News Sentiment and Sovereign Credit Risk*

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Abstract

We study the interaction between the media and sovereign credit risk and investigate whether media tone captures hard to quantify aspects of sovereign fundamentals. We use the Thomson Reuters News Analytics (TRNA) database and an extensive set of sovereign Credit Default Swap (CDS) data. We also decompose CDS spreads into their risk premium and default risk components within an affine credit risk valuation model. We find that media tone explains and predicts sovereign CDS returns. The effect on the CDS and default risk component returns partially reverses within five weeks whereas the effect on the risk premium reverses fully. Our findings suggest that the overall impact on CDS returns is a mixture of noise and new information, consistent with prevailing theories of investor over-and underreaction. News sentiment influences the default risk component and leads to reassessment of the fundamentals of sovereign economies.

Keywords: CDS, Sovereign Risk, Credit Risk Premium, Media Tone.

JEL Classification: G12; G15.

1 Introduction

Does news sentiment impact sovereign credit risk? Does it improve our understanding of countries' fundamentals? Does it proxy for investor sentiment? We investigate these questions by using an extensive sovereign credit default swap (CDS) dataset and the ratings of news content (i.e. sentiment) from Thomson Reuters News Analytics (TRNA). We consider sovereign CDS contracts as a proxy for country specific credit risk. These represent an insurance contract against sovereign default or restructuring events and are generally more liquid than the underlying bond. In the TRNA database news items are rated in terms of sentiment (positive or negative) in real time using a highly sophisticated neural network which provides an improvement over traditional approaches (such as bag-of-words). Furthermore, TRNA reflects a more accurate representation of the news set used by actual investors, as it is a commercial product that is sold directly to subscribers.

Numerous studies have explored sovereign credit risk and several of its determinants[1]. In particular, Longstaff, Pan, Pedersen, and Singleton (2011) highlight the high level of commonality in sovereign credit spreads and find that they are mainly explained by global factors[2]. Country-specific fundamentals have less explanatory power. Coupled with global factors, behavioural measures, such as market sentiment, have also been found to influence sovereign credit risk[3]. To the best of our knowledge, the impact of news sentiment on sovereign credit risk has yet to be explored.

The ability of media content to impact equity markets has recently received considerable attention in the literature. In particular, Tetlock (2007) examines how qualitative information is incorporated in aggregate market valuations, and Garcia (2013) shows that the predictability of stock returns using news content is concentrated in recessions. Dougal, Engelberg, Garcia, and Christopher (2012) identify a causal relationship between financial reporting and stock market per-

[1]These include, among others, Edwards (1984, 1986); Berg and Sachs (1988); Boehmer and Megginson (1990); Duffie, Pedersen, and Singleton (2003), Longstaff, Pan, Pedersen, and Singleton (2011); Pan and Singleton (2008); Remolona, Scatigna, and Wu (2007); Jeanneret (2015) and Badaoui, Cathcart, and El-Jahel (2013); Monfort and Renne (2014)

[2]The most significant variables for CDS spreads have been found to be the US stock and high yield markets and the VIX index.

[3]Georgoutsos and Migiakis (2013); Tang and Yan (2013)

formance. Engelberg and Parsons (2011) find that local media coverage strongly predicts local trading, and that local trading is strongly related to the timing of local reporting. Uhl, Pedersen, and Malitius (2015) find a longer-run effect of news sentiment on equities with weekly data. Tetlock, Saar-Tsechansky, and Macskassy (2008) examine the impact of negative words on individual S&P 500 firms and Hillert, Jacobs, and Müller (2014) find that firms particulary covered by media exhibit stronger momentum and that this effect depends on media tone. Hence, media coverage and sentiment in news influence investors and potentially exacerbate investor biases.

To investigate the impact of media tonality in the sovereign CDS market, we first construct a global "news sentiment" variable from TRNA by filtering news according to global debt markets, U.S. and regional classifiers, such as Europe, Latin America and Asia. The motivation for a global "news sentiment" variable is built on results established in the literature which are suggestive of increasing economic integration across countries, growing dependence on global markets and a spill-over effect from the US to other sovereign countries.[4] Second, we decompose the CDS spread into risk premium[5] and default risk components for each country using an affine sovereign credit risk model in line with Pan and Singleton (2008) and Longstaff, Pan, Pedersen, and Singleton (2011). This allows for a better understanding of the role of media coverage and helps to shed light on whether news sentiment can convey information about countries' fundamentals. In order to analyse the data, we conduct principal component analyses, fixed effect panel regressions and panel vector autoregressive models (VAR) in order to capture the dynamic interdependencies present in the data using a minimal set of restrictions. This also allows impulse response analysis to be constructed in a relatively straightforward way.

We obtain several interesting findings based on our analysis. First, we find, in line with Longstaff, Pan, Pedersen, and Singleton (2011) a high level of commonality in sovereign credit risk, with the first principle component explaining 62% of the CDS spread returns. We also find that the commonality is mainly driven by the default risk component and to a lesser extent by the

[4] Longstaff, Pan, Pedersen, and Singleton (2011) document a strong relation between CDS spreads and global variables, in particular the VIX and the US stock market.

[5] Risk premium is defined as distress risk, i.e it is the premium associated with the unpredictable variation in the arrival rate of credit events.

risk premium. The first principal component explains 57% and 14% of the default risk component and the risk premium returns, respectively. Furthermore, the first principle component of CDS, default risk and risk premium returns has a correlation of -15%, -15% and -12% with news sentiment, respectively. Thus, news sentiment influences sovereign credit risk, with the link being stronger for the default risk component than for the risk premium.

Second, we find that news sentiment drives sovereign credit risk. Specifically, we regress CDS returns on the news sentiment variable in a fixed effect panel and control for local and global variables. The news sentiment variable has significant explanatory power for CDS returns. The relationship between CDS returns and news sentiment is negative, implying an improvement in media tone (positive) decreases returns. We repeat the same exercise for the default risk component and risk premium. We find that news sentiment is a significant driver of the default risk component, although it loses significance for the risk premium component.

Third, using a panel VAR, we show that news sentiment is able to predict CDS returns. This effect is robust to controls for autocorrelation and determinants of CDS returns and partially reverses within five weeks. News sentiment can act as a proxy for investor sentiment, a novel informational channel, or it could be a mixture of both. On the one hand, sentiment theory postulates that short-term returns will be reversed in the long run. On the other hand, information theory predicts that they will persist indefinitely. A mixture of noise and information will correspond to a partial reversal and will lend support for theories of over- or underreaction to news, which is in line with Daniel, Hirshleifer, and Subrahmanyam (1998).

In order to shed more light on the present issue, we run the same return predictability regressions on both the default and risk premium components of CDS spreads. We find news sentiment predicts both component's returns significantly. However, the effect on the default component partially reverses over the following five weeks whereas the effect on the risk premium reverses fully. This result confirms that news sentiment is a mixture of noise and information. The informational channel is more likely to impact the default component and lead to reassessments of the fundamentals of sovereign economies. The noise channel is more likely to impact the risk premium and induce a temporary change in investors' appetite for credit exposure. Overall, our results support behavioural theory and the theories of over- and underreaction. In particular, the literature of behavioral economics has shown that sentiment can move financial assets[6]. Investor biases can also lead to overreaction, as Daniel, Hirshleifer, and Subrahmanyam (1998) show.

In summary, our work is the first to show that news sentiment explains and predicts CDS returns, while conveying information about countries' fundamentals as well as demonstrating that the sovereign credit market is subject to behavioral biases. Our paper contributes to two strands of literature: new determinants of sovereign credit risk as well as the role of media in CDS markets. On the one hand, it adds to the work of Longstaff, Pan, Pedersen, and Singleton (2011), Remolona, Scatigna, and Wu (2007) and Pan and Singleton (2008) with respect to sovereign credit risk. On the other hand, it extends the news sentiment literature as in Tetlock (2007) and Garcia (2013) from equity return predictability to CDS returns.

[6] See Hirshleifer (2001) for a survey on this topic.

2 Data

This section describes the CDS and Thomson Reuters News Analytics datasets. We present descriptive statistics and a brief summary on the construction of the default and risk premium components.

2.1 CDS Data

A CDS is an insurance contract that protects the holder against the default of the underlying reference entity. The buyer pays an annuity premium to the protection seller at a quarterly or bi-yearly frequency. If a default were to occur, the CDS buyer then receives a payment from the CDS seller. This payment amounts to the difference between the notional principal and the loss upon the default of the reference entity.

We use sovereign CDS contracts as a proxy for country specific credit risk. Several studies have highlighted the merits of using CDS contracts (rather than bonds) to capture the default risk of the underlying entities [7]. There are numerous reasons for this. Sovereign CDS contracts are not subject to the complex guarantees and options which are typically embedded in government bonds. Therefore, it is easier to infer the default risk of the underlying from CDS contracts. Government bond yields are also impacted by taxation standards and the legislation procedures of the issuing countries. This is problematic considering that the countries in our sample have different standards in this regard, so using CDS contracts ensures comparability. Finally, the CDS market offers better liquidity than the underlying bonds for many countries.

We focus on contracts with a maturity of five years, given that this is the most liquid maturity in the CDS term structure. Furthermore, we specify the clauses as senior debt for the government bonds that are underlying the sovereign CDS contracts. Senior debt entitles the bond holder to seniority (over subordinate debt) when claiming losses, given that the bond issuer defaults on both senior and subordinate bonds. Senior debt contains less credit risk and has a better recovery rate. The market for sovereign CDS contracts written on senior debt is also more liquid than the

[7] See Augustin and Tédongap (2016); Augustin, Subrahmanyam, Tang, and et al (2014); Pan and Singleton (2008); Longstaff, Pan, Pedersen, and Singleton (2011); Fontana and Scheicher (2016)

market for subordinate bonds. We consider the recovery criteria for the underlying government debt contracts as 'NO Restructuring', and the notional is expressed in US dollars.

We originally included 26 countries in our sovereign list as in Longstaff, Pan, Pedersen, and Singleton (2011). The frequency of our data is weekly. We excluded countries that have observations less than 200, such as Pakistan, Hungary, Peru, Thailand and Turkey, and Japan. The sample period is from January 2003 until April 2014. For missing data points, we interpolate using the credit term structure (with four and seven year maturities). Additionally, we winsorise the data by replacing extreme outliers with cut-off points for observations in the 1st and 99th percentile. We only consider emerging countries from different geographical regions. Our remaining sample consists of Bulgaria, Brazil, Chile, China, Colombia, Croatia, Israel, Korea, Malaysia, Mexico, Panama, Philippines, Poland, Qatar, Romania, Russia, Slovak, South of Africa, Ukraine and Venezuela.

