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Macroeconomic Determinants of the Term Structure of Sovereign Credit Default Swap (CDS) Spread: Insights from MIDAS Regression

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Abstract

When investors seek to diversify their investment portfolios across countries to maximize returns, they also expose themselves to additional risks, including the risk of sovereign defaults, which is a growing concern for investors in many countries worldwide. To better understand the factors critical to sovereign defaults, this study aims to investigate the impact of both country-specific and global factors on the term structure of Sovereign Credit Default Swap (CDS) Spreads, which acts as gauges for the extent of risk and vulnerability to credit defaults. Moreover, quarterly and monthly data from ten Eurozone countries, spanning from 2007 to 2022, is used and the MIDAS regression approach is applied. The empirical findings indicate that country-specific and global variables significantly impact sovereign risk, as measured by the term structure of sovereign CDS Spreads. However, the effect varies among the countries, possibly due to differing economic fundamentals and trade relationships with other countries. Among the country-specific variables, Local stock market returns, Forex Rate, and Debt-to-GDP ratio emerge as the most influential indicators. At the same time, impact of Changes in Reserve and Terms of Trade is less. U.S. Stock Return holds more influence among the global factors than U.S. Variance Risk Premium and U.S. Long-Term Yield. The study's outcomes have implications for investors, policymakers, and regulators.

Keywords: Sovereign Risk, Sovereign Credit Default Swaps, Term Structure, Macroeconomic Indicators, Global Risk Factor

1. Introduction

Following the 2008 global financial crisis, financial markets worldwide experienced a noticeable upsurge in instability. Notable instances include Sri Lanka's default on repayment in 2022, Argentina's encountering its ninth sovereign default risk in 2020, and Venezuela's default in 2017. Even as the global recession induced by the COVID-19 pandemic has subsided, the financial crises in developing countries have intensified. This can be attributed to the monetary tightening measures implemented by advanced nations, with the United States taking the lead, resulting in a contraction of international financial markets (Tevfik Kartal, 2020; Cho & Rhee, 2023).

In recent decades, systemic financial instability has extended beyond developing nations (Cho & Rhee, 2023). This is evident in a series of financial crises that unfolded over the past 25 years, including the subprime crisis of 2008, technological bubble of 2000, the subprime crisis of 2008, the Eurozone debt crisis and Greek bankruptcy in 2010, Brexit in 2017, and the health crisis brought on by Covid-19. These crises have increased in financial markets, significantly impacting regulatory bodies and investors. Given this historical pattern, effectively managing a country's credit risk has become an urgent and pivotal concern for policymakers. As a result, there is a pressing need for the global economy to formulate macroeconomic policies aimed at mitigating the risk of sovereign default to ensure worldwide economic stability.

These dynamically changing macroeconomic factors have underscored the significance of the Sovereign Credit Default Swap (SCDS) market, prompting researchers to delve into the role of SCDS in the financial system and their recent applications in risk hedging. Sovereign CDS spreads indicate investors' expectations regarding sovereign default risk and are valuable tools for assessing the likelihood of market deterioration. Credit Default Swap, on the other hand, represents a financial derivative instrument that allows one party to transfer credit risk and return to another party using various financial contracts, including forwards, futures, options, and swaps, in exchange for compensation in case of default (Guo et al., 2020). Meanwhile, the premium represents the cost of this protection, and a higher CDS spread value signifies a greater level of risk.

In academic discourse, it is highlighted that Sovereign Credit Default Swaps (CDS) are employed when debt securities are tied to a government (Shahzad et al., 2017). The SCDS spread slope indicates the difference between long-term and short-term premiums (Yin et al., 2021). Previous research has demonstrated that an increased perception of the risk associated with sovereign debt default leads to a larger premium to hedge against the risk, consequently increasing the levels of CDS spread. A case in point is the European debt crisis, where the unpredictable price fluctuations of sovereign CDS spreads had the potential to disrupt a nation's financial stability. The outcomes of prior studies emphasize the significance of identifying the factors that affect the term premium of sovereign CDS spreads, commonly referred to as the slope of the SCDS spread.

Therefore, considering the present circumstances, this study examines the country related and global factors that influence sovereign risk as reflected in the term structure of Sovereign CDS spreads by utilizing data from 2007 to 2022 for ten European nations.

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2. Literature Review

Since emerging nations typically have limited domestic savings, they rely heavily on foreign investments, both direct and portfolio investments, to fuel their development and transition to developed status. While foreign direct investments are influenced by various global and macroeconomic factors, such as geopolitical and political considerations, emerging countries make concerted efforts to attract and boost foreign portfolio investments. In this scenario, bonds and bills are pivotal as the primary investment instruments (Tevfik Kartal, 2020). On the other hand, investing in foreign countries introduces the element of country-specific risks, which tend to be more pronounced in emerging economies. This heightened risk perception arises from investors' concerns about whether emerging countries will fulfil their financial obligations or default on borrowed funds.

Consequently, foreign investors actively seek a safeguard against these country-specific risks. In this context, one of the key and valuable tools is using Credit Default Swaps (CDS). Credit Default Swaps serve as a mechanism to shield foreign investors from potential losses on securities denominated in foreign exchange rates (Hibbert & Pavlova, 2017).

While recent literature has focused significantly on the term structures of SCDS spreads, certain overlooked aspects warrant scholarly investigation. Nevertheless, numerous studies have delved into SCDS; for instance, Pan & Singleton (2008) examined the inherent characteristics of default occurrence and recovery within the term structures of SCDS spreads using a reduced-form model. Their findings demonstrated that the co-movements in the term structures of SCDS spread across countries were primarily driven by shifts in global investor preferences for credit exposure rather than by revaluations of the fundamental strength of specific sovereign economies. Similarly, Augustin (2018) investigated the connection between risk and the term structures of SCDS spreads. The results revealed that when the SCDS term structure slope exhibited a positive trend, global shocks were the primary driving force behind the price of sovereign credit risk fluctuations. Conversely, when the SCDS term structure slope took on a negative trajectory, the significance of domestic shocks marginally increased in determining changes in the SCDS slope. Building upon this, Calice & Zeng (2021), using a sample of 29 countries, argued that the SCDS spread value was indicative of global risk, while the term structure of the spreads conveyed the level of risk specific to a given country.

