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Economic Policy Uncertainty and the Volatility of Sovereign CDS Spreads

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Economic Policy Uncertainty and the Volatility of Sovereign CDS Spreads

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Abstract

Multipliers estimated for sixteen major economies predict that 1% more economic policy uncertainty (EPU) produces about 0.3% - 0.8% more sovereign CDS volatility. The impact of EPU is strong but short-lived. US EPU is an important additional source of CDS volatility for European countries, Japan, China, and South Korea. European EPU does, in contrast, not affect the CDS volatility of other countries.

Keywords: Credit default swap; Economic policy uncertainty; Sovereign credit risk; Volatility

JEL codes: D80, E66, G18

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Non-Technical Summary

Credit default swap (CDS) spreads reflect the market's view about the solvency of a country. The volatility of CDS spreads signals how uncertain the market is about the correct level of CDS spreads.

Economic theory suggests that rising deficits, large levels of public debt, and weak economic performance are all possible consequences of economic policy uncertainty (EPU). High EPU may thus fuel uncertainty about solvency of a country and thereby drive up CDS volatility.

This paper examines whether EPU helps to explain the volatility of sovereign CDS spreads. The paper considers sixteen economies: Germany, France, Italy, Spain, Netherlands, Ireland, Sweden, Great Britain, the US, Japan, Australia, China, Russia, South Korea, Brazil, and Chile.

The empirical results provide strong support for a positive link between EPU and sovereign CDS volatility. The results imply that 1% more EPU produces about 0.3% - 0.8% more sovereign CDS volatility.

The paper also considers spillovers from US and European EPU to the CDS volatility of other countries. It turns out that US EPU affects foreign CDS volatility in many cases. European EPU has, in contrast, no important effect on the CDS volatility of other countries.

1 Introduction

Government debt is risky because a country might default, or try to restructure its debt repayments. Sovereign credit default swaps (CDS) help trading such risks.

The sovereign CDS market is big. The Bank for International Settlements reports 1,638 billion US dollars of notional amounts on sovereign CDS contracts outstanding in the first half of 2017.

Buyers of protection against sovereign credit risk pay periodic CDS premiums. These “spreads” reflect the market’s view about the solvency of a country. CDS spreads are high when a default is likely, and when the risk premium for bearing sovereign credit risk is high.

Volatile CDS spreads signal that market participants revise their view quickly. CDS volatility thus reflects uncertainty about the correct level of CDS spreads. High CDS volatility implies that CDS spreads become a less reliable measure of credit risk.

This paper examines whether economic policy uncertainty (EPU) helps to explain the volatility of sovereign CDS spreads.

EPU could be an important source of CDS volatility. Theories of public expenditures and the strategic use of debt (Carmignani, 2003) argue that rising deficits, larger levels of public debt, and reduced economic performance are all possible consequences of EPU. High EPU may thus fuel uncertainty about the ability of a country to pay its debt and thereby drive up CDS volatility.

Figure 1 supports this argument. The plot shows how EPU and CDS volatility for Germany, the US, Australia, and Brazil evolved over the last few years. As can be seen, both series move together.[1]

The literature on sovereign CDS (Hilscher and Nosbusch, 2010; Dieckmann and Plank, 2011; Aizenman et al., 2013, among others) has until now mainly focused on determinants of the *level* of CDS spreads. Spillovers (Tamakoshi and Hamori, 2013; Lucas et al., 2014) between stock, bond, and CDS markets have also been considered. See Augustin (2014) for a survey.

Another literature studies how uncertainty affects economic activity (Bloom, 2009; Boutchkova et al., 2012; Kelly et al., 2016; Pástor and Veronesi, 2013, among others). A key finding there is that rising uncertainty dampens real activity, increases risk premiums, and drives up the volatility of stocks (Liu and Zhang, 2015). Baum and Wan (2010) and Wisniewski and Lambe (2015) find that macroeconomic- and economic policy uncertainty also affects CDS spreads for firms.

[1] The series are standardized to be comparable. Sections 2 and 3 describe the construction of these series in detail.

Until now the impact of EPU on sovereign CDS *volatility* has not been studied. This paper tries to fill this gap in the literature.

The paper considers sixteen major economies: Germany, France, Italy, Spain, Netherlands, Ireland, Sweden, Great Britain, the US, Japan, Australia, China, Russia, South Korea, Brazil, and Chile.

EPU is measured by monthly EPU country indexes introduced in Baker et al. (2015). These indexes are constructed from keyword searches in newspaper archives.

Monthly CDS volatility is modeled as an autoregressive process augmented with EPU. The model has two representations that yield direct estimates of multipliers for transitory and permanent EPU changes.

The estimated multipliers provide strong support for a positive link between EPU and sovereign CDS volatility. The paper also considers spillovers from US EPU to the CDS volatility of other countries. It turns out that US EPU affects foreign CDS volatility in many cases. European EPU has, in contrast, no important effect on the CDS volatility of other countries.

The paper proceeds as follows: The next section introduces the data. Section 3 outlines how CDS volatility is computed. Section 4 describes the econometric methodology. Section 5 presents the empirical findings. The last section provides conclusions.[2]

2 Data

As just said, the study covers Germany, France, Italy, Spain, Netherlands, Ireland, Sweden, Great Britain, the US, Japan, Australia, China, Russia, South Korea, Brazil, and Chile. The sample runs from 2008m10 - 2017m3. The sample starts in October 2008 because sovereign CDS trading just took off after the crash of Lehman Brothers (IMF, 2013, chap. 2).

2.1 Economic policy uncertainty

EPU is measured by monthly news-based indexes (Baker et al., 2015). The indexes (available on http://www.policyuncertainty.com/) rest on keyword searches in electronic archives of the most important newspapers of a country.

