

Spillovers Between Sovereign CDS, Exchange Rate and Market Fear: Evidence From Latin America

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Efecto contagio entre los CDS soberanos, el tipo de cambio y el miedo del mercado: Evidencia de América Latina

Efeitos colaterais entre CDS soberano, taxa de câmbio e medo do mercado: evidências da América Latina

This study examines the spillover effects among sovereign Credit Default Swap (CDS) markets, exchange rates, and market fear in Latin America. Using a Time-Varying Parameter Vector Autoregressive (TVP-VAR) model, we identify significant spillovers among these markets. Sovereign CDS spreads from Colombia, Mexico, and Peru are the main transmitters of risk, while the US dollar and Euro act as dominant sources of volatility in exchange rate markets. The results reveal a bidirectional relationship between market fear, measured by the VIX and OVX indices, and CDS and exchange rates. These interactions increase vulnerability during periods of global uncertainty, emphasizing the need for macroprudential policies to manage financial risks in emerging economies. The findings contribute to the understanding of financial contagion in Latin America and offer policy insights into mitigating external financial shocks.

Este estudio examina los efectos de contagio entre los mercados de Credit Default Swaps (CDS) soberanos, los tipos de cambio y el miedo de los mercados en América Latina. Utilizando un modelo autorregresivo vectorial con parámetros variables en el tiempo (TVP-VAR), identificamos importantes efectos de contagio entre estos mercados. Los spreads de CDS soberanos de Colombia, México y Perú son los principales transmisores de riesgo, mientras que el dólar estadounidense y el euro actúan como fuentes dominantes de volatilidad en los mercados de tipos de cambio. Los resultados revelan una relación bidireccional entre el miedo del mercado, medido por los índices VIX y OVX, y los CDS y los tipos de cambio. Estas interacciones aumentan la vulnerabilidad en periodos de incertidumbre mundial, subrayando la necesidad de políticas macroprudenciales para gestionar los riesgos financieros en las economías emergentes. Los resultados contribuyen a la comprensión del contagio financiero en América Latina y ofrecen ideas de política para mitigar los choques financieros externos.

Este estudo examina os efeitos de repercussão entre os mercados de Credit Default Swap (CDS) soberanos, as taxas de câmbio e o medo do mercado na América Latina. Usando um modelo autorregressivo vetorial de parâmetros variáveis no tempo (TVP-VAR), identificamos repercussões significativas entre esses mercados. Os spreads de CDS soberanos da Colômbia, México e Peru são os principais transmissores de risco, enquanto o dólar americano e o euro atuam como fontes dominantes de volatilidade nos mercados de taxas de câmbio. Os resultados revelam uma relação bidireccional entre o medo do mercado, medido pelos índices VIX e OVX, e as taxas de câmbio e CDS. Essas interações aumentam a vulnerabilidade durante períodos de incerteza global, enfatizando a necessidade de políticas macroprudenciais para gerenciar riscos financeiros em economias emergentes. Os resultados contribuem para a compreensão do contágio financeiro na América Latina e oferecem percepções de políticas para atenuar os choques financeiros externos.

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1. Introduction

Financial markets have become increasingly interconnected across instruments and sectors, particularly in emerging economies such as Latin America (Gamboa-Estrada & Romero, 2024). Sovereign credit default swaps (CDS) have emerged as crucial tools for managing credit risk, enabling investors to hedge against sovereign debt defaults (Hui & Fong, 2015; Mensi, Gemici, Polat, & Kang, 2025). The relationship between exchange rates and sovereign default risk is well-documented, as fluctuations in currency values often reflect broader economic vulnerabilities linked to credit risk Liu, Sun, & Li (2023). However, recent studies such as those by Feng, Sun, Liu, & Li (2021) and Liu et al. (2023) emphasize the importance of market sentiment in understanding sovereign default risk and exchange rates.

This study investigates the dynamics of volatility spillovers between financial markets under conditions of heightened uncertainty and fear. In particular, it focuses on sovereign CDS and exchange rate markets in Latin America, a region characterized by significant exposure to global economic shocks. This study explores whether periods of increased market fear amplify interdependence between these markets, thereby influencing regional financial stability.

Sovereign CDS spreads are widely recognized as indicators of investors' perceptions of a country's political and economic stability (Aljarba, Naifar, & Almeshal, 2024; M'beirick & Haddou, 2024). The CDS market offers participants an opportunity to mitigate credit risk, while allowing sellers to earn income through credit risk exposure by charging a fixed premium, known as the CDS spread (Mensi et al., 2025). Global financial markets are consistently influenced by uncertainty driven by political events, commodity price shocks, and economic recessions, which heighten perceived risks and generate market fear (Lu, Sun, & Ge, 2017). Pan, Wang, Xiao, Xu, & Zhang (2024) find that a 1% increase in uncertainty causes a 0.85% increase in CDS spreads.