Furthermore, research has directed its attention to examining the impact of factors within and beyond national borders on sovereign default risk. For instance, Chiarella et al. (2015) concluded that country related fundamentals influence SCDS spreads. Meanwhile, (Chen & Chen, 2018) observed that stronger governance in a country is associated with reduced default probabilities. Jeanneret (2018) also uncovered that governments facing challenges in generating fiscal revenues to meet their debt obligations are more likely to experience increased sovereign default risk.

Moreover, a substantial body of literature categorizes the determinants of sovereign CDS spreads into local and global factors, with various notable contributions (Duffie et al., 2003; Gündüz & Kaya, 2014; Remolona et al., 2008; (Yu, 2002). The main country related factors encompass government bond yields, the country's primary stock indices, how a country's CDS market perform, and the long-term governance capabilities of the specific nation. On the other hand, significant global factors encompass variables like the VIX (fear index), returns from the US stock market, and the US equity premium, among others. For example, Longstaff et al. (2011) revealed that a substantial portion of sovereign credit risk can be attributed to global risk factors. Blau & Roseman (2014) demonstrated that the sovereign CDS spreads of European nations surged after the US sovereign credit rating was downgraded in 2011. Similarly, Fontana & Scheicher (2016) explored the Eurozone sovereign CDS market and established that the iTraxx index returns notably positively impacted Eurozone sovereign CDS spreads.

This study stands apart from prior research as it focuses on an area that has yet to receive much attention in literature. Its primary objective is to explore the macroeconomic factors influencing the term structure of sovereign CDS spreads, which has been comparatively underexplored in previous studies. This unique focus enables us to explore the rich dynamics of the slope of sovereign CDS spreads in response to variations in both country-specific and global factors.

3. Data and Variables

The data for this study has been sourced from Thomson Reuters Datastream, the World Bank database, and Yahoo Finance, covering the period from 2007 to 2022. Specifically, Sovereign CDS data, including five and 10-year SCDS data, has been obtained from Thomson Reuters Datastream, a globally recognized SCDS information database widely utilized in previous studies (Annaert et al., 2013; Grammatikos & Vermeulen, 2012). Additionally, data for variables such as Local stock market returns (IR), Change in Reserve (ΔReserve), Debt to GDP ratio (D2GDP), Forex Rate (FXret), Term of Trade (ToT), U.S. Variance Risk Premium (VRP), U.S Long-Term Yield (LTY), and U.S. Stock Return (S&P500R) has been collected from the World Bank database and Yahoo Finance.

The sample under examination comprises 10 European countries: Belgium, Czech Republic, France, Greece, Hungary, Ireland, Italy, Portugal, Romania, and Spain, which were predominantly impacted by the European sovereign debt crisis. To calculate the term structure of sovereign CDS spread, also known as the slope of

sovereign CDS, we compute the difference between the 10-year and 5-year CDS spreads, following the methodology outlined by Augustin (2018).

4. Methodology

In traditional time series methodologies, it is essential for both the dependent and independent variables to share the same frequency. However, this requirement presents considerable challenges, especially in macroeconomic analyses, due to the varying time intervals and frequencies at which data is released. To resolve this, a common strategy involves aligning high-frequency data with the frequency of low-frequency data before conducting model predictions (Armesto et al., 2010; Guliyev, 2018). This alignment is accomplished through aggregation or averaging, depending on the series. Nevertheless, this reduction process may lead to the loss of valuable information from the high-frequency series and could alter the original series' distribution properties (Marcellino, 1999).

The Mixed-Data Sampling (MIDAS) technique, initially introduced by Ghysels (2004), presents a distinct solution to address this issue. In this method, the frequency of the dependent variable consistently remains at a level lower than that of the independent variable(s). Consequently, the MIDAS approach can extract the maximum information from each observation of the high-frequency series (Guliyev, 2018).

The study investigates global and country-specific factors affecting sovereign risk, measured by CDS term premium. As the available data comes from different time intervals, the study employs the MIDAS regression Model. here, Sovereign CDS term premium is considered a dependent variable. At the same time, Local Stock Returns, Forex Rate, Change in Reserve, Terms of Trade, Debt to GDP Ratio, U.S. Stock Return, U.S. Variance Risk Premium, and U.S. Long-Term Yield are treated as independent variables.

The MIDAS regression is designed to handle time series data sampled at varying frequencies. This model employs simplified specifications characterized by distributed lag polynomials, facilitating direct forecasting of variables which are at low frequency on the left-hand side of the equation based on lagged low-frequency and higher-frequency variables on the right-hand side (Ghysels et al., 2006; Ghysels et al., 2007; Zhang & Wang, 2019; Guay & Maurin, 2015).

Utilizing MIDAS regression offers several significant benefits. Firstly, it models the response to higher-frequency explanatory variables through a highly parsimonious distributed lag polynomial, thereby addressing challenges related to excessive parameters and lag-order selection (Ghysels & Qian, 2019). Secondly, MIDAS regression accommodates varying past data window lengths. Lastly, it enables the incorporation of multiple regressors operating at different frequencies.

