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# The Relationship Between Credit Default Swap (Cds), Central Government External Debt Stock, and the Current Account Deficit in Türkiye

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## Abstract

Debt ratios are often a static indicator of the borrowing situation in an economy. Since the debt burden, interest burden, or ratio to the national income of an economy shows the current situation, it does not provide health information for the future. Dynamic indicators are needed to understand potential debt relationships in the future. CDS spreads, which are based on a swap transaction and gained importance after the global crisis, have recently been used as a dynamic debt ratio. There are basically two reasons for this situation. The first reason is that static analyses are considered insufficient by market participants. The other reason is that CDS spreads clearly reveal the risk cost for the lender. The reason for the current account deficit and external borrowing can be sometimes the increased need for foreign exchange in a country. When considering foreign exchange and interest rate swaps within this framework, the relationship between the current account deficit and CDS spreads becomes more pronounced. This is because, among the reasons for foreign exchange inflows and outflows, there are factors such as foreign trade transactions, external borrowing, and swap transactions. The study analyzed the variables of central government external debt stock, current account deficit, and CDS spreads using wavelet coherence analysis in the R Studio program for the period of 2008:1-2023:3. The main reason for choosing this analysis method is that it obtains findings for the entire time period included in the analysis and increases the data set to very high dimensions with simulation. This characteristic of the analysis enhances the validity level of the findings. The study found no relationship between the central government external debt stock and CDS spreads in Türkiye, except for the two years following the 2008 global financial crisis. Additionally, a positive relationship was identified between the current account deficit and CDS spreads. These findings indicate that in Türkiye, the current account deficit has a greater impact on CDS spreads compared to the components of CDS spreads.

**Keywords:** Swap Contracts, Credit Default Swap (CDS), Central Government External Debt Stock, Current Account Deficit, Wavelet Coherence Analysis

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# Türkiye'de Kredi Temerrüt Takası (CDS), Merkezi Yönetim Dış Borç Miktarı ve Cari Açık Arasındaki İlişki

**Emrah Noyan** [1] **Aylin İDİKUT ÖZPENÇE** [2]

## Öz

Borç rasyoları genellikle bir ekonomideki borçlanmaya ilişkin durumun statik bir göstergesidir. Bir ekonominin içinde bulunduğu borç yükü, faiz yükü ya da bunların milli gelire oranı o anki durumu gösterdiği için geleceğe yönelik sağlıklı bir bilgi sunmaz. Gelecekte meydana gelebilecek bir borç ilişkisi için dinamik göstergelere ihtiyaç vardır. Temeli bir takas işlemi olan ve küresel kriz sonrası önem kazanan kredi temerrüt takası primleri son yıllarda dinamik bir borç rasyosu olarak kullanılmaya başlanmıştır. Bu durumun temelde iki sebebi bulunmaktadır. Bunlardan ilki statik analizlerin piyasadaki aktörler tarafından yetersiz bulunmasıdır. Diğeri ise CDS priminin borç veren taraf açısından risk maliyetini net bir şekilde ortaya koymasıdır. Cari açık ve dış borçlanmanın nedeni bazen ülkenin döviz ihtiyacının artmasından kaynaklanabilir. Döviz ve faiz swapları da bu çerçevede ele alındığında cari açık ve CDS primi ilişkisi daha belirgin hale gelmektedir. Çünkü döviz giriş çıkışlarının sebepleri arasında dış ticaret işlemleri ya da dış borçlanma gibi etmenlerin yanı sıra swap işlemleri de yer almaktadır. Çalışmada 2008:1-2023:3 dönemine ilişkin merkezi yönetim dış borç stoku, cari açık ve CDS primi değişkenleri R studio programında wavelet uyum analizi ile analiz edilmiştir. Bu analiz yönteminin tercih edilmesindeki en temel sebep analize dahil edilen zaman diliminin tamamına yönelik bulgu elde etmesi ve simülasyon ile veri kümesini çok yüksek boyutlara çıkarmasıdır. Analizin bu özelliği bulguların geçerlilik düzeyini artırmakla birlikte Türkiye'de merkezi yönetim dış borç stoku ile CDS primi arasında 2008 küresel krizi sonrasındaki iki yıl hariç ilişki tespit edilmemiştir. Diğer taraftan cari açık ve CDS primi arasında ise pozitif bir ilişki bulunmuştur. Elde edilen bulgular da göstermektedir ki Türkiye'de CDS priminin bileşenlerinden ziyade cari açık, CDS primlerine daha fazla etki etmektedir.