Evidence suggests that financial shocks increase risk aversion among investors, often resulting in currency depreciation. This depreciation exacerbates sovereign risk for highly indebted countries by increasing their financial vulnerability to exchange rate fluctuations (Feng et al., 2021). While the relationship between CDS and exchange rates is well established, few studies have addressed both phenomena simultaneously, particularly in the context of uncertainty and market fear. Feng et al. (2021) explore this connection by analyzing fear-driven spillovers in Latin American markets, specifically in Mexico and Brazil, the region's largest economies. Key indices, such as the CBOE Volatility Index (VIX) and the Oil Volatility Index (OVX), are frequently used to capture investor sentiment and market volatility, reflecting broader macroeconomic expectations (Sun, Chen, Wang, & Li, 2020).

This study delves into the concept of spillover effects, which describe how fluctuations in one market influence interconnected markets (Yang, Zhou, & Cheng, 2020). Specifically, we address two key questions: How do return spillovers occur between sovereign CDS and exchange rate markets? and how does the inclusion of market fear into the analysis affect the paired spillovers within the "sovereign CDS–exchange rate" system? To quantify these effects, we apply a time-varying parameter vector autoregressive (TVP-VAR) model based on the Dynamic Total Connectedness (DTC) measure introduced by Antonakakis, Chatziantoniou, & Gabauer (2020). Our aim is to identify how changes in sovereign CDS spreads from Latin American countries affect

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**TVP-VAR;
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PALABRAS CLAVE

**TVP-VAR; Efecto
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exchange rates and risk perception globally and vice versa, particularly during periods of heightened economic uncertainty.

Our results show a high connectivity between sovereign CDS and exchange rate markets, identifying Mexico, Colombia, and Peru as net return spillover transmitters in the sovereign CDS group. On the other hand, currencies such as the dollar and the euro are transmitters in the exchange rate market. However, when incorporating the market fear variables, the return spillover index increases, demonstrating the significance of these variables in the analysis.

The findings contribute to the literature by providing a deeper understanding of spillover effects across financial markets, with an emphasis on the underexplored Latin American context. This region's vulnerability to external shocks underscores the importance of analyzing how sovereign CDS, exchange rates, and market fear interact. Insights from this research can inform macroprudential policies aimed at mitigating risk and enhancing financial stability in emerging economies.

The remainder of this paper is organized as follows. Section 2 presents a brief literature review; Section 3 presents the methodology used in this analysis. Section 4 provides a descriptive analysis of the data and the variables. Section 4 discusses the results for both the static and dynamic forms. Finally, Section 5 concludes the study and presents the main findings.

2. Related Literature

The relationship between sovereign risk and exchange rate stability has been a subject of study for decades. However, this link has gained particular relevance in the field of international finance since the 2008 global financial crisis and subsequent sovereign debt crisis in Europe. These crises drove increased volatility in the financial and foreign exchange markets. For example, (Hui & Fong, 2015) document how, in 2008, the US dollar depreciated by 30% against the Japanese yen, while the euro fell by 19% against the dollar in 2019 due to tensions in Europe.

In specialized literature, it is possible to identify two main lines of research on sovereign risk. First, we examined its relationship with specific markets. For example, Wang & Liang, (2024) explore the interaction between sovereign CDS, exchange rates, and volatility in emerging markets and find evidence of long-term integration. Similarly, Rikhotso & Simo-Kengne, (2022) analyze the structure of the dependence between sovereign CDS and global risk factors in BRICS countries (Brazil, Russia, India, China, and South Africa) by means of a copula model, identifying heterogeneous effects between each country's sovereign CDS and risk factors (Brent crude oil price, global equity market volatility index, and local exchange rates against the US dollar).

The second line of research addresses the interaction between sovereign and currency risks. Augustin, Chernov, & Song (2020) use CDS quanto spreads to analyze how sovereign credit risk is linked to currency devaluations, identifying global and regional volatility factors that influence this relationship.

Other studies such as those by (Feng et al., 2021; Liu et al., 2023; M'beirick & Haddou, 2024) reaffirmed the strong connection between these variables from different methodological approaches.

Both sovereign risk and exchange rate are significantly influenced by external factors that generate market uncertainty. Lu et al., (2017) highlight the use of indices such as the VIX and the OVX as barometers of market sentiment. Feng et al. (2021) employ the spillover volatility index to explore the relationship between sovereign CDS, exchange rate and market fear, showing that the connection reaches 51.3%, increasing when incorporating these uncertainty variables

Liu et al. (2023) use wavelet analysis to investigate the co-movements between sovereign CDS, exchange rate, and market sentiment in BRICS countries, Japan, France, Germany, and PIIGS countries. Their results show a positive relationship in the medium to long term, with VIX and OVX as key drivers in commodity-dependent economies. Complementarily, Huang & Liu (2023) construct interaction networks between sovereign CDS, equity, currency and commodity markets in G20 countries, identifying high levels of risk spillover and a predominant role of emerging countries as uncertainty transmitters.

Based on the literature review and the research questions, this study proposes the following hypotheses. H_1 : Return spillovers between sovereign CDS and exchange rate markets are significant and vary depending on market conditions, showing stronger effects during periods of heightened financial instability. H_2 : The inclusion of market fear measures such as VIX and OVX amplifies the paired spillovers between sovereign CDS and exchange rate markets, leading to increased volatility transmission.

In summary, the literature confirms the close relationship between sovereign CDS and the exchange rate, influenced by external factors such as market sentiment and global uncertainty. This study seeks to contribute to this line of research by analyzing how these relationships manifest in emerging and developed markets, considering the influence of risk and fear measures.