For the USA, for instance, the search goes over the archives of USA Today, Miami Herald, Chicago Tribune, Washington Post, Los Angeles Times, Boston Globe, San Francisco Chronicle, Dallas Morning News, New York Times, and Wall Street Journal. Articles must contain the

[2]Results that are not reported to save space are available upon request.

triples “economic” or “economy”, “uncertain” or “uncertainty” and at least one of the terms “congress”, “deficit”, “Federal Reserve”, “legislation” or “White House” to be counted.[3]

Baker et al. (2015) and Baker et al. (2016) describe EPU index construction in detail. They list searched newspapers and keywords for each country. They also report checks for accuracy and unbiasedness of the US index.

EPU indexes are now very popular in empirical research, but there are of course also other measures of uncertainty. These measures include stock market volatility, disagreement of professional forecasters, and measures extracted from large sets of economic time series (Jurado et al., 2015)

News-based EPU indexes are attractive for at least two reasons. First, they focus directly on EPU, whereas other measures are often less specific. Disagreement of forecasters, for example, captures uncertainty about variables such as output and inflation rather than uncertainty about economic policy per se.

Second, EPU indexes are based on news rather than on economic and financial series that could themselves be driven by CDS volatility. As just mentioned, searched keywords are words like “deficit”, “regulation”, or “legislation”, not words like “CDS”, “volatility”, or “financial markets”. Reverse causality is thus less likely a problem for news-based EPU indexes.

Table 1 reports summary statistics for the EPU indexes used in this paper.[4] As can be seen, average EPU was somewhat larger in France and Great Britain than in the other countries. There is also an EPU index for the European Union (EU) based on news counts for Germany, France, Italy, Spain, and Great Britain. The statistics show that EU EPU was somewhat higher and more volatile than US EPU.

2.2 CDS spreads

CDS volatility is computed from daily spreads quoted for sovereign CDS contracts in US dollars with a term of five years.[5]. The CDS spreads come from Datastream.

For most countries average daily spreads were well below 100 basis points (Table 2). Average spreads were much higher for Italy, Spain, Ireland, Russia, and Brazil, however, mainly because of serious concerns about economic performance and the size of government debt.

[3]For the US Baker et al. (2015) issue also an EPU index consisting of three components, namely Tax Code Expiration, Forecaster Disagreement, and News Coverage of EPU. This paper uses the US EPU index based on the news component.

[4]The indexes are not fully comparable because the normalization period of the indexes varies somewhat across countries.

[5]This type of contract is most frequently traded (Vogel et al., 2013)

3 CDS volatility

CDS volatility is constructed as follows. Daily CDS spread changes $\Delta s_t = s_t - s_{t-1}, t = 1, ..., T$ are regressed on their first four lags

$$\Delta s_t = \alpha_0 + \alpha_1 \Delta s_{t-1} + ... + \alpha_4 \Delta s_{t-4} + e_t \tag{1}$$

to remove any predictable mean dynamics in Δs_t. Changes are used because the spreads display non-stationarity.[6]

Volatility is then calculated from the absolute values of the residuals e_t in (1) as

$$\sigma_m = a \sqrt{\frac{\pi}{2}} \sum_{i=1}^{D} \frac{|e_i|}{D} \tag{2}$$

where D denotes the number of trading days in month m. Equation (2) uses absolute residuals because of their robustness against extreme observations.

The factor $a = \sqrt{252}$ in (2) converts daily volatility into annual volatility. The term $\sqrt{\pi/2}$ comes from the result that the expectation of the absolute value of a random variable $R = \sigma \cdot u$ is $E(|R|) = \sigma\sqrt{2/\pi}$ when σ is a positive constant and u is standard normally distributed. This correction has also been used in Schwert (1989) and Ederington and Guan (2005).

As noted before, the CDS spreads for Italy, Spain, Ireland, Russia, and Brazil are the largest ones in the sample. These spreads are also the most volatile ones (Table 3).

4 Econometric methodology

EPU indexes and CDS volatility have a monthly frequency. A simple model should therefore be able to capture the dynamics in CDS volatility. In this spirit the baseline model is set up as an autoregression

$$y_m = \alpha_0 + \alpha_1 y_{m-1} + ... + \alpha_p y_{m-p} + \beta x_m + u_m \tag{3}$$

where $y_m = log(\sigma_m^c)$ is the logarithm of CDS volatility for country c in month m, $x_m = log(epu_m^c)$ is the log of EPU, and u_m is an independently and identically distributed error with zero mean and finite variance. Taking logs removes much of the skewness in CDS volatility and guaranties that volatility is positive.

The β in equation (3) measures the instantaneous impact of EPU on CDS volatility in percentage terms. The model is stable when all roots of the characteristic polynomial $(1 - \alpha_1 z - ... - \alpha_p z^p)$ are outside the unit circle.

[6] Augmented Dickey-Fuller tests do not reject the hypothesis that CDS spreads have a unit root.

Model (3) can be expressed in different ways. Solving equation (3) forward by recursive substitution yields

$$y_{m+k} = \gamma_0 + \gamma_1 y_{m-1} + ... + \gamma_p y_{m-p} + \delta_k x_{m+k} + \delta_{k-1} x_{m+k-1} + ... + \delta_0 x_m + e_{m+k} \tag{4}$$

where $e_{m+k} = \theta_0 u_m + \theta_1 u_{m+1} + ... + \theta_{k-1} u_{m+k-1} + u_{m+k}$ is a moving average of order $k-1$. This representation shows that in this model only EPU contributes systematically to CDS volatility. The other contributions result from unsystematic events.