Table 2 provides summary statistics. All sovereign spreads are expressed in basis points. We observe large cross sectional variation in our sample. Among the countries considered, China has the lowest mean CDS spread and smallest standard deviation (64 basis points and 46, respectively). At the other end of the spectrum, Venezuela has the highest mean spread of 825 basis points. Ukraine is second with a mean of 660 basis points. The spreads of both countries are also highly volatile with standard deviations of 703 and 547, respectively. On a country specific level, we find large dispersion in the time series.[8]

We decompose the sovereign CDS spread into two components: a default risk component and a risk premium component. This is done by an affine credit risk valuation model, in line with the methodology outlined by Longstaff, Pan, Pedersen, and Singleton (2011). Further information is available in Appendix B. The risk premium is defined as the unpredictable variation in the arrival rate λ of a credit event.[9] The default risk component is the difference between the market-implied CDS spread and the risk premium we constructed[10].

[8] For instance, the sovereign spread for Ukraine ranges from 126 to 5288 basis points, whilst China's CDS spread varies from 9 to 277 basis points during the same sample period.

[9] The risk premium in this context is called distress risk. This is different from the jump-at-event risk premium associated with a surprise jump in price at the moment of a credit event.

[10] For additional information regarding the CDS decomposition see Appendix B

We perform the credit risk decomposition for all 21 countries in our sample. The summary statistics relating to the credit risk premium are reported in Table 4. As can be seen, there is a great deal of dispersion within our sample; Slovakia has the lowest average risk premium at 15 bps whilst Pakistan has a mean of 104 bps. The same applies for standard deviation. Ukraine has the largest standard deviation with a variation of 349 bps[11].

2.2 News Sentiment

The second pillar of our study concerns sentiment in newspaper articles. News sentiment is extracted from the Thomson Reuters News Analytics (TRNA) database. There are several merits of using this database. First, in comparison to self-collected and analysed news sentiment (Tetlock, 2007; Tetlock, Saar-Tsechansky, and Macskassy, 2008), TRNA is a commercial product that directly feeds analysed news sentiment results to its subscribers, which are investment professionals. Second, the previous literature focuses largely on the equity market and uses primarily scheduled firm-specific news (Smales, 2014). TRNA includes both schedule and non-scheduled news events in both equity and non-equity markets. For example, the debt sentiment score time series is constructed based on 5,932,324 news articles over the sample period from 2003 to 2014. Third, the most important feature that distinguishes TRNA from other sentiment software is its highly sophisticated Natural Language Processing Technique (NLP). For each news article, the TRNA database generates metadata as described in Smales (2014). We will focus on the following:

- Topic Code: the subject of interest mentioned in the news;
- Timestamp: exact arrival time of the news article;
- Sentiment: a discrete score based on pure content linguistic analysis with values of positive (+1), negative (-1) and neutral (0);
- Sentiment probability: the share in percentage terms of each sentiment classification (positive, neutral, negative). For each article, all shares (positive, neutral, negative) always add up to

[11] The summary statistics results are in line with the findings of Longstaff, Pan, Pedersen, and Singleton (2011).

100 percent.

In order to generate the data, we aggregate the high-frequency news sentiment data for positive, neutral and negative scores from 2003-2014. We then divide the aggregated score by the number of news articles on the subject within a day and exclude weekend days, as the news are mostly repetitive over weekens. We then aggregate these scores to obtain weekly data (as shown in equation 1):

$$Avg\_Senti = \frac{\sum_{i=1}^{n_{positive}} 1 + \sum_{i=1}^{n_{neutral}} 0 + \sum_{i=1}^{n_{negative}} (-1)}{n_{positive} + n_{neutral} + n_{negative}} \tag{1}$$

The sentiment scores are determined by an algorithm that operates in three major steps: first, a news article is pre-processed. The media content is broken down into basic linguistic elements commonly known as parts of speech. This includes structural elements such as sentences and phrases, as well as verbs, nouns and adjectives. In the second step, items are connected to sentiment-bearing phrases, usually consisting of adjective-noun combinations. In the final step, said phrases are then subject to feature extracting, taking into account a series of predetermined positive and negative keywords and phrases. The dictionary used for this stage contains nearly 16,000 words while the lexicon features almost 2,500 phrases (Cahan, Cahan, Lee, and Nguyen, 2015). These classifications are based on human coders and are incorporated into a learning algorthim. Therefore, such a method is superior to the traditional "bag-of-words" approach by better identifying sentiment within a context where the order of words matters. Another unique advantage of the database is highlighted by Dzielinski (2011). Reuters has strict style rules in place regarding the reporting of news content, and carefully monitors all contributions.

The news sentiment database is filtered according to the following regional classifiers: Europe, Latin America and Asia. Additionally, a debt variable is constructed incorporating global media sentiment related to debt markets, which includes news about the US debt market. We then take the average of all sentiment scores in order to create a global news sentiment variable.

Table 1 summarises the statistics of the news sentiment variables as well as its components. Figure 1 plots the time series of news sentiment from January 2003 to April 2014. As can be seen, the news sentiment score experiences a sudden drop after the default of Lehman Brothers on 15 September 2008. The sentiment score stays negative during the global financial crisis, while turning positive in the second half of 2009. Figure 2 shows the inter-dynamics of news sentiment and the VIX. The negative relationship between news sentiment and the VIX implies higher expected market volatility is associated with lower (or negative) news sentiment.

3 Principal Component Analysis

Existing literature has shown that a large degree of commonality and co-movement exists in sovereign credit spreads[12]. We therefore explore the potential sources of this kind of variation, with a particular focus on the impact of news sentiment. We perform a principal component analysis (PCA) on the returns of sovereign CDS spreads, the default risk component, as well as on the risk premium, for which we use simple returns.[13] We analyse the correlation coefficients between the first three latent principal components and our variable of interest: news sentiment. We also use the VIX risk premium, and US equity market excess return as comparison benchmarks.[14] We want to capture the influence of the U.S. economy on other regions of the world with these proxies.

The results of the PCA and correlation analysis are reported in Table 5. The PCA is based on the correlation matrix of weekly returns of CDS spreads, default components as well as risk premiums. We calculate the pair-wise correlation between two countries whenever observations are available for both. This correlation matrix is then used to estimate the principal components.

In the top part of Table 5, the first column reports the proportion of variations explained by the first three components. The second column reports the cumulative proportion of variation explained by the corresponding components. We find that the first component explains around 62 percent of total variation in the CDS returns across all countries. Cumulatively, all three components explain approximately 73 percent of sovereign CDS returns. The PCA analysis echoes the findings in Longstaff, Pan, Pedersen, and Singleton (2011), indicating that there is strong commonality in the cross sectional sovereign spread movements. In a next step, we report the correlations between the time series of the first three principal components and our variables of interest (news sentiment,

[12] Ang and Longstaff (2013); Longstaff, Pan, Pedersen, and Singleton (2011); Pan and Singleton (2008)

[13] The simple returns are approximated by $Y_{i,t} = \frac{CDS_{i,t} - CDS_{i,t-1}}{CDS_{i,t-1}}$. However, this definition does not correspond to the dollar return on a CDS position given a change in spread which requires the use of a pricing model to ascertain given newly-issued at-market CDS data.

[14] Please refer to the Appendix C for a definition of the VIX risk premium and US equity excess return. We also calculate the correlation between our principal factors with changes in the VIX index as in Longstaff, Pan, Pedersen, and Singleton (2011). The correlation between the changes in the VIX index and the first principal component amounts to 64 percent and is significant at the 1% level.

VIX risk premium, US excess return) for the sample period. We find a negative correlation between the first principle component and all three variables. These are all significant at the 1-percent level. In particular, the correlation between the first principle component and news sentiment, VIX risk premium and US excess returns is -15 percent, -29 percent, and -15 percent, respectively.

In the second part of Table 5, the PCA and correlation analysis for the default component is shown. The first principal component explains 57 percent of the total variation in the return of the default premium. This is slightly lower than the proportion explained by the first principal component for CDS returns. All three components cumulatively explain 68 percent of the given variation. The first component is negatively and significantly correlated with all three risk factors. The correlations between the first component and news sentiment, the VIX risk factor and US excess stock returns are -15 percent, -28 percent and -14 percent, respectively.

The third part of Table 5 shows the principal component and correlation coefficients for the risk premium. Here, the first principal component explains 14 percent of the cross sectional variation in the CDS risk premium. Cumulatively, all three principal components explain 27 percent of the risk premium movements. Compared to our previous analysis, there is much less commonality in the cross sectional movement of the CDS risk premium. Turning to the correlation coefficient analysis, the first component still illustrates negative correlation of -12 percent, -17 percent and -14 percent with news sentiment, the VIX risk premium and US excess stock returns, respectively. These are all significant at the 1-percent level. However, the correlation levels between risk premium and the three variables of interest are smaller than the correlation of CDS returns and the default component.

The PCA and correlation analysis suggest that there is commonality in the variation of sovereign CDS returns and both the default and risk premium components, albeit to a lesser extent with the risk premium. Furthermore, we find that the principal sources of return movements are significantly correlated with news sentiment with comparable correlation levels to our benchmark variables, such as the VIX risk premium and US excess stock returns.

4 Regression Analysis

In order to explore the role of news sentiment as a driver for returns of sovereign CDS, the default risk component and the risk premium, we perform regression analyses. We perform panel regressions with fixed effects to study the cross sectional and time series dynamics. The panel regressions include news sentiment as well as various control variables for robustness checks. For these control variables, we distinguish between three categories of explanatory variables: global risk factors, local variables and sovereign spreads.[15]

Global Risk Factors

We use excess returns of the US stock market as an equity market proxy. To capture the conditions in the US fixed income market, we construct a treasury market proxy based on the return of the five-year constant maturity Treasury rate from the US Federal Reserve. Furthermore, we consider two variables from the US corporate credit market: investment grade and high yield spreads. The investment grade variable is based on the return of the difference between five-year BBB- and AAA-rated corporate effective yields. The high yield spread is calculated as the return of the difference between BB- and BBB-rated corporate bond yields. We construct the volatility risk premium as the VIX index minus the one-month implied volatility of the S&P 500 index. As credit market proxy, we consider the term premium, which is the yield differential between the 10-year USD Interest Rate Swap Rate and the one-month USD Libor rate. This variable aims to capture the potential influence of flight-to-quality, as noted by Pan and Singleton (2008); Augustin and Tédongap (2016); Kallestrup, Lando, and Murgoci (2016).

Local Risk Factors

Local economic conditions are important for a sovereign's credibility, which is in turn are reflected in its CDS pricing. Next to global risk factors, we therefore also include two local risk factors which

[15] For the construction of these variables, see Appendix C.

can affect the sovereign's ability to repay its debt, such as exchange rate returns and local stock returns.