3. Methodology

We use the approach developed by Antonakakis, Chatziantoniou, & Gabauer (2020) as an extension to the Spillover Index proposed by Diebold & Yilmaz (2009, 2012, 2014) to study the

$$y_t = \Phi_t y_{t-1} + \epsilon_t \quad \epsilon_t \sim N(0, S_t) \quad (1)$$

$$\text{vec}(\Phi_t) = \text{vec}(\Phi_{t-1}) + \xi_t \quad \xi_t \sim N(0, \Xi_t) \quad (2)$$

Where y_t , ϵ_t and ξ_t a vector $(N \times 1)$, and S_t and Φ_t are Ξ_t matrixes of order $(N \times N)$. The approach of Diebold & Yilmaz (2012) uses time-varying parameters of moving average vectors (TVP - VMA) as the generalized forecast error variance decomposition (GFEVD) of (Koop et al., 1996; Pesaran and Shin, 1998). Thus, using Wold's theorem representation is possible to transform the TVP-VAR into a VMA as:

$$x_t = \sum_{i=1}^p \Phi_i x_{t-1} + \epsilon_t = \sum_{j=1}^{\infty} A_{jt} \epsilon_{t-j} + \epsilon_t$$

Therefore, the GFEVD could be expressed as:

$$\varnothing_{ij,t}^H(J) = \frac{s_{ii,t}^{-1} \sum_{t=1}^{J-1} \left(\rho_i' A_t S_t \rho_j \right)^2}{\sum_{j=1}^N \sum_{t=1}^{J-1} (\rho_i A_t S_t A_t' \rho_i')} \quad \tilde{\varnothing}_{ij,t}^H(J) = \frac{\varnothing_{ij,t}^g(J)}{\sum_{j=1}^N \varnothing_{ij,t}^g(J)} \quad (3)$$

Where ρ_t is a vector with a one at position i and zeros at all others positions. By construction $\sum_{j=1}^N \tilde{\varnothing}_{ij,t}^N(J) = 1$ and $\sum_{i,j=1}^N \sum_{j=1}^N \tilde{\varnothing}_{ij,t}^N(J) = N$. The parameter $\tilde{\varnothing}_{ij,t}^H(J)$ represents a directional connectivity loss from market j to market i .

Therefore, with the GFEVD it is possible to calculate the spillover measures proposed by Diebold & Yilmaz (2014). Then, we define the total spillover effect as:

$$TS_t = \frac{\sum_{j=1; j \neq i}^H \tilde{\varnothing}_{ij,t}^H(J)}{N}$$

The net spillover index is defined as:

$$NS_{ij,t}^H = \left(\tilde{\varnothing}_{ji,t}^H(J) - \tilde{\varnothing}_{ij,t}^H(J) \right) * 100$$

Additionally, it is possible to generate a spillover index by groups, following the work done by Sun et al., (2020) where it is possible to study the within-group and between-group effect. Assuming that group K is composed of $k_1, k_2, k_3, \dots, k_n$. The within-group effect can be obtained as:

$$SW_{k \rightarrow k} = \frac{\sum_{\eta, \delta=1; \eta \neq \delta}^n \tilde{\varnothing}_{k_\eta, k_\delta}^H(J)}{\sum_{i,j=1; i \neq j}^n \tilde{\varnothing}_{i,j}^H(J)}$$

Then, the spillover effect of group K into another group L can be expressed as:

$$SW_{k \rightarrow l} = \frac{\sum_{\alpha=1}^n \sum_{\beta=1}^m \tilde{\varnothing}_{l_\beta, k_\alpha}^H(J)}{\sum_{i,j=1; i \neq j}^n \tilde{\varnothing}_{i,j}^H(J)}$$

4. Data

For this study, we used a sample of G7 countries (United States, Japan, Germany, the United Kingdom, France, and Italy) and Latin American economies (Brazil, Mexico, Chile, Colombia, and Peru) from January 1, 2009, to June 30, 2024. However, Canada and Argentina were excluded from the sample due to insufficient data availability. This sample is representative of both developed economies (G7) and emerging markets in Latin America.

Regarding the selection of variables, we use five-year sovereign CDS spreads for the 12 countries, focusing on the most liquid markets in sovereign CDS trading (Feng et al., 2021). For the foreign exchange market, the study includes the exchange rates of individual currencies against the U.S. dollar, as well as the U.S. dollar. Dollar Index (USDIX). For France, Germany, and Italy, which are part of the Eurozone, the Euro-to-US dollar exchange rate was used.

To capture market fear and volatility, two widely recognized indices were employed: the CBOE Volatility Index (VIX), based on S&P 500 index options, and the CBOE Crude Oil Volatility Index (OVX), which reflects fluctuations in the crude oil market. We selected these indices because of their relevance in capturing investor sentiment and market volatility. All data were sourced from DataStream by Refinitiv, ensuring standardized accuracy and consistency across the variables used in the study.

During the data preprocessing phase, this study applied first-order differences to all variables to capture the daily fluctuations in sovereign CDS spreads, exchange rates, and market fear variables.