Ordinary least squares (OLS) estimates the coefficients in (4) consistently since $x_m, ..., x_{m+k}$ are exogenous by assumption and $y_{m-1}, ..., y_{m-p}$ are predetermined. Standard errors must be corrected for autocorrelation, however. Newey-West autocorrelation and heteroskedasticity consistent (HAC) standard errors provide such a correction (Newey and West, 1987).

Model (3) is more parsimonious than (4) because it has fewer parameters. Representation (4) has, however, also some advantages.

First, estimates from (4) are less vulnerable to measurement error in y. Suppose, for simplicity, that the true model is $y^*_m = \alpha y^*_{m-1} + \beta x_m + u_m$ where $|\alpha| < 1$, but we can only observe $y_m = \alpha y_{m-1} + \beta x_m + u_m$ where $y_m = y^*_m + v_m$ and $y_{m-1} = y^*_{m-1} + v_{m-1}$ are error ridden measures of y_m and y_{m-1}. The measurement errors v_m and v_{m-1} are assumed to be unsystematic and uncorrelated with each other. It can then be shown that the covariance between y_{m-1} and u_m in (3) is $\mathrm{Cov}(y_{m-1}, u_m) = -\alpha\sigma^2_{m-1}$, whereas the covariance between y_{m-1} and e_{m+k} in (4) is $\mathrm{Cov}(y_{m-1}, e_{m+k}) = -\alpha^{k+1}\sigma^2_{m-1}$. Thus, the influence of measurement errors in (4) decreases rapidly as k increases.

Second, representation (4) yields direct estimates of dynamic multipliers. Multipliers can be calculated from (3) by iteration, but standard errors are more difficult to obtain since the multipliers are nonlinear functions of the estimated parameters. In contrast, the $\delta_j = \partial y_{m+k}/\partial x_{m+k-j}$, $j = 0, ..., k$ in (4) measure the effect of a change in x on current and future values of y directly. The δ_j can easily be estimated with OLS, and robust standard errors are readily available.

The robustness and flexibility of representation (4) has a price, of course. More parameters must be estimated, and the estimates may be less precise when successive values of x_m are highly correlated.

Model (3) has another useful representation. Adding and subtracting the terms $\delta_k x_{m+k-1} - \delta_k x_{m+k-1} + ... + (\delta_0 + ... + \delta_k) x_m - (\delta_0 + ... + \delta_k) x_m$ to equation (4) gives

$$y_{m+k} = \gamma_0 + \gamma_1 y_{m-1} + ... + \gamma_p y_{m-p} + \lambda_k \Delta x_{m+k} + \lambda_{k-1} \Delta x_{m+k-1} + ... + \lambda_0 x_m + e_{m+k} \tag{5}$$

where Δ denotes the first difference operator. The coefficients $\lambda_k = \delta_k$, $\lambda_{k-1} = (\delta_k + \delta_{k-1})$, and $\lambda_0 = (\delta_k + \delta_{k-1} + ... + \delta_0)$ measure effects of permanent changes in x on current and future y. Equation (5) yields therefore direct estimates of multipliers of a permanent change in EPU.

Note that the adding and subtracting strategy does neither change the coefficients of the autoregressive terms nor the error term e_{m+k}. The estimated intercept and coefficients on the lagged y in (4) and (5) are therefore identical.

External EPU can easy be incorporated into this framework. One just needs to add a measure of external EPU to model (3). Effects of transitory changes in external EPU can be estimated from

$$y_{m+k} = \gamma_0 + \gamma_1 y_{m-1} + ... + \gamma_p y_{m-p} + \delta_k x^{dom}_{m+k} + ... + \delta_0 x^{dom}_m + \varphi_k x^{ext}_{m+k} + ... + \varphi_0 x^{ext}_m + e_{m+k} \quad (6)$$

where $x^{ext}_m = log(epu^{ext}_m)$ and $x^{dom}_m = log(epu^{dom}_m)$ is the log of external and domestic EPU in month m, respectively. Effects of a permanent change in external EPU can be obtained from

$$y_{m+k} = \gamma_0 + \gamma_1 y_{m-1} + ... + \gamma_p y_{m-p} + \lambda_k \Delta x^{dom}_{m+k} + ... + \lambda_0 x^{dom}_m + \kappa_k \Delta x^{ext}_{m+k} + ... + \kappa_0 x^{ext}_m + e_{m+k}. \quad (7)$$

Both equations can be estimated by OLS with HAC standard errors.

5 Empirical analysis

The empirical analysis has three parts. The first part studies effects of domestic EPU on CDS volatility. The second part quantifies EPU spillovers from the US and the EU to other countries. The third part of the analysis consists of robustness checks.

5.1 Domestic economic policy uncertainty

Model (3) is estimated for each country with domestic EPU and five lags of CDS volatility. All models turn out to be stationary. Tests for autocorrelation and heteroskedasticity suggest that the residuals are uncorrelated and have constant variance.

The estimates for β - the response of CDS volatility in percent to a 1% change in domestic EPU - are all positive. Eleven out of sixteen estimates are statistically significantly different from zero at usual significance levels (Table 4). Most β's lie between 0.2 - 0.6, and many are above 0.3. Furthermore, the model fits the data quite well. Most adjusted R-squares are between 50% - 70%.

In model (3) lagged EPU should not help to predict current CDS volatility. Lagged volatility should already soak up effects of past EPU. As a test the model is re-estimated for each country with lagged EPU included. Lagged EPU is in no case statistically significant.

Table 5 shows multipliers estimated from representations (4) and (5). The multiplier δ_2 for an instantaneous change in domestic EPU is again always positive. The estimates are, except for Sweden and Australia, also larger than the β's from model (3). A smaller impact of potential measurement errors in CDS volatility and explicit conditioning on lagged EPU terms may explain this result.