**Anahtar Kelimeler:** Swap Sözleşmeleri, Kredi Temerrüt Takası (CDS), Merkezi Yönetim Dış Borç Miktarı, Cari Açık, Wavelet Coherence Analizi

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## Introduction

Financial markets, where suppliers and demanders of funds come together, have evolved and undergone changes in the last century, exerting influence on various areas of the economy. Cash flow and delivery of goods and services, which are the two most important components of commercial life, have taken different forms with the development of financial markets. When financial markets started to offer hedging transactions, also known as counter transactions, that could eliminate risks and uncertainties in commercial life, conventional methods began to be abandoned.

Financial markets have become even more important during a possible crisis periods or times when liabilities, in other words, interest rates are increase. The transformation of financial markets into a structure that can eliminate uncertainties and possible risks in commercial life has increased hedging transactions by bringing derivative instruments to the fore. The fact that countries are becoming more financially interconnected day by day and the rapid movement of capital in the international arena has brought with it risks related to capital. Especially from the lender's perspective, presentation of capital to a completely unfamiliar country carried the risk of non-repayment, prompting the financial system to search for a solution to this problem. The financial system introduced the concept of the Credit Default Swap (CDS) during the 2008 Global Financial Crisis (GFC).

The 2008 GFC sparked by the mortgage crisis created a wave of defaults. CDS played a significant role in the 2008 GFC as it forced many CDS sellers to make substantial payments to buyers. Because CDSs are the most liquid among various credit derivatives that are traded in financial markets. They serve as fundamental components or building blocks for more intricate structured credit products. CDS is a contractual agreement that offers protection against the risk of a credit event occurring with respect to a specific company or country (Blanco et al. 2005, p. 2256).

CDS spreads, by their nature, affect not only private-sector external borrowing but also public-sector external borrowing in an economy. Changes in CDS spreads create an additional cost for both the private sector and the public sector in terms of borrowing. This is because an increase in CDS margins indicates a perceived increase in the level of risk for the debtor. In response to this situation, the lender demands a higher interest rate. When looking at the concept of CDS from this perspective, a relationship is expected between both private-sector borrowing and public sector borrowing. Based on this point, the study aims to reveal the relationship between the central government external debt stock and CDS spreads in Türkiye.

There ere are several reasons why static debt indicators are so ineffective (Sturzenegger, 2004, p. 205-206); firstly, debt problems are often associated with inter-temporal constraints. A country's debt burden can be considered a problem or not depending on the market's assessment of the country's ability to meet its future payments. Therefore analysts and market participants care less about the present situation as they think about the future situation of the country. Second, debt ratios may not fully reflect a country's financial health. Debt ratios simply calculate a country's debt by dividing it by its income or national income. However, these ratios do not take into account a country's debt repayment ability, economic growth potential, or other important factors. Third, debt ratios are generally based on a country's past performance and may be limited in predicting future changes. A country's financial situation can change over time, and

therefore it can be difficult to accurately assess debt problems based on historical data alone. However, despite all these limitations, analysis of debt ratios is still used as an important method in evaluating debt problems. However, it is important to consider other dynamic factors and trends for a more comprehensive analysis.

Country-specific macro variables, including reserve adequacy, external debt level, and current account deficit, have a significant impact on the determination of the CDS Premium (Inflation Report, 2019, p. 74). These variables play a crucial role in shaping investors' perception of default risk and subsequently influence the pricing of CDS contracts. By considering factors such as the sufficiency of reserves, the magnitude of external debt, and the size of the current account deficit, market participants assess the potential creditworthiness of a country and adjust the CDS premium accordingly.

The indicators closely monitored by investors considering direct or indirect investments in Türkiye, such as public external debt, current account deficit, and CDS spreads, do not pose any vulnerability during periods of stable exchange rates. However, these indicators become concerning for investors during periods of increased exchange rate volatility. The fear of instability in the financial market may lead investors to be more cautious in lending (Kılcı, 2019, p. 77).

