i}$). This approach is in line with Bedendo and Colla (2015) who used a similar instrument.[9] The sub-regions used for the construction of this variable are shown in Table 1. If the corporate CDS data of the sub-region is unavailable, we use the variation in corporate CDS of the neighboring countries located in same geographical region. For our instrument to be valid, the variation in corporate CDS of neighboring countries must be uncorrelated with the variation in sovereign CDS of the respective country after taking into account the other independent variables in the regression. We expect that the variation in corporate CDS can influence its own sovereign CDS, but they are very unlikely to influence the sovereign CDS of the foreign country contemporaneously. The reader may raise the concern that sub-regional corporate CDS variation may affect domestic sovereign CDS spreads, but we argue that if this correlation exists then it is only possible through indirect channels that flows through multiple steps and time periods. For instance, domestic banks' exposure to sovereign or corporate debt of the neighboring countries will influence the risk condition of domestic corporate sectors and with the change in home country corporate sectors' risk conditions it will further influence the domestic sovereign credit risk.[10] The spillover of soaring CDS of the European banks was evident during the Euro crisis.

Credit risk spillovers between non-financial institutions are more likely to happen in close geographical proximity as well. Geographic proximity intensifies economic trade (Hegre, 2004) and bilateral trade decreases with physical distance (Disdier and Head, 2008). Trade costs increase with distance and the likelihood of trade frictions is lower between neighboring countries. In

[8]The results of unit root tests (ADF) and trend stationarity tests (Kwiatkowski-Phillips-Schmidt-Shin) are available on request.

[9]For a sample of European countries, the study by Bedendo and Colla (2015) uses $\Delta\overline{SCDS}_{-i,t,EU}$ as an instrument for $\Delta SCDS_{i,t}$.

[10]If there is any correlation between regional corporate CDS and domestic sovereign CDS, then it is merely an accidental correlation and not necessarily causation.

general, firms are facilitated with local specializations in product development and innovation (Audretsch and Feldman, 1996), and their customers are homogeneous culturally (Felbermayr and Toubal, 2010). Thus, companies trade intensely with related firms in geographical proximity and thereby, their financial risks are more interlinked with each other than with companies from further regions. To test the validity of our instrument, we perform a weak instrument test find that the first stage F-test is greater than the widely accepted rule-of-thumb threshold value of 10 (Stock and Yogo, 2004).

As an alternative to regional corporate CDS variation, natural calamities could also be a potential candidate as an instrumental variable because they are considered to be random events. Natural calamities, however usually occur concurrently in the same geographic region and influence the financial position of all sovereigns located in the same region. Therefore, natural calamities do not qualify as a proper instrumental variable for corporate CDS.

Dynamic panel models control for endogeneity arising from a reverse causality relationship between the dependent and independent variables (see Bedendo and Colla (2015) and Wintoki et al. (2012), amongst others). In the AR(1) dynamic panel model, we add the lagged value of the dependent variable, i.e., $\Delta SCDS_{i,t-1}$ to take care of any potential endogeneity resulting from the dynamic nature between sovereign and corporate CDS. The dynamic panel model is an autoregressive model and therefore prone to have biased estimates if the number of cross-sections exceeds the time dimension $N > T$ (Nickell, 1981). This can be solved by using a GMM estimation. However, our panel consists of 29 countries and 71 to 118 monthly observations, thus it doesn't suffer from a Nickell bias. We estimate the AR(1) model with White robust standard errors.

4. Corporate credit risk as a predictor of sovereign credit risk

4.1. Granger causality tests

We begin our analysis by investigating whether corporate credit risk can serve as a predictor of sovereign credit risk, employing empirical methods such as Granger causality tests to assess the direction and significance of these linkages.

The Granger (1969) causality test is not designed to identify a relationship between cause and effect, rather it tests the incremental predictive accuracy. For a bivariate stationary series of sovereign CDS (henceforth, $SCDS$) and corporate CDS (henceforth, $CCDS$), we aim to find whether variation in CCDS helps to reduce the forecast error of SCDS. If this is the case, we can conclude that $CCDSs$ Granger cause $SCDSs$. The outcome of a Granger causality test is sensitive to the choice of lag length. We use the Akaike information criterion (AIC) to determine the optimal lag length that minimizes the prediction error. We test the following three spillover scenarios: *(i)* unidirectional causality from $CCDS$ to $SCDS$ or vice versa, *(ii)* bidirectional causality, and *(iii)* $CCDS$ and $SCDS$ are independent and no Granger causality exists.

The CDS premia are non-stationary in the levels but stationary at first differences. The series are $I(1)$ and we find the SCDS and CCDS premia to be cointegrated according to the Johansen (1991) test.[11] We investigate the direction of causality between $\Delta CCDS$ and $\Delta SCDS$ using an error correction model, which is carried out for each country i on daily CDS data. More specifically, we carry out the following steps:

1. We extract the residual Z_t from the cointegration process in Eq 2, where μ is a constant and λ is the coefficient of $CCDS$.[12]

$$\ln SCDS_t = \mu + \lambda \ln CCDS_t + Z_t \tag{2}$$

2. We treat $\Delta SCDS_t = (\ln SCDS_t - \ln SCDS_{t-1})$ as an univariate auto-regressive process and compute the AIC with lag orders from 1 to M in Eq 3. We determine the lag length m ($m \leqslant M$) that yields the lowest AIC, where M is set to 30 days. We then update $M = m$. In Eq 3, α_0 is a constant, ρ_t the time trend and ϵ_t is the residual.

$$\Delta SCDS_t = \alpha_0 + \rho_t + \sum_{m=1}^{M} \gamma^m \, \Delta SCDS_{t-m} + \epsilon_t \tag{3}$$

3. We use the lagged value for $\Delta CCDS_t$ as an additional predictor in Eq 3. The lag order ranges from 1 to M. The optimal lag length in Eq 4 is again determined based on the AIC.

[11] The cointegration test results are available upon request.

[12] We use log of CDS spreads to reduce outlier effects and enhance sovereign comparison across time periods.

Note that if $SCDS$ and $CCDS$ are $I(1)$ but not cointegrated then $\beta = 0$.

$$\Delta SCDS_t = \alpha_0 + \rho_t + \beta Z_{t-1} + \sum_{m=1}^{M} \gamma^m \, \Delta SCDS_{t-m} + \sum_{m=1}^{M} \delta^m \, \Delta CCDS_{t-m} + \epsilon_t \quad (4)$$

4. We test the null hypothesis: $\delta^m = 0, \quad \forall \quad m$ using a chi-squared test. If we reject the null hypothesis, then $CCDS$ Granger causes $SCDS$ and the AIC of Eq 4 should be lower than the AIC of Eq 3.

5. We repeat steps 1 to 4 with $CCDS$ as a dependent variable and $SCDS$ as a predictor.

Table 2 and 3 show the F-statistics and corresponding p-value for the causality tests under the null hypothesis of no causal relationship between USD-denominated corporate and sovereign CDS. Test results for the euro CDSs are reported in the Appendix. The results for the financial sector and sovereign CDS in Table 2 provide evidence for both unidirectional and bidirectional causality, but bivariate causality is more common. Out of 45 countries, bivariate causality between financial sector CDS and sovereign CDS occurs 34 times. We find a unidirectional causality from sovereign to financial sector CDS for 6 countries, notably Austria, Japan, Sweden, Tunisia, Turkey and the United States. Ireland is the only country for which we find a unidirectional causality from the financial sector to the government. In the euro sample, bidirectional causality between financial sector and sovereign CDS is less common than in the dollar sample. We find evidence for bidirectional causality for 13 out of 29 countries.

Table 3

Table 3 shows the causality test results for the non-financial corporate CDS and sovereign CDS. In total, we report causality tests for 43 countries, for which 30 countries in which we find a bidirectional causal link between sovereign credit risk and corporate CDS. A unidirectional link from sovereign to non-financial corporate CDS is found for 8 countries, while a unidirectional from corporate to sovereign CDS is found for three countries. For the 30 countries in the euro sample with non financial corporate CDS series, we find bidirectional causality in 15 cases. SCDS Granger cause non-financial CDS unidirectionally in 11 cases, and CCDS undirectionally cause SCDS in one country.

Overall, the causality test results report a high occurrence of bidirectional links between corporate and sovereign CDS. Together with the economic intuition for a feedback loop of credit risk contagion from the corporate to the country level provided in Section 2.1, we will further to examine the relationship between sovereign and corporate credit risk in the following section.

4.2. Main results

In this section we present the estimation results for the 2SLS and the dynamic panel. The model specification in Equation 1 is applied to four panel datasets. For each currency, USD and EUR, we explain the variation in sovereign CDS returns with financial sector CDS and non-financial corporate sector CDS returns respectively. For conciseness we only present US dollar-based results in the main text (see Table 4 and 5) and include the euro-based results in the Appendix (see Tables A.10 and A.11). Any difference in the results in dollar and euro is discussed in the text.

Table 4 shows the estimation results for the model that tests the predictive value of financial sector CDS returns for sovereign CDS returns. The first column with coefficient estimates shows the results from a simple pooled OLS. The second column and third column contain the estimation results for a two-way fixed effects panel estimation without and with corporate risk factors, respectively. The 2SLS results are in columns (4) to (6). In column (4), regional financial sector CDS returns are used as an instrument for country-level financial sector CDS returns. In column (5) the instrumental variable regression is estimated with fixed effects and in column (6) the IV regression is estimated with an error correction term and country fixed effects. The dynamic panel estimation results without and with instrumental variable are reported in columns (7) and (8) respectively. Table 5 has the same structure, but the corporate risk factors contain non-financial CDS returns.