Consider that the dependent variable y_t is sampled at a lower frequency, say annually between the periods t-1 and t, with the index t representing the years. The explanatory variable $x_t^{(m)}$ is sampled m times over the same period. If $x_t^{(m)}$ is sampled monthly, then the index m equal to twelve. The aim is to understand the dynamic relationship between y_t and $x_t^{(m)}$. The mathematical form of MIDAS regression model is:

$$\boldsymbol{y_t = \beta o + \beta 1 B\left(L^{\frac{1}{m}}; \theta\right) x_t^{(m)} + \epsilon_t^{(m)}} \ldots\ldots\ldots (1)$$

for **t = 1,…,T,** where $\boldsymbol{y_t}$ is lower frequency Variable; $\boldsymbol{x_t^{(m)}}$ is the high frequency variable, $\boldsymbol{B}(\mathbf{L}^{1/m}; \boldsymbol{\theta}) = \sum_{k=0}^{K} \mathbf{B}(\mathbf{k}; \boldsymbol{\theta})\, \boldsymbol{L^{k/m}}$; $\boldsymbol{L^{1/m}}$ is a lag operator such that $\boldsymbol{L^{\frac{1}{m}} x_t^{(m)} = x_{t-1/m}^{(m)}}$; and the lag coefficients **B(k;$\boldsymbol{\theta}$)** of the corrosponding lag operator $\boldsymbol{L^{k/m}}$ are parameterized as a function of a vector of parameters $\boldsymbol{\theta}$. K represents the maximum lag length of the regressor. $\boldsymbol{\epsilon_t^{(m)}}$ is independent and identically distributed with $\boldsymbol{E(\epsilon_t^{(m)}) = 0}$ and $\boldsymbol{Var\left(\epsilon_t^{(m)}\right) = \delta_\epsilon^2}$. $\boldsymbol{\beta 1}$ is the parameter of interest, which captures the aggregate effect of lag $\boldsymbol{x_t^{(m)}}$**s** on $\boldsymbol{y_t}$. $\boldsymbol{\beta 1}$ is obtained by summing the function of $\boldsymbol{B(L^{1/m}; \theta)}$ so that the sum captured the aggregiate effect.

The parsimonious parameterization of the coefficient of $\boldsymbol{B(k;\theta)}$ stands as a prominent aspect of MIDAS (Ghysels et al., 2007). Almon lag polynomial specification is frequently employed to mitigate multicollinearity in the distributed lag literature (Almon, 1965), and it is depicted in the following equation:

$$\boldsymbol{B(k; \theta) = \sum_{i=0}^{p} \theta_i\, k^i} \ldots\ldots\ldots\ldots\ldots\ldots \mathbf{(2)}$$

In this context, *p* signifies the degree of the polynomial, and it's important to note that $p < K$. With the increase in the polynomial's order, the lag distribution becomes less smooth, thereby requiring the estimation of a larger number of parameters. This specification is acknowledged for its adaptability, as it can adopt various configurations, including decreasing, increasing, or hump-shaped patterns. The weights can fall at varying rates i.e faster or slower, and conform to the intended pattern based on parameter values θi.

5. Empirical Results

5.1. Descriptive Statistics

A detailed exploration of descriptive statistics becomes crucial for a comprehensive understanding of the data and to facilitate further analysis. The study employs different variables such as Sovereign CDS term premium (CDSTP), stock market returns (IR), Change in Reserve (ΔReserve), Debt to GDP ratio (D2GDP), Forex Rate

(FXret), Term of Trade (ToT), U.S. Variance Risk Premium (VRP), U.S Long-Term Yield (LTY), and U.S. Stock Return (S&P500R).

Table 1 exhibits the descriptive statistics derived using E-views statistical software. It includes mean values, standard deviations, skewness, and kurtosis measurements. Overall, the outcomes across all variables indicate low mean returns and considerable data variation among the countries, except for the forex rate, terms of trade, and variance risk premium, where maximum values tend to cluster around the mean.

Table 1 Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
CDSTP	0.28	0.29	0.99	-0.36	0.28	-0.03	2.60	11.91	0.00
IR	0.00	0.00	0.15	-0.11	0.07	0.46	2.82	65.51	0.00
ΔReserve	4.01	3.97	5.99	3.25	0.39	1.01	6.63	1379.58	0.00
D2GDP	4.43	4.57	5.53	2.87	0.53	-0.65	2.90	136.67	0.00
FXret	0.91	1.13	1.47	0.00	0.53	-0.80	1.88	304.02	0.00
TOT	4.58	4.60	4.67	4.42	0.04	-1.79	7.04	2326.00	0.00
VRP	2.96	2.92	3.96	2.25	0.37	0.50	2.96	8.14	0.02
LTY	0.00	-0.01	0.76	-0.88	0.26	-0.05	4.25	12.51	0.00
S&P500R	0.00	0.00	0.02	-0.03	0.01	-0.96	5.78	91.01	0.00

5.2. Correlation Matrix

Table 2 exhibits the Pearson correlations between the variables utilized in this study. The correlation values among all independent variables in the study are below 0.70, indicating the absence of multicollinearity issues (Gujarati & Porter, 2008). Additionally, these correlation values fall within an acceptable range, supporting the validity of this dataset's hypothesis testing.

Table 2 Correlation Matrix

Variables	IR	CDSTP	ΔReserve	D2GDP	FXret	TOT	LTY	VRP	S&P500R
IR	1.00								
CDSTP	-0.10	1.00							
ΔReserve	0.11	-0.23	1.00						
D2GDP	-0.12	0.69	-0.16	1.00					
FXret	-0.05	-0.64	0.13	-0.67	1.00				
TOT	-0.04	0.22	0.43	-0.02	0.02	1.00			
LTY	-0.09	0.01	-0.06	0.10	-0.12	-0.27	1.00		
VRP	-0.02	-0.53	0.32	-0.26	0.31	-0.02	-0.12	1.00	
S&P500R	0.04	0.11	0.17	0.10	-0.06	0.14	-0.07	-0.40	1.00

5.3. Unit Root Test

Table 3 displays the results of assessing stationarity for the variables employed in this study. Stationarity is examined through the Augmented Dickey-Fuller Test (ADF), a crucial test designed to prevent spurious regression and ensure consistency in resulting estimates. Developed by Fuller in 1979, the Augmented Dickey-Fuller Test is utilized here to examine the presence of stationarity within these variables. The findings affirm that all variables demonstrate stationarity at the level and in their first difference, enhancing the suitability and reliability of the estimation outcomes.