Sovereign Spreads

We capture the influence of regional and global CDS spread movements by incorporating two sovereign spread factors: a regional spread and a global spread. Our sample is divided into four categories according to geographical location: Latin America, Asia, Europe and the Middle East/Other. The variables are constructed as follows: first, for each sovereign in our sample, two average CDS spreads are computed: the average regional spread and the average global spread. The average regional spread is the mean CDS spread for the other countries in the same region. The average global spread is the mean CDS spread for the countries in the other three regions. We regress the return of the average regional spread (global spread) on all global risk factors. We then take the residuals of these regressions, which serve as additional explanatory variables for the overall regression analysis in the next part.

4.1 Methodology & Regression Results

4.1.1 Main Results

We perform panel regressions, as shown in equation (2), with returns of CDS spreads, default risk and risk premium components denoted by $Y_{i,t}$, respectively. We control for heteroskedasticity by using Halbert White (1980) standard errors. Fixed effects are included in the regression to ensure that country specific characteristics are considered. We perform regressions on the weekly returns of the aforementioned components, ensuring that all variables are stationary for the panel regressions.

$$\begin{aligned} Y_{i,t} = \alpha_i &+ \beta_{i,1} US\ stock_t + \beta_{i,2} Vol\ prem_t + \beta_{i,3} Term\ prem_t + \beta_{i,4} Treasury_t \\ &+ \beta_{i,5} IG_t + \beta_{i,6} High\ yield_t + \beta_{i,7} Exchange\ return_{i,t} + \beta_{i,8} Stock\ return_{i,t} \\ &+ \beta_{i,9} Regional\ spread_{i,t} + \beta_{i,10} Global\ spread_{i,t} + \beta_{i,11} News\ sentiment_t + \epsilon_{i,t} \end{aligned} \tag{2}$$

The results of equation (2) are reported in Table 6. These consist of the robust coefficient estimates, the adjusted R-squared as well as the number of observations for each regression. The first column shows the estimation of the sovereign CDS returns. News sentiment and all of the global risk factors are shown to be highly statistically significant for explaining sovereign CDS returns, with a negative coefficient sign. Positive news sentiment results in a reduction of the credit risk associated with sovereign debt markets. As has been mentioned in the previous section, our measure of news sentiment is global. The high degree of relevance and significance of this factor is in line with previous work highlighting the importance of global risk factors for credit default swaps. News sentiment, however, proves to be a novel explanatory variable in the literature.

With regards to the local variables, both domestic exchange returns and stock index returns tend to have a negative impact on sovereign CDS returns. However, the impact of exchange rate returns is not statistically significant. We expect sovereign CDS spreads to increase when the region experiences an economic shock or when there is a global shock. We find a positive relationship between regional sovereign spreads and the country's credit spread returns. Similar results were also found for global sovereign spreads. The Adjusted R-squared is 66.3 percent, indicating a high degree of explanatory power in the variation of sovereign CDS returns.

The regression on the default risk component returns also shows a highly statistically significant negative relationship with news sentiment. Positive news sentiment therefore results in a decline in the default risk. Furthermore, news sentiment has an even stronger impact on the default component than on the total sovereign spread return. It has been established in the literature that the media consistently affects consumer perception of the state of the economy (Doms and Morin, 2004). This typically occurs through multiple channels, including the informational channel, as news convey the latest economic data releases as well as other news which have a potential impact on a sovereign. Importantly, the tone of media reporting generates a signal about the global and local economy for consumers. Thus, as news sentiment changes, investors revise their expectations regarding the economy and in turn reassess the fundamental components of sovereign credit risk. Most of the global risk factors (except the term premium) are statistically significant at the 1-percent level. The relationship between the default risk component and the global factors confirms the existing evidence of increasing economic integration and dependence on global capital markets and a spill-over effect from the U.S. to other sovereign economies.

Risk premium returns, however, are not impacted by news sentiment in a statistically significant manner. The negative coefficient sign of news sentiment on risk premium returns suggests that an improvement in news sentiment reduces the uncertainty regarding the potential default event arrival. However, the impact of news sentiment is much smaller than on CDS returns and the default component. Instead, other global factors such as the volatility premium, term premium, high yield spread, global spread and treasury market play a significant role in explaining risk premium returns. The relationship between risk premium returns and global factors can be explained by the presence of global investors in credit markets and is consistent with risk pricing by a marginal investor with a global portfolio see, as in Longstaff, Pan, Pedersen, and Singleton (2011).

4.1.2 Additional Results

In addition to the regression estimations, we perform several robustness checks. First, we run the same panel regressions for the CDS, default risk component and risk premium returns (equation 2), while controlling for the U.S. financial and the EU sovereign crises by introducing a dummy variable in our framework. We set the dummy variable equal to one from September 2008 to March 2009 and from July 2011 to April 2014, and 0 otherwise. The ranges are based on the business cycle indicator reported in CEPR. The results remain consistent and the significance of the global risk factors and of news sentiment remain unaltered.[16] Second, we run the same regressions (equation 2) on the returns of individual country's sovereign CDS spreads, default risk and risk premium returns. The results are aligned and consistent with the panel regression. The regression results for individual countries' sovereign CDS returns are reported in Appendix A, Table A1. Third, to check the validity of news sentiment, we build two different news sentiment variables: a regional variable and a purely global variable. Based on the fact that the sample is divided into four geographical regions, we filter all the news of the region where a sovereign is located to construct a regional sentiment variable. We then run individual country regressions (CDS returns and components returns) for all countries based in the same region using the respective regional sentiment variable. The explanatory power of these regional news sentiment variables is not comparable with that of the global news sentiment variable. The regression results for CDS returns are reported in Appendix A, Table A2. For the purely global sentiment variable, we remove the respective regional news from the global variable and run similar individual countries regressions for all countries based in the same regions using the respective global sentiment variable without the aforementioned regional news. The results remain consistent, which suggests that the major contribution of the news sentiment variables on CDS returns stems from global news. This shows that the news effect is rather a top-down driver than a bottom-up one. The results are reported in Appendix A, Table A3.[17]

[16]Results are available upon request.

[17]The results for the default risk and risk premium components for the individual regressions with the news sentiment, regional and purely global sentiment variables are available from the authors upon request.

5 Informational Content of News Sentiment

In the previous section, we established that news sentiment is a highly significant explanatory variable for credit default swap and default risk component returns. The impact on the default risk component in particular indicates that news sentiment might contain new information about countries' fundamentals. In the following, we explore this idea further by examining the content of the news inherent in news sentiment. We also turn to a key consideration establishing the causality of the impact of news sentiment as noted by Engelberg and Parsons (2011). Separating the causal impact of media reporting on asset prices is no easy feat. This is particularly true because news coverage does not occur at random. It is difficult to know whether it was the media which garnered a reaction by markets, or the event itself, which caused markets to react.

We use a panel vector autoregression (panel VAR) model and associated impulse response functions for the returns of CDS spreads, as well as for returns of the default component and the risk premium.We also explore the existence of a feedback loop.

The endogenous variables in the panel VAR are CDS returns (both default component and risk premiums returns), denoted by $Y_{i,t}$, and news sentiment. The exogenous variables are the determinants of CDS returns established in the previous section: global risk factors, sovereign spreads and local variables denoted by $X_{k,t}$, wherein $k = 1, ...10$ control variables. We use five lags of news sentiment, i.e. five weeks of past information. This lag length was chosen in accordance with the Bayesian information criteria and is the optimal number in this framework. We control for both heteroskedasticity and autocorrelation. The return equation for the first panel VAR is as follows:

$$Y_{i,t} = \alpha_i + \beta_{i,k} X_{k,t-1} + \sum_{l=1}^{5} \delta_{i,l} Y_{i,t-l} + \sum_{l=1}^{5} \gamma_{i,l} News_{t-l} + \epsilon_{i,t} \tag{3}$$

A panel VAR contains a cross sectional dimension as represented in the i of the $Y_{i,t}$ series. Hence, such a cross sectional panel will allow to study both the dynamic interdependencies in $Y_{i,t}$ as well as the static interdependence of the error term $\epsilon_{i,t}$. The standard VAR model would be incapable of showing the dynamic interdependencies by assuming sectoral homogeneity at apriori level. Furthermore, the main feature which distinguishes a panel VAR from traditional VAR models is that it allows for the cross sectional heterogeneity assumption, whilst most VAR models assume cross sectional homogeneity as in Canova and Ciccarelli (2013). The results for equation (3) are reported in Table 7. The results for CDS returns are presented in the first column. News sentiment has a statistically significant negative relationship at the 1%-level for the first two lags. For the third and fourth lag, news sentiment remains statistically significant at the 5%-level, but has a positive coefficient as the effect reverses. In the fifth week, the effect vanishes and news sentiment is no longer statistically significant for explaining CDS returns. In addition, we perform an F-Test with the null hypothesis that the sum of the coefficients corresponding to the five lags of news sentiment is equal to zero. The F-statistic for the sovereign CDS returns is 7.37 with a p-value of 0.006. This test allows a rejection of the null hypothesis of a full reversal at the relevant significance levels. This is further confirmed by an impulse response function (see Figure 3a), in which a shock of one unit of news sentiment on CDS returns (ceteris paribus) in the context of the VAR model is displayed. The effects of this shock are not fully reversed within 10 weeks. How can this observation be interpreted? One possibility is that if news sentiment only contained pure information, we should not have observed a reversal. Another possibility is that if news sentiment only contained pure noise or "sentiment," we should have observed a complete return reversal. The evidence we observe of an initial decline and subsequent partial reversal is consistent with the notion that news sentiment is a mixture of both noise and information.

To further investigate the characteristics of news sentiment, we examine the effect of the content of news sentiment on the default and risk premium components. The results are reported in the second and third column of Table 7. For the default component, the observed reversal is less pronounced. Only the first two lags are statistically significant and display a negative impact, as significance declines from the 1%-level for the first lag to the 5%-level for the second lag. This impact is less than is the case for CDS returns, but remains intact. The F-statistic for the default component returns is 4.17 with a p-value of 0.041, which also allows for a rejection of the null hypothesis of a full reversal. The impulse response functions as shown in Figure 3b also confirm the previous result: the effect of a shock of one unit of news sentiment on the default component returns (ceteris paribus) is not fully reversed within 10 weeks. Therefore, we conclude that the news sentiment inherent in media content contains new information with regards to fundamentals.

A different picture emerges for the relationship between media content and the risk premium component.[18] The F-test for the risk premium fails to reject the null hypothesis of a full reversal. It therefore appears that this component is largely affected by noise implicit in media content. Positive news sentiment induces optimism and a decline in the risk premium returns followed by a full reversion to initial values. Based on this analysis, we conclude that the impact of media content on CDS returns, which is accompanied by a partial reversal within five weeks, is a mixture of both new information and sentiment. However, the noise signal appears to impact the risk premium and leads to a temporary change in investors' appetite for credit exposure. The information signal influences the default risk component and leads to a reassessment of the fundamentals of sovereigns.