In all model specifications, lagged corporate CDS changes are significant predictors of sovereign CDS price changes, implying that credit risk at the corporate level spills over to the sovereign. This is the case both for financial and non-financial sector CDS. The coefficient estimates for the financial sector CDS are generally higher than those for the non-financial corporate CDS. This indicates that the impact of financial sector CDS on sovereign CDS is larger than the effect of non-financial CDS on sovereign CDS, which is not surprising. With regard to the other corporate risk factors, we find a positive relationship between the ratio of credit provided to the private sector to GDP and sovereign spread changes, which means that higher levels of private debt coincide with increasing sovereign credit spreads. For the corporate borrowing rate, no coefficient estimate is significantly different from zero. The effect of the corporate tax rate on sovereign CDS is weakly negative. The coefficient estimate is negative in all regression specifications, but only significantly different from zero in four out of eight regression specifications. Based on the literature, we expected a positive relation between the corporate tax rate and sovereign CDS spreads, because higher corporate taxes may induce over-indebtedness and strategic defaults, which may spill over to the country level. Our results show a negative (or no) relation between the corporate tax rate and sovereign CDS changes. Recall that the Laffer curve describes the relationship between government revenues and tax rates to be inverted U-shaped. Our results imply that for corporate tax rates, the average country in our sample is situated on the upward sloping part of the curve. This means that a corporate tax increase taxes initially, if not excessive, leads to higher income for the government, which improves its budgetary balance and thus its creditworthiness. Overall, we find changes in corporate CDS spreads to be the only corporate risk factor that consistently helps to predict sovereign CDS changes. The other corporate risk factors show weak results. A potential reason for this is that the effects from corporate credit risk may already be captured by the corporate CDS risk factor in our model.

Table 4

Table 5

The strong results for the corporate CDS changes in the pooled OLS and fixed-effects models may be biased due to endogeneity issues (reverse causality). To address this we include lagged value of the residuals from the cointegration equation, i.e. the error correction term (Z_{t-1}) from equation (1). We rerun the 2SLS models with controlling for the error correction term in columns 3 and 6 and we include it in the dynamic AR(1) model in columns 7 and 8. The error correction term, denoted ECT in the table, is negative and significant, indicating a cointegration between sovereign CDS and corporate CDS.

The autoregressive dynamic panel model shows that lagged sovereign CDS changes have a significantly explanatory power to predict current sovereign CDS variation, at least for the model with non-financial corporate CDS. For the model with financial sector CDS, we find that when we instrument the financial sector CDS variation of the country by the lagged regional financial CDS changes, the lagged value for sovereign CDS changes is no longer significant. The results for the instrumental variable regresion and the AR(1) panel show that once we correct for endogeneity and include the error correction term, the positive relationship between sovereign credit risk and corporate credit risk is even stronger than without these corrections. More specifically, the coefficient estimate for corporate CDS changes is approximately four times larger for both financial and non-financial sectors than when esitmated with pooled OLS or a simple fixed-effects panel regression.

The explanatory power of the different models cannot be directly compared, but we can assess the statistical importance of the corporate risk factors by comparing the R^2 reported in columns (2) and (3), which show the fixed-effect panel estimation excluding and including the corporate risk factor respectively. When corporate risk factors are included, R^2 increases from 5 percent to 10.5 percent in Table 4 and from 3.4 to 5.6 percent in Table 5, illustrating the importance of these factors.

Apart from the corporate risk factors, we find that sovereign CDS returns are explained by CDS changes in the same region. Once we control for regional commonalities, the global risk factor are not statistically significant in the 2SLS and dynamic panel models. We do find strong support for domestic macroeconomic and political fundamentals as explanatory variables for sovereign credit risk. Previous defaults are positively significant in three regression specifications only, once for the model with financial sector CDS and twice for the model with non-financial corporate sector CDS.[13]

This paper focuses on the feedback loop in credit risk contagion from the corporate sector to the sovereign. Credit risk spillover effects from the country level to the corporate sector are already well documented in the literature. However, to confirm these studies, we also test a version of Eq. 1 in which we explain corporate CDS changes ($\Delta SCDS$) with sovereign CDS changes ($\Delta SCDS$). The estimation results are in the Appendix (Tables A.12 to A.15). We find that sovereign CDS changes significantly predict both financial and non-financial sector CDS variation, which is in line with previous research. This is the case for all regression specifications for

[13]For the euro-CDS regressions, the previous default indicator could not be included due to a shortage of default events.

both the USD and Euro sample. These results are in line with the existence of a circular model of credit risk contagion as illustrated in Figure 1.

5. Conclusion

Several studies have proven that an increase in sovereign credit risk translates into a deterioration of corporate credit quality (Augustin et al., 2018, Bedendo and Colla, 2015). We provide empirical evidence for a feedback mechanism from the corporate to the country level, indicating the existence of a circular model of credit risk contagion, instead of a waterfall process from the country to the corporate level. We first investigate the dynamic interactions between sovereign and corporate CDS spreads through Granger causality tests and find strong support for the existence of bidirectional causality between sovereign and corporate credit risk. Based on this finding, we use the variation in financial and non-financial corporate sector CDS to improve a model explaining the variation in sovereign CDS. We find that corporate credit risk factors are significant predictors of changes in sovereign CDS spreads.

Our results have important implications for investors and analysts. We show that a top-down approach for assessing sovereign credit risk, where the emphasis is placed on macroeconomic fundamentals and global and regional risk factors, may be complemented by a bottom-up approach that also considers elements of corporate credit risk. This means that sovereign credit risk models may be improved if corporate data is feeded to the model. Policy makers should also be aware of the reverse causality in the sovereign to corporate credit risk dynamics. A deterioration of corporate credit quality can typically be identified more timely because corporate data is much more detailed and available at a higher frequency. Therefore, corporate data may be an early predictor of an increase in sovereign credit risk and can even help to predict sovereign defaults. This claim has not been studied in this paper, but may be an angle of future research.

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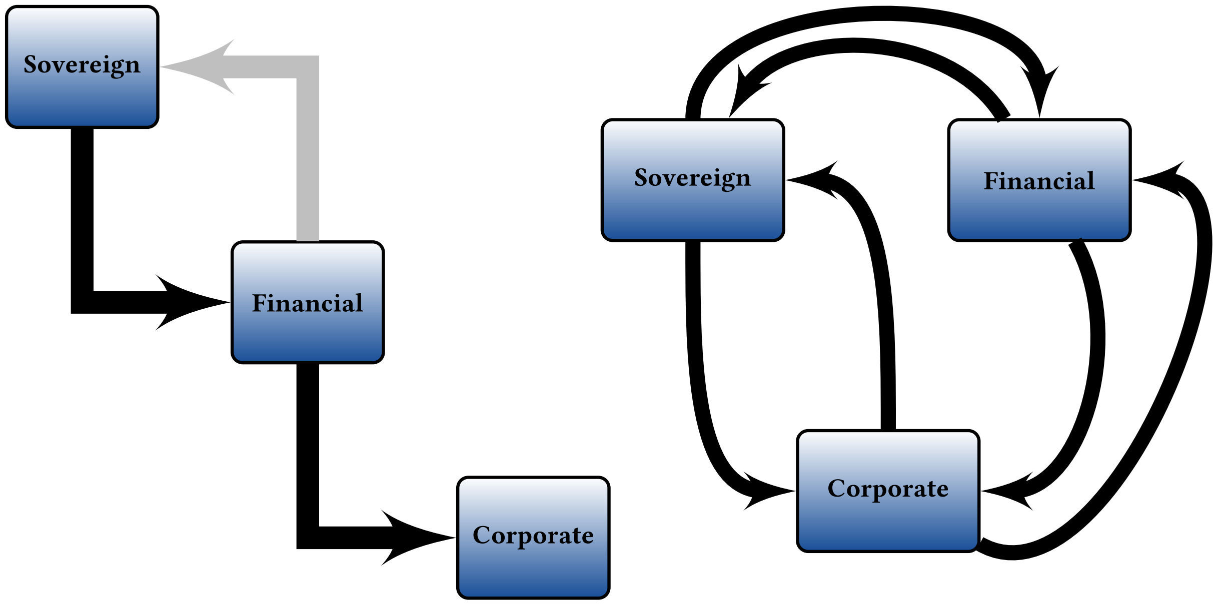