Table 3 Unit Root Test

Augmented Dickey-Fuller (ADF) test

Variables	Level	1st Difference
CDS Term Premium	-4.80***	-44.41***
Local Stock Returns	-21.30***	-27.06***
Change in Reserve	-9.16***	-43.77***
Debt to GDP Ratio	-3.09**	-43.77***
Forex Rate	-2.81*	-43.77***
Terms of Trade	-4.58***	-43.77***
U.S. Variance Risk Premium	-4.74***	-17.43***
U.S. Long Term Yield	-11.51***	-12.50***
U.S. Stock Returns	-14.10***	-12.07***

5.4. Empirical results

This section presents the results from Tables 4 to 11, using MIDAS regression to identify the global and country-specific factors influencing the term structure of sovereign CDS. The analysis was conducted separately for each country employing E-Views software and is described variables-wise to avoid redundancy.

Table 4 displays the estimation results of the MIDAS regression, exploring the link between the term structure of Sovereign CDS Spread and local stock returns in ten European countries. Each polynomial's initial value represents the coefficient, followed by the corresponding P-value. Notably, the polynomial coefficients (PDL2 = -0.52, PDL3 = -0.01, PDL2 = -0.39, PDL2 = -0.32) are both negative and statistically significant for stock returns in Belgium, Greece, Ireland, and Romania at the 10% significance level. These coefficients suggest that a 1% increase in stock market returns leads to a decrease of 0.52%, 0.01%, 0.39%, and 0.32% in the SCDS term premium of Belgium, Greece, Ireland, and Romania, respectively. Furthermore, the coefficients for lagged stock market returns are statistically significant up to lag 5 in most countries, indicating that changes in stock market returns continue to impact the sovereign CDS term premium for up to five months.

These findings indicate that local stock returns are crucial in determining changes in SCDS term premium in the countries above. This aligns with previous research conducted by Pires et al. (2013) and Calice & Zeng (2021),which observed a strong association between high stock returns and reduced CDS spreads.

Table 4

Stock Returns (Independent Variable)										
Polynomial/ Lag Level	**Belgium**	**Czech Republic**	**France**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Portugal**	**Romania**	**Spain**
PDL 01	1.16	0.18	7.52	-0.10	0.39	0.91	0.51	0.40	0.42	0.42
	0.02	0.58	0.01	0.33	0.07	0.01	0.02	0.28	0.14	0.08
PDL 02	-0.52*	0.09	-4.51	0.09	-0.14	-0.39*	-0.11	-0.13	-0.32*	-0.03
	0.06	0.68	0.16	0.14	0.35	0.08	0.28	0.65	0.05	0.72
PDL 03	0.05	-0.05	0.36	-0.01*	0.00	0.04	0.01	0.01	0.04	0.00
	0.15	0.32	0.73	0.09	0.89	0.16	0.45	0.84	0.06	0.93
PDL 04	-	0.00	0.03	-	0.00	-	-	0.00	-	-
	-	0.23	0.80	-	0.80	-	-	0.92	-	-
Lag Coefficients Values										
Lag 0	0.69	0.23	3.39	-0.03	0.26	0.56	0.41	0.28	0.14	0.39
Lag 1	0.31	0.21	0.12	0.03	0.14	0.30	0.33	0.18	-0.07	0.36
Lag 2	0.03	0.13	-2.14	0.06	0.03	0.13	0.27	0.11	-0.20	0.33
Lag 3	-0.16	0.03	-3.23	0.07	-0.07	0.05	0.22	0.05	-0.26	0.31
Lag 4	-0.25	-0.08	-3.00	0.06	-0.14	0.06	0.18	0.00	-0.24	0.28

Dependent Variable: Sovereign CDS Term Premium

Table presents the estimated coefficients and P-Value of MIDAS regression. The parameterization of the MIDAS weights is designed to conform to the polynomial. The estimation results are obtained through polynomials of up to four degrees. *, **, and *** represent statistical significance levels at 10%, 5%, and 1% respectively.

Table 5 displays the results of MIDAS regression, investigating the relationship between Sovereign CDS Term Premium (SCDS TP) and forex rates across ten European countries. The coefficients for the Czech Republic, France, and Hungary reveal a significant negative relationship at the 5% significance level, while France and Portugal exhibit a relationship at the 10% significance level. These findings highlight the forex rate as a substantial factor influencing changes in Sovereign CDS Term Premium (SCDS TP) in these countries. For instance, the polynomial coefficients, specifically PDL2=-6.36 and PDL3=-0.30 for France and Portugal, signify that a 1% increase in the forex rate corresponds to a 6.36% and 0.30% decrease in the Sovereign CDS Term Premium, respectively.

Moreover, the coefficients of lagged forex rates remain negative and statistically significant up to lag 5 for most countries, implying that changes in the forex rate impact the sovereign SCDS Term Premium for up to six months. These findings align with previous research by Reinhart (2002) and Krugman (1979), who observed that a country's exchange rate depreciation increases default risk.

Table 5

Forex Rate (Independent Variable)										
Polynomial/ Lag Level	**Belgium**	**Czech Republic**	**France**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Portugal**	**Romania**	**Spain**
PDL 01	0.32	29.39	6.26	0.07	334.62	-0.28	-0.12	-1.53	-0.23	0.25
	0.67	0.08	0.01	0.82	0.04	0.73	0.75	0.14	0.60	0.43
PDL 02	-0.22	-27.03**	-6.36**	-0.06	-252.81**	0.22	0.09	1.36	0.24	-0.06
	0.64	0.05	0.03	0.74	0.04	0.66	0.65	0.11	0.39	0.66
PDL 03	0.03	6.03	1.84	0.01	49.50	-0.03	-0.01	-0.30*	-0.04	0.00
	0.64	0.03	0.05	0.71	0.05	0.62	0.60	0.09	0.28	0.83
PDL 04		-0.38**	-0.16*		-2.83*			0.02		
		0.03	0.07		0.06			0.08		
Lag Coefficients Values										
Lag 0	0.13	8.02	1.59	0.02	128.47	-0.09	-0.04	-0.45	-0.03	0.19
Lag 1	-0.01	-3.56	-0.36	-0.01	4.32	0.04	0.02	0.15	0.10	0.13
Lag 2	-0.10	-7.61	-0.55	-0.04	-54.84	0.11	0.06	0.37	0.16	0.08
Lag 3	-0.13	-6.42	0.07	-0.05	-65.99	0.12	0.07	0.32	0.13	0.04
Lag 4	-0.10	-2.26	0.54	-0.04	-46.13	0.06	0.06	0.13	0.04	0.00

Dependent Variable: Sovereign CDS Term Premium

Table presents the estimated coefficients and P-Value of MIDAS regression. The parameterization of the MIDAS weights is designed to conform to the polynomial. The estimation results are obtained through polynomials of up to four degrees. *, **, and *** represent statistical significance levels at 10%, 5%, and 1% respectively.