5. Empirical Results

This section presents the findings of our empirical analysis, directly addressing the research questions and hypotheses formulated in this study. The results provide evidence on the spillovers between sovereign CDS and exchange rate markets, as well as the role of market fear in amplifying these interactions.

5.1. Spillover Effects between Sovereign CDS and Exchange Rate Markets

Table 1 presents the static return spillover results for the sample. The return spillover index for the “sovereign CDS exchange rate” system was 67.81%, indicating a high level of interdependence between these variables. This means that on average, 67.81% of the forecast error variance in these variables is attributed to spillover effects, with the remaining 32.19% potentially arising from idiosyncratic shocks. These findings support the first hypothesis that spillovers are significant and that they vary under different market conditions. Specifically, spillovers intensify during periods of financial stress, as seen during the European sovereign debt crisis, the COVID-19 pandemic, and geopolitical tensions such as the Russia-Ukraine War.

The “From” column in **Table 1** indicates the total percentage of variance of a market that is attributable to all other markets (i.e., how much one market receives from the others). On the other hand, the “To” row shows the contribution of a market to the forecast variance of all other markets. Similarly, the NET row calculates the difference between what a market contributes to others (To) and what it receives (From). A positive value indicates that a market is a net sender of volatility, whereas a negative value indicates that it is a net receiver. The diagonal values represent part of the return spillover explained internally by the market itself. For example, the USA has 51.69% of its spillover explained by itself.

Among the sovereign CDS variables, Latin American countries exhibit the strongest spillover effects, with Mexico acting as the largest transmitter, followed by Colombia, and Peru. These developing economies also receive the most spillovers, making Latin American sovereign CDSs net spillover transmitters. In contrast, the US dollar and euro, in the context of exchange rate variables, are the largest transmitters of spillovers, receiving the least from other variables, thus becoming net transmitters of risk. This highlights that the sovereign CDS and exchange rates of Latin American countries are not only influenced by international markets, but also have a notable impact on them.

5.2. Impact of Market Fear on Sovereign CDS–Exchange Rate Spillovers

To evaluate the second hypothesis, we incorporate the market fear measures (VIX and OVX) into the spillover analysis. **Table 2** shows that the spillover index increases from 67.81% to 68.78% when market fear is included, confirming that uncertainty amplifies the volatility transmission between sovereign CDS and exchange rate markets.

Further, our findings indicate a bidirectional relationship between market fear and financial variables: while the VIX and OVX significantly affect CDS and exchange rates, changes in CDS spreads and exchange rates also influence fear indices. This mutual reinforcement exacerbates financial instability during periods of heightened uncertainty, supporting the hypothesis that fear-driven spillovers intensify systemic risks.

The analysis also investigates the spillover effects within and between the sovereign CDS market, exchange rate market, and market fear. As shown in **Table 3**, 32.97% of the spillover effects occur within the sovereign CDS market, 22.68% within the exchange rate market, and 0.77% within the market fear group. When looking at the spillover effects between groups, the sovereign CDS market contributes 15.66% to the exchange rate market and 4.20% to market fear, while the exchange rate market contributes 14.02% to the CDS market and 3.4% to market fear. These findings suggest that the relationships between the variables within the same group are stronger than those across different groups, which is consistent with the findings of Sun et al. (2020) and Feng et al. (2021). Interestingly, the spillover effects related to market fear show that cross-group transmission is greater than within-group effects, with spillovers from market fear to the CDS market (3.26%) and exchange rate market (3.03%).

In terms of market fear and cross-group interactions, **Table 4** shows the contribution of each variable from market fear to the sovereign CDS exchange rate system. The spillover from market fear to the CDS exchange rate system is 6.29%, with the VIX contributing 4.11% and OVX contributing 2.18%. Conversely, the spillover from the CDS-exchange rate system to market fear is 7.60%, indicating a stronger contribution from the financial market. These results reveal a bidirectional relationship, where market fear influences sovereign CDS and exchange rates and vice versa.