(a) Traditional view on credit risk contagion

(b) Circular view on credit risk contagion

Figure 1: Credit risk contagion models

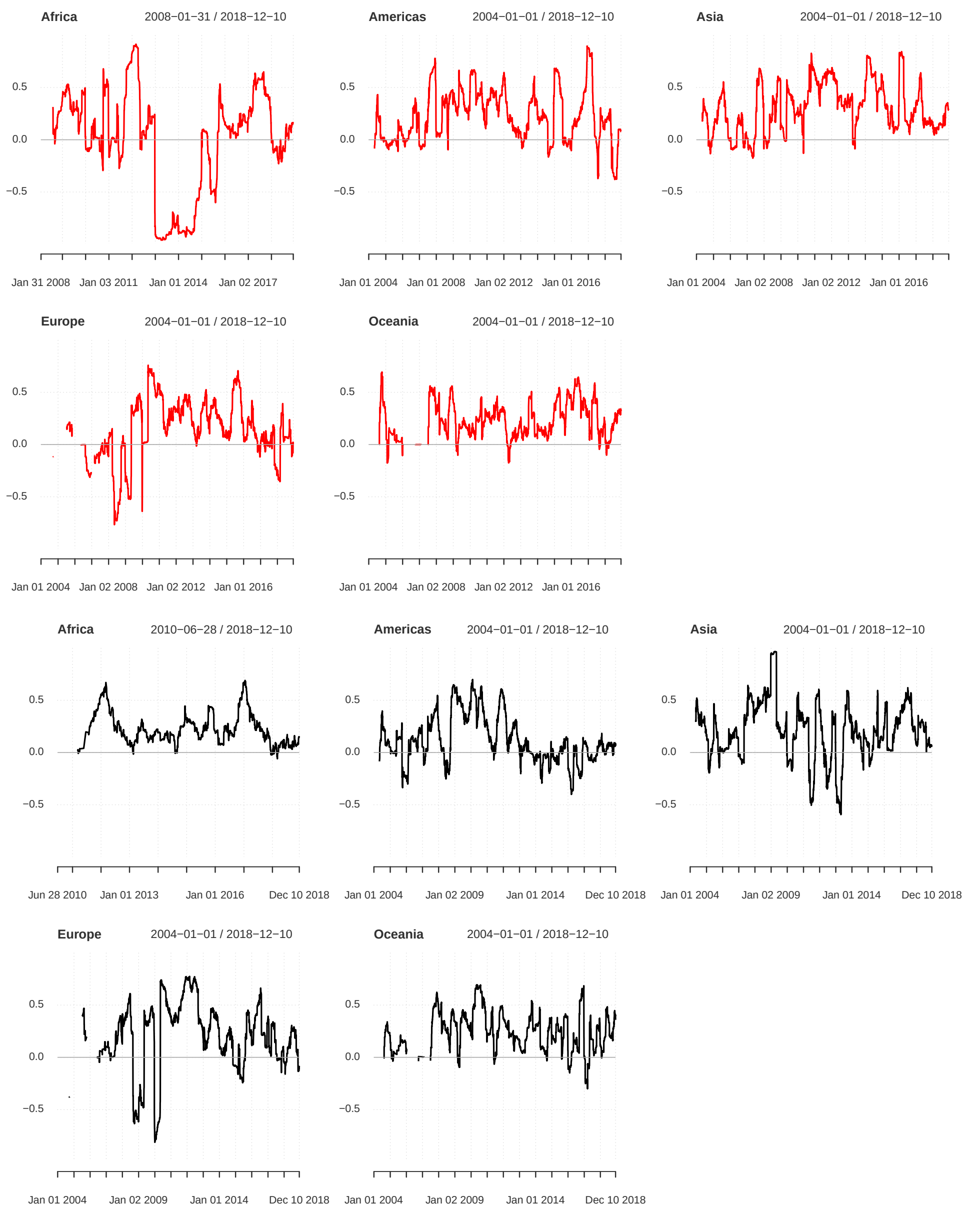

Figure 2: Comovement between sovereign CDS changes and financial (top) and non-financial (bottom) corporate CDS changes in USD

The top panel shows the 90-days rolling correlation between sovereign CDS spread changes and financial sector CDS spread changes. The bottom panel shows the same for sovereign CDS and non-financial corporate CDS spread changes. All CDS contracts are on U.S. dollar denominated debt instruments.

Table 1: Summary statistics for daily CDS premia on US dollar-denominated bonds

	Sovereign CDS					Financial Sector CDS						Non-Financial Sector CDS						Sov. CDS Correlation with	
Region	mean	sd	median	skew	kurtosis	n	mean	sd	median	skew	kurtosis	n	mean	sd	median	skew	kurtosis	Fin Sect	Non-Fin Sect.
Africa:																			
Northern Africa	245.029	92.936	238.000	0.264	-1.143	2231	300.160	88.552	308.600	-0.687	-0.392							0.357^{***}	
Southern Africa	203.817	73.330	186.954	1.943	4.576	2651	302.093	125.793	278.000	0.417	-0.674	2006	258.726	86.151	231.503	1.277	1.341	0.655^{***}	0.837^{***}
Western Africa	274.893	62.471	293.920	-0.192	-1.017	295	18.677	8.219	10.680	0.124	-1.836							0.812^{***}	
Americas:																			
Central America	146.405	76.119	126.615	1.988	5.091	3846	119.801	61.304	103.000	1.372	2.565	3929	133.437	58.697	123.000	2.949	11.913	0.347^{***}	0.955^{***}
Northern America	19.085	11.250	19.770	1.151	5.468	6366	83.671	45.203	78.250	1.230	3.686	6366	100.559	48.069	92.066	2.118	6.782	0.863^{***}	0.688^{***}
South America	948.835	2281.144	169.988	4.088	17.876	11396	158.826	73.808	148.280	1.084	2.012	11202	286.005	260.898	220.702	2.274	6.442	-0.068^{***}	0.451^{***}
Asia:																			
Central Asia	227.171	188.742	189.080	3.938	19.588	3122	615.959	428.979	489.500	2.513	6.568	502	192.460	30.584	210.000	-0.575	0.201	0.856^{***}	0.731^{***}
Eastern Asia	80.090	71.162	57.875	1.727	3.631	18777	100.505	69.987	85.490	2.180	8.910	17619	86.745	53.972	79.015	2.334	11.346	0.477^{***}	0.511^{***}
South-Eastern Asia	132.078	92.065	116.460	3.121	18.753	14490	149.141	110.975	120.849	1.588	3.250	14888	184.287	152.045	131.250	2.004	5.567	0.752^{***}	0.653^{***}
Southern Asia	72.417	27.402	66.000	1.269	2.435	3461	186.500	95.283	174.670	0.963	1.424	5548	292.101	153.507	273.853	1.234	2.076	0.696^{***}	0.660^{***}
Western Asia	157.850	99.753	118.740	1.185	1.236	12514	182.160	101.572	141.537	1.606	3.624	10133	173.668	85.459	156.500	1.687	4.513	0.501^{***}	0.420^{***}
Europe:																			
Eastern Europe	415.523	614.470	204.284	6.036	85.511	6985	410.619	303.026	286.510	0.949	-0.547	3682	264.932	141.214	238.000	2.981	11.747	0.698^{***}	0.805^{***}
Northern Europe	64.747	126.471	24.888	4.247	19.081	13479	514.549	15700.393	145.000	51.820	2685.764	11185	371.952	680.371	115.215	4.592	28.853	0.147^{***}	-0.123^{***}
Southern Europe	430.296	1232.662	182.375	15.081	328.963	10161	410.475	456.460	237.500	3.191	13.980	10395	229.637	256.678	157.000	5.017	34.129	0.703^{***}	0.750^{***}
Western Europe	50.202	48.336	34.500	2.401	7.178	17082	141.226	79.961	122.915	1.293	2.836	16513	87.608	38.388	78.797	1.461	3.159	0.757^{***}	0.616^{***}
Oceania:																			
Australia and New Zealand	31.772	27.849	29.000	1.357	3.167	3928	85.668	55.235	84.500	0.367	-0.307	6325	81.739	33.161	79.845	0.745	1.338	0.898^{***}	0.886^{***}

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 2: Granger causality tests for sovereign and financial sector CDS in US Dollar

	H_0 : Sov. does not cause Fin. Sect		H_0 : Fin. Sect. does not cause Sov.	
	F-test	p-value	F-test	p-value
Australia	4.638	0.000***	4.095	0.000***
Austria	1.958	0.004***	0.616	0.890
Bahrain	1.338	0.107	0.999	0.392
Belgium	3.013	0.000***	3.851	0.009***
Brazil	9.460	0.000***	2.551	0.002***
Canada	3.015	0.049**	2.616	0.000***
Chile	125.727	0.000***	2.042	0.070*
China (Mainland)	14.890	0.000***	7.485	0.000***
Colombia	1.226	0.235	0.880	0.494
Denmark	3.916	0.000***	1.679	0.048**
Finland	2.526	0.000***	3.273	0.038**
France	5.332	0.000***	2.912	0.000***
Germany	2.601	0.004***	1.906	0.022**
Greece	9.536	0.000***	8.832	0.000***
Hong Kong	14.973	0.000***	3.748	0.000***
Hungary	3.869	0.000***	5.038	0.000***
India	2.112	0.001***	2.080	0.001***
Indonesia	4.635	0.000***	6.457	0.000***
Ireland	1.235	0.184	2.742	0.000***
Italy	8.813	0.000***	4.460	0.000***
Japan	3.865	0.000***	1.401	0.101
Kazakhstan	4.635	0.000***	4.239	0.001***
Kuwait	0.135	0.873	0.174	0.990
Malaysia	8.152	0.000***	5.267	0.000***
Netherlands	4.125	0.000***	10.610	0.000***
Norway	0.755	0.784	0.672	0.864
Panama	8.714	0.000***	4.004	0.000***
Philippines	3.663	0.000***	2.978	0.000***
Portugal	7.569	0.000***	4.592	0.001***
Qatar	3.840	0.000***	4.379	0.013**
Russia	12.098	0.000***	1.973	0.002***
Saudi Arabia	17.875	0.000***	9.321	0.002***
South Africa	6.288	0.000***	1.510	0.047**
South Korea	7.502	0.000***	23.688	0.000***
Spain	5.661	0.000***	3.351	0.000***
Sweden	4.231	0.000***	0.987	0.484
Taiwan	4.576	0.000***	2.195	0.000***
Thailand	14.092	0.000***	6.358	0.000***
Tunisia	2.645	0.000***	0.576	0.936
Turkey	12.130	0.000***	0.180	0.982
Ukraine	0.514	0.725	0.588	0.623
United Arab Emirates	3.690	0.000***	1.775	0.007***
United Kingdom	7.123	0.000***	4.421	0.000***
United States	1.874	0.009***	1.528	0.115
Venezuela	2.197	0.015**	2.161	0.017**

H_0 denotes the null hypothesis.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 3: Granger causality tests for sovereign and non-financial sector CDS in USD