The estimated δ_2 are almost always statistically significant. More importantly, the estimates are also economically significant. For example, US CDS volatility responds with an instantaneous increase of more than 0.6% to a 1% increase in US EPU. The responses are similar in many other cases.

The δ_1 and δ_0 in representation (4) measure the effect of a transitory changes in EPU on CDS volatility after one and two months. These effects are often small and statistically insignificant. Notable exceptions are Germany and Sweden where EPU shocks have also a sizable impact on CDS volatility next month. Another exception is Great Britain where CDS volatility reverts two months later.

The multiplier $\lambda_0 = (\delta_2+\delta_1+\delta_0)$ for a permanent shock in domestic EPU is in most cases not much larger than the multiplier for a single shock. This is of course a consequence of the small δ_1 and δ_0. Exceptions are again Germany and Sweden where the impact of a permanent shock is much larger, and Great Britain, where the long-term multiplier is essentially zero because of the reversal effect mentioned before.

5.2 Economic policy uncertainty spillovers

Colombo (2013) finds that US EPU shocks have negative effects on real economic activity in Euro area countries. US EPU could thus affect foreign CDS volatility too.

To examine this issue the baseline model and its derived representations now include domestic EPU and US EPU. The US model has EU EPU as a second source of uncertainty. The modified baseline model is

$$y_m = \alpha_0 + \alpha_1 y_{m-1} + ... + \alpha_p y_{m-p} + \beta_1 x_m^{dom} + \beta_2 x_m^{ext} + u_m \quad (8)$$

where x_m^{dom} and x_m^{ext} are the logs of domestic and external EPU.

Table 6 shows the estimates β_1 and β_2 for instantaneous changes in domestic and external EPU from equation (8). US EPU is now much more important than domestic EPU for most European countries, Japan, and China. US EPU does, however, not affect CDS volatility for Australia, Brazil, Chile, and Russia. Furthermore, EU EPU has no significant impact on US CDS volatility.

The estimates from representations (6) and (7) in Table 7 tell essentially the same story. The instantaneous multiplier δ_2 for a shock to domestic EPU is always positive. The multipliers for Great Britain and China are now statistically significant, and the multipliers for Germany, Italy, and Spain are, although not statistically significant, around 0.30.

The longer term multipliers δ_1 and δ_0 are again quite small for domestic EPU. Exceptions are as before Germany, Sweden, and Great Britain.

The instantaneous effect φ_2 of an US EPU change is for most European countries larger than the domestic effect. US EPU has also an impact on the CDS volatility of Japan, China, and South Korea. The longer term multipliers φ_1 and φ_0 for US EPU are small, except for Ireland and Russia where φ_0 is negative and significant.

The multipliers for permanent EPU shocks in the right part of Table (7) mirror the former findings. The multiplier λ_0 for domestic EPU is large when US EPU is unimportant and the US EPU multiplier κ_0 is typically large when domestic EPU has little effect on CDS volatility.

EU EPU does not affect US CDS volatility, but EU EPU may have an impact on the CDS volatility of other countries. The model

$$y_m = \alpha_0 + \alpha_1 y_{m-1} + ... + \alpha_p y_{m-p} + \beta_1 x_m^{dom} + \beta_2 x_m^{us} + \beta_3 x_m^{eu} + u_m \tag{9}$$

where x^{eu} is the log of EU EPU accounts for this possibility. The model is estimated for all countries except Germany, France, Italy, and Spain. The later countries are considered separately because EU EPU is constructed from the news-counts for these four countries. It turns out that EU EPU has no important impact on the CDS volatility of the remaining countries.

To test whether German EPU affects French, Italian, or Spanish CDS volatility, a model like (9) is estimated for each of these countries. The only difference is that German EPU replaces EU EPU. The same exercise is also repeated with French, Italian, and Spanish EPU as external EPU measure. Non of the four EPU measures has any statistically significant effect on the CDS volatility of the other three countries.

5.3 Robustness checks

Volatility is computed from absolute residuals. To see whether the empirical results depend on how volatility is constructed the analysis is repeated with CDS volatility computed from squared residuals as

$$\sigma_m = a\sqrt{\sum_{i=1}^{D} \frac{e_i^2}{D}} \tag{10}$$

where e_i^2 are the squared residuals from equation (1), D denotes the number of trading days in month m, and $a = \sqrt{252}$ converts daily volatility into annual volatility. It turns out that the results are very similar.

It could be that the impact of EPU on CDS volatility differs in recession and non-recession periods. To test for this possibility three state-dependent versions of the baseline model are estimated. The versions are

$$y_m = \alpha_0 + \rho_0 rec + \sum_{i=1}^{5} \alpha_i y_{m-i} + \beta x_m + \rho_1 rec \cdot x_m + u_m, \tag{11}$$

$$y_m = \alpha_0 + \rho_0 rec + \sum_{i=1}^{5} \alpha_i y_{m-i} + \beta_1 x_m^{dom} + \rho_1 rec \cdot x_m^{dom} + \beta_2 x_m^{ext} + \rho_2 rec \cdot x_m^{ext} + u_m, \tag{12}$$

and

$$y_m = \alpha_0 + \rho_0 rec + \sum_{i=1}^{5} \alpha_i y_{m-i} + \sum_{i=1}^{5} \rho_i rec \cdot y_{m-i} + \beta_1 x_m^{dom} + \rho_6 rec \cdot x_m^{dom} + \beta_2 x_m^{ext} + \rho_7 rec \cdot x_m^{ext} + u_m. \tag{13}$$

The variable rec is an indicator that takes on a value of 1 in recessions and 0 otherwise. The division into recession and non-recession periods follows the OECD classification. The recession indicator comes from the economic database of Federal Reserve Bank of St. Louis.