Table 1. - Spillovers of Sovereign CDS and Exchange Rate

	CDS Market										Exchange Rate Market										FROM
	USA	UK	IT	AL	FR	JA	BR	MX	CL	CO	PE	USDX	GBP	EU	JP	BR	MX	CL	CO	PE	
USA	51.69	4.55	3.21	4.73	3.51	2.18	1.99	2.2	2	2.38	2.44	2.98	1.96	3.36	1.86	1.91	2.01	1.73	1.48	1.83	48.31
UK	3.29	41.41	5.74	7.25	7.44	2.48	2.66	3.35	2.82	3.14	3.12	2.07	2.41	2.04	1.63	2.11	2.16	1.55	1.86	1.48	58.59
IT	2.18	5.28	36.56	4.74	7.41	1.73	4.46	5.05	4.38	5.07	4.89	2.18	2.03	2.16	2.3	1.54	2.63	1.71	2	1.7	63.44
AL	3.59	7.58	5.44	43.77	8.65	2.39	2.8	2.83	2.56	2.98	2.96	1.75	1.59	1.78	1.16	1.91	1.87	1.58	1.46	1.35	56.23
FR	2.63	7.35	8.31	8.1	40.04	2.41	2.88	3.41	2.9	3.35	3.34	1.94	1.74	1.92	1.73	1.8	1.94	1.4	1.55	1.26	59.96
JA	2.34	3.52	3.2	3.22	3.63	46.82	3.74	4.09	3.67	4.21	3.96	1.71	1.64	1.54	1.82	2.37	2.71	1.76	2.28	1.75	53.18
BR	0.82	1.27	2.47	1.43	1.44	1.02	19.05	12.76	10.04	12.46	11.29	2.08	1.73	1.85	1.11	5.3	4.76	3.06	3.79	2.26	80.95
MX	0.85	1.52	2.62	1.28	1.61	1.06	12.1	17.75	10.75	13.37	12.3	2.01	1.88	1.8	1.28	3.14	5.56	2.84	3.81	2.47	82.25
CL	0.94	1.48	2.48	1.56	1.65	1.03	10.69	12.08	20.4	12.11	12.38	1.75	1.71	1.55	1.46	3.06	4.35	3.39	3.68	2.27	79.6
CO	0.92	1.46	2.65	1.4	1.63	1.06	11.89	13.5	10.85	17.82	12.68	1.96	1.78	1.74	1.22	3.13	4.7	2.86	4.39	2.35	82.18
PE	1.01	1.48	2.56	1.47	1.61	0.98	10.97	12.68	11.53	12.99	18.92	2	1.68	1.8	1.29	2.89	4.47	2.94	3.57	3.15	81.08
USDX	1.48	1.26	1.73	1.08	1.34	0.72	2.57	2.52	1.86	2.42	2.36	25.12	12.03	21.2	6.23	3.14	4.11	3.44	3.03	2.35	74.88
GBP	1.34	1.76	1.97	1.27	1.52	0.99	2.82	3.08	2.37	2.83	2.58	14.85	31.81	11.32	3.15	3.05	4.73	3.26	2.82	2.48	68.19
EU	1.81	1.4	1.84	1.13	1.41	0.62	2.4	2.38	1.74	2.29	2.28	23.02	9.96	27.27	4.54	3.21	4.42	3.22	2.84	2.24	72.73
JP	1.88	1.46	2.53	1.26	1.66	1.28	2.39	2.79	2.62	2.61	2.66	10.07	4.11	6.48	45.21	2.25	3.01	2.08	2.02	1.63	54.79
BR	0.82	1.13	1.23	1.12	1.06	0.83	7.8	4.91	3.96	4.81	4.36	3.89	3.13	3.7	1.69	32.78	8.57	5.17	5.54	3.49	67.22
MX	0.9	1.25	1.85	1.14	1.28	0.79	5.93	7.21	4.64	6.01	5.7	4.55	4.08	4.48	1.96	7.24	26.13	5.58	5.64	3.63	73.87
CL	1.08	1.25	1.57	1.19	1.2	0.79	4.78	4.67	4.79	4.69	4.65	4.45	3.4	3.78	1.69	5.2	6.67	32.41	6.96	4.79	67.59
CO	0.92	1.22	1.79	1	1.16	1.26	5.51	5.81	4.93	6.53	5.27	3.86	2.9	3.33	1.48	5.42	6.38	6.61	29.89	4.72	70.11
PE	1.24	1.26	2.01	1.08	1.39	1.11	4.03	4.52	3.64	4.31	5.44	3.43	2.83	2.99	1.55	4.02	4.85	5.53	5.84	38.93	61.07
TO	30.06	47.47	55.2	45.45	50.58	24.73	102.41	109.84	92.04	108.57	104.66	90.57	62.57	78.82	39.16	62.7	79.89	59.71	64.57	47.2	1356.21
NET	-18.25	-11.12	-8.23	-10.78	-9.38	-28.4	21.46	27.59	12.44	26.39	23.58	15.69	-5.62	6.1	-15.63	-4.53	6.02	-7.88	-5.54	-13.86	67.81

Note: The results are based on a TVP-VAR model with a lag length of order 1 as determined by the Schwarz Information Criterion (BIC) and a generalized prediction error variance decomposition with 10 steps ahead.