	H_0 : Sov. does not cause Non-Fin. Sect		H_0 : Non-Fin. Sect. does not cause Sov.	
	F-test	p-value	F-test	p-value
Argentina	1.064	0.382	1.047	0.397
Australia	29.920	0.000***	4.266	0.000***
Austria	6.785	0.000***	11.187	0.000***
Belgium	2.491	0.006***	4.832	0.002***
Brazil	10.125	0.000***	5.691	0.000***
Canada	1.957	0.024**	1.659	0.015**
Chile	2.873	0.000***	0.231	0.985
China (Mainland)	32.383	0.000***	9.699	0.000***
Colombia	2.843	0.005***	1.814	0.068*
Denmark	5.065	0.000***	0.801	0.678
Finland	9.310	0.000***	1.982	0.138
France	3.362	0.000***	3.837	0.000***
Germany	10.076	0.000***	3.702	0.000***
Greece	1.897	0.041**	3.754	0.000***
Hong Kong	6.769	0.000***	9.287	0.000***
India	0.992	0.421	2.734	0.000***
Indonesia	4.407	0.036**	2.874	0.003***
Ireland	2.492	0.060*	1.052	0.370
Israel	4.201	0.000***	2.273	0.004***
Italy	13.788	0.000***	2.144	0.001***
Japan	4.033	0.000***	5.132	0.000***
Kazakhstan	2.134	0.095*	2.415	0.048**
Malaysia	20.720	0.000***	15.515	0.000***
Mexico	18.144	0.000***	4.177	0.000***
Netherlands	2.717	0.006***	2.209	0.000***
New Zealand	7.968	0.000***	2.412	0.002***
Norway	0.413	0.996	0.299	0.999
Philippines	6.802	0.000***	1.422	0.076*
Portugal	7.706	0.000***	20.936	0.000***
Qatar	2.556	0.000***	1.416	0.243
Russia	7.003	0.000***	1.636	0.022**
South Africa	9.622	0.000***	2.000	0.063*
South Korea	17.814	0.000***	13.309	0.000***
Spain	3.494	0.000***	4.214	0.000***
Sri Lanka	2.469	0.116	1.663	0.016**
Sweden	3.705	0.000***	2.209	0.000***
Taiwan	0.124	0.724	2.746	0.000***
Thailand	13.889	0.000***	3.697	0.000***
Turkey	57.990	0.000***	0.791	0.531
United Arab Emirates	2.718	0.000***	0.494	0.990
United Kingdom	5.938	0.000***	4.924	0.000***
United States	2.317	0.031**	2.386	0.006***
Venezuela	65.730	0.000***	0.711	0.615

H_0 denotes the null hypothesis.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table 4: Predictive value of financial sector CDS for sovereign CDS returns (USD)

		Dependent variable: ΔSCDS							
		POLS	FE		IV			Dynamic	Dynamic + IV
	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Corporate risk									
ΔFin. Sect CDS	+	0.198***	0.146***	0.178***	0.891***	0.889***	0.885***	0.174***	0.906***
		(0.039)	(0.026)	(0.029)	(0.125)	(0.123)	(0.111)	(0.031)	(0.118)
Comm. BanksFCY Liab./GDP	+	0.000							
		(0.000)							
Comm. Banks credit to Pvt.NonFin.Sect./GDP	+	0.000*	0.002***	0.005***	0.000	0.002*	0.008***	0.004***	0.007***
		(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.002)
Δ Corp. borrowing rate	+	0.004	0.001	−0.002	0.001	−0.000	−0.006	−0.004*	−0.007
		(0.003)	(0.002)	(0.002)	(0.004)	(0.005)	(0.004)	(0.002)	(0.004)
Δ Corp. tax rate	+	−0.004	−0.000	−0.000	−0.005**	−0.006***	−0.005***	−0.000	−0.005***
		(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Global commonalities									
ΔVIX	+	0.049***			0.026	0.025	0.011		0.021
		(0.017)			(0.021)	(0.021)	(0.020)		(0.022)
ΔS&P500	−	−0.551***			0.326	0.323	0.219		0.305
		(0.108)			(0.209)	(0.206)	(0.188)		(0.189)
ΔTED	+	0.016*			−0.011	−0.011	−0.007		−0.008
		(0.009)			(0.015)	(0.015)	(0.014)		(0.013)
Δ(BBB − OIS)	+	0.007**			−0.001	−0.002	−0.002		−0.004
		(0.003)			(0.003)	(0.003)	(0.003)		(0.003)
ΔTreasury yield	+	−0.006			0.039*	0.040*	0.024		0.038*
		(0.024)			(0.022)	(0.022)	(0.021)		(0.020)
GFC	+	−0.001			−0.000	−0.000	−0.000		0.000
		(0.000)			(0.001)	(0.001)	(0.001)		(0.001)
Regional commonality									
$\Delta\overline{\text{Reg. SCDS}}$	+	0.527***	0.284***	0.278***	0.338***	0.339***	0.331***	0.265***	0.322***
		(0.041)	(0.044)	(0.041)	(0.045)	(0.045)	(0.042)	(0.042)	(0.042)
Domestic macro-fundamentals									
ΔEcon Fin	−	−0.016***	−0.016***	−0.016***	−0.012	−0.011	−0.012	−0.017***	−0.013
		(0.005)	(0.005)	(0.005)	(0.008)	(0.008)	(0.008)	(0.005)	(0.008)
ΔPoli	−	−0.028***	−0.041***	−0.038***	−0.007	−0.007	−0.009	−0.036***	−0.013
		(0.009)	(0.010)	(0.010)	(0.014)	(0.014)	(0.012)	(0.009)	(0.012)
Prev. Default	+	0.001	0.001	0.004	0.002	−0.001	0.005	0.003*	0.007*
		(0.001)	(0.002)	(0.003)	(0.004)	(0.003)	(0.003)	(0.002)	(0.004)
Liquidity									
ΔSov. Bid Ask spreads	−	−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)
ΔSov. CDS	+							0.161***	0.037
								(0.026)	(0.025)
ECT				−0.004***			−0.007***	−0.004***	−0.006***
				(0.000)			(0.001)	(0.000)	(0.001)
(Intercept)		0.000			−0.000	−0.003	−0.009***		−0.009***
		(0.000)			(0.000)	(0.002)	(0.002)		(0.002)
R^2		0.496	0.054	0.105	0.037	0.038	0.131	0.138	0.142
Num. obs.		3027	3027	3027	3027	3027	3027	2998	2998
Weak instruments					53.268***	53.671***	53.285***		53.285***
Wu-Hausman					38.249***	37.622***	34.383***		34.383***
Country FE		N	Y	Y	N	Y	Y	Y	Y
Months FE		N	Y	Y	N	N	N	Y	N

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

All predictors are one month lagged. Column (1) shows the estimation results for pooled OLS, (2) two-way fixed effects excluding corporate risks, (3) two-way fixed effects with error correction term, (4) instrumental variable regression where $\Delta\text{Fin. Sect CDS}_{i,t-1,USD}$ is instrumented by $\Delta\overline{\text{Reg. Fin. Sect CDS}}_{-i,t-1,r,USD}$, (5) instrumental variable with country fixed effects, (6) instrumental variable with error correction term and country fixed effects, (7) dynamic panel model (AR1) with error correction term and (8) dynamic panel model (AR1) with error correction and instrumental variable.

Table 5: Predictive value of non-financial sector corporate CDS for sovereign CDS returns (USD)

		Dependent variable: ΔSCDS							
		POLS	FE		IV			Dynamic	Dynamic + IV
	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Corporate risk									
ΔNonFin. Sect CDS	+	0.152***	0.102**	0.112***	0.691***	0.696***	0.768***	0.108***	0.791***
		(0.055)	(0.040)	(0.043)	(0.129)	(0.129)	(0.139)	(0.041)	(0.147)
Credit to Pvt.NonFin.Sect./GDP	+	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)
ΔCorp.borrowingrate	+	0.004	0.003	0.002	0.004	0.004	0.001	0.001	0.001
		(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
ΔCorp.taxrate	+	−0.008	−0.003	−0.003	−0.004	−0.003	−0.003	−0.004	−0.004
		(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Global commonalities									
ΔVIX	+	0.044***			−0.008	−0.008	−0.020		−0.002
		(0.017)			(0.023)	(0.023)	(0.025)		(0.027)
ΔS&P500	−	−0.683***			−0.060	−0.047	−0.023		0.105
		(0.119)			(0.185)	(0.186)	(0.194)		(0.205)
ΔTED	+	0.020**			0.015	0.015	0.013		0.006
		(0.010)			(0.013)	(0.013)	(0.013)		(0.014)
Δ(BBB − OIS)	+	0.005***			−0.003	−0.003	−0.004		−0.007*
		(0.002)			(0.003)	(0.003)	(0.004)		(0.004)
ΔTreasury yield	+	0.005			0.044**	0.044**	0.037*		0.056**
		(0.019)			(0.021)	(0.021)	(0.021)		(0.022)
GFC	+	−0.000			0.000	0.000	−0.000		0.000
		(0.000)			(0.001)	(0.001)	(0.001)		(0.001)
Regional commonality									
$\Delta\overline{\text{Reg. SCDS}}$	+	0.540***	0.271***	0.264***	0.401***	0.401***	0.372***	0.245***	0.351***
		(0.041)	(0.040)	(0.039)	(0.044)	(0.045)	(0.047)	(0.038)	(0.049)
Domestic macro-fundamentals									
ΔEcon Fin	−	−0.013**	−0.015***	−0.015***	−0.010	−0.009	−0.010	−0.016***	−0.012*
		(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
ΔPoli	−	−0.036***	−0.051***	−0.050***	−0.030***	−0.031***	−0.031***	−0.044***	−0.026**
		(0.008)	(0.010)	(0.009)	(0.011)	(0.011)	(0.011)	(0.009)	(0.012)
Prev. Default	+	0.002	0.001	0.003	0.007	0.006	0.009	0.005***	0.011
		(0.002)	(0.002)	(0.002)	(0.006)	(0.006)	(0.007)	(0.002)	(0.008)
Liquidity									
ΔSov. Bid Ask spreads	−	−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)
ΔSov. CDS	+							0.195***	0.099***
								(0.019)	(0.023)
$ECT(Z_{t-1})$				−0.002***			−0.003***	−0.002***	−0.003***
				(0.000)			(0.001)	(0.000)	(0.001)
(Intercept)		0.000			−0.000	−0.000	−0.000		0.000
		(0.000)			(0.000)	(0.002)	(0.002)		(0.002)
R^2		0.489	0.034	0.056	0.203	0.195	0.139	0.100	0.123
Num. obs.		3095	3095	3095	3095	3095	3095	3067	3067
Weak instruments					25.068***	25.142***	23.072***		22.457***
Wu-Hausman					13.434***	13.608***	15.897***		15.821***
Country FE		N	Y	Y	N	Y	Y	Y	Y
Months FE		N	Y	Y	N	N	N	Y	N

Note: *p<0.1; **p<0.05; ***p<0.01

All predictors are one month lagged. Column (1) contains the results for pooled ols, (2) two-way fixed effects excluding corporate risk factors, (3)two-way fixed effects and error correction term, (4) instrumental variable regression where $\Delta \text{Non Fin. Sect CDS}_{i,t-1,USD}$ is instrumented by $\Delta\overline{\text{Reg.Non Fin. Sect CDS}}_{-i,t-1,r,USD}$, (5) instrumental variable with country fixed effects, (6) instrumental variable with error correction term and country fixed effects, (7) dynamic panel model (AR1) with error correction term and (8) dynamic panel model (AR1) with error correction and instrumental variable.