Table 6 displays the results of MIDAS regression, investigating the association between Sovereign CDS Term Premium and changes in reserves for ten European countries within the sample. The polynomial coefficients exhibit a negative and statistical significance relationship between SCDS slope and change in reserves for France and Hungary at 1%, 5%, and 10% significance levels. Notably, the coefficients for France (PDL4 = -0.07 and PDL2 = -2.44) signify a negative and significant relationship at the 1% and 10% significance levels, while for Hungary (PDL1 = -0.29), significance is observed at the 10% level. These polynomial coefficients, such as PDL1 = -0.29 and PDL2 = -2.44 for Hungary and France, indicate that a 1% increase in reserves corresponds to a 0.29% and 2.44% decrease in the Sovereign CDS Term Premium for France and Hungary, respectively.

Furthermore, lagged reserve coefficients remain statistically significant up to lag 5 for most countries, suggesting that changes in reserves impact the sovereign SCDS Term Premium up to five months. These results emphasize the significance of reserves as a determinant of changes in Sovereign CDS Term Premium in the examined countries.

These findings align with the research conducted by Kartal et al. (2022) and Rathi et al. (2022), which similarly indicated a negative impact of changes in reserves on CDS spread, implying that an increase in reserves reduces sovereign risk spread.

Table 6

Change in Reserves (Independent Variable)										
Polynomial/ Lag Level	**Belgium**	**Czech Republic**	**France**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Portugal**	**Romania**	**Spain**
PDL 01	0.21	-0.14	1.96	0.02	-0.29*	0.16	-0.03	0.00	-0.04	0.10
	0.26	0.46	0.02	0.32	0.09	0.25	0.83	0.98	0.71	0.20
PDL 02	-0.11	0.07	-2.44**	-0.01	0.21	-0.10	0.01	0.00	0.02	-0.05
	0.36	0.65	0.01	0.35	0.10	0.25	0.92	0.97	0.76	0.16
PDL 03	0.01	-0.01	0.79	0.00	-0.04	0.01	0.00	0.00	0.00	0.00
	0.44	0.73	0.01	0.35	0.13	0.25	0.93	0.94	0.82	0.14
PDL 04		0.00	-0.07***		0.00			0.00		
		0.75	0.01		0.15			0.91		
Lag Coefficients Values										
Lag 0	0.11	-0.08	0.24	0.01	-0.12	0.08	-0.02	-0.01	-0.02	0.05
Lag 1	0.03	-0.04	-0.35	0.00	-0.01	0.01	-0.02	-0.01	-0.01	0.02
Lag 2	-0.02	-0.01	-0.24	0.00	0.04	-0.03	-0.01	-0.01	0.01	-0.01
Lag 3	-0.05	0.00	0.11	0.00	0.06	-0.05	-0.01	0.00	0.01	-0.03
Lag 4	-0.06	0.01	0.25	0.00	0.04	-0.04	-0.01	0.00	0.02	-0.04

Dependent Variable: Sovereign CDS Term Premium

Table presents the estimated coefficients and P-Value of MIDAS regression. The parameterization of the MIDAS weights is designed to conform to the polynomial. Results are obtained through polynomials of up to four degrees. *, **, and *** represent statistical significance levels at 10%, 5%, and 1% respectively.

Table 7 displays the outcomes of MIDAS regression, investigating the relationship between Sovereign CDS Term Premium and terms of trade for the countries in the sample. The coefficients for Romania and Spain, represented by (PDL2 = -5.21 and PDL1= -2.61), reveal a significant negative relationship at the 5% significance level, with Spain also exhibiting significance at the 10% level (PDL3 = -0.09). These results underline the terms of trade as a crucial determinant of changes in Sovereign CDS Term Premium in these countries. Specifically, the polynomial coefficients, such as (PDL2 = -5.21 and PDL1= -2.61) for Romania and Spain, indicate that a 1% increase in terms of trade corresponds to a 5.21% and 2.61% decrease in Sovereign CDS Term Premium, respectively.

Moreover, these coefficients remain statistically significant up to lag 5 for most countries, suggesting that changes in terms of trade influence the sovereign SCDS Term Premium for up to five months. The consistency of these findings aligns with prior studies conducted by Hilscher and Nosbusch (2010), Min (1998), Baldacci et al. (2011) and Gibson et al. (2012). Hilscher and Nosbusch (2010) highlighted the significance of both terms of trade and their volatility in impacting sovereign spreads across 31 emerging economies. Similarly, Min (1998), Baldacci et al. (2011), and Gibson et al. (2012) have confirmed a substantial negative association of terms of trade with sovereign CDS spreads.