Considering the technical components of CDS spreads, it would be a reasonable expectation for there to be a relationship between the central government external debt stock and CDS spreads in Türkiye. However, given central government external borrowing requirement and foreign exchange needs, this relationship may deviate from the expected pattern. Firstly, when examining the distribution of external borrowing in Türkiye between the private sector and the public sector, it can be observed that the share of the central government external debt stock in total debt is relatively low. This situation calls to mind that the impact of the central government external borrowing requirement and the changes in the CDS spreads in this area is may low. On the other hand, one of the main reasons for external borrowing in Türkiye is the foreign exchange bottleneck, making foreign exchange one of the fundamental components of CDS spreads. In this context, it is natural to expect a relationship between CDS spreads and the current account deficit. Therefore, the study not only investigates the relationship between the central government's external debt stock and CDS spreads but also examines the relationship between the current account deficit and CDS spreads.

While conducting our empirical literature review as part of this study, it became evident that there is a notable dearth of research focusing on the interplay between CDS spreads and the current account deficit. This suggests that the relationship between the current account deficit and CDS spreads has not received significant attention or investigation in previous studies. In the study, after providing a detailed explanation of swap transactions, wavelet coherence analysis, a new generation analysis, is used to determine the relationship between variables.

The rest of the paper is organized as follows. Section 1 describes swap contracts. Because to understand the CDS spreads correctly, it is necessary to know the swap transactions. Section 2, it answers the questions of how CDS is calculated and what it means. Section 3 reviews the empirical literature on CDS, external debt, and current account deficit. Section 4 presents the data and Wavelet coherence analysis results. Section 5 of the study includes the discussion and lastly, conclusion part is submitted.

## Swap Contracts

When classified according to maturities, there are two different markets: the spot market and the futures market. Spot markets are markets where payment and delivery are carried out simultaneously. Futures markets, on the other hand, are those where payment and delivery take place in the future.

In futures markets, there are underlying assets such as stock prices, bond prices, interest rates, or exchange rates. The performance of derivative products traded in futures markets is shaped by the price of these underlying assets. However, what makes these derivative products special is that they provide individuals with specific rights and obligations for the future. Because purchasing these products helps determine future variables such as price, interest rates, or exchange rates. From the perspective of economic actors, eliminating uncertainties regarding future variables like price, interest rates, and exchange rates forms the basis of hedging transactions. Derivative products are highly effective tools in facilitating hedging transactions through specific rights or obligations (Durmuş and Coşkun, 2019: 508-509).

Derivative products can be classified into forward contracts, option contracts, and swap contracts. Forward contracts are contracts that give an obligation to buy or sell a certain underlying asset at a certain maturity. Options, similar to forward contracts, are agreements that give the right to buy or sell a specific underlying asset at a specified maturity (Chambers, 2007: 1). Swap contracts, on the other hand, are presented as a swapping agreement. Swap agreements are instruments that oblige two parties to exchange certain cash flows for a specified interest rate, exchange rate, or future value of a market variable. While interest rate and currency swap contracts are common in global markets, another common type of swap contract is conducted in relation to loans.

The fundamental aspect of swap contracts is the cash flow between the two parties involved. This cash flow will take shape according to the variable underlying the swap contract. Swap contracts typically involve at least one variable value. For example, in an interest-rate swap contract, at least one of the parties has to pay with floating interest. Therefore, when two parties enter into a mutual swap agreement, the cash flow for each party will change according to the fluctuation in the element underlying the swap contract.

## Interest Rate Swap Transaction

Interest swaps are swap transactions carried out in line with the expectations of the parties, as a result of different interest conditions on similar or identical debts amount. The foundation of this swap transaction, which is conducted based on interest payments without swapping the principal, is that the interest liabilities are different. In interest swaps, which are carried out without any limitation in terms of amount and maturity, one of the parties must have variable interest debt and the other party must have fixed interest debt. The change in interest rates following an interest swap will change the cash flows between the parties (Yılmaz and Şahin, 2009: 399).

If we explain how the cash flow is structured in an interest rate swap contract between two parties and how the swap contract provides a hedging mechanism with an example:

Let's say Company A has a variable interest-bearing liability (debt) with a rate of Libor+0.2. If the managers of Company A anticipate an increase in future Libor interest rates, they may seek to enter into a swap agreement to mitigate the risk associated with the variable Libor interest obligation. Let's say Company B has a fixed interest-bearing liability (debt) at a rate of 5.5%. If the managers of Company B anticipate a future decrease in Libor interest rates, they may seek to enter into a swap agreement to exchange their fixed interest obligation for a variable interest obligation.