The results support a behavioural story. In particular, we can relate the pattern observed in the impulse response function of CDS returns to the theory of over- and underreaction, as laid out by Daniel, Hirshleifer, and Subrahmanyam (1998). In this setting, investors tend to misinterpret new information. The cognitive psychological investor biases of overconfidence and self-attribution play a key role. These well-documented features of investor psychology are in line with theories of self-deception, as noted by Hirshleifer (2001). Numerous studies have shown that individuals tend to believe that their knowledge is more accurate than it actually is (Daniel, Hirshleifer, and Subrahmanyam, 1998). Overconfidence then spurs overoptimism with regards to the success of a given venture. Naturally, then, individuals will experience failure more often than anticipated, which leads to the emergence of an additional bias: self-attribution. As a result of said cognitive biases, actors are likely to overweight the accuracy of a private signal they observe. In the context of this study, it implies that investors read the news and believe they have a better indication on the impact this might have on economic fundamentals of sovereigns. This generates an over-reaction to private information. Once this particular economic impact becomes clear, the over-reaction is

[18] See impulse response function for this component in Figure 3c

followed by an under-reaction to the now public information. This is shown in the "hump shaped" impulse response function. Our findings are also in line with those of Hillert, Jacobs, and Müller (2014), which show that media coverage can enhance existing behavioural biases among investors. These effects are even stronger when the tone (i.e. sentiment) of news reporting is considered.

Furthermore, we explore the possibility of a feedback loop between CDS returns and news content. We check whether a shift in the CDS market induces a change in the tone of news coverage. We run a similar panel VAR, as follows:

$$News_t = \alpha'_i + \beta'_{i,k} X_{k,t-1} + \sum_{l=1}^{5} \delta'_{i,l} Y_{i,t-l} + \sum_{l=1}^{5} \gamma'_{i,l} News_{t-l} + \epsilon'_{i,t} \tag{4}$$

Where the regressor $Y_{i,t}$ stands for CDS returns, the default component and risk premium, respectively. The results are shown in Table 8. As can be seen in the first column, only the second and the fifth lag of $Y_{i,t}$ (CDS returns) are statistically significant. For the second lag, this relationship is negative while a reversal occurs exclusively in the fifth week, both significant at the 1%-level. Very similar results are obtained for the default component shown in the second column, relating to the regression coefficients. With respect to the risk premium in the final column of Table 8, only the third lag shows to be statistically significant in the VAR regression. Given these findings, it appears that the main source of causality runs from media content to CDS returns.

6 Conclusion

We explore the interaction between news sentiment and sovereign credit risk. First, we establish that media content can explain and predict sovereign CDS returns. Second, we investigate whether media tone contains aspects of sovereign fundamentals, whether it represents investor sentiment or whether it is a mixture of both. To capture sovereign credit risk, we use an extensive sovereign credit default swap dataset. For media content and tone, we use the sentiment classifications of news from Thomson Reuters News Analytics. We construct a ”global” news sentiment variable by filtering news according to regional classifiers, such as Europe, Latin America and Asia, and global debt markets. In order to shed more light on the informational content of news sentiment, we use an affine sovereign credit risk valuation model to decompose sovereign CDS spreads into their risk-premium and default risk components, as in Pan and Singleton (2008) and Longstaff, Pan, Pedersen, and Singleton (2011). We find that news sentiment impacts sovereign credit risk. The relationship between CDS returns and news sentiment is negative, implying an improvement in sentiment (positive) is followed by a decrease in returns. Additionally, using a panel VAR, we show that news sentiment can also predict CDS returns, default risk and risk premium components. This result is robust to controls for autocorrelation and determinants of CDS returns. We find that the effect on the CDS and default component returns partially reverses over five weeks, whereas the effect on the risk premium reverses fully. This result confirms the hypothesis that news sentiment is a mixture of noise and information. However, the informational channel is more likely to impact the default component whereas the noise channel is more likely to impact the risk premium. Overall, our results support a behavioral story and the theories of over- or under-reaction, which is in line with the cognitive biases documented by Daniel, Hirshleifer, and Subrahmanyam (1998).

Table 1: Summary Statistics: News Sentiment

This table reports the summary statistics for news sentiment and its components, including news on Europe, Latin America, Asia, debt and on the U.S. The full sample ranges from January 2003 to April 2014. The reported statistics are the mean, standard deviation (S.D), minimum (Min), median and maximum (Max).

	Mean	SD	Minimum	Median	Maximum	N
News Sentiment	0.055	0.099	-0.225	0.056	0.307	569
News Europe	0.128	0.101	-0.164	0.134	0.405	569
News Latin America	0.028	0.139	-0.369	0.017	0.639	569
News Asia	0.029	0.085	-0.273	0.032	0.273	569
News Debt	-0.022	0.131	-0.357	-0.025	0.305	569
News U.S.	0.088	0.091	-0.348	0.097	0.388	569

Figure 1: Time Series of News Sentiment

This figure plots the time series of news sentiment extracted from Thomas Reuters News AnalyticS (TRNA). The full sample ranges from January 2003 to April 2014. The red vertical line marks the default of Lehman Brothers on 15 September 2008.

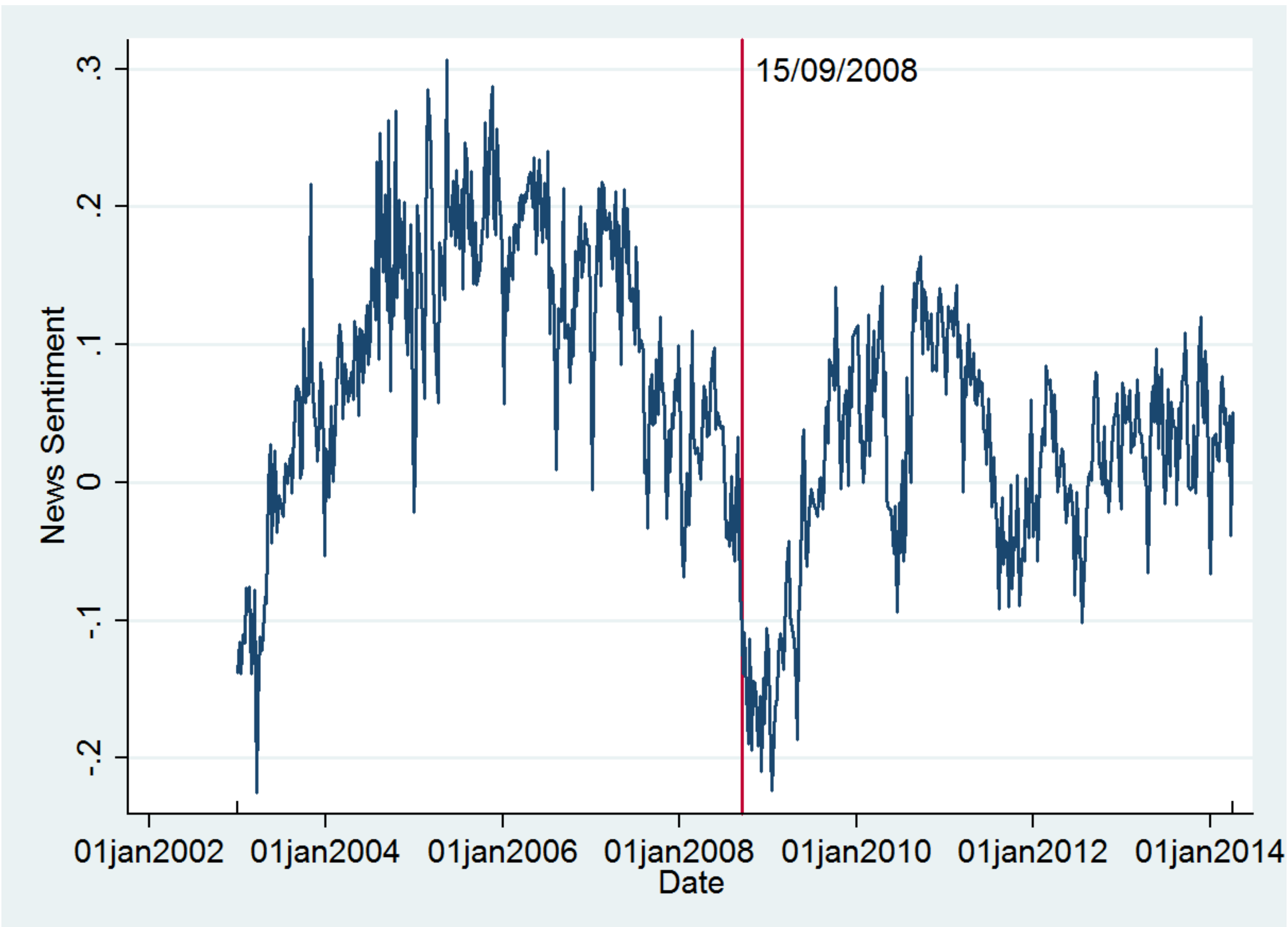


Figure 2: Time Series of News Sentiment and VIX

This figure plots the time series of news sentiment extracted from Thomas Reuters News AnalyticS (TRNA), as well as the VIX index. The full sample ranges from January 2003 to April 2014.