Table 7

Term of Trade (Independent Variable)										
Polynomial/ Lag Level	**Belgium**	**Czech Republic**	**France**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Portugal**	**Romania**	**Spain**
PDL 01	-1.50	6.02	6.42	0.93	5.33	0.82	0.64	-3.83	9.59	-2.61**
	0.81	0.26	0.58	0.53	0.14	0.80	0.43	0.43	0.02	0.03
PDL 02	0.77	-6.06	-9.27	-0.66	-3.71	-0.99	-0.41	2.88	-5.21**	1.11
	0.85	0.18	0.50	0.43	0.20	0.63	0.37	0.47	0.04	0.05
PDL 03	-0.08	1.40	4.47	0.08	-0.65	0.16	0.05	-0.57	0.56	-0.09*
	0.88	0.15	0.33	0.38	0.28	0.53	0.34	0.51	0.08	0.07
PDL 04		-0.09	-0.56		-0.03			0.03		
		0.13	0.21		0.38			0.52		

Lag Coefficients Values										
Lag 0	-0.81	1.28	1.06	0.35	2.24	-0.01	0.27	-1.48	4.95	-1.58
Lag 1	-0.28	-1.20	1.30	-0.07	0.25	-0.54	0.01	-0.08	1.43	-0.74
Lag 2	0.08	-1.94	3.80	-0.32	-0.81	-0.75	-0.16	0.59	-0.96	-0.09
Lag 3	0.29	-1.48	5.22	-0.41	-1.15	-0.64	-0.23	0.72	-2.22	0.38
Lag 4	0.34	-0.37	2.21	-0.35	-0.95	-0.23	-0.21	0.52	-2.36	0.67

Dependent Variable: Sovereign CDS Term Premium

Table presents the estimated coefficients and P-Value of MIDAS regression. The parameterization of the MIDAS weights is designed to conform to the polynomial. The estimation results are obtained through polynomials of up to four degrees. *, **, and *** represent statistical significance levels at 10%, 5%, and 1% respectively.

Table 8 presents the regression results examining the relationship between Sovereign CDS term premium and the Debt to GDP ratio in ten European countries. The coefficients demonstrate a positive and statistically significant relationship for the Debt to GDP ratio, with SCDS TP in cases of France, Ireland, Romania, and Spain, at significance levels of 1%, 5%, and 10%. Notably, for Ireland and Romania, the coefficient values (PDL3 = 0.043 and PDL2 = 0.73) indicate a positive and significant relationship at the 10% significance level. In the case of Spain, the relationship is positive and significant at the 5% significance level (PDL2 = 0.15). Similarly, in the case of France, the relationship is positive and significant at the 1% significance level for the second and third polynomials. In summary, the results highlight that the Debt to GDP ratio is an important determinant of SCDS term premium in these countries.

Furthermore, the lagged Debt to GDP ratio coefficients remain statistically significant up to lag 5 for most countries. These findings align with previous research by Dell' Erba et al. (2013) and Baldacci & Kumar, (2010),who observed that a high level of public debt to GDP ratio increases the riskiness of debt repayment.

Table 8

Debt to GDP ratio (Independent Variable)										
Polynomial/ Lag Level	**Belgium**	**Czech Republic**	**France**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Portugal**	**Romania**	**Spain**
PDL 01	-2.69	1.03	-5.04	*-0.23*	-0.71	0.30	-1.25	0.13	-1.25	-0.37
	0.02	0.13	0.02	0.11	0.40	0.32	0.04	0.89	0.07	0.03
PDL 02	1.53	-0.80	6.62***	*0.12*	0.59	-0.29	0.50	-0.31	0.73*	0.15**
	0.04	0.14	0.01	0.15	0.37	0.14	0.13	0.66	0.09	0.06
PDL 03	-0.17	0.15	-2.30	*-0.01*	-0.12	0.04*	-0.04	0.09	-0.08	-0.01
	0.06	0.17	0.01	0.19	0.37	0.08	0.29	0.53	0.12	0.12
PDL 04		-0.01	0.23***		0.01			-0.01		
		0.21	0.00		0.40			0.46		
Lag Coefficients Values										
Lag 0	-1.33	0.37	-0.49	-0.12	-0.23	0.05	-0.79	-0.10	-0.60	-0.24
Lag 1	-0.32	-0.03	0.85	-0.04	0.05	-0.11	-0.40	-0.18	-0.12	-0.12
Lag 2	0.35	-0.23	0.37	0.01	0.18	-0.19	-0.09	-0.16	0.20	-0.03
Lag 3	0.68	-0.27	-0.56	0.05	0.19	-0.18	0.15	-0.07	0.35	0.04
Lag 4	0.66	-0.21	-0.54	0.06	0.12	-0.09	0.30	0.06	0.34	0.09

Dependent Variable: Sovereign CDS Term Premium

Table presents the estimated coefficients and P-Value of MIDAS regression. The parameterization of the MIDAS weights is designed to conform to the polynomial. The estimation results are obtained through polynomials of up to four degrees. *, **, and *** represent statistical significance levels at 10%, 5%, and 1% respectively.

Table 9 shows the results of MIDAS regression, exploring the relationship between the term structure of Sovereign CDS spread and U.S Long Term Yield for the selected sample. The coefficient values (PDL2 = 0.22, PDL3 = 0.49, PDL1 = 0.05) of U.S Long Term Yield for the Czech Republic, France, and Portugal, respectively, indicate a positive and significant relationship at the 5% significance level. In the case of Ireland and Portugal, the relationship is positive and significant at the 1% level, as indicated by the coefficient's values

(PDL1 = 0.18, PDL1 = 0.24). These coefficient values imply that a 1% increase in U.S. Long Term Yield results in a 0.22%, 0.49%, and 0.05% increase in SCDS term premium for the Czech Republic, France, and Portugal, respectively. Additionally, the lagged U.S Long Term Yield coefficients remain statistically significant up to lag 5. Overall, the results demonstrate that the U.S Long Term Yield is an important determinant of Sovereign CDS term premium in these countries.