An even impact of EPU on CDS volatility in both states implies $\rho_0 = \rho_1 = 0$ in (11), $\rho_0 = \rho_1 = \rho_2 = 0$ in (12), and $\rho_0 = \rho_1 = \rho_2 = ... = \rho_7 = 0$ in equation (13). These hypotheses can be tested with an F-test. The test results suggest that the link between EPU and CDS volatility is stable.

The last check uses a vector autoregressive (VAR) model to investigate whether the findings hold in a VAR framework as well. To this end a VAR model

$$z_m = \mu + \Phi_1 z_{m-1} + ... + \Phi_p z_{m-p} + v_m \tag{14}$$

is estimated for each country. The column vector z_m in (14) contains external EPU, domestic EPU, and sovereign CDS volatility, the $\Phi's$ are coefficient matrices, and v_m is an identically and independently distributed column vector of disturbances.

For all countries, except the US, $z_m = (x_m^{us}, x_m^{dom}, y_m)$. This ordering of the variables defines a recursive structure in the standard triangular identification scheme of structural shocks. Domestic EPU and CDS volatility shocks have no immediate effect on US EPU in the first equation. In the second equation US EPU shocks may directly affect domestic EPU. In the third equation

EU EPU shocks and domestic EPU shocks may instantaneously affect volatility. For the US the vector $z_m = (x_m^{us}, x_m^{eu}, y_m)$. This ordering implies that EU EPU shocks have no immediate effect on US EPU, but US EPU shocks may have an instantaneous effect on EU EPU.

Figure 2 illustrates some of the VAR results. Shown are responses (with 90% confidence intervals) of CDS volatility to unexpected structural shocks in external and domestic EPU. All VAR's are estimated with three lags of z_m.[7] VAR's with two, four, or five lags yield similar findings, however. Shocks are one unit shocks to enable direct comparisons with single equation results.

Let us turn to the plots in Figure 2. The response of US CDS volatility to EU EPU shocks is small and statistically insignificant. US EPU shocks have a large impact on Swedish CDS volatility, but Swedish EPU has also a delayed large impact. US and domestic EPU shocks are important for Chinese CDS volatility. US EPU shocks are unimportant for Brazil. These patterns are also predicted by the estimated multipliers from the single equation models. The VAR and single equation results are also similar for the other countries.[8]

6 Conclusions

The models estimated in this paper make three important predictions: First, EPU has substantial impact on sovereign CDS volatility. When EPU rises CDS volatility rises too. Second, US EPU is a major source of CDS volatility for many other countries. Third, EU EPU does not affect CDS volatility of other countries. What do these predictions imply?

Risk managers may exploit EPU to better predict sovereign CDS volatility. EPU may also help to improve forecasts of corporate CDS volatility if EPU translates into higher corporate credit risk (Bedendo and Colla, 2015).

The link between EPU and CDS volatility may also be useful in policy analysis. High CDS volatility comes with high EPU. Sovereign CDS volatility could thus serve as a timely market based indicator of EPU.

US EPU affects the CDS volatility of many other countries, but EU EPU does not. But why is US EPU so important? Is it because of strong economic or political ties? Or does US

[7] Information criteria suggest specifications of at most three lags.

[8] Another conceivable check would be to use for instance stock market volatility as an alternative to the EPU index. Such a strategy is problematic, for at least two reasons, however. First, stock market volatility is likely to be a noisy indicator of EPU. Substituting stock market volatility for EPU in the models would thus create an errors in variable problem. Second, CDS volatility might affect stock market volatility. Substituting stock market volatility for EPU could therefore worsen any potential reverse causality problem. This strategy is therefore not pursued in this paper.

EPU have an unduly strong effect on the behavior of CDS traders? Answering these questions requires further research.