If both companies make a mutual swap agreement in a period when the libor rate is 5%, both companies will have realized the desired transaction. Assuming that the principal liabilities of both companies are the same, company A pays 5.2% fixed interest to company B; If a swap agreement is established in such a way that company B also agrees to pay Libor interest to company A.

When considering the perspective of Company A in the above scenario, Company A is meeting its variable interest obligation through Company B and, in return, accepting to pay an interest rate of 5.2% to Company B. As a result of the swap contract, Company A's interest obligation transforms into the form of "Libor + 0.2 + 5.2 - Libor," resulting in a net fixed interest obligation of 5.4%. On the other hand, Company B swaps its fixed interest obligation for a variable interest (Libor). Company B will pay interest to Company A based on the Libor rate and, in return, receive a fixed interest rate of 5.2% from Company A. Therefore, Company B's interest obligation after the swap agreement will take the form of "5.5 + Libor - 5.2," resulting in a variable interest obligation of Libor + 0.3.

Assuming both companies have the same amount of debt obligation in terms of principal and the debt maturity is also the same for both, let's say three years. It was assumed that the Libor rate was 5% at the beginning of the period. In each interest swap period, the variable interest payment obligation of the company will vary based on the changes in the Libor rate.

## Currency Swap Transaction

One of the risk factors in commercial transactions is the exchange rate. With the increasing volume of international trade, the exchange rate poses a risk element in both long-term investments and portfolio investments. Therefore, another common swap transaction in global markets is currency swap agreements. In currency swap agreements, there are two parties in need of different currencies. The parties agree to exchange the principal and interest payment obligations in one currency with those in another currency in the future, for a specified period. Unlike interest swap agreements, currency swap agreements require both the exchange of obligations and the exchange of principal amounts. In other words, both at the beginning and at the maturity of the contract, the principal amounts are transferred mutually (Başçı, 2003: 25-26).

In currency swap agreements, at the beginning of the contract, the principal amounts are equal in terms of the spot exchange rate. However, since the exchange rate will fluctuate during the contract period, it is expected that the principal amounts will not be equal at the end of the contract. The interest rates applied to the two different currencies involved in the swap agreement can be either fixed or variable. On the other hand, the difference

between the interest rates of the currencies subject to swap transactions in their own countries may also be high. To illustrate the concept in a simple manner, let's consider a hypothetical contract between an A company based in the United States and a B company based in Türkiye. Let's assume that the interest rates involved in the contract are fixed. It is assumed that B company needs dollars, and A company needs Turkish lira. Under market conditions where the Turkish lira interest rate is 10%, the dollar interest rate is 4%, and the dollar exchange rate is 20 TL, let's assume a one-year swap agreement is made for a principal amount of 20,000,000 TL.

As a result of this agreement, at the end of the contract or interest period, A company will pay 2,000,000 TL interest to B company at a rate of 10%, and B company will pay $40,000 interest to A company at a rate of 4%. Currency swap agreements can take shape according to the parties' needs, and there are no transaction restrictions. Even if one of the parties has no obligation, they can enter into a swap agreement and use the funds obtained for another swap agreement. In the example provided, A company can use the Turkish lira obtained through the swap agreement to buy dollars in the spot market and enter into another swap agreement. The determining factors in such practices are margin, exchange rate, and interest rate fluctuations.

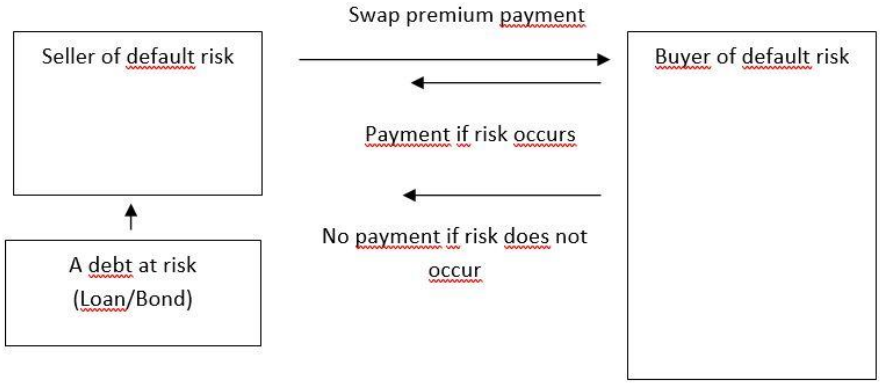
Currency swap agreements similarly involve reciprocal swaps, and the variable liability that is subject to the swap is not necessarily the only one that differs from interest rate swaps. In other words, both sides of the swap agreement can be volatile.