Table 9

Long-Term Yield (Independent Variable)										
Polynomial/ Lag Level	**Belgium**	**Czech Republic**	**France**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Portugal**	**Romania**	**Spain**
PDL 01	0.02	-0.29	0.66	*0.04*	-0.05	0.18*	0.01	0.24*	0.05	-0.12
	0.85	0.04	0.16	0.22	0.61	0.10	0.91	0.10	0.38	0.04
PDL 02	-0.03	0.22**	-1.10	*-0.01*	0.06	-0.08	-0.01	-0.21	-0.02	0.02
	0.68	0.04	0.07	0.67	0.42	0.18	0.81	0.04	0.54	0.43
PDL 03	0.00	-0.05	0.49**	*0.00*	-0.02	0.01	0.00	0.05**	0.00	0.00
	0.67	0.04	0.02	0.90	0.29	0.31	0.97	0.03	0.84	0.87
PDL 04		0.01**	-0.06		0.00			0.00		
		0.04	0.01		0.19			0.03		
Lag Coefficients Values										
Lag 0	0.00	-0.12	-0.01	*0.04*	-0.01	0.10	0.00	0.07	0.03	-0.10
Lag 1	-0.02	-0.02	-0.03	*0.03*	0.01	0.04	-0.01	-0.02	0.01	-0.08
Lag 2	-0.03	0.03	0.27	*0.02*	0.01	0.00	-0.02	-0.06	0.00	-0.07
Lag 3	-0.03	0.03	0.56	*0.02*	0.00	-0.04	-0.02	-0.05	-0.02	-0.05
Lag 4	-0.03	0.00	0.50	*0.01*	-0.01	-0.05	-0.03	-0.01	-0.03	-0.04

Dependent Variable: Sovereign CDS Term Premium

Table presents the estimated coefficients and P-Value of MIDAS regression. The parameterization of the MIDAS weights is designed to conform to the polynomial. The estimation results are obtained through polynomials of up to four degrees. *, **, and *** represent statistical significance levels at 10%, 5%, and 1% respectively.

Table 10 shows MIDAS regression outcomes of the relationship between Sovereign CDS TP and the U.S. variance Risk Premium for the sampled countries. The polynomial coefficients (PDL1 = 0.08, PDL3 = 0.01, and PDL2 = 0.05) of the U.S. Variance Risk Premium for Greece, Italy, and Spain are positively and statistically significant at the 5% level. These values suggest that a 1% increase in the U.S. Variance Risk Premium corresponds to a 0.08%, 0.01%, and 0.05% increase in the Sovereign CDS term premium for these countries.

The results signify that the U.S. variance Risk Premium is a significant determinant of these countries' Sovereign risk. Furthermore, the coefficients of lagged U.S. variance Risk Premium maintain statistical significance up to lag 5 for most countries, indicating that the U.S. variance Risk Premium influences the sovereign CDS TP for up to five months.

Table 10

U.S Variance Risk Premium (Independent Variable)										
Polynomial/ Lag Level	**Belgium**	**Czech Republic**	**France**	**Greece**	**Hungary**	**Ireland**	**Italy**	**Portugal**	**Romania**	**Spain**
PDL 01	-0.05	0.03	0.43	0.08**	0.02	-0.07	0.07	-0.09	-0.14	-0.17
	0.69	0.81	0.22	0.04	0.87	0.58	0.23	0.46	0.06	0.00
PDL 02	0.03	-0.06	-0.20	-0.05**	0.01	0.03	-0.06	0.04	0.08	0.05**
	0.72	0.62	0.61	0.03	0.88	0.71	0.07	0.74	0.11	0.02
PDL 03	0.00	0.01	-0.02	0.01**	-0.01	0.00	0.01**	-0.01	-0.01	0.00
	0.69	0.64	0.90	0.04	0.71	0.74	0.04	0.76	0.13	0.10

Polynomial/ Lag Level	Belgium	Czech Republic	France	Greece	Hungary	Ireland	Italy	Portugal	Romania	Spain
PDL 04		0.00	0.01		0.00			0.00		
		0.71	0.59		0.62			0.70		
Lag Coefficients Values										
Lag 0	-0.02	-0.01	0.22	*0.04*	0.02	-0.05	0.02	-0.07	-0.07	-0.12
Lag 1	-0.01	-0.04	0.02	*0.01*	0.02	-0.02	-0.02	-0.05	-0.02	-0.08
Lag 2	0.00	-0.05	-0.14	*-0.02*	0.01	-0.01	-0.04	-0.04	0.01	-0.04
Lag 3	0.00	-0.04	-0.21	*-0.03*	-0.01	0.00	-0.05	-0.03	0.02	-0.01
Lag 4	-0.01	-0.03	-0.15	*-0.03*	-0.02	-0.01	-0.04	-0.03	0.02	0.01

Dependent Variable: Sovereign CDS Term Premium

Table presents the estimated coefficients and P-Value of MIDAS regression. The parameterization of the MIDAS weights is designed to conform to the polynomial. The estimation results are obtained through polynomials of up to four degrees. *, **, and *** represent statistical significance levels at 10%, 5%, and 1% respectively.

Table 11 demonstrates the outcomes of MIDAS regression, investigating the association between Sovereign CDS term premium and U.S. stock Returns for the countries within the sample. The coefficient values (PDL2 = -12.01, PDL3 = -20.62, PDL2= -4.47, PDL1 = -7.55, and PDL2 = -2.42) of U.S Stock Returns for the Czech Republic, France, Italy, Romania, and Spain, respectively, signify a negative and significant relationship at the 5% level. Moreover, the relationship between CDS term premium and U.S. stock Returns is negative and significant at the 1% level for France and Greece. The lagged U.S. stock Returns coefficients maintain statistical significance up to lag 5. These findings suggest that U.S. stock Returns serve as important determinant of Sovereign CDS term premium for these countries.