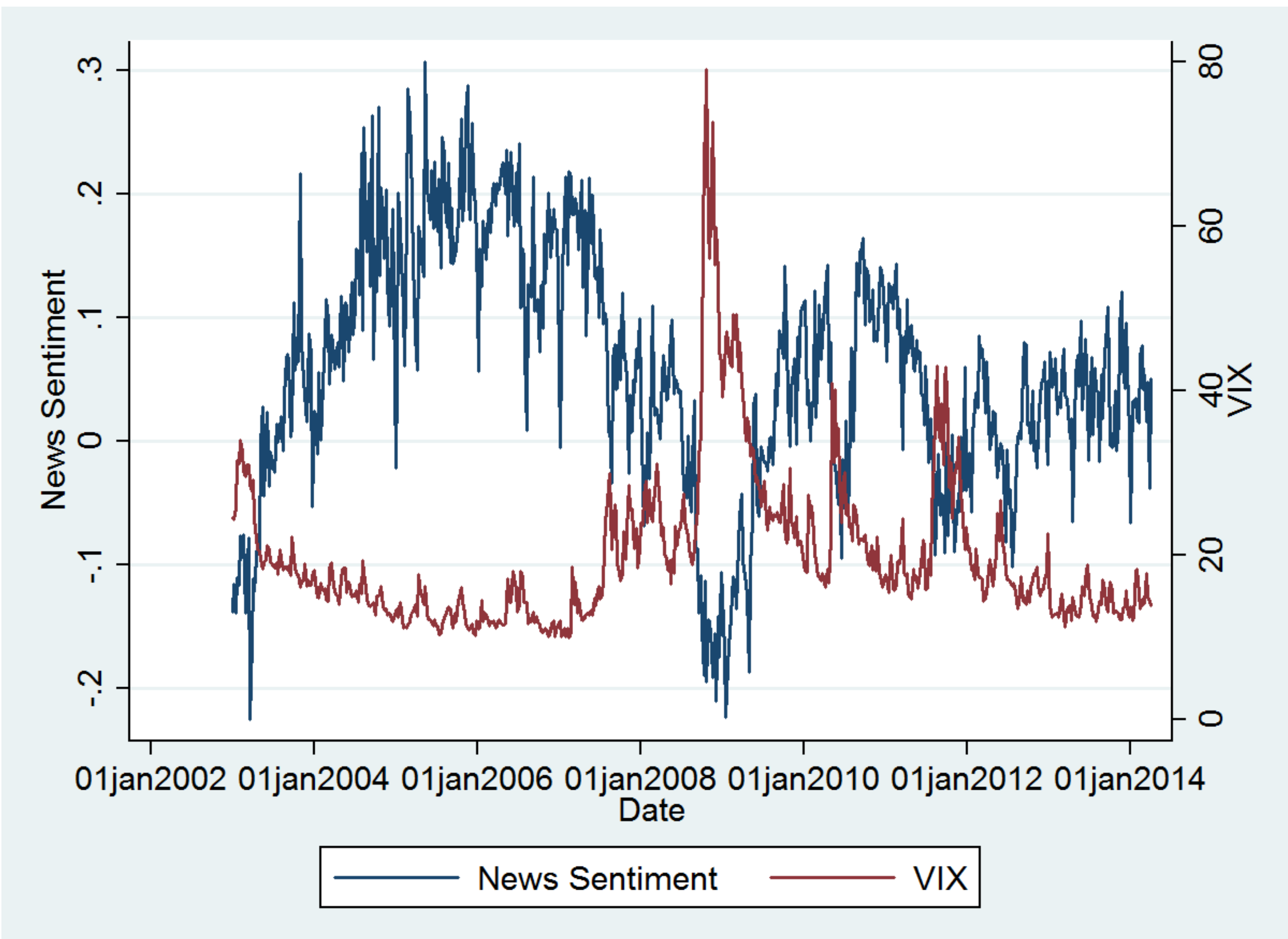


Table 2: Summary Statistics: Sovereign CDS

This table reports the summary statistics for the five-year sovereign CDS contracts for 21 countries. The numbers are reported in basis points. The full sample ranges from January 2003 to April 2014. The reported statistics are the mean, standard deviation (S.D), minimum (Min), median and maximum (Max).

	Mean	SD	Minimum	Median	Maximum	N
BGARIA	168.63	132.14	12.82	128.91	682.96	569
BRAZIL	273.61	297.12	61.14	150.59	2057.22	569
CHILE	72.73	51.14	12.53	69.45	315.95	569
CHINA	64.12	46.50	9.35	60.64	277.31	569
COLOM	223.68	158.22	67.61	150.81	840.00	569
CROATI	192.89	152.29	15.20	127.50	591.29	569
ISRAEL	97.68	57.94	16.92	103.85	272.86	569
KOREA	89.42	78.65	14.39	73.14	708.64	569
MALAYS	81.60	57.31	11.96	79.07	505.40	569
MEX	124.01	72.51	28.51	110.44	587.88	569
PANAMA	177.63	102.96	62.15	137.44	590.60	569
PHILIP	246.84	143.33	82.43	187.21	865.63	569
POLAND	89.84	80.71	7.66	68.28	418.56	569
QATAR	75.89	56.07	9.28	66.96	356.20	569
ROMANI	212.44	152.64	16.94	198.45	765.98	569
RUSSIA	185.53	141.44	37.66	158.40	1060.41	569
SLOVAK	70.27	71.71	5.50	54.11	322.03	569
SOAF	139.95	86.57	24.53	136.77	658.08	569
UKRAIN	660.01	703.63	126.62	459.00	5288.98	533
VENZ	825.94	547.66	119.89	770.46	3218.44	569

Table 3: Maximum Likelihood Estimates for the Sovereign CDS Parameters

This table reports the maximum likelihood parameter estimates of sovereign CDS for all countries based on the Pan-Singleton Model. The term structure of sovereign CDS considers the three-year, five-year and seven-year CDS contracts for each country. The sample period ranges from January 2003 to April 2014 with weekly frequency.

Country	$\theta^Q \kappa^Q$	κ^Q	σ	$\theta^P \kappa^P$	κ^P
BGARIA	-1.080	0.245	1.734	-1.140	0.456
BRAZIL	3.648	-0.938	0.826	-3.817	0.960
CHILE	-0.477	0.095	1.340	-2.853	0.561
CHINA	-0.456	0.098	1.165	-2.213	0.255
COLOM	3.537	-0.904	0.665	-4.289	1.031
CROATI	-0.539	0.149	1.695	-3.614	0.427
ISRAEL	-1.458	0.306	0.863	-1.736	0.358
KOREA	-0.552	0.123	1.435	-4.644	0.563
MALAYS	-0.809	0.241	1.081	-1.330	0.275
MEX	-0.624	0.108	2.241	-3.202	0.832
PANAMA	3.899	-0.966	1.261	-4.030	0.978
PHILIP	0.864	-0.029	1.504	-1.612	0.330
POLAND	-0.405	0.051	0.944	-4.776	-0.535
QATAR	-1.469	0.287	0.890	-1.711	0.330
ROMANI	-4.636	1.167	2.570	-4.818	1.199
RUSSIA	-1.610	0.202	1.617	-1.772	0.109
SLOVAK	-0.194	0.048	1.043	-1.430	0.269
SOAF	-0.564	0.096	1.843	-2.514	0.594
UKRAIN	-11.143	4.112	5.051	-10.968	4.028
VENZ	-0.784	0.309	0.646	-0.794	0.309

Table 4: Summary Statistics: Credit Risk Premium

This table reports the summary statistics for sovereign credit risk premia for 21 countries. The numbers are reported in basis points. The full sample ranges from January 2003 to April 2014. The reported statistics are the mean, standard deviation (S.D), minimum (Min), median and maximum (Max).

	Mean	SD	Minimum	Median	Maximum	N
BGARIA	27.53	18.82	-17.10	22.99	74.57	569
BRAZIL	57.61	37.09	-53.11	39.93	253.61	569
CHILE	20.18	12.62	-0.10	20.60	63.96	569
CHINA	19.40	13.23	3.06	15.96	55.30	569
COLOM	57.20	32.63	19.72	40.14	151.15	569
CROATI	25.66	18.11	-11.95	19.78	65.62	569
ISRAEL	23.80	12.55	3.74	24.07	55.37	569
KOREA	18.61	11.97	-0.53	15.32	53.74	569
MALAYS	22.51	13.39	4.08	21.41	55.34	569
MEX	32.61	12.28	7.20	32.72	73.21	569
PANAMA	48.85	24.69	19.84	37.05	131.80	569
PHILIP	63.39	30.57	-3.39	52.56	177.59	569
POLAND	19.23	14.15	0.38	15.64	54.47	569
QATAR	18.50	10.60	2.68	15.50	44.59	569
ROMANI	31.64	23.75	-28.77	24.91	93.48	569
RUSSIA	28.82	29.69	-144.10	28.38	94.20	569
SLOVAK	15.71	14.47	-3.13	12.37	53.26	569
SOAF	30.75	13.77	0.34	31.18	57.01	569
UKRAIN	91.44	349.37	-297.77	49.01	3485.93	533
VENZ	74.86	151.11	-141.13	62.33	1409.82	569

Table 5: Principal Components Analysis Results

This table reports the summary statistics for the principal components analysis and the correlation analysis from January 2003 to April 2014. The PCA analysis is reported on the left side of the table based on the correlation matrix of weekly returns for sovereign CDS, default components and risk premium. The right side of the table reports the correlation analysis between the first three principal components and three potential risk factors. ***stands for a 1% significance level.

Principal Components Analysis			**Correlation between PCs and Risk Factors**			
	CDS Returns				**CDS Returns**	
Component	**Proportion**	**Cumulative**		**News**	**VIX Risk**	**US Stock**
First	0.6238	0.6238	**First**	-0.1523***	-0.2957***	-0.1504***
Second	0.0609	0.6847	**Second**	0.0384	-0.0989	-0.012
Third	0.051	0.7357	**Third**	-0.0157	-0.0721	0.061
	Default Component				**Default Component**	
Component	**Proportion**	**Cumulative**		**News**	**VIX Risk**	**US Stock**
First	0.5719	0.5719	**First**	-0.1514***	-0.2843***	-0.1449***
Second	0.0614	0.6333	**Second**	0.0523	-0.0816	0.0182
Third	0.0519	0.6852	**Third**	-0.0083	-0.0503	0.061
	Risk Premium				**Risk Premium**	
Component	**Proportion**	**Cumulative**		**News**	**VIX Risk**	**US Stock**
First	0.1407	0.1407	**First**	-0.1213***	-0.1796***	-0.1407***
Second	0.0724	0.2131	**Second**	0.1085	-0.1914***	0.0607
Third	0.065	0.2781	**Third**	-0.012	0.0661	-0.0299

Table 6: Panel OLS Regression

The following table reports the panel regressions of the three components: sovereign CDS returns, the default component and the risk premium. Explanatory variables include global risk factors, local variables, sovereign spreads as well as news sentiment. The sample period is from January 2003 to April 2014. *** stands for 1% significance level; ** stands for 5% significance level; * stands for 10% significance level.