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7 Figures

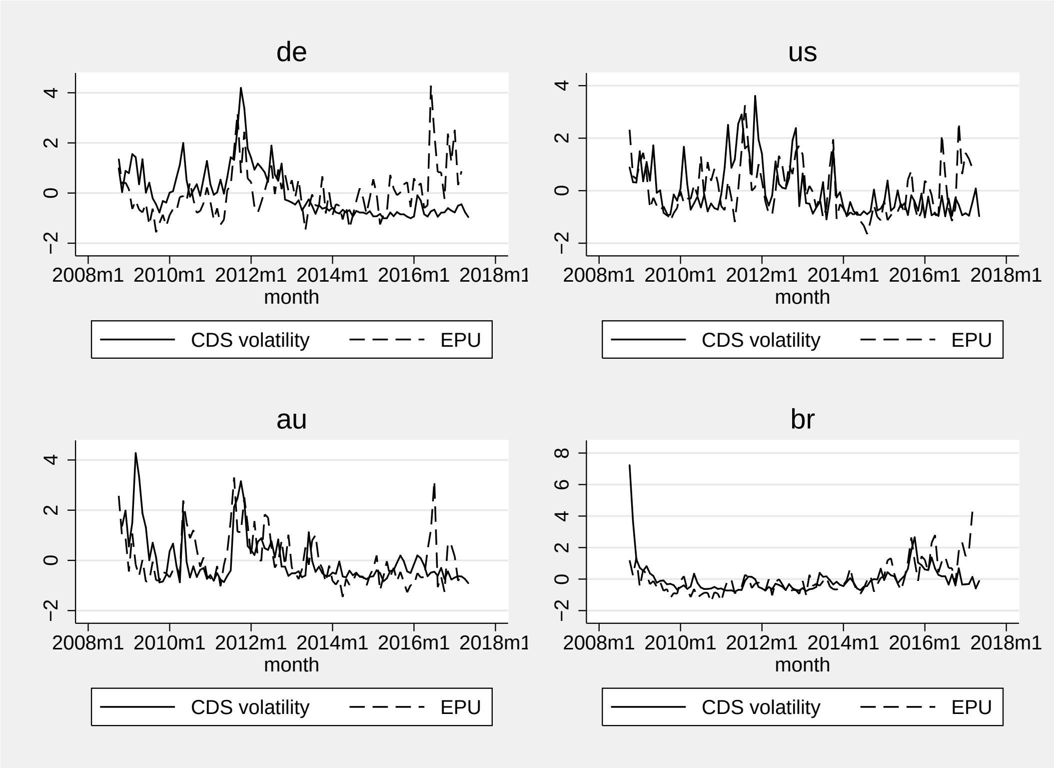

Figure 1: Evolution of standardized series of economic policy uncertainty and CDS volatility for Germany, the US, Australia, and Brazil.

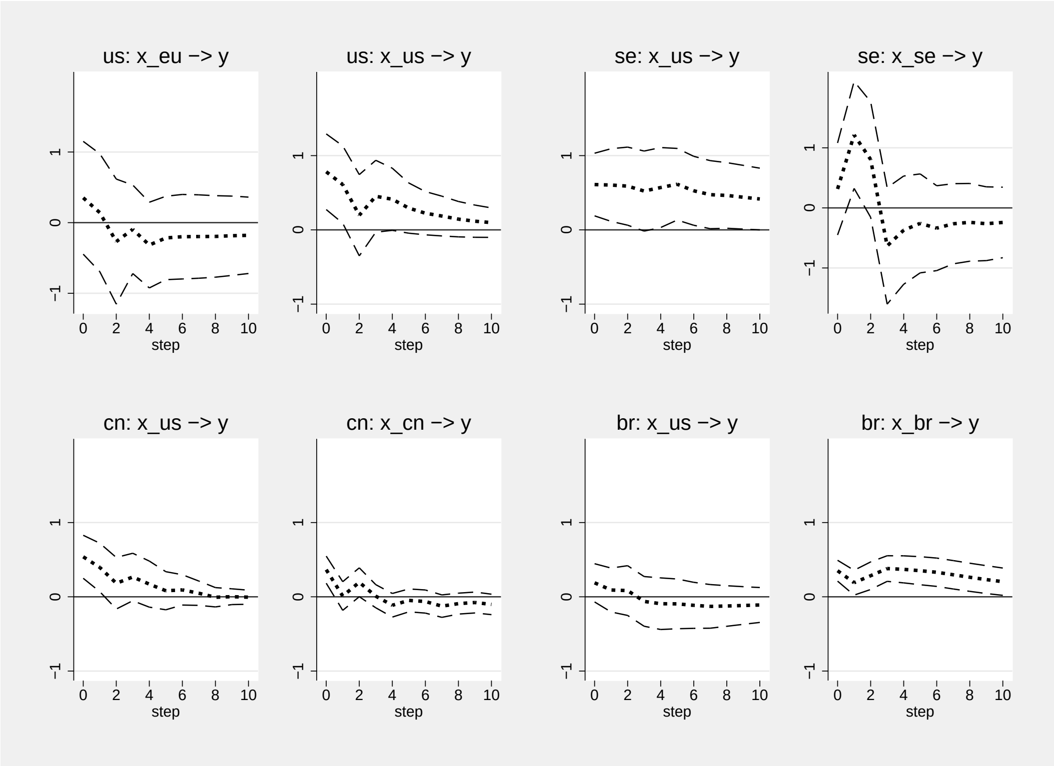

Figure 2: VAR models for the US, Sweden, China, and Brazil: response of sovereign CDS volatility y to external and domestic EPU shocks x.

8 Tables

Table 1: Summary statistics of economic policy uncertainty indices

country	mean	sd	min	max	N
de	164.3	67.0	59.6	451.4	102
fr	237.3	85.3	98.0	521.6	102
it	126.3	34.8	54.1	241.0	102
sp	122.6	44.3	54.4	276.4	102
nl	108.9	52.4	29.4	302.2	102
ir	145.9	46.7	34.0	235.7	102
se	99.7	17.5	62.2	156.7	101
gb	259.5	153.5	95.4	1141.8	102
us	137.9	44.8	63.9	283.7	102
jp	115.2	34.7	44.8	196.0	91
au	128.9	63.0	37.1	337.0	102
cn	190.3	128.1	26.1	694.8	102
ru	163.9	80.8	32.4	400.0	102
kr	149.0	64.1	56.6	408.7	102
br	176.6	106.2	22.3	630.8	102
cl	111.5	53.0	32.2	345.4	102
eu	184.7	61.3	91.4	432.6	102

Table 2: Summary statistics of daily CDS spreads

country	mean	sd	min	max	N
de	36.2	23.6	12.1	118.4	2218
fr	69.0	49.1	17.3	245.3	2218
it	191.0	119.1	50.0	586.7	2218
sp	184.5	130.9	47.3	634.3	2218
nl	45.9	28.8	13.1	133.8	2218
ir	245.2	243.7	36.6	1249.3	2218
se	34.3	25.5	12.6	159.0	2218
gb	50.5	28.3	15.4	165.0	2218
us	25.1	12.6	6.5	90.0	2218
jp	62.6	26.8	18.0	152.6	2218
au	49.6	23.9	19.8	185.0	2191
cn	99.1	34.3	52.0	284.0	2218
ru	252.0	144.8	116.4	1106.0	2218
kr	103.7	78.4	40.2	680.0	2218
br	200.3	99.0	91.2	606.3	2218
cl	97.9	39.9	48.5	309.9	2218