## Credit Swaps

Besides the interest rate and currency swap agreement, another common swap agreement is credit swaps. Credit swaps, which emerged in 1993 and are widely used in today's economy, can be expressed as the process of transferring the risks in a debt relationship to the other party at a low cost. Credit swap agreements are commonly used for risk management purposes. The swap transaction involves an exchange, and parties in a debt relationship may resort to swap transactions from time to time based on market trends. For instance, a variable interest-bearing debt can be a risk factor depending on market trends (Demir, 2021: 1642-1643). At times, a variable interest-bearing debt may be more favorable compared to a fixed-interest debt. Since swaps are based on exchange, they can also be used for managing credit risks by providing the parties in a debt relationship with the opportunity to exchange obligations.

## Credit Default Swap (CDS)

We hope to fix some misunderstandings on CDS-related issues and offer more. Credit default swap is a type of swap contract that eliminates the default risk of the borrower from the perspective of the lender in exchange for periodic premium payments. As the premiums for credit default swaps increase in an economy, it becomes more challenging for that economy to access external financing. This is because the cost is borne by the lending party to eliminate the default risk through a swap agreement increase. The general operation of credit default swap agreements is described as follows;




The operation of the credit default swap is expressed in its simplest form in the figure above. The lender can eliminate the default risk arising from the debt relationship with a swap agreement in return for a certain premium. This premium has been recorded in the literature as CDS spread and is considered as a common financial indicator today.

The CDS spread reflects the instantaneous reaction of the market as it is re-determined every moment based on supply and demand. This concept, which is very important for financial markets, allows investors to monitor the risk associated with a particular asset or investment.

Credit derivatives are one of the most important inventions of financial markets for investors. For companies, it has become a tool to both manage and trade credit risks by spreading them across the market. One of the most famous credit derivatives is CDS. CDS is insurance against the default of a company or a powerful institution. The company is accepted as a reference organization. It is also known as the company's default loan. The buyer of the insurance in question makes periodic payments at certain periods. In return, if the loan is realized, it gets the right to sell the bond issued by the reference institution at its nominal value (Hull et al. 2004, p. 2789).

Investors use CDS to protect themselves from default risk. CDS which transfers credit risk between parties is also one of the financial instruments. In a CDS contract, one party buys credit protection from another party to protect against potential losses from a credit event involving a specific entity. This protection remains in place until a specified maturity date. The buyer pays regular premiums to the seller, allowing for the separate trading of credit risks. This promotes a wider distribution of credit risks, enhancing the resilience of the financial system. CDS instruments also enable risk diversification in sectors that are not direct creditors, contributing to risk management and the promotion of financial stability (Angelini, 2012, p. 584). CDSs have a significant impact on the decision-making processes of both direct investments and portfolio investments. The country's default risk directly affects the cost of external borrowing due to being a strong indicator of its resilience against financial shocks. Therefore, the level of a country's default risk has a direct influence on the financing costs of its external debt (Kılcı, 2017, p. 72).

Kayalar et al. (2017) define correct CDS contracts to transfer credit risk from the buyer to the seller in exchange for a fee. As a result, CDS spreads are commonly used as an indicator or proxy for the default probability of the borrower. Higher CDS spreads generally imply a higher perceived likelihood of default, while lower spreads indicate a lower perceived default risk.

By providing lenders with increased bargaining power in post-debt renegotiations, CDS functions as a commitment mechanism for lenders, enabling them to negotiate and secure higher repayment amounts from the debtor country. CDS helps mitigate agency frictions that are inherent in lending contracts, which can be especially challenging to address in the context of sovereign debt. Consequently, CDS facilitates the borrower's ability to access more external capital (Sambalaibat, 2019).The legal terms of credit default swap agreements follow a standardized duration. Fundamental agreements are a common market practice also supported by the International Swap and Derivatives Association (ISDA). Thus setup and negotiation costs are significantly reduced (Bomfim, 2022, p.7).

CDS spread changes are influenced by real-time macroeconomic variables. Default events for CDSs may encompass some or all of the following (Blanco et al. 2005, p. 2257; Ams et al., 2018, p. 11):

- Bankruptcy or insolvency of the reference entity.