A. Appendix

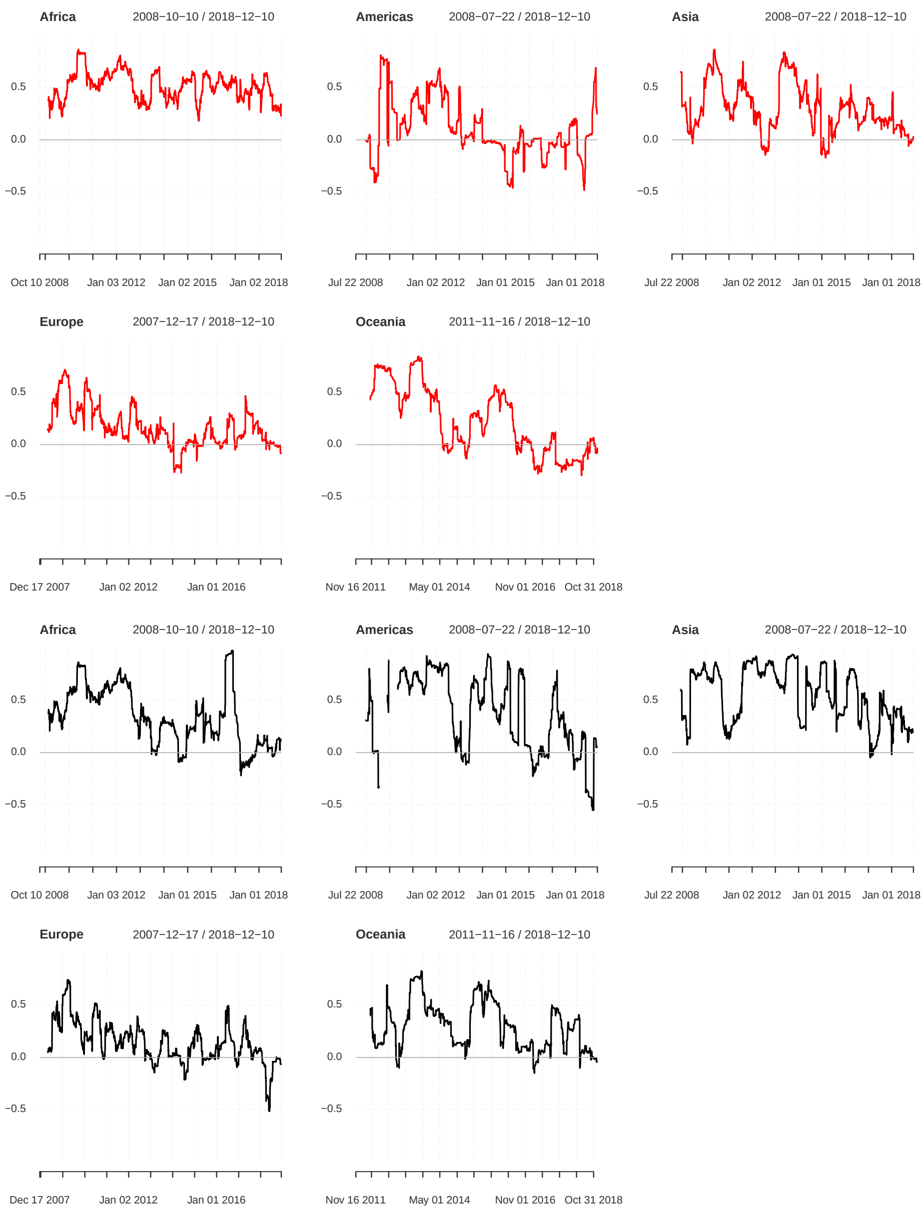

Figure A.3: Comovement between sovereign CDS and financial (top) and non-financial (bottom) corporate CDS in EUR

The top figure shows the 90-days rolling correlation between sovereign CDS spreads and financial sector CDS spreads. The bottom figure shows the same for sovereign CDS spreads and non-financial corporate CDS spreads. All CDS contracts are on euro denominated debt instruments.

Table A.6: Summary statistics for Daily CDS referenced to Euro bonds

	Sovereign CDS					Financial Sector CDS						Non-Financial Sector CDS						Sov. CDS Correlation with	
Region	mean	sd	median	skew	kurtosis	n	mean	sd	median	skew	kurtosis	n	mean	sd	median	skew	kurtosis	Fin Sect	Non-Fin Sect.
Africa:																			
Southern Africa	187.625	71.016	170.710	2.297	6.834	2582	359.089	213.285	257.750	1.151	0.537	2621	261.048	97.504	235.910	1.310	1.555	0.314***	0.617***
Americas:																			
Central America	137.061	62.735	120.020	2.991	10.923							2641	161.664	68.112	143.510	2.777	9.518		0.967***
Northern America	31.151	12.578	30.500	1.218	2.932	3354	128.614	56.416	119.160	1.576	3.804	3381	94.115	29.058	89.922	2.014	6.494	0.757***	0.761***
South America	1338.139	1964.301	240.420	1.445	0.710	1957	239.751	119.263	219.720	0.982	0.504	3941	219.371	161.243	167.425	2.477	6.738	-0.581***	0.909***
Asia:																			
Central Asia	189.101	52.856	177.550	0.460	-0.762	1701	561.099	136.106	511.540	1.147	0.827							0.538***	
Eastern Asia	82.346	53.175	70.820	3.464	19.054	7634	118.904	74.377	102.000	2.573	9.670	7638	96.172	54.627	83.513	2.942	13.726	0.892***	0.922***
South-Eastern Asia	119.490	47.365	107.340	2.139	6.810	2404	141.735	69.592	124.020	2.797	9.033	3507	110.167	43.974	100.020	2.575	10.548	0.942***	0.988***
Western Asia	220.161	71.706	208.860	1.614	3.296	825	341.031	86.136	303.400	1.185	1.488	2626	172.710	48.585	158.171	1.348	2.313	0.953***	0.691***
Europe:																			
Eastern Europe	349.031	864.345	208.135	13.273	195.015	6214	299.024	261.913	201.803	1.458	1.236	7377	207.298	120.437	173.000	1.532	2.553	0.391***	0.597***
Northern Europe	64.445	128.972	19.322	3.930	16.632	10848	197.829	235.241	139.000	5.386	58.221	8604	118.457	121.405	89.500	19.693	698.163	0.894***	0.152***
Southern Europe	183.550	197.336	122.000	3.105	11.424	8499	269.214	213.495	191.375	2.192	5.729	8499	139.500	86.617	115.875	2.061	6.757	0.937***	0.78***
Western Europe	37.660	36.986	25.030	2.633	9.452	15497	127.682	58.370	113.800	1.739	4.232	15495	92.329	37.349	83.660	1.330	2.251	0.745***	0.712***
Oceania:																			
Australia and New Zealand	37.523	16.560	35.500	0.897	0.551	1771	99.862	45.615	83.502	1.381	1.363	2992	85.856	22.112	80.857	0.568	-0.186	0.922***	0.496***

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

Table A.7: Granger causality tests for sovereign and financial sector CDS in Euro

	H_0 : Sov. does not cause Fin. Sect		H_0 : Fin. Sect. does not cause Sov.	
	F-test	p-value	F-test	p-value
Australia	5.205	0.000***	0.940	0.440
Austria	14.092	0.000***	1.388	0.158
Belgium	1.457	0.061*	13.717	0.000***
Brazil	95.037	0.000***	2.017	0.043**
Canada	0.853	0.427	0.515	0.473
China (Mainland)	25.668	0.000***	0.838	0.501
Denmark	2.755	0.001***	2.345	0.071*
Finland	4.242	0.000***	3.787	0.052*
France	4.158	0.000***	3.877	0.004***
Germany	6.566	0.000***	0.729	0.698
Hungary	29.686	0.000***	0.547	0.459
Ireland	2.268	0.000***	0.542	0.950
Italy	28.475	0.000***	0.884	0.505
Japan	4.755	0.000***	3.824	0.002***
Kazakhstan	1.478	0.207	3.516	0.061*
Malaysia	56.559	0.000***	1.462	0.223
Netherlands	3.774	0.000***	2.224	0.000***
Norway	1.275	0.247	0.538	0.878
Portugal	22.325	0.000***	3.470	0.016**
Russia	4.338	0.000***	6.791	0.000***
South Africa	13.882	0.000***	1.435	0.151
South Korea	2.447	0.001***	21.991	0.000***
Spain	8.679	0.000***	0.838	0.501
Sweden	2.482	0.000***	3.985	0.008***
Turkey	5.955	0.016**	0.170	0.681
Ukraine	4.171	0.000***	0.143	0.866
United Kingdom	17.977	0.000***	3.771	0.005***
United States	4.549	0.000***	3.749	0.000***
Venezuela	4.892	0.029**	0.354	0.906

H_0 denotes the null hypothesis.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.8: Granger causality tests for sovereign and non-financial sector CDS in Euro

	H_0 : Sov. does not cause Non-Fin. Sect		H_0 : Non-Fin. Sect. does not cause Sov.	
	F-test	p-value	F-test	p-value
Australia	11.483	0.000***	1.728	0.142
Austria	0.892	0.345	2.431	0.003***
Belgium	7.150	0.000***	2.666	0.103
Brazil	24.450	0.000***	1.723	0.126
Canada	0.371	0.691	1.021	0.313
Chile	12.793	0.000***	1.523	0.181
China (Mainland)	17.777	0.000***	2.882	0.022**
Czech Republic	10.756	0.000***	1.433	0.077*
Denmark	2.169	0.090*	1.701	0.165
Finland	2.060	0.104	0.479	0.489
France	9.968	0.000***	2.521	0.039**
Germany	3.117	0.000***	3.127	0.001***
Hungary	16.097	0.000***	0.372	0.542
Israel	9.615	0.000***	2.518	0.007***
Italy	9.893	0.000***	1.164	0.323
Japan	7.370	0.000***	2.724	0.019**
Malaysia	13.868	0.000***	3.339	0.019**
Mexico	45.592	0.000***	0.641	0.722
Netherlands	3.766	0.053*	1.394	0.081*
New Zealand	0.805	0.688	0.210	0.889
Norway	1.778	0.038**	0.495	0.907
Portugal	31.531	0.000***	1.095	0.350
Russia	3.216	0.000***	1.851	0.004***
South Africa	22.278	0.000***	1.186	0.291
South Korea	90.151	0.000***	3.067	0.080*
Spain	20.488	0.000***	2.335	0.054*
Sweden	7.419	0.000***	11.110	0.000***
Thailand	9.440	0.000***	4.207	0.041**
United Kingdom	3.042	0.004***	8.558	0.000***
United States	6.168	0.000***	1.684	0.039**

H_0 denotes the null hypothesis.