Table 3: Summary statistics of CDS volatility

country	mean	sd	min	max	N
de	16.6	16.4	0.1	85.6	104
fr	30.8	32.3	2.3	169.4	104
it	99.6	82.4	8.6	440.4	104
sp	96.8	80.9	6.5	354.0	104
nl	19.1	19.8	0.3	106.1	104
ir	101.9	126.6	2.9	816.9	104
se	15.6	18.7	0.1	89.6	104
gb	21.1	21.2	1.0	93.1	104
us	19.4	16.8	1.0	79.8	104
jp	26.1	22.3	0.6	113.3	104
au	18.7	18.8	1.6	99.0	103
cn	49.7	50.8	8.5	449.9	104
ru	164.3	253.9	26.0	1940.5	104
kr	65.9	127.7	6.3	1202.4	104
br	101.3	104.0	17.8	853.2	104
cl	52.3	48.7	6.4	401.8	104

Notes: CDS volatility is annualized and computed from daily data on a monthly frequency

Table 4: Economic policy uncertainty and CDS volatility: baseline model

country	β	p-value	R^2_{adj}	N
de	0.44	0.03	0.67	97
fr	0.38	0.02	0.69	97
it	0.39	0.06	0.57	97
sp	0.42	0.00	0.70	97
nl	0.02	0.89	0.70	97
ir	0.14	0.37	0.84	97
se	1.02	0.02	0.75	96
gb	0.13	0.33	0.71	97
us	0.55	0.04	0.29	97
jp	0.21	0.24	0.45	86
au	0.53	0.00	0.43	96
cn	0.11	0.13	0.28	97
ru	0.29	0.00	0.55	97
kr	0.42	0.00	0.62	97
br	0.35	0.00	0.67	97
cl	0.22	0.04	0.50	97

Notes: The Table reports estimates of the impact β of EPU on CDS volatility, along with p-values and the adjusted R-squared, R^2_{adj}, from the baseline model $y_m = \alpha_0 + \alpha_1 y_{m-1} + ... + \alpha_5 y_{m-5} + \beta x_m + u_m$. Log CDS volatility in month m is denoted as y_m, log EPU is x_m. N denotes the number of observations

Table 5: Multipliers for the impact of domestic economic policy uncertainty on CDS volatility.

country	δ_2	p-value	δ_1	p-value	δ_0	p-value	λ_0	p-value
de	0.69	0.00	0.67	0.02	-0.40	0.14	0.96	0.01
fr	0.49	0.02	0.17	0.39	-0.17	0.47	0.49	0.11
it	0.61	0.07	0.12	0.58	-0.07	0.86	0.66	0.15
sp	0.48	0.00	0.02	0.89	-0.03	0.89	0.47	0.11
nl	0.10	0.55	0.02	0.91	0.01	0.95	0.14	0.69
ir	0.22	0.25	0.13	0.46	-0.03	0.89	0.33	0.41
se	0.79	0.10	1.09	0.04	0.14	0.79	2.02	0.05
gb	0.71	0.01	0.29	0.26	-1.00	0.00	0.00	0.98
us	0.65	0.04	0.04	0.93	-0.06	0.87	0.63	0.17
jp	0.37	0.10	0.21	0.35	0.17	0.45	0.76	0.04
au	0.44	0.02	0.27	0.21	0.16	0.46	0.86	0.01
cn	0.31	0.00	-0.18	0.13	-0.03	0.80	0.11	0.39
ru	0.34	0.01	0.12	0.36	0.14	0.20	0.60	0.01
kr	0.53	0.01	0.04	0.89	0.03	0.87	0.59	0.09
br	0.43	0.00	0.04	0.69	0.21	0.05	0.68	0.00
cl	0.35	0.03	0.05	0.72	0.02	0.87	0.42	0.01

Notes: The table reports multipliers for effects of EPU changes on CDS volatility. The δ_2 is the multiplier for the immediate impact of a transitory change in domestic EPU, δ_1 is the multiplier for the effect in the next month, and δ_0 is the multiplier for the effect after two months. These multipliers are estimated from the representation $y_{m+2} = \gamma_0 + \gamma_1 y_{m-1} + ... + \gamma_5 y_{m-5} + \delta_2 x_{m+2} + \delta_1 x_{m+1} + \delta_0 x_m + e_{m+2}$ where y_{m+k} is log CDS volatility and x_{m+k} is log EPU in month $m+k$. The λ_0 is the multiplier for a permanent change in EPU over three months. This multiplier is estimated from the representation $y_{m+2} = \gamma_0 + \gamma_1 y_{m-1} + ... + \gamma_5 y_{m-5} + \lambda_2 \Delta x_{m+2} + \lambda_1 \Delta x_{m+1} + \lambda_0 x_m + e_{m+2}$. P-values are based on HAC standard errors.