	CDS Return	**Default Component**	**Risk Premium**
Global risk factors			
US stock market	-0.005***	-0.006***	0.002
Volatility premium	-0.003***	-0.003***	-0.001**
Term premium	0.001***	0.001	0.002***
Treasury market	0.122***	0.133***	0.043***
Investment grade	-0.003***	-0.004***	0.002
High yield	1.294***	1.554***	0.283***
Local variables			
Exchange return	-0.079	-0.078	-0.175
Stock return	-0.176***	-0.202***	0.045
Sovereign spreads			
Regional spread	0.205***	0.218***	0.020
Global spread	0.663***	0.764***	0.227***
News sentiment	-0.122***	-0.137***	-0.025
Constant	0.000	0.002*	-0.001
N	10,775	10,775	10,775
Adjusted R2	0.663	0.598	0.018

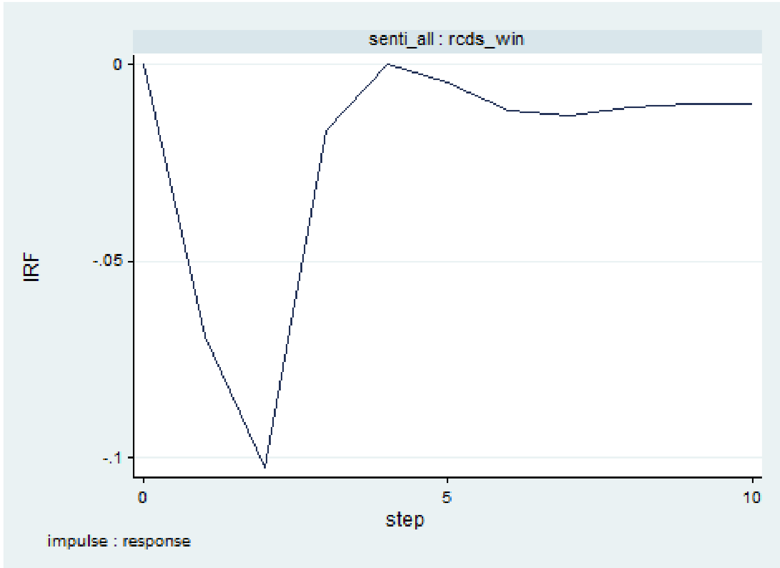
Table 7: VAR Regression Using News Sentiment

The following table reports the panel VAR regression based on weekly returns of sovereign CDS spreads, default risk and risk premium for five lags of news sentiment, five lags of the return components itself (not reported in the table), and robust explanatory variables including global risk factors, local variables and sovereign spreads. The sample period is from January 2003 to April 2014. *** stands for 1% significance level; ** stands for 5% significance level; * stands for 10% significance level.

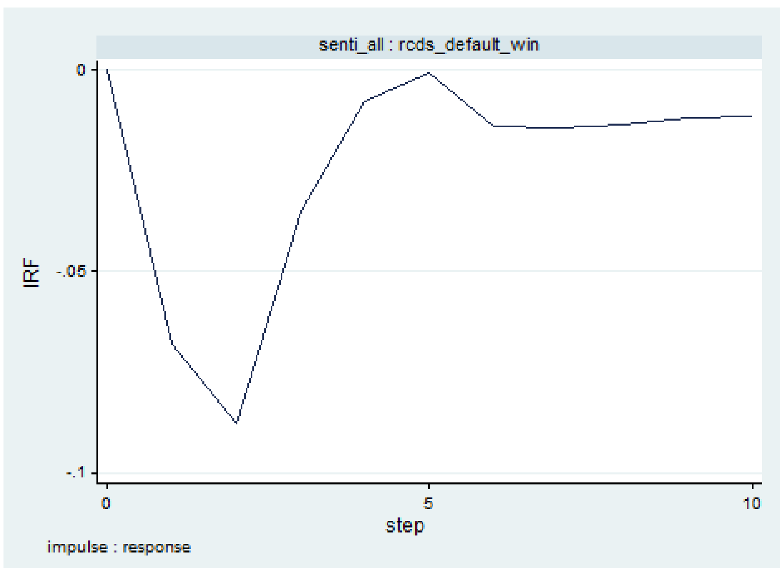
Figure 3 plots the impulse response function of the panel sovereign CDS returns on news sentiment, including up to 10 weeks.

	CDS Return	**Default Component**	**Risk Premium**
Global risk factors			
US stock market (t-1)	-0.014***	-0.017***	-0.005**
Volatility premium (t-1)	0.002***	0.002***	-0.000
Term premium (t-1)	-0.001***	-0.001	-0.001
Treasury market (t-1)	-0.033***	-0.027**	-0.015
Investment grade (t-1)	0.001	0.001	0.000
High yield (t-1)	0.079	0.179***	-0.056
Local variables			
Exchange premium (t-1)	-0.113	-0.178*	0.079
Equity premium (t-1)	-0.062	-0.094**	0.050
Sovereign spreads			
Regional spread (t-1)	0.016	0.030	-0.012
Global spread (t-1)	0.014	0.040	0.037
News sentiment (t-1)	-0.069***	-0.068***	-0.083**
News sentiment (t-2)	-0.071***	-0.060**	-0.029
News sentiment (t-3)	0.052**	0.024	0.092**
News sentiment (t-4)	0.044**	0.041	0.045
News sentiment (t-5)	0.010	0.023	-0.033
Chi2 (5) [Joint]	54.139***	33.834***	13.323**
N	11,766	10,673	10,673

Figure 3: Impulse Response Function



(a) CDS returns



(b) Default Component

(c) Risk Premium

Table 8: VAR Regression for Feedback Reaction

The following table reports the panel VAR regression of news sentiment on five lags of different CDS components, five lags of news sentiment (not reported in the table), as well as robust explanatory variables including global risk factors, local variables and sovereign spreads. The sample period is from January 2003 to April 2014. *** stands for 1% significance level; ** stands for 5% significance level; * stands for 10% significance level.

	CDS Return	**Default Component**	**Risk Premium**
Global risk factors			
US stock market (t-1)	0.007***	0.007***	0.007***
Volatility premium (t-1)	-0.001***	-0.001***	-0.001***
Term premium (t-1)	0.001***	0.001***	0.001***
Treasury market (t-1)	-0.026***	-0.025***	-0.026***
Investment grade (t-1)	0.000**	0.000**	0.000***
High yield (t-1)	-0.031	-0.026	-0.050***
Local variables			
Exchange premium (t-1)	-0.014	-0.016	-0.018
Equity premium (t-1)	0.013	0.012	0.014
Sovereign spreads			
Regional spread (t-1)	0.010	0.011	0.011
Global spread (t-1)	-0.011	-0.008	-0.013
Y (t-1)	-0.008	-0.010	-0.000
Y (t-2)	-0.021***	-0.015***	-0.001
Y (t-3)	-0.004	-0.005	0.007***
Y (t-4)	0.001	0.001	0.001
Y (t-5)	0.024***	0.021***	0.001
Chi2 (5) [Joint]	50.378***	51.368***	8.078
N	11,766	10,673	10,673

References

Ang, A., and F. A. Longstaff, 2013, "Systemic sovereign credit risk: Lessons from the US and Europe," *Journal of Monetary Economics*, 60(5), 493–510.

Augustin, P., M. G. Subrahmanyam, D. Y. Tang, and S. Q. W. et al, 2014, "Credit Default Swaps: A survey," *Foundations and Trends in Finance*, 9(1-2), 1–196.

Augustin, P., and R. Tédongap, 2016, "Real economic shocks and sovereign credit risk," *Journal of Financial and Quantitative Analysis*, 51(2), 541–587.

Badaoui, S., L. Cathcart, and L. El-Jahel, 2013, "Do sovereign credit default swaps represent a clean measure of sovereign default risk? A factor model approach," *Journal of Banking & Finance*, 37(7), 2392–2407.

Berg, A., and J. Sachs, 1988, "The debt crisis structural explanations of country performance," *Journal of Development Economics*, 29(3), 271–306.

Boehmer, E., and W. L. Megginson, 1990, "Determinants of secondary market prices for developing country syndicated loans," *Journal of Finance*, 45(5), 1517–1540.

Cahan, R. H., S. F. Cahan, T. Lee, and N. H. Nguyen, 2015, "Media content, accounting quality, and liquidity volatility," *European Accounting Review*, 0, 1–25.

Canova, F., and M. Ciccarelli, 2013, "Panel vector Autoregressive models: A survey," in *VAR Models in Macroeconomics-New Developments and Applications: Essays in Honor of Christopher A. Sims (Advances in Econometrics)*, ed. by F. Tomas, C. Hill, I. Jeliazkov, and J. Carlos. Emerald, Bingley, vol. 32, 205-246.

Daniel, K., D. Hirshleifer, and A. Subrahmanyam, 1998, "Investor psychology and security market under-and overreactions," *Journal of Finance*, 53(6), 1839–1885.

Doms, M. E., and N. J. Morin, 2004, "Consumer sentiment, the economy, and the news media," working paper, FRB of San Francisco.

Dougal, C., J. Engelberg, D. Garcia, and P. Christopher, 2012, "Journalsits and the stock market," *Review of Financial Studies*, 25, 639–679.

Duffie, D., L. H. Pedersen, and K. J. Singleton, 2003, "Modeling sovereign yield spreads: A case study of Russian debt," *Journal of Finance*, 58(1), 119–159.

Dzielinski, M., 2011, "News sensitivity and the cross-section of stock returns," working paper, Stockholm University.

Edwards, S., 1984, "LDC foreign borrowing and default risk: An empirical investigation, 1976-80," *American Economic Review*, 74(4), 726–734.

———, 1986, "The pricing of bonds and bank loans in international markets: An empirical analysis of developing countries' foreign borrowing," *European Economic Review*, 30(3), 565–589.

Engelberg, J. E., and C. A. Parsons, 2011, "The causal impact of media in financial markets," *Journal of Finance*, 66(1), 67–97.

Fontana, A., and M. Scheicher, 2016, "An analysis of euro area sovereign CDS and their relation with government bonds," *Journal of Banking & Finance*, 62, 126–140.

Garcia, D., 2013, "Sentiment during recessions," *Journal of Finance*, 68(3), 1267–1300.

Georgoutsos, D. A., and P. M. Migiakis, 2013, "Heterogeneity of the determinants of euro-area sovereign bond spreads; what does it tell us about financial stability?," *Journal of Banking & Finance*, 37(11), 4650–4664.

Hillert, A., H. Jacobs, and S. Müller, 2014, "Media makes momentum," *Review of Financial Studies*, 27(12), 3467–3501.

Hirshleifer, D., 2001, "Investor psychology and asset pricing," *Journal of Finance*, 61, 1533–1597.

Jeanneret, A., 2015, "The Dynamics of sovereign credit risk," *Journal of Financial and Quantitative Analysis*, 50(05), 963–985.

Kallestrup, R., D. Lando, and A. Murgoci, 2016, "Financial sector linkages and the dynamics of bank and credit spreads," *Journal of Empirical Finance*, 38, 374–393.

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

Monfort, A., and J.-P. Renne, 2014, "Decomposing euro-area sovereign spreads: credit and liquidity risks," *Review of Finance*, 18(6), 2103–2151.

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

Remolona, E. M., M. Scatigna, and E. Wu, 2007, "Interpreting sovereign spreads," *BIS Quarterly Review*.

Smales, L. A., 2014, "News sentiment in the gold futures market," *Journal of Banking & Finance*, 49, 275–286.

Tang, D. Y., and H. Yan, 2013, "What moves CDS spreads?," working paper, University of Hong Kong.

Tetlock, P., M. Saar-Tsechansky, and S. Macskassy, 2008, "Investor psychology and asset pricing," *Journal of Finance*, 63, 1437–1467.

Tetlock, P. C., 2007, "Giving content to investor sentiment: The role of media in the stock market," *Journal of Finance*, 62(3), 1139–1168.