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Table A.9: Descriptive statistics of predictors used in regression analysis for USD

	mean	sd	min	max	skew	kurtosis
Levels						
VIX	18.279	7.355	10.379	64.303	2.427	8.292
S&P500	1,635.785	434.981	758.783	2,476.495	0.121	-1.206
TED	0.361	0.309	0.121	3.176	4.495	27.378
(BBB − OIS)	4.803	1.216	0.941	8.770	-0.457	2.250
Treasury yield	0.017	0.009	0.007	0.051	1.774	3.311
GFC	0.067	0.250	0	1	3.460	9.975
$\overline{\text{Reg. SCDS}}$	127.374	88.544	9.167	570.513	1.304	2.417
Econ Fin	77.283	6.943	58.500	94.500	0.012	-0.594
Poli	74.004	10.189	50	92.500	-0.478	-0.843
Prev. Default	0.014	0.118	0	1	8.206	65.365
Sov. Bid Ask spreads	0.104	0.079	-0.004	0.711	2.068	7.111
Comm. Banks						
FCY Liab./GDP	0.407	0.601	0.0001	4.166	2.906	9.211
Credit to						
Pvt.NonFin.Sect./GDP	1.560	0.704	0.238	3.986	0.207	-0.471
Comm. Banks credit to						
Pvt.NonFin.Sect./GDP	0.977	0.415	0.224	2.484	0.562	0.655
Corp. borrowing rate	0.057	0.044	0.004	0.226	1.505	1.527
Corp. tax rate	0.261	0.058	0.090	0.420	-0.037	0.028
$\overline{\text{Reg. Fin CDS}}$	188.040	161.431	17.675	1,322.379	2.940	11.225
$\overline{\text{Reg. Non Fin CDS}}$	149.547	116.167	15.083	901.992	2.547	8.831
First Difference						
ΔVIX	0.0001	0.008	-0.021	0.026	0.328	1.222
ΔS&P500	0.0004	0.001	-0.007	0.004	-0.940	3.056
ΔTED	0.0001	0.009	-0.026	0.040	0.310	2.418
Δ(BBB − OIS)	-0.005	0.054	-0.300	0.436	2.642	20.496
ΔTreasury yield	0.0001	0.006	-0.013	0.021	0.538	1.072
$\Delta\overline{\text{Reg. SCDS}}$	0.00002	0.006	-0.031	0.036	0.260	2.894
ΔEcon Fin	0.001	0.016	-0.163	0.128	0.008	17.446
ΔPoli	-0.0004	0.009	-0.077	0.116	0.802	15.908
ΔSov. Bid Ask spreads	0.122	1.383	-32.665	38.153	3.109	476.109
ΔCorp. borrowing rate	-0.004	0.025	-0.310	0.335	0.542	30.560
ΔCorp. tax rate	-0.001	0.021	-0.747	0.307	-18.570	638.698
$\Delta\overline{\text{Reg. Fin CDS}}$	-0.00004	0.007	-0.048	0.047	0.472	8.372
$\Delta\overline{\text{Reg. Non Fin CDS}}$	-0.00004	0.007	-0.049	0.095	2.080	25.630

Table A.10: Financial sector CDS as predictor of sovereign CDS in Euro

		Dependent variable: ΔSCDS							
		POLS	FE		IV			Dynamic	Dynamic + IV
	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Corporate risk									
ΔFin. Sect CDS	+	0.364***	0.233***	0.261***	0.697***	0.705***	0.730***	0.232***	0.649***
		(0.048)	(0.065)	(0.065)	(0.109)	(0.110)	(0.112)	(0.058)	(0.112)
Comm. BanksFCY Liab./GDP	+	−0.000							
		(0.000)							
Comm. Banks credit to Pvt.NonFin.Sect./GDP	+	0.000	0.001**	0.003***	−0.000	−0.000	0.003**	0.002***	0.002*
		(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Δ Corp. borrowing rate	+	0.003	0.002	0.000	0.002	0.002	0.003	−0.002	0.002
		(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Δ Corp. tax rate	+	0.002	0.002	0.004	0.002	0.001	0.003	0.002	0.003
		(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Global commonalities									
ΔVIX	+	−0.038			−0.057***	−0.058***	−0.058***		−0.007
		(0.024)			(0.022)	(0.022)	(0.021)		(0.021)
ΔS&P500	−	−0.756***			−0.271	−0.259	−0.283		−0.102
		(0.159)			(0.211)	(0.213)	(0.211)		(0.202)
ΔTED	+	0.009			−0.009	−0.008	−0.015		−0.022
		(0.017)			(0.017)	(0.017)	(0.017)		(0.017)
Δ(BBB − OIS)	+	0.017***			0.019***	0.020***	0.017***		0.013***
		(0.003)			(0.004)	(0.004)	(0.003)		(0.004)
ΔTreasury yield	+	−0.001**			−0.001**	−0.001**	−0.001***		−0.001***
		(0.000)			(0.000)	(0.000)	(0.000)		(0.000)
GFC	+	−0.002***			−0.001*	−0.001**	−0.002***		−0.002***
		(0.000)			(0.001)	(0.001)	(0.001)		(0.001)
Regional commonality									
$\Delta\overline{\text{Reg. SCDS}}$	+	0.319***	0.119**	0.125***	0.253***	0.249***	0.247***	0.114***	0.245***
		(0.071)	(0.051)	(0.048)	(0.036)	(0.037)	(0.036)	(0.043)	(0.034)
Domestic macro-fundamentals									
ΔEcon Fin	−	−0.021**	−0.026***	−0.026***	−0.019***	−0.019***	−0.021***	−0.027***	−0.025***
		(0.009)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.010)	(0.007)
ΔPoli	−	−0.029**	−0.037***	−0.034***	−0.016	−0.014	−0.014	−0.024**	0.002
		(0.013)	(0.012)	(0.012)	(0.016)	(0.016)	(0.016)	(0.012)	(0.015)
ΔSov. CDS	+							0.271***	0.196***
								(0.038)	(0.027)
(Intercept)		0.000			0.000	0.001	−0.003		−0.003
		(0.000)			(0.000)	(0.002)	(0.002)		(0.002)
ECT				−0.004***			−0.004***	−0.004***	−0.004***
				(0.001)			(0.001)	(0.001)	(0.001)
R^2		0.390	0.006	0.046	0.335	0.329	0.350	0.123	0.401
Num. obs.		2171	2171	2171	2171	2171	2171	2146	2146
Weak instruments					27.582***	26.847***	25.424***		25.424***
Wu-Hausman					.083***	7.129***	5.730**		5.730**
Country FE		N	Y	Y	N	Y	Y	Y	Y
Months FE		N	Y	Y	N	N	N	Y	N

Note: *p<0.1; **p<0.05; ***p<0.01

All predictors are lagged to one month. Column 1 is pooled ols, 2 is with two-ways fixed effects excluding corporate risks, 3 is with two-ways fixed effects and error correction term, 4 is instrumental variable regression where $\Delta\text{Fin. Sect CDS}_{i,t-1,\text{Euro}}$ is instrumented to $\Delta\overline{\text{Reg. Fin. Sect CDS}}_{-i,t-1,r,\text{Euro}}$, 5 is instrumental variable with country fixed effects, 6 is instrumental variable with error correction term and country fixed effects, 7 is dynamic panel model (AR1) with error correction term and 8 is dynamic panel model (AR1) with error correction and instrumental variable.