- Failure to make principal or interest payments on the referenced debt.

- Debt restructuring or debt forgiveness.

- Repudiation or moratorium on debt payments.

- Distressed exchange, where the terms of the debt are modified in a way that is unfavorable to the bondholders.

- Other specified credit events defined in the CDS contract.

**Table 1: CDSs Determinants**

| **GLOBAL FACTORS** | | |
|---|---|---|
| Risk-free interest rate (such as LIBOR) | Credit ratings | External shocks (such as VIX Index oil prices, war, terrorism, and immigration) |
| Global interest rate | Economic and financial crises | Global Liquidity |
| Risk appetite | International relations | Expectations |
| US Treasury bond yield | Economic environment | Capturing general market |
| **MACROECONOMIC FACTORS** | | |
| Interest rate and payments | Current Account Deficit | External and domestic debt and to GDP ratio (other ratios related to the debt) |

| | | |
|---|---|---|
| GDP growth rate, GDP per capita | Budget deficit and other ratios related to the budget | Export and import and other ratios related to the these indicators |
| Inflation | Investment (Public and private) | Foreign exchange rate |
| Central bank transactions and reserves | Tax system | Devaluation of the Exchange rate |
| **MARKET FACTORS** | | |
| Market volatility and return (such as BIST 100 | The soundness of the banking sector (such as Past banking crises) | Net capital inflows |
| Risk-free rate | Swap rate | Openness |
| Confidence | Stock return | |
| **LOCAL FACTORS** | | |
| Leverage: Stock return | Asset volatility | Liquidity |
| Business climate | Political stability | Fiscal imbalances |
| Legislative and executive indices | Reserves | Deregulation |
| Property rights | | |

Source: (Kajurova, 2015; Asonuma et al. 2019; Sturzenegger, 2004; Kartal et al. 2022; Ceylan and Özpençe, 2020) edited by us

After the 2008 GFC, there is no consensus on the determinants of CDS and their distributions; however, the interest of both researchers and policymakers continues to increase (Kajurova, 2015, p. 1303). CDS determinants consist of global, macroeconomic, market, and local factors. As a result of globalization, countries becoming financially interconnected and the increase in international capital mobility, a change in global factors affects the CDS spread in a country. This situation will additionally be reflected in macroeconomic indicators and cause volatility in the CDS spread. For example, a significant deficit in the current account balance will increase the need for foreign exchange, leading to the exchange of currency swaps. On the other hand, variables in the swap markets affect the CDS spread. Every variable from swap interest rates to risk-free interest rates can have a positive or negative impact on the CDS spread. Local factors, on the other hand, are indicative of the outcome of shaping the domestic dynamics of the private and public sectors and have an impact on CDS.

## Review of Related Literature

The literature on sovereign credit risk has primarily focused on the debate regarding whether sovereign credit spreads are driven by global or country-specific risk factors (Augustin et al. 2016, p. 189). The objective of Csonto and Ivaschenko's (2013) analysis is to examine the fluctuations in emerging market debt spreads and distinguish the influence of global and country-specific factors. According to their findings, both country-specific and global developments significantly impact spreads in the long term, with global factors having a greater influence on spreads in the short term. Similarly, Augustin and Tedongap (2011, p. 37), Longstaff et al. (2011, p. 98) findings indicate that sovereign credit risk is priced at a global level rather than being determined by local factors.

However, Hilscher and Nosbusch's (2010) findings highlight that country-specific fundamentals hold significant explanatory power in determining sovereign credit risk, even when controlling for global factors and credit ratings. These country-specific factors play a crucial role in understanding and predicting the level of credit risk associated with a particular country, indicating that they cannot be solely attributed to global factors or credit rating agencies.

Turguttopbaş (2013) has focused on the local and global factors affecting the CDS spreads in his study and also aimed to figure out the CDS spreads of six countries, namely Brazil, Russia, South Korea, Türkiye, Greece, and Spain. Considering only country factors the relationship between external debt and CDS spreads is positive across countries, except for Greece. The research reveals a consistent negative relationship between the Balance of Payment as a percentage of GDP and CDS spreads across all countries. This finding aligns with logical expectations, as an increase in the Balance of Payment ratio indicates higher inflows from trade relations and capital flows. Consequently, the perceived riskiness associated with a country decreases, leading to narrower CDS spreads. This suggests that a stronger balance of payment position contributes to improved market perception and reduced credit risk. The research findings indicate that while global financial factors produce similar results on external debt, only in Russia and Korea is there a significant positive relationship in terms of local factors regarding the balance of payments to ratio GDP.