Uhl, M. W., M. Pedersen, and O. Malitius, 2015, “What’s in the News? Using News sentiment momentum for tactical asset allocation,” *The Journal of Portfolio Management*, 41(2), 100–112.

Appendix A Additional Regression Results

Table A1: Regression Results: CDS^Q return

This table reports the coefficients of the robust regressions of five-year CDS simple returns on the explanatory variables. The global risk factors include US stock excess returns, VIX volatility premia, term premia, changes in the 5-year US Treasury rates, investment grade spreads and high yield premia. Local risk variables contain local exchange rate returns, and local equity risk returns. Sovereign spreads are comprised of global sovereign spreads and regional sovereign spreads. Furthermore, news sentiment is also included. The sample period ranges from January 2003 to April 2014 with weekly frequency. *** stands for 1% significance level; ** stands for 5% significance level; * stands for 10% significance level.

	BGARIA	**BRAZIL**	**CHILE**	**CHINA**	**COLOM**	**CROATI**	**ISRAEL**
Global risk factors							
US stock market	-0.008***	-0.010***	-0.005*	-0.003	-0.011***	-0.008***	-0.003
Volatility premium	-0.002***	-0.002***	-0.003***	-0.003***	-0.003***	-0.002***	-0.002***
Term premium	0.001	-0.000	0.000	0.003***	-0.000	0.000	0.002**
Treasury market	0.098***	0.219***	0.071**	0.155***	0.219***	0.077***	0.060***
Investment grade	-0.005***	-0.003***	-0.003**	-0.004*	-0.003***	-0.005***	-0.002
High yield	1.563***	1.214***	1.565***	1.447***	1.407***	1.501***	0.924***
Local variables							
Exchange return	-0.137	-0.371***	0.319	-0.353	-0.072	0.079	-0.239
Stock return	0.116	-0.195***	-0.168	0.015	-0.099	0.058	0.067
Sovereign spreads							
Regional spread	0.059	0.118	0.284**	0.278*	0.149*	0.089	0.348***
Global spread	0.898***	0.979***	0.445***	0.946***	1.024***	0.846***	0.362***
News sentiment	-0.112***	-0.089***	-0.123***	-0.109***	-0.093***	-0.114***	-0.075***
Constant	0.009**	0.002	0.005	0.004	-0.001	0.008**	0.000
N	448	568	568	568	568	568	568
Adjusted R2	0.782	0.889	0.589	0.769	0.890	0.748	0.579

	QATAR	**ROMANI**	**RUSSIA**	**SLOVAK**	**SOAF**	**UKRAIN**	**VENZ**
Global risk factors							
US stock market	-0.000	-0.006*	-0.007	-0.002	-0.006	-0.007**	-0.007**
Volatility premium	-0.002***	-0.002***	-0.002	-0.004***	-0.002***	-0.000	-0.001
Term premium	0.000	0.001	0.000	0.003	0.002**	0.001	-0.000
Treasury market	0.078***	0.055***	0.150***	0.043	0.152***	0.079**	0.127***
Investment grade	0.001	-0.005***	-0.003*	-0.003***	-0.005***	-0.000	-0.002
High yield	0.974***	1.427***	1.493***	1.418***	1.397***	1.313***	0.973***
Local variables							
Exchange return	0.677	-0.240	-0.343	-0.079	-0.350**	-0.051	0.047
Stock return	-0.167*	0.043	-0.369**	-0.138	0.157	-0.248***	-0.194**
Sovereign spreads							
Regional spread	0.398***	-0.116*	0.281	0.208	0.807***	0.275***	0.099
Global spread	0.221**	0.926***	0.493***	0.872***	0.074	0.321***	0.527***
News sentiment	-0.122***	-0.095***	-0.072*	-0.200***	-0.078**	-0.069*	-0.089***
Constant	0.005	0.007**	0.007	0.001	0.003	0.010*	0.006*
N	448	422	568	283	568	397	568
Adjusted R2	0.567	0.786	0.659	0.755	0.671	0.575	0.511

	KOREA	**MALAYS**	**MEX**	**PANAMA**	**PHILIP**	**POLAND**
Global risk factors						
US stock market	0.004	-0.000	-0.009***	-0.008***	-0.002	-0.007**
Volatility premium	-0.004***	-0.003***	-0.003***	-0.003***	-0.003***	-0.002***
Term premium	0.003*	0.003**	0.001**	0.002	0.001**	0.001*
Treasury market	0.130***	0.121***	0.190***	0.183***	0.119***	0.087***
Investment grade	-0.006***	-0.005***	-0.005***	-0.002***	-0.002*	-0.005***
High yield	1.528***	1.371***	1.454***	1.499***	0.942***	1.598***
Local variables						
Exchange return	-0.348	-0.531	-0.857***		-1.237***	-0.319**
Stock return	-0.012	-0.187	0.022	-0.185**	-0.302***	-0.098
Sovereign spreads						
Regional spread	-0.074	-0.037	0.065	0.021	0.275***	0.080
Global spread	1.051***	1.096***	0.953***	1.015***	0.418***	0.926***
News sentiment	-0.116***	-0.058**	-0.098***	-0.083***	-0.053***	-0.097***
Constant	0.002	0.000	0.001	0.001	-0.002	0.007**
N	568	568	568	257	568	568
Adjusted R2	0.700	0.782	0.842	0.922	0.754	0.707

Table A2: Regression Results with Regional News: CDS^Q return

This table reports the coefficients of the robust regressions of five-year CDS simple returns on the explanatory variables. News sentiment only includes the local regional news sentiment and the debt news sentiment. The global risk factors include US stock excess returns, VIX volatility premia, term premia, and changes in the 5-year US Treasury rates, investment grade spreads and high yield premia. Local risk variables contain local exchange rate returns, and local equity risk returns. Sovereign spreads are comprised of global sovereign spreads and regional sovereign spreads. The sample period ranges from January 2003 to April 2014 with weekly frequency. *** stands for 1% significance level; ** stands for 5% significance level; * stands for 10% significance level.

	BGARIA	**BRAZIL**	**CHILE**	**CHINA**	**COLOM**	**CROATI**
Global risk factors						
US stock market	-0.008***	-0.010***	-0.005*	-0.003	-0.012***	-0.008***
Volatility premium	-0.002***	-0.002***	-0.002***	-0.003***	-0.003***	-0.002***
Term premium	0.001	-0.000	0.000	0.003***	-0.000	0.000
Treasury market	0.099***	0.222***	0.075**	0.157***	0.221***	0.077***
Investment grade	-0.005***	-0.003***	-0.003**	-0.003*	-0.002***	-0.005***
High yield	1.571***	1.230***	1.589***	1.466***	1.420***	1.509***
Local variables						
Exchange return	-0.200	-0.373***	0.322	-0.158	-0.078	0.040
Stock return	0.100	-0.197***	-0.171	0.014	-0.114*	0.030
Sovereign spreads						
Regional spread	0.060	0.121	0.290**	0.271*	0.152*	0.085
Global spread	0.891***	0.971***	0.435***	0.947***	1.014***	0.842***
Region news sentiment	-0.090***	-0.048***	-0.066***	-0.086**	-0.043***	-0.087***
Constant	0.013***	-0.001	0.001	0.001	-0.004	0.013***
N	448	568	568	568	568	568
Adjusted R2	0.778	0.886	0.583	0.763	0.886	0.743

	POLAND	ROMANI	RUSSIA	SLOVAK	UKRAIN	VENZ
Global risk factors						
US stock market	-0.007**	-0.006*	-0.007	-0.002	-0.007**	-0.007**
Volatility premium	-0.002***	-0.002***	-0.002	-0.004***	-0.000	-0.001
Term premium	0.001*	0.001	0.000	0.003	0.001	-0.000
Treasury market	0.087***	0.055**	0.150***	0.047	0.079**	0.129***
Investment grade	-0.005***	-0.005***	-0.003*	-0.003***	-0.000	-0.002
High yield	1.604***	1.439***	1.500***	1.432***	1.305***	0.988***
Local variables						
Exchange return	-0.345**	-0.286*	-0.346	0.021	-0.035	0.049
Stock return	-0.104	0.039	-0.364**	-0.148	-0.238***	-0.193**
Sovereign spreads						
Regional spread	0.078	-0.114*	0.282	0.213*	0.279***	0.104
Global spread	0.921***	0.919***	0.492***	0.859***	0.318***	0.519***
Region news sentiment	-0.081***	-0.078***	-0.087**	-0.174***	-0.112**	-0.061***
Constant	0.012***	0.012***	0.013	0.013**	0.018**	0.004
N	568	422	568	283	397	568
Adjusted R2	0.705	0.784	0.662	0.755	0.581	0.510

	KOREA	MALAYS	MEX	PANAMA	PHILIP
Global risk factors					
US stock market	0.004	-0.001	-0.009***	-0.008***	-0.003
Volatility premium	-0.004***	-0.003***	-0.003***	-0.002***	-0.003***
Term premium	0.003*	0.003**	0.001*	0.002	0.001**
Treasury market	0.132***	0.122***	0.194***	0.182***	0.120***
Investment grade	-0.006***	-0.004***	-0.005***	-0.002***	-0.002*
High yield	1.533***	1.380***	1.472***	1.524***	0.952***
Local variables					
Exchange return	-0.445	-0.558	-0.863***		-1.221***
Stock return	-0.028	-0.192	0.029	-0.216**	-0.289***
Sovereign spreads					
Regional spread	-0.085	-0.040	0.071	0.017	0.268***
Global spread	1.045***	1.096***	0.946***	1.010***	0.422***
Region news sentiment	-0.049	-0.031	-0.070***	-0.023	-0.068***
Constant	-0.002	-0.002	-0.001	-0.000	-0.003
N	568	568	568	257	568
Adjusted R2	0.691	0.780	0.842	0.919	0.755

Table A3: Regression Results with Global News: CDS^{Q} return

This table reports the coefficients of the robust regressions of five-year CDS simple returns on the explanatory variables. News sentiment includes all global news contents that exclude the local media coverage in the region of each country. The global risk factors include US stock excess returns, VIX volatility premia, term premia, and changes in the 5-year US Treasury rates, investment grade spreads and high yield premia. Local risk variables contain the local exchange rate returns, and local equity risk returns. Sovereign spreads are comprised of global sovereign spreads and regional sovereign spreads. The sample period ranges from January 2003 to April 2014 with weekly frequency. *** stands for 1% significance level; ** stands for 5% significance level; * stands for 10% significance level.