Table 2. - Spillovers of Sovereign CDS, Exchange Rate and Market Fear

	CDS Market										Exchange Rate Market										Market Fear		FROM
	USA	UK	IT	AL	FR	JA	BR	MX	CL	CO	PE	USD	GBP	EU	JP	BR	MX	CL	CO	PE	VIX	OVX	
USA	50.57	4.54	3.15	4.80	3.42	2.00	1.93	2.13	2.05	2.35	2.42	2.85	1.86	3.15	1.83	1.86	1.87	1.67	1.39	1.82	1.22	1.14	49.43
UK	3.15	40.38	5.85	7.03	7.46	2.32	2.49	3.18	2.76	2.93	2.90	1.94	2.32	1.89	1.47	1.99	2.06	1.45	1.75	1.39	1.70	1.59	59.62
IT	2.11	5.26	34.54	4.54	7.00	1.55	4.29	4.78	4.18	4.82	4.68	2.19	1.98	2.17	2.14	1.42	2.46	1.51	1.77	1.57	3.27	1.79	65.46
AL	3.49	7.46	5.27	42.60	8.69	2.27	2.65	2.68	2.54	2.84	2.80	1.76	1.53	1.72	1.10	1.77	1.70	1.46	1.41	1.29	1.60	1.38	57.40
FR	2.47	7.32	8.07	8.06	38.70	2.26	2.78	3.25	2.77	3.20	3.15	1.97	1.75	1.93	1.65	1.73	1.80	1.31	1.51	1.10	1.85	1.37	61.30
JA	2.07	3.52	3.09	3.08	3.55	44.51	3.52	3.86	3.54	3.99	3.74	1.58	1.48	1.47	1.74	2.28	2.62	1.63	2.05	1.71	3.04	1.95	55.49
BR	0.70	1.21	2.35	1.33	1.40	0.94	18.05	12.11	9.58	11.78	10.64	1.91	1.66	1.70	1.05	5.04	4.52	2.95	3.53	2.13	4.00	1.43	81.95
MX	0.73	1.44	2.40	1.19	1.54	1.00	11.40	16.68	10.22	12.66	11.61	1.86	1.79	1.67	1.18	2.93	5.29	2.76	3.54	2.40	4.15	1.57	83.32
CL	0.84	1.44	2.28	1.47	1.52	0.98	10.10	11.49	18.98	11.50	11.71	1.67	1.66	1.45	1.33	2.89	4.16	3.26	3.52	2.20	4.00	1.56	81.02
CO	0.79	1.37	2.48	1.30	1.56	0.99	11.23	12.84	10.35	16.83	11.95	1.85	1.76	1.63	1.13	2.92	4.47	2.75	4.09	2.27	3.85	1.60	83.17
PE	0.88	1.41	2.44	1.35	1.53	0.96	10.36	12.11	11.01	12.31	17.86	1.86	1.63	1.63	1.18	2.70	4.26	2.84	3.33	3.05	3.84	1.47	82.14
USD	1.37	1.24	1.73	1.10	1.36	0.63	2.42	2.40	1.83	2.36	2.28	24.32	11.73	20.73	6.10	2.99	3.89	3.38	2.80	2.19	2.09	1.05	75.68
GBP	1.24	1.71	1.90	1.21	1.53	0.89	2.79	3.04	2.32	2.86	2.61	14.26	30.54	10.90	2.97	2.71	4.38	3.18	2.67	2.40	2.51	1.38	69.46
EU	1.65	1.33	1.81	1.12	1.42	0.60	2.32	2.33	1.72	2.24	2.21	22.29	9.72	26.15	4.38	3.02	4.16	3.11	2.65	2.06	2.47	1.23	73.85
JP	1.70	1.31	2.31	1.13	1.51	1.15	2.26	2.58	2.37	2.40	2.44	9.54	3.81	6.15	42.33	2.00	2.70	1.99	1.94	1.51	4.97	1.89	57.67
BR	0.77	1.12	1.14	1.03	1.05	0.69	7.53	4.71	3.78	4.60	4.19	3.71	2.79	3.45	1.55	30.71	8.16	5.12	5.35	3.08	3.60	1.83	69.29
MX	0.74	1.14	1.65	0.96	1.10	0.69	5.55	6.79	4.39	5.64	5.36	4.11	3.66	3.98	1.72	6.72	23.85	5.28	5.33	3.29	5.60	2.44	76.15
CL	0.97	1.22	1.43	1.11	1.12	0.74	4.57	4.51	4.61	4.48	4.47	4.26	3.26	3.60	1.59	5.07	6.55	30.26	6.65	4.36	3.13	2.05	69.74
CO	0.82	1.10	1.51	0.95	1.13	1.07	5.18	5.49	4.80	6.21	4.99	3.59	2.75	3.09	1.44	5.19	6.23	6.44	28.43	4.31	3.07	2.22	71.57
PE	1.22	1.15	1.80	1.07	1.25	0.99	3.91	4.50	3.62	4.28	5.38	3.29	2.86	2.81	1.45	3.72	4.56	5.14	5.41	37.32	2.29	2.00	62.68
VIX	0.66	1.25	2.39	1.09	1.23	0.82	6.09	6.64	5.61	6.18	6.04	2.40	2.49	2.51	3.54	3.42	6.44	2.92	3.20	1.91	28.42	4.75	71.58
OVX	1.03	1.65	2.04	1.46	1.43	1.34	3.14	3.61	3.15	3.56	3.20	1.81	2.01	1.79	1.99	2.53	3.88	2.77	3.26	2.55	6.97	44.83	55.17
TO	29.41	49.17	57.07	46.36	51.81	24.90	106.50	115.03	97.22	113.17	108.76	90.72	64.49	79.39	42.53	64.89	86.14	62.94	67.17	48.60	69.20	37.71	1513.16
NET	-20.03	-10.45	-8.39	-11.05	-9.48	-30.60	24.54	31.71	16.20	30.01	26.63	15.03	-4.97	5.54	-15.15	-4.40	9.99	-6.81	-4.40	-14.08	-2.38	-17.46	68.78

Note: The results are based on a TVP-VAR model with a lag length of order 1 as determined by the Schwarz Information Criterion (BIC) and a generalized prediction error variance decomposition with 10 steps ahead.