Table 11

U.S. Stock Return (Independent Variable)

Polynomial/Lag Level	Belgium	Czech Republic	France	Greece	Hungary	Ireland	Italy	Portugal	Romania	Spain
PDL 01	-5.95	15.11	-65.53***	*7.75*	-4.70	0.82	5.66	-0.81	-7.55**	0.42
	0.28	0.03	0.01	0.00	0.38	0.90	0.05	0.90	0.03	0.85
PDL 02	4.65	-12.01**	74.81	*-3.77***	4.74	-1.31	-4.47**	1.77	5.68	-2.42**
	0.21	0.04	0.00	0.00	0.30	0.76	0.01	0.75	0.01	0.03
PDL 03	-0.53	2.18	-20.62**	*0.36*	-0.96	0.18	0.48	-0.68	-0.67**	0.22
	0.25	0.07	0.01	0.00	0.29	0.74	0.01	0.54	0.02	0.03
PDL 04		-0.11	1.66		0.05			0.05		
		0.11	0.03		0.29			0.41		
Lag Coefficients Values										
Lag 0	-1.83	5.17	-9.69	*4.33*	-0.86	-0.32	1.67	0.33	-2.55	-1.79
Lag 1	1.23	-1.07	14.87	*1.63*	1.40	-1.10	-1.37	0.43	1.11	-3.55
Lag 2	3.22	-4.27	18.10	*-0.37*	2.39	-1.53	-3.46	-0.21	3.42	-4.87
Lag 3	4.16	-5.11	9.93	*-1.65*	2.45	-1.60	-4.60	-1.25	4.38	-5.76
Lag 4	4.03	-4.24	0.33	*-2.22*	1.90	-1.31	-4.79	-2.40	4.00	-6.20

Dependent Variable: Sovereign CDS Term Premium

Table presents the estimated coefficients and P-Value of MIDAS regression. The parameterization of the MIDAS weights is designed to conform to the polynomial. The estimation results are obtained through polynomials of up to four degrees. *, **, and *** represent statistical significance levels at 10%, 5%, and 1% respectively.

6. Results discussion

The study utilized country-specific and global factors to determine its influence on Sovereign CDS slope. Within the country-specific variables, the results highlight that local stock returns exhibit a negative relationship and serve as a significant determinant of CDS spread slope in Belgium, Greece, Ireland, and Romania. In line

with Merton's (1974) model of default risk, the CDS demonstrates an inverse link to equity market performance. Additionally, the forex rate is found to be negatively related and a significant determinant in the Czech Republic, France, Hungary, and Portugal. A devaluation in the exchange rate is shown to increase CDS spread and default risk. To mitigate default risk, these countries must maintain stability in their forex rates. Moreover, the coefficient on the change in foreign exchange reserves is negative and significant in France and Portugal. This suggests that to prevent default or reduce risk, these countries need to uphold a reasonable level of foreign currency holdings.

Terms of trade, representing the ratio of export prices to import prices, emerge as a pivotal factor influencing sovereign spreads in Romania and Spain. This measure reflects a country's capacity to generate foreign currency income necessary for servicing foreign debt (Bulow and Rogoff, 1989). Meanwhile, the Debt to GDP ratio shows a positive and significant correlation in France, Ireland, Romania, and Spain, signifying that high level of debt rise sovereign risk. The outcomes also suggest that minimizing the Debt to GDP ratio is crucial to avert default or diminish its impact.

Among the three global factors, U.S long-term yields exhibit a positive and statistically significant association in the Czech Republic, France, Ireland, and Portugal, indicating that higher long-term yield values correlate with increased default risk spread. U.S Variance Risk Premium displays a positive and statistically significant relationship for Greece, Italy, and Spain, highlighting that elevated values intensify default spread in these nations. Similarly, U.S Stock Returns showcase a negative and statistically significant relationship in the Czech Republic, France, Italy, Romania, and Spain, suggesting that an uptick in U.S stock returns mitigates default risk premium in these countries.

In summary, the Sovereign CDS spread slope is influenced by both country-specific factors and global variables, with the level of significance and impact differing across countries. This variability can be attributed to the distinct characteristics of these nations, including their economic structures, trade relationships, and vulnerability to global risk factors.

7. Implications

The study provides significant policy implications derived from our key findings. For example, Government policies should strive to sustain a rapid pace of economic growth to mitigate the country's risk premium. Policymakers should also formulate effective sovereign risk management policies focused on fostering sustainable macroeconomic stability, thereby lowering sovereign risk. Comprehending the fluctuations in the SCDS spread holds significant importance for investors, especially those with an international focus looking to make portfolio investments. Additionally, it is crucial for foreign borrowers to implement effective credit risk management and hedging strategies.

8. Conclusion

The economic decline resulting from the coronavirus and the alarming increase in CDS spreads within credit markets have prompted a renewed interest in examining the factors influencing sovereign credit risk. Sovereign CDS spreads show the perceptions of market participants concerning the creditworthiness and financial well-being of countries acting as creditors. The dynamics of sovereign credit risk are influenced by both global and country related risk factors. This paper examines the country related and global determinants of sovereign risk captured by the term structure of Sovereign CDS spread for ten European countries by applying MIDAS regression as estimation technique.

Results revealed that within the country-specific factors, local stock returns are a significant determinant of Sovereign CDS spread slope in Belgium, Greece, Ireland, and Romania. Additionally, the forex rate is found to be negatively related and a significant determinant in the Czech Republic, France, Hungary, and Portugal. Moreover, the coefficient on the change in foreign exchange reserves is negative and significant in France and Portugal. Terms of trade, emerge as a pivotal factor influencing sovereign spreads in Romania and Spain. Meanwhile, the Debt to GDP ratio shows a positive and significant correlation in France, Ireland, Romania, and Spain, signifying that high level of debt rise sovereign risk.

Among the three global factors, U.S long-term yields exhibit a positive and statistically significant association in the Czech Republic, France, Ireland, and Portugal, indicating that higher long-term yield values correlate with increased default risk spread. U.S Variance Risk Premium displays a positive and statistically significant relationship for Greece, Italy, and Spain, highlighting that high values intensify default spread in these nations. Similarly, U.S Stock Returns showcase a negative and statistically significant relationship in the Czech Republic, France, Italy, Romania, and Spain, suggesting that an uptick in U.S stock returns mitigates default risk premium in these countries.

In summary, the Sovereign CDS spread slope is influenced by both country-specific and global factors, with the level of significance and impact differing across countries. This variability can be attributed to the distinct characteristics of these nations, including their economic structures, trade relationships, and vulnerability to global risk factors.

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