	BGARIA	**BRAZIL**	**CHILE**	**CHINA**	**COLOM**	**CROATI**	**ISRAEL**
Global risk factors							
US stock market	-0.009***	-0.010***	-0.005*	-0.003	-0.012***	-0.009***	-0.003
Volatility premium	-0.001**	-0.002***	-0.003***	-0.003***	-0.003***	-0.002***	-0.002***
Term premium	0.001	-0.000	0.000	0.003***	-0.000	0.000	0.002**
Treasury market	0.100***	0.219***	0.071**	0.155***	0.218***	0.077***	0.061***
Investment grade	-0.005***	-0.003***	-0.003**	-0.004*	-0.003***	-0.005**	-0.002
High yield	1.573***	1.216***	1.572***	1.453***	1.411***	1.508***	0.931***
Local variables							
Exchange return	-0.155	-0.375***	0.320	-0.316	-0.065	0.082	-0.246
Stock return	0.091	-0.198***	-0.172	0.012	-0.093	0.046	0.068
Sovereign spreads							
Regional spread	0.053	0.117	0.283**	0.276*	0.148*	0.083	0.343***
Global spread	0.899***	0.976***	0.442***	0.947***	1.024***	0.848***	0.365***
Global news sentiment	-0.081***	-0.094***	-0.125***	-0.108***	-0.115***	-0.108***	-0.067***
Constant	0.007**	0.004	0.008**	0.007	0.003	0.008**	0.001
N	448	568	568	568	568	568	568
Adjusted R2	0.776	0.888	0.585	0.768	0.890	0.745	0.575

	QATAR	ROMANI	RUSSIA	SLOVAK	SOAF	UKRAIN	VENZ
Global risk factors							
US stock market	-0.000	-0.006*	-0.007	-0.003	-0.006	-0.007**	-0.007**
Volatility premium	-0.002***	-0.001**	-0.001	-0.004***	-0.002***	-0.000	-0.001
Term premium	0.000	0.001	0.000	0.003	0.002**	0.001	-0.000
Treasury market	0.079***	0.055**	0.150***	0.045	0.153***	0.079**	0.126***
Investment grade	0.001	-0.005***	-0.003*	-0.002**	-0.005***	0.000	-0.002
High yield	0.991***	1.446***	1.498***	1.441***	1.404***	1.315***	0.979***
Local variables							
Exchange return	0.491	-0.282*	-0.317	-0.075	-0.345**	-0.016	0.043
Stock return	-0.163*	0.022	-0.367**	-0.150	0.156	-0.238***	-0.196**
Sovereign spreads							
Regional spread	0.394***	-0.120*	0.278	0.203	0.803***	0.272***	0.099
Global spread	0.224**	0.922***	0.496***	0.873***	0.078	0.323***	0.525***
Global news sentiment	-0.113***	-0.050*	-0.089*	-0.174***	-0.078*	-0.100**	-0.094***
Constant	0.006*	0.006*	0.007	0.001	0.004	0.011**	0.009**
N	448	422	568	283	568	397	568
Adjusted R2	0.560	0.781	0.660	0.751	0.670	0.578	0.509

	KOREA	MALAYS	MEX	PANAMA	PHILIP	POLAND
Global risk factors						
US stock market	0.004	-0.000	-0.009***	-0.008***	-0.002	-0.007**
Volatility premium	-0.004***	-0.003***	-0.003***	-0.003***	-0.003***	-0.002***
Term premium	0.003*	0.003**	0.001**	0.001	0.001**	0.001*
Treasury market	0.130***	0.121***	0.189***	0.186***	0.119***	0.088***
Investment grade	-0.006***	-0.005***	-0.005***	-0.002***	-0.002*	-0.005***
High yield	1.535***	1.374***	1.456***	1.497***	0.945***	1.605***
Local variables						
Exchange return	-0.359	-0.533	-0.854***		-1.239***	-0.326**
Stock return	-0.009	-0.194	0.010	-0.192**	-0.302***	-0.106
Sovereign spreads						
Regional spread	-0.077	-0.038	0.064	0.022	0.274***	0.075
Global spread	1.052***	1.096***	0.949***	1.015***	0.419***	0.926***
Global news sentiment	-0.115***	-0.053**	-0.100***	-0.085***	-0.053***	-0.080***
Constant	0.005	0.002	0.004	0.004	-0.001	0.006*
N	568	568	568	257	568	568
Adjusted R2	0.699	0.782	0.840	0.921	0.754	0.703

Appendix B Decomposing the CDS Spread

In the following, we outline the method for the decomposition of CDS spreads.

The model we construct for sovereign credit default swaps closely follows the methodology outlined by Pan and Singleton (2008) and Longstaff, Pan, Pedersen, and Singleton (2011). In particular, the spread of a M-year CDS contract is given by the following expression:

$$CDS_t^Q(M) = \frac{2(1-R^Q)\int_t^{t+M} E_t^Q[\lambda e^{-\int_t^u (r_s+\lambda_s)ds}]du}{\sum_{j=1}^{2M}[E_t^Q e^{-\int_t^{t+j/2}(r_s+\lambda_s)ds}]} \tag{5}$$

Where E^Q is the expectation under the risk-neutral measure, R^Q is the risk-neutral fractional recovery rate on the underlying given that a relevant credit event occurs (i.e. a default), r_t is the risk-less rate, and λ_t is the risk-neutral intensity (i.e. the arrival rate of a credit event). The numerator of equation (5) represents the present value of the contingent payment made by the protection seller to the protection buyer in light of a credit event. The denominator represents the present value of the M-year semiannual annuity, conditional on the fact that there has not been a credit event. And the discount rate $r_t + \lambda_t$ reflects the survival-dependent nature of the CDS contract.

We assume the behaviour of the default intensity λ follows a log-normal distribution governed by parameter κ, θ, σ. As for the notation, superscripts Q and P are used to denote the parameters of the intensity process λ under the risk-neutral and objective measure, respectively. In particular, equation (6) shows the default intensity dynamics under the risk-neutral measure Q, whilst equation (7) shows the dynamics under the objective measure P.

$$d\ln\lambda_t = \kappa^Q(\theta^Q - \ln\lambda_t)dt + \sigma_\lambda dB_t^Q. \tag{6}$$

$$d \ln \lambda_t = \kappa^P(\theta^P - \ln \lambda_t)dt + \sigma_\lambda dB_t^P. \tag{7}$$

We assume that r_t and λ_t are independent, so that market CDS spreads are now given by equation (8),

$$CDS_t^Q(M) = \frac{2(1-R^Q)\int_t^{t+M} D(t,u)E_t^Q[\lambda e^{-\int_t^u \lambda_s ds}]du}{\sum_{j=1}^{2M} D(t,t+j/2)[E_t^Q e^{-\int_t^{t+j/2}\lambda_s ds}]} \tag{8}$$

where $D(t,u)$ is the price of a default-free zero-coupon bond, issued at date t and maturing at date u. The corresponding CDS spreads implied by the P objective process $CDS_t^P(M)$ are given by equation (9) where E^P is the expectation under the objective measure:

$$CDS_t^P(M) = \frac{2(1-R^Q)\int_t^{t+M} D(t,u)E_t^P[\lambda e^{-\int_t^u \lambda_s ds}]du}{\sum_{j=1}^{2M} D(t,t+j/2)[E_t^P e^{-\int_t^{t+j/2}\lambda_s ds}]} \tag{9}$$

First, in order to price said security, we take the expectation with respect to the distribution of λ under the risk-neutral process. We bootstrap the hazard rate from the sovereign CDS spread we observe in the market, and we obtain the parameters (ie. $\kappa^Q, \theta^Q, \sigma$) under the risk-neutral setting based on equation (8). Second, to estimate the parameters under the physical measure (ie. κ^P, θ^P), we take the expectation with respect to the probability distribution implied by the objective process. We apply the maximum likelihood estimator based on the term structure of sovereign credit spreads using equation (9). For the term structure, we use 3-year, 5-year and 7-year CDS spreads. Unlike Longstaff, Pan, Pedersen, and Singleton (2011), we assume the 5-year sovereign CDS is perfectly priced, and the 3-year and the 7-year contracts are priced with a normally distributed error of mean zero and standard deviation $\sigma_\epsilon(3)$ and $\sigma_\epsilon(5)$. Furthermore, we use weekly observations rather than monthly.

These parameters backed out from the two processes may differ from one another. However, the two are related by the "market price of risk" as shown in equation (10). Equation (11) displays the connection between the parameters as the probability distribution shifts from P to Q

$$\eta_t = \delta_0 + \delta_1 \ln \lambda_t \tag{10}$$

$$\begin{aligned} \kappa^Q &= \kappa^P + \delta_1 \sigma_\lambda \\ \kappa^Q \theta^Q &= \kappa^P \theta^P - \delta_0 \sigma_\lambda \end{aligned} \tag{11}$$

For $\delta_0 = 0$ and $\delta_1 = 0$, the risk-neutral Q process coincides with the objective process P since the market price of "distress" risk η that is associated with unpredictable variation in λ_t is zero.

However, the expectations in expression (8) and (9) have no closed form solutions. Thus, we compute these expectations numerically by using an implicit finite-difference method to solve the Feynman-Kac partial differential equation. Once we obtain the parameters estimates under the physical measure, we then estimate the sovereign CDS spreads under the physical measure by using equation (9). The risk premium is therefore defined as the observed market sovereign CDS spread minus the CDS spread estimated under the P distribution. Finally, we calculate the default risk component of CDS spreads as the difference between the CDS spreads under the Q distribution and the risk premium.

Appendix C Variables Construction

US stock market are the excess returns for the U.S. stock market, which are the daily value-weighted returns on all NYSE, AMEX, and NASDAQ stocks from CRSP in excess of Treasury bill returns (from Ibbotson Associates). The data was obtained from Kenneth French's website.[19]

Volatility premium is the daily VIX index minus the 30 days realized volatility of the S& P 500 index.

Term premium is calculated as the difference between the 10-year USD Interest Rate Swap rate and the 1-month USD Libor rate.

Treasury market is the change in the 5-year US Treasury rate. The data are downloaded from Bloomberg.

Investment grade is the daily return on the basis point yield between the Bank of America/ Merrill Lynch US Corporate BBB Effective Yield and the corresponding Corporate AAA Effective Yield.

High yield is the daily return in basis points spread difference between the Bank of America/Merrill Lynch US High Yield BB and the corresponding Corporate BBB Effective yield. The data are downloaded from the Federal reserve Bank of St. Louis in both cases.

Funding premium is calculated as the difference between the 3-month Libor rate and the OIS rates for the Euro and US Dollar, respectively.

Exchange return is defined as the return of the exchange rate, which is expressed as units of

[19] http://mba.tuck.dartmouth.edu /pages/faculty/ken.french/date_library.html.

the local currency per US dollar. The data are obtained from Bloomberg and Datastream.[20]

Stock return is calculated as the rate of return for local MSCI equity index. The data are download from the same source.

[20]The exchange rate against USD for Panama stays constant over the period, the return is set as zero over the period and the variable is omitted in the regression.