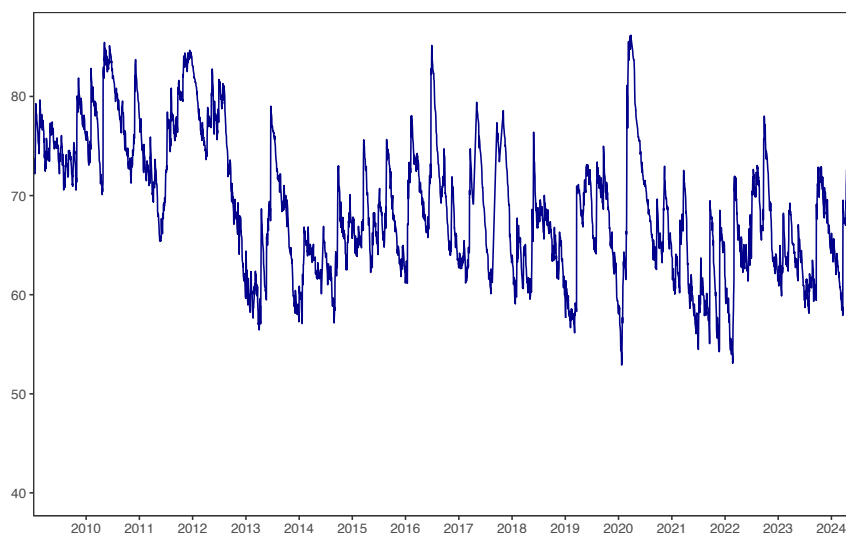
Table 3. - Spillovers between of Sovereign CDS, Exchange Rate and Market Fear

Spillover	CDS Market											Exchange Rate Market										Market Fear		Spillover
	USA	UK	IT	AL	FR	JA	BR	MX	CL	CO	PE	USDX	GBP	EU	JP	BR	MX	CL	CO	PE	VIX	OVX		
Withing CDS	17.23	34.97	37.38	34.15	37.67	15.27	60.75	68.43	59	68.38	65.6													32.97%
CDS to exchange rate	10.48	11.32	15.28	9.68	11.47	7.45	36.53	36.35	29.44	35.07	33.93													15.66%
CDS to market fear	1.69	2.9	4.43	2.55	2.66	2.16	9.23	10.25	8.76	9.74	9.24													4.20%
Withing exchange rate												65.05	40.58	54.71	21.2	31.42	40.63	33.64	32.8	23.2				22.68%
Exchange rate to CDS												21.44	19.42	20.41	15.8	27.53	35.21	23.59	27.89	20.93				14.02%
Exchange rate to market fear												4.21	4.5	4.3	5.53	5.95	10.32	5.69	6.46	4.46				3.40%
Withing market fear																					6.97	4.75		0.77%
Market fear to CDS																					32.52	16.85		3.26%
Market fear to exchange rate																					29.73	16.09		3.03%

Table 4 - Spillovers between Sovereign CDS - Exchange Rate System and Market Fear

Spillover	VIX	OVX	ALL
To sovereign CDS - Exchange Rate System	4.11%	2.18%	6.29%
From sovereign CDS - Exchange Rate System	4.42%	3.19%	7.60%
Net	-0.30%	-1.01%	-1.31%

Figure 1 - Dynamic Total Spillover



Note: The results are based on a TVP-VAR model with a lag length of order 1 as determined by the Schwarz Information Criterion (BIC) and a generalized prediction error variance decomposition with 10 steps ahead.

The analysis so far has focused on static results, providing a snapshot of the relationships between sovereign CDS, exchange rates, and market fear. However, these relationships are likely to evolve over time, influenced by major economic events. Figure 1 illustrates the dynamic spillover index from 2009 to 2024, highlighting key events that significantly increased the spillover index.

Considering the results for market fear and the interaction between groups, Table 3 demonstrates the contribution of each variable from market fear to the sovereign CDS exchange rate system. The spillover from market fear to the CDS exchange rate system is 6.29%, with contributions from VIX (4.11%) and OVX (2.18%). Conversely, the spillover from the CDS exchange rate system to market fear was 7.60%, indicating a stronger contribution from the financial market. These findings reveal a bidirectional relationship in which market fear influences sovereign CDS and exchange rates and vice versa.

Thus far, the analysis has focused on static results, providing an overview of the relationships between sovereign CDS, exchange rates, and market fear. However, it is reasonable to expect that these relationships vary over time and are influenced by underlying events. Figure 1 shows the results of the dynamic spillover index from 2009 to 2024, identifying significant events that increase the spillover index, such as