Table A.11: Non Financial sector CDS as predictor of sovereign CDS in Euro

		Dependent variable: ΔSCDS							
		POLS	FE		IV			Dynamic	Dynamic + IV
	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Corporate risk									
ΔNonFin. Sect CDS	+	0.308***	0.242***	0.254***	0.659***	0.659***	0.723***	0.238***	0.663***
		(0.064)	(0.067)	(0.070)	(0.102)	(0.101)	(0.097)	(0.067)	(0.099)
Credit to Pvt.NonFin.Sect./GDP	+	−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)
ΔCorp.borrowingrate	+	0.002	0.003	0.002	0.002	0.001	0.001	−0.000	−0.001
		(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.002)	(0.004)
ΔCorp.taxrate	+	0.002	0.002	0.003	0.003	0.004	0.005	0.003	0.005
		(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Global commonalities									
ΔVIX	+	−0.045**			−0.086***	−0.086***	−0.089***		−0.042*
		(0.019)			(0.022)	(0.022)	(0.022)		(0.022)
ΔS&P500	−	−0.835***			−0.413**	−0.417**	−0.363**		−0.144
		(0.155)			(0.175)	(0.175)	(0.170)		(0.172)
ΔTED	+	0.018			0.016	0.016	0.015		0.007
		(0.013)			(0.014)	(0.014)	(0.014)		(0.014)
Δ(BBB − OIS)	+	0.010***			0.008**	0.008***	0.007**		0.005
		(0.003)			(0.003)	(0.003)	(0.003)		(0.003)
ΔTreasury yield	+	−0.001***			−0.002***	−0.002***	−0.002***		−0.002***
		(0.000)			(0.001)	(0.001)	(0.001)		(0.001)
GFC	+	−0.001**			−0.001	−0.001	−0.002***		−0.002***
		(0.000)			(0.001)	(0.001)	(0.001)		(0.001)
Regional commonality									
$\Delta\overline{\text{Reg. SCDS}}$	+	0.386***	0.187***	0.184***	0.320***	0.320***	0.301***	0.173***	0.294***
		(0.056)	(0.041)	(0.040)	(0.035)	(0.035)	(0.034)	(0.039)	(0.034)
Domestic macro-fundamentals									
ΔEcon Fin	−	−0.023***	−0.026***	−0.026***	−0.018**	−0.019***	−0.020***	−0.026***	−0.021***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
ΔPoli	−	−0.034***	−0.034***	−0.030***	−0.022*	−0.023*	−0.021*	−0.022**	−0.011
		(0.010)	(0.010)	(0.010)	(0.013)	(0.013)	(0.012)	(0.011)	(0.012)
ΔSov. CDS	+							0.245***	0.170***
								(0.039)	(0.026)
$\text{ECT}(Z_{t-1})$				−0.004***			−0.004***	−0.004***	−0.004***
				(0.001)			(0.000)	(0.000)	(0.000)
(Intercept)		0.001***			0.001**	0.001	0.001		0.002
		(0.000)			(0.000)	(0.002)	(0.002)		(0.002)
R^2		0.419	0.050	0.089	0.350	0.346	0.346	0.153	0.394
Num. obs.		2514	2514	2514	2514	2514	2514	2485	2485
Weak instruments					61.024***	61.724***	59.073***		54.666***
Wu-Hausman					8.591***	8.548***	12.244***		9.912***
Country FE		N	Y	Y	N	Y	Y	Y	Y
Months FE		N	Y	Y	N	N	N	Y	N

Note: *p<0.1; **p<0.05; ***p<0.01

All predictors are lagged to one month. Column 1 is pooled ols, 2 is with two-ways fixed effects excluding corporate risks, 3 is with two-ways fixed effects and error correction term, 4 is instrumental variable regression where $\Delta\text{Non Fin. Sect CDS}_{i,t-1,USD}$ is instrumented to $\Delta\overline{\text{Reg. Non Fin. Sect CDS}}_{-i,t-1,r,USD}$, 5 is instrumental variable with country fixed effects, 6 is instrumental variable with error correction term and country fixed effects, 7 is dynamic panel model (AR1) with error correction term and 8 is dynamic panel model (AR1) with error correction and instrumental variable.

Table A.12: Sovereign CDS as predictor of Financial Sector CDS in USD

		Dependent variable: ΔFin. Sect CDS							
		POLS	FE		IV			Dynamic	Dynamic + IV
	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sovereign risk									
ΔSov. CDS	+	0.348***	0.278***	0.316***	0.415***	0.414***	0.397***	0.299***	0.399***
		(0.041)	(0.055)	(0.056)	(0.055)	(0.056)	(0.052)	(0.047)	(0.053)
Corporate risk									
ΔFin. Sect CDS	+							0.157**	0.124**
								(0.064)	(0.055)
Comm. BanksFCY Liab./GDP	+	−0.000							
		(0.000)							
Comm. Banks credit to Pvt.NonFin.Sect./GDP	+	0.000	−0.001	−0.005**	−0.000	−0.002	−0.004**	−0.004**	−0.003**
		(0.000)	(0.002)	(0.002)	(0.000)	(0.001)	(0.002)	(0.002)	(0.001)
Δ Corp. borrowing rate	+	0.003	0.002	0.002	0.002	0.003	0.002	0.003	0.003
		(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Δ Corp. tax rate	+	0.003*	0.003**	0.003*	0.003*	0.004**	0.002	0.003*	0.002
		(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Global commonalities									
ΔVIX	+	0.009			0.004	0.005	0.011		0.028
		(0.024)			(0.019)	(0.019)	(0.019)		(0.020)
ΔS&P500	−	−0.912***			−0.826***	−0.823***	−0.779***		−0.715***
		(0.086)			(0.137)	(0.136)	(0.131)		(0.121)
ΔTED	+	0.029***			0.027**	0.027**	0.014		0.003
		(0.011)			(0.013)	(0.012)	(0.012)		(0.012)
Δ(BBB − OIS)	+	0.009***			0.007***	0.008***	0.006**		0.004
		(0.002)			(0.003)	(0.003)	(0.003)		(0.003)
ΔTreasury yield	+	−0.052***			−0.052***	−0.052***	−0.041**		−0.030
		(0.019)			(0.019)	(0.019)	(0.019)		(0.021)
GFC	+	−0.000			−0.000	−0.000	0.000		−0.000
		(0.001)			(0.001)	(0.001)	(0.001)		(0.001)
Regional commonality									
$\Delta\overline{\text{Reg. Fin. Sect CDS}}$	+	0.115***	−0.026	−0.028	0.097***	0.098***	0.095***	−0.029	0.088***
		(0.032)	(0.033)	(0.031)	(0.020)	(0.020)	(0.019)	(0.030)	(0.020)
Domestic macro-fundamentals									
ΔEcon Fin	−	0.001	−0.003	0.000	0.002	0.002	0.002	−0.000	0.001
		(0.008)	(0.006)	(0.005)	(0.009)	(0.008)	(0.008)	(0.005)	(0.008)
ΔPoli	−	−0.019	−0.014	−0.012	−0.017	−0.016	−0.018	−0.006	−0.009
		(0.019)	(0.016)	(0.014)	(0.013)	(0.013)	(0.012)	(0.013)	(0.011)
Prev. Default	+	−0.001	0.002	−0.006*	−0.001	0.000	−0.009**	−0.007**	−0.009**
		(0.001)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
Liquidity									
ΔSov. Bid Ask spreads	−	−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)
ECT				−0.007***			−0.007***	−0.006***	−0.006***
				(0.002)			(0.001)	(0.001)	(0.001)
(Intercept)		0.000			0.000	0.003	0.005**		0.005**
		(0.000)			(0.000)	(0.002)	(0.002)		(0.002)
Adj. R^2		0.277	−0.023	0.061	0.273	0.273	0.332	0.074	0.344
Num. obs.		3027	3027	3027	3027	3027	3027	2998	2998
Weak instruments					429.206***	427.060***	427.645***		427.645***
Wu-Hausman					1.481	1.392	0.664		0.664
Country FE		N	Y	Y	N	Y	Y	Y	Y
Months FE		N	Y	Y	N	N	N	Y	N

Note: *p<0.1; **p<0.05; ***p<0.01

All predictors are lagged to one month. Column 1 is pooled ols, 2 is with two-ways fixed effects excluding corporate risks, 3 is with two-ways fixed effects and error correction term, 4 is instrumental variable regression where $\Delta Sov\ CDS_{i,t-1,USD}$ is instrumented to $\Delta\overline{Reg.\ Sov\ CDS}_{-i,t-1,r,USD}$, 5 is instrumental variable with country fixed effects, 6 is instrumental variable with error correction term and country fixed effects, 7 is dynamic panel model (AR1) with error correction term and 8 is dynamic panel model (AR1) with error correction and instrumental variable.

Table A.13: Sovereign CDS as predictor of Financial Sector CDS in Euro

		Dependent variable: ΔFin. Sect CDS							
		POLS	FE		IV			Dynamic	Dynamic + IV
	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sovereign risk									
ΔSov. CDS	+	0.262***	0.179***	0.191***	0.434***	0.436***	0.424***	0.187***	0.423***
		(0.046)	(0.043)	(0.044)	(0.063)	(0.064)	(0.062)	(0.042)	(0.062)
Corporate risk									
ΔFin. Sect CDS	+							0.116***	0.076***
								(0.028)	(0.024)
Comm. BanksFCY Liab./GDP	+	0.000***	0.001***	0.001*	0.001*	0.001*	0.001	0.001	0.001
		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
Comm. Banks credit to Pvt.NonFin.Sect./GDP	+	0.001**	0.002***	0.002	0.000	0.001	0.001	0.001	0.000
		(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Δ Corp. borrowing rate	+	−0.001	−0.001	−0.000	−0.001	−0.001	−0.002	−0.000	−0.002
		(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Δ Corp. tax rate	+	0.000	0.000	−0.000	−0.000	−0.000	−0.001	−0.001	−0.001
		(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
Global commonalities									
ΔVIX	+	0.038			0.047**	0.043**	0.046**		0.059***
		(0.026)			(0.020)	(0.019)	(0.019)		(0.020)
ΔS&P500	−	−1.008***			−0.731***	−0.737***	−0.694***		−0.611***
		(0.156)			(0.148)	(0.148)	(0.146)		(0.145)
ΔTED	+	0.042***			0.036**	0.038***	0.038***		0.029*
		(0.014)			(0.015)	(0.015)	(0.014)		(0.015)
Δ(BBB − OIS)	+	−0.009***			−0.014***	−0.013***	−0.012***		−0.013***
		(0.003)			(0.004)	(0.004)	(0.003)		(0.004)
ΔTreasury yield	+	0.001			0.001*	0.001*	0.001**		0.001*
		(0.000)			(0.000)	(0.000)	(0.000)		(0.000)
GFC	+	−0.000			0.000	−0.000	0.000		0.001
		(0.001)			(0.001)	(0.001)	(0.001)		(0.001)
Regional commonality									
$\Delta\overline{\text{Reg. Fin Sect CDS}}$	+	0.184**	0.031	0.026	0.144***	0.142***	0.137***	0.027	0.131***
		(0.082)	(0.022)	(0.022)	(0.033)	(0.032)	(0.032)	(0.021)	(0.031)
Domestic macro-fundamentals									
ΔEcon Fin	−	0.001	−0.006	−0.003	0.005	0.005	0.007	−0.004	0.006
		(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)
ΔPoli	−	−0.032**	−0.015	−0.013	−0.023*	−0.020	−0.022	−0.008	−0.017
		(0.013)	(0.011)	(0.011)	(0.014)	(0.014)	(0.014)	(0.011)	(0.013)
ECT				−0.004***			−0.004***	−0.004***	−0.004***
				(0.001)			(0.001)	(0.001)	(0.001)
(Intercept)		−0.000			−0.000	−0.002	−0.002		−0.001
		(0.000)			(0.000)	(0.002)	(0.002)		(0.002)
R^2		0.386	−0.007	0.021	0.354	0.352	0.376	0.034	0.367
Num. obs.		2171	2171	2171	2171	2171	2171	2146	2146
Weak instruments					151.214***	151.687***	156.349***		156.349***
Wu-Hausman					8.413***	8.778***	8.337***		8.337***
Country FE		N	Y	Y	N	Y	Y	Y	Y
Months FE		N	Y	Y	N	N	N	Y	N

Note: *p<0.1; **p<0.05; ***p<0.01

All predictors are lagged to one month. Column 1 is pooled ols, 2 is with two-ways fixed effects excluding corporate risks, 3 is with two-ways fixed effects and error correction term, 4 is instrumental variable regression where $\Delta \text{Sov CDS}_{i,t-1,Euro}$ is instrumented to $\Delta\overline{\text{Reg. Sov CDS}}_{-i,t-1,r,Euro}$, 5 is instrumental variable with country fixed effects, 6 is instrumental variable with error correction term and country fixed effects, 7 is dynamic panel model (AR1) with error correction term and 8 is dynamic panel model (AR1) with error correction and instrumental variable.