Table 6: Impact of domestic and external economic policy uncertainty on CDS volatility: extended baseline model

country	β_1	p-value	β_2	p-value	R^2_{adj}	N
de	0.08	0.75	0.71	0.04	0.68	97
fr	0.15	0.42	0.53	0.03	0.70	97
it	0.23	0.27	0.48	0.01	0.60	97
sp	0.32	0.06	0.24	0.24	0.70	97
nl	-0.02	0.89	0.61	0.00	0.72	97
ir	0.09	0.57	0.56	0.00	0.85	97
se	0.62	0.20	0.44	0.10	0.75	96
gb	-0.01	0.97	0.40	0.09	0.72	97
us	0.68	0.06	-0.20	0.56	0.29	97
jp	0.06	0.73	0.58	0.00	0.50	86
au	0.43	0.01	0.25	0.31	0.43	96
cn	0.04	0.62	0.40	0.02	0.32	97
ru	0.29	0.00	0.01	0.96	0.54	97
kr	0.23	0.21	0.33	0.15	0.62	97
br	0.35	0.00	-0.04	0.78	0.67	97
cl	0.22	0.04	0.19	0.23	0.51	97

Notes: The table reports estimates of the impact of domestic and US EPU on CDS volatility along with p-values, the adjusted R-squared, R^2_{adj}, and the number of obsevations N. The coefficient β_1 and β_2 measure the impact of domestic and US EPU, respectively. For the US β_2 measures the impact of EU EPU. The estimates come from the extended baseline model $y_m = \alpha_0 + \alpha_1 y_{m-1} + ... + \alpha_5 y_{m-5} + \beta_1 x_m^{dom} + \beta_2 x_m^{ext} + u_m$ where y_m denotes log CDS volatility in month m, x_m^{dom} is domestic log EPU, and x_m^{ext} is external log EPU. P-values are based on HAC standard errors.

Table 7: Multipliers for domestic and external economic policy uncertainty

country	δ_2	p-value	δ_1	p-value	δ_0	p-value	φ_2	p-value	φ_1	p-value	φ_0	p-value	λ_0	p-value	κ_0	p-value
de	0.34	0.14	0.48	0.18	-0.66	0.04	0.63	0.09	0.25	0.51	0.52	0.12	0.16	0.74	1.40	0.02
fr	0.11	0.69	0.15	0.53	-0.14	0.65	0.85	0.02	-0.00	0.99	-0.05	0.87	0.12	0.77	0.80	0.15
it	0.36	0.20	0.00	0.99	0.02	0.96	0.68	0.01	0.17	0.46	-0.28	0.20	0.38	0.39	0.57	0.09
sp	0.26	0.15	-0.03	0.86	0.09	0.74	0.40	0.18	0.08	0.75	-0.36	0.25	0.32	0.36	0.12	0.80
nl	0.02	0.91	0.02	0.91	0.07	0.70	0.76	0.02	0.15	0.65	0.12	0.71	0.11	0.75	1.03	0.06
ir	0.22	0.25	0.13	0.43	-0.10	0.64	0.47	0.09	0.35	0.16	-0.42	0.08	0.25	0.51	0.40	0.32
se	0.29	0.58	0.89	0.13	-0.12	0.83	0.73	0.06	-0.06	0.85	0.19	0.51	1.06	0.34	0.86	0.11
gb	0.64	0.01	0.19	0.50	-1.03	0.00	0.28	0.35	0.21	0.43	0.14	0.57	-0.21	0.21	0.63	0.09
us	0.73	0.12	0.12	0.83	0.35	0.45	0.21	0.74	-0.19	0.78	-0.64	0.21	1.20	0.04	-0.62	0.31
jp	0.28	0.20	0.13	0.56	0.17	0.53	0.53	0.04	-0.33	0.26	0.44	0.15	0.58	0.12	0.63	0.13
au	0.42	0.05	0.25	0.24	0.12	0.58	0.15	0.56	-0.11	0.74	0.13	0.65	0.80	0.04	0.17	0.72
cn	0.28	0.02	-0.18	0.16	-0.06	0.58	0.31	0.05	-0.11	0.63	0.21	0.42	0.04	0.78	0.41	0.22
ru	0.33	0.00	0.14	0.26	0.13	0.23	-0.03	0.84	-0.26	0.30	-0.47	0.06	0.60	0.00	-0.77	0.07
kr	0.31	0.26	0.09	0.77	0.02	0.95	0.40	0.12	-0.14	0.69	0.04	0.92	0.42	0.36	0.30	0.62
br	0.43	0.00	0.06	0.61	0.22	0.04	-0.10	0.58	-0.12	0.54	-0.14	0.38	0.71	0.00	-0.36	0.22
cl	0.34	0.03	0.05	0.70	0.03	0.81	0.12	0.49	-0.02	0.93	-0.01	0.97	0.42	0.02	0.08	0.85

Notes: The table reports multipliers for the impact of domestic and external EPU on CDS volatility. The δ_2 is the multiplier for the immediate impact of a transitory change in domestic EPU, δ_1 is the multiplier for the effect next month, and δ_0 is the multiplier for the effect after two month. The φ_2, φ_1, and φ_0 are the corresponding multipliers for transitory changes in US EPU. For the US these multipliers are for changes in EU EPU. The multipliers are estimated from the representation $y_{m+2} = \gamma_0 + \gamma_1 y_{m-1} + ... + \gamma_5 y_{m-5} + \delta_2 x^{dom}_{m+2} + ... + \delta_0 x^{dom}_m + \varphi_2 x^{ext}_{m+2} + ... + \varphi_0 x^{ext}_m + e_{m+2}$ where y_m denotes the log of CDS volatility, and x^{dom}_m and x^{ext}_m are the logs of domestic and external EPU in month m, respectively. The λ_0 and κ_0 are multipliers for a permanent change in domestic and external EPU over three month. These multipliers are estimated from the representation $y_{m+2} = \gamma_0 + \gamma_1 y_{m-1} + ... + \gamma_5 y_{m-5} + \lambda_2 \Delta x^{dom}_{m+2} + ... + \lambda_0 x^{dom}_m + \kappa_2 \Delta x^{ext}_{m+2} + ... + \kappa_0 x^{ext}_m + e_{m+2}$. P-values are based on HAC standard errors.

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