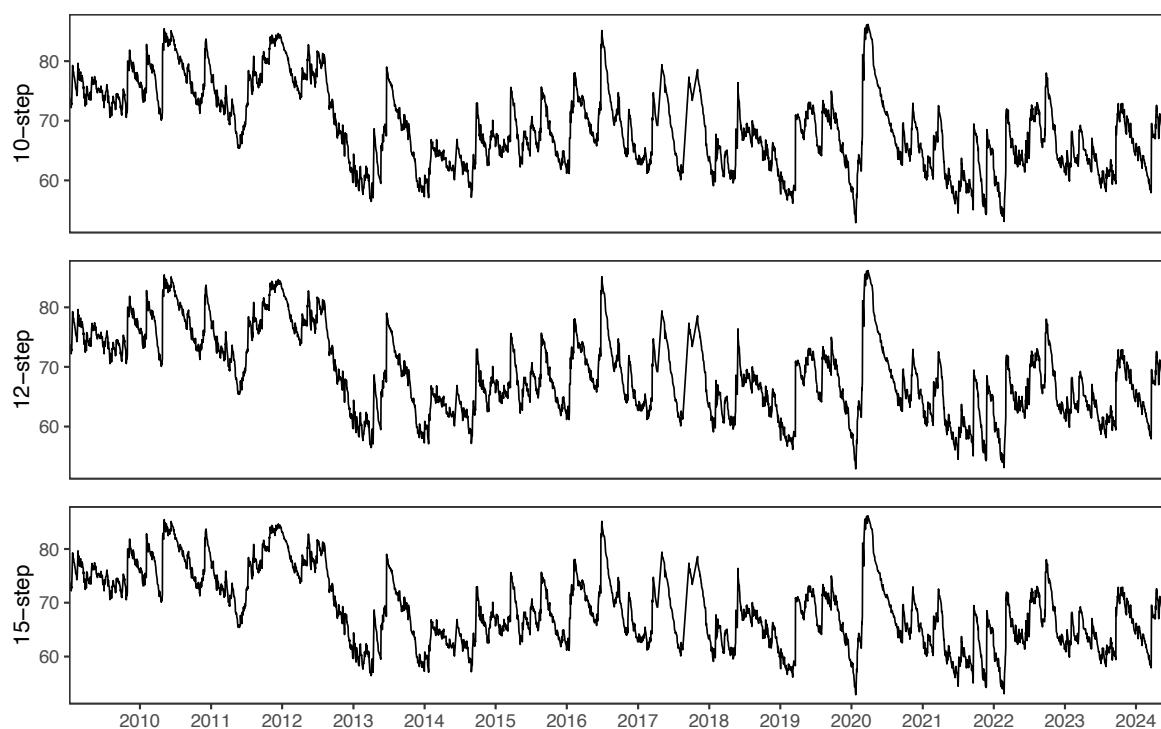
- The European sovereign debt crisis from 2009 to 2013.
- The "Flash Crash" in the US Treasury bonds market and the collapse of oil prices in the last quarter of 2014.
- The peak in 2017 was due to the international oil crisis and supply cuts announced by the OPEC
- The Trade War between the United States and China in 2018
- There was a sharp increase in 2020, reaching nearly 90%, due to the global market uncertainty triggered by the COVID-19 pandemic.

- The Ukraine-Russia war in 2022 caused energy and food supply disruptions and contributed to high global inflation.

These results are consistent with the findings of (Diebold & Yilmaz, 2009; Liu et al., 2023; Sun et al., 2020), confirming that economic and financial events intensify the spillover index between system variables.

To assess the sensitivity of the total spillover indices, robustness tests are performed using alternative forecast horizons (10, 12, and 15 steps ahead). **Figure 2** confirms that the spillover indices follow a similar pattern, regardless of the forecast horizon, demonstrating the robustness and consistency of our results.

Figure 2 - The dynamics of spillover index with m-step horizon.



Note: The results are based on a TVP-VAR model with a lag length of order 1 as determined by the Schwarz Information Criterion (BIC) and a generalized prediction error variance decomposition with 10, 12 and 15 steps ahead.

6. Conclusions

This study provides critical insights into the intricate dynamics among sovereign CDS markets, exchange rates, and market fear in Latin America using a time-varying parameter vector autoregressive (TVP-VAR) model. The findings demonstrate pronounced spillover effects, with sovereign CDS spreads from Colombia, Mexico, and Peru emerging as pivotal transmitters of financial stress to exchange rate markets and fear indices, such as the VIX and OVX. These results highlight the significant influence of emerging economies on both regional and global financial stability, particularly under conditions of heightened market uncertainty.

Furthermore, exchange rate markets, with the US dollar and euro as dominant transmitters, exhibit robust interconnectedness with sovereign CDS markets. The bidirectional relationship between market fear and sovereign risk, manifested through CDS spreads and exchange rates, underscores the amplifying effect of global uncertainty on financial vulnerability. During periods of elevated volatility, emerging economies face increased exposure to external financial shocks, underscoring their heightened susceptibility to systemic risk.

The policy implications of this study are substantial. Policymakers in Latin America must prioritize the implementation of targeted macroprudential strategies to mitigate the risks associated with international financial volatility. This includes designing mechanisms to manage spillover effects between exchange rates and sovereign CDS markets as well as fostering resilience against external shocks. Strengthening regulatory frameworks, improving financial market transparency, and enhancing regional cooperation will be essential in reducing systemic vulnerabilities and ensuring financial stability.

Looking ahead, the increasing interconnectedness of global markets underscores the need for further research into the additional drivers of market fear, including geopolitical tensions, commodity price fluctuations, and monetary policy shifts. Investigating these factors will provide a more comprehensive understanding of sovereign risk transmission channels and help design effective risk management strategies. Moreover, future studies should explore the heterogeneous impact of these risks on different economies, considering structural differences between emerging and developed markets. This broader perspective will be crucial in adapting financial policies to the evolving global financial landscape, particularly as emerging markets deepen their integration into global financial systems.

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