Table A.14: Sovereign CDS as predictor of Non Financial Sector CDS in USD

		Dependent variable: ΔNon Fin. Sect CDS							
		POLS	FE		IV			Dynamic	Dynamic + IV
	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sovereign risk									
ΔSov. CDS	+	0.303***	0.213***	0.238***	0.407***	0.407***	0.399***	0.238***	0.377***
		(0.044)	(0.045)	(0.046)	(0.042)	(0.041)	(0.040)	(0.046)	(0.040)
Corporate risk									
ΔNonFin. Sect CDS	+							0.167***	0.143***
								(0.055)	(0.046)
Credit to Pvt.NonFin.Sect./GDP	+	−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)
Δ Corp. borrowing rate	+	0.000	−0.003	−0.003	−0.001	−0.001	−0.003	−0.003	−0.002
		(0.003)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Δ Corp. tax rate	+	−0.005	−0.002	−0.003	−0.004	−0.004	−0.005	−0.003	−0.006
		(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
Global commonalities									
ΔVIX	+	0.069***			0.063***	0.063***	0.068***		0.088***
		(0.020)			(0.021)	(0.021)	(0.021)		(0.020)
ΔS&P500	−	−0.872***			−0.711***	−0.712***	−0.694***		−0.633***
		(0.108)			(0.140)	(0.138)	(0.135)		(0.131)
ΔTED	+	0.006			0.002	0.002	−0.005		−0.012
		(0.012)			(0.013)	(0.013)	(0.013)		(0.013)
Δ(BBB − OIS)	+	0.013***			0.011***	0.011***	0.009***		0.006
		(0.003)			(0.004)	(0.004)	(0.003)		(0.004)
ΔTreasury yield	+	−0.065***			−0.066***	−0.066***	−0.052***		−0.030
		(0.015)			(0.021)	(0.021)	(0.019)		(0.022)
GFC	+	−0.001			−0.001	−0.001	0.000		0.000
		(0.001)			(0.001)	(0.001)	(0.001)		(0.001)
Regional commonality									
$\Delta\overline{\text{Reg. NonFin. Sect CDS}}$	+	0.104***	−0.003	−0.005	0.085***	0.085***	0.074***	−0.003	0.075***
		(0.035)	(0.032)	(0.031)	(0.021)	(0.021)	(0.020)	(0.030)	(0.020)
Domestic macro-fundamentals									
ΔEcon Fin	−	−0.003	−0.003	−0.001	−0.001	−0.001	−0.001	−0.003	−0.003
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
ΔPoli	−	−0.001	−0.002	−0.005	0.004	0.004	−0.001	0.001	0.003
		(0.012)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)	(0.009)	(0.013)
Prev. Default	+	−0.009***	−0.009***	−0.023***	−0.009	−0.009	−0.021**	−0.028***	−0.025***
		(0.001)	(0.001)	(0.004)	(0.008)	(0.008)	(0.008)	(0.006)	(0.010)
Liquidity									
ΔSov. Bid Ask spreads	−	−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)
(Intercept)		0.000***			0.000	0.000	−0.002		−0.002
		(0.000)			(0.000)	(0.002)	(0.001)		(0.001)
ECT				−0.005***			−0.005***	−0.006***	−0.006***
			(0.001)			(0.002)	(0.001)	(0.001)	
Adj. R^2		0.264	−0.041	0.014	0.258	0.253	0.295	0.045	0.318
Num. obs.		3095	3095	3095	3095	3095	3095	3067	3067
Weak instruments					487.605***	484.962***	487.733***		480.499***
Wu-Hausman					7.539***	7.526***	5.468**		3.153*
Country FE		N	Y	Y	N	Y	Y	Y	Y
Months FE		N	Y	Y	N	N	N	Y	N
Note:									*p<0.1; **p<0.05; ***p<0.01

All predictors are lagged to one month. Column 1 is pooled ols, 2 is with two-ways fixed effects excluding corporate risks, 3 is with two-ways fixed effects and error correction term, 4 is instrumental variable regression where $\Delta \text{Sov CDS}_{i,t-1,USD}$ is instrumented to $\Delta\overline{\text{Reg. Sov CDS}}_{-i,t-1,r,USD}$, 5 is instrumental variable with country fixed effects, 6 is instrumental variable with error correction term and country fixed effects, 7 is dynamic panel model (AR1) with error correction term and 8 is dynamic panel model (AR1) with error correction and instrumental variable.

Table A.15: Sovereign CDS as predictor of Non Financial Sector CDS in Euro

		Dependent variable: ΔNon Fin. Sect CDS							
		POLS	FE		IV			Dynamic	Dynamic + IV
	Exp. sign	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sovereign risk									
ΔSov. CDS	+	0.254^{***}	0.229^{***}	0.244^{***}	0.322^{***}	0.320^{***}	0.325^{***}	0.239^{***}	0.311^{***}
		(0.042)	(0.042)	(0.043)	(0.055)	(0.056)	(0.056)	(0.043)	(0.056)
Corporate risk									
ΔNonFin. Sect CDS	+							0.099^{***}	0.085^{***}
								(0.023)	(0.017)
Credit to Pvt.NonFin.Sect./GDP	+	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)
Δ Corp. borrowing rate	+	0.000	0.002	0.003	−0.000	−0.001	0.000	0.003	0.001
		(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Δ Corp. tax rate	+	−0.003	−0.002	−0.002	−0.003	-0.004^{*}	-0.004^{*}	−0.003	-0.005^{**}
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Global commonalities									
ΔVIX	+	0.097^{***}			0.099^{***}	0.099^{***}	0.097^{***}		0.107^{***}
		(0.023)			(0.019)	(0.019)	(0.019)		(0.019)
ΔS&P500	−	-0.639^{***}			-0.538^{***}	-0.535^{***}	-0.518^{***}		-0.515^{***}
		(0.129)			(0.127)	(0.127)	(0.126)		(0.124)
ΔTED	+	0.001			−0.002	−0.002	−0.006		−0.009
		(0.008)			(0.012)	(0.012)	(0.012)		(0.012)
Δ(BBB − OIS)	+	0.002			0.000	0.000	0.000		−0.000
		(0.003)			(0.003)	(0.003)	(0.003)		(0.003)
ΔTreasury yield	+	0.001^{**}			0.001^{*}	0.001^{*}	0.001^{**}		0.001^{*}
		(0.001)			(0.001)	(0.001)	(0.001)		(0.001)
GFC	+	-0.001^{**}			-0.001^{*}	−0.001	0.001		0.000
		(0.000)			(0.001)	(0.001)	(0.001)		(0.001)
Regional commonality									
$\Delta\overline{\text{Reg. NonFin. Sect CDS}}$	+	0.219^{***}	0.067^{***}	0.053^{**}	0.199^{***}	0.202^{***}	0.186^{***}	0.046^{**}	0.177^{***}
		(0.034)	(0.025)	(0.023)	(0.031)	(0.031)	(0.032)	(0.023)	(0.031)
Domestic macro-fundamentals									
ΔEcon Fin	−	−0.008	-0.010^{*}	−0.009	−0.005	−0.005	−0.004	-0.010^{*}	−0.006
		(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
ΔPoli	−	-0.022^{**}	−0.016	-0.018^{*}	−0.019	−0.016	-0.019^{*}	−0.012	−0.014
		(0.010)	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)	(0.011)	(0.011)
ECT				-0.005^{***}			-0.004^{***}	-0.005^{***}	-0.004^{***}
				(0.001)			(0.001)	(0.001)	(0.001)
(Intercept)		0.000			−0.000	−0.003	-0.004^{**}		-0.004^{**}
		(0.000)			(0.000)	(0.002)	(0.002)		(0.002)
R^2		0.373	0.012	0.038	0.369	0.368	0.383	0.048	0.389
Num. obs.		2514	2514	2514	2514	2514	2514	2485	2485
Weak instruments					214.669^{***}	208.466^{***}	210.296^{***}		210.184^{***}
Wu-Hausman					1.656	1.537	1.267		0.880
Country FE		N	Y	Y	N	Y	Y	Y	Y
Months FE		N	Y	Y	N	N	N	Y	N

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

All predictors are lagged to one month. Column 1 is pooled ols, 2 is with two-ways fixed effects excluding corporate risks, 3 is with two-ways fixed effects and error correction term, 4 is instrumental variable regression where $\Delta \text{Sov CDS}_{i,t-1,Euro}$ is instrumented to $\Delta\overline{\text{Reg. Sov CDS}}_{-i,t-1,r,Euro}$, 5 is instrumental variable with country fixed effects, 6 is instrumental variable with error correction term and country fixed effects, 7 is dynamic panel model (AR1) with error correction term and 8 is dynamic panel model (AR1) with error correction and instrumental variable.