The Eurozone debt crisis, which commenced in late 2009, rekindled the attention of scholars and investors on the stability of sovereign debt. Recent literature on the costs of sovereign defaults reveals that debt restructurings impose significant costs on both issuers and investors (Rodriguez et al. 2019, p. 229).

Some studies propose that CDS trading can enhance the efficiency of debt contracts, facilitate higher leverage ratios, and longer debt maturities, and serve as a commitment mechanism for borrowers and lenders (Kim, 2016; Amiram et al., 2017; Saretto and Tookes, 2012; Streitz, 2016). However, other studies suggest that CDS trading may raise the cost of debt and not necessarily reduce the cost of debt financing for the average borrower (Bolton and Oehmke, 2011; Narayanan and Uzmanoglu, 2018; Sambalaibat, 2022; Morrison, 2005).

Studies addressing the effects of CDS in terms of public outsourcing indicate that government external debt can be influenced by CDS in various ways. CDS can impact bankruptcy risk (Blanco-Oliver et al. 2015; Subrahmanyam et al. 2014), debt overhang (Wong and Yu, 2021; Gan et al. 2022), borrowing cost (Delatte et al. 2012), debt structure (Clark et al. 2022), investment (Bartram et al. 2017; Kartal and Bektaş, 2022), and economic growth (Kırca et al. 2019), while also mitigating agency frictions in the context of sovereign debt.

Huyugüzel Kışla et al. (2022) analyze the relationships between CDS spreads in 13 European countries using spatial econometrics techniques. The model enables the estimation of both direct and indirect transmission of sovereign risk and feedback effects within the network of these countries. Trade linkages between the countries are identified as the main channel driving spillovers of sovereign risk. Their findings indicate that trade linkages play a significant role in the transmission of sovereign debt risk. The study

suggests that the indirect effects of government debt increases have a relatively larger impact on the rise of CDS spreads, particularly in the core Eurozone countries.

Akkuş (2021) researches the existence of a causal relationship between Türkiye's CDS risk premiums and its external debt. In this study is found a bidirectional causal relationship between CDS risk premiums and public external debt, while no causal relationship is found between CDS risk premiums and private sector external debt. In contrast to the symmetric causal relationship between the variables, it is determined that negative shocks in public external debt are not the cause of positive or negative shocks in CDS. However, it is concluded that there is a mutual causal relationship between public external debt and positive and negative shocks in CDS. Additionally, Török (2022) points out The COVID-19 pandemic has led to a rise in global gross external debt and sovereign public debt, including in the eurozone countries. This has increased the risk for investors buying debt securities. However, his study found that the relationship between CDS spreads and gross government debt was stronger than with gross external debt. The study concluded that the increase in government debt did not cause a corresponding increase in CDS spreads due to financial factors associated with the pandemic. When CDS spreads rise, borrowing expenses tend to escalate, leading to a subsequent impact on interest rates (Ustaoğlu, 2022, p. 303 from Arzova et al. 2020).

Augustin et al. (2016), sovereign risk and returns cannot be precisely determined, but they emphasize that the introduction of a ban on the naked sovereign CDS contracts in Europe is an important step to mitigate the negative externalities arising from trading in sovereign CDS contracts.

Yılmaz and Ünlü (2018) analyze the cointegration and causal relationships among the current account balance, foreign exchange, and CDS spread within the Turkish economy. The study focused on data collected from January 2011 to March 2017. Their aim is to explore the interdependencies and potential causal links between these variables during the specified time period in Türkiye. After conducting their analysis, they have determined that there is evidence of Granger causality flowing from the current account balance to foreign exchange and from foreign exchange to CDS spread, indicating a sequential relationship. In addition, there is a long-term positive relationship between the exchange rate and the CDS spread according to cointegration coefficient. Whereas in their study show that there is not statically significant relationship between the current account balance and CDS spread. Also writers point out the higher the current account deficit flow the greater the contry's risk.

Baltacı and Akyol (2016) examined the macroeconomic variables (current account deficit, real interest rate, GDP inflation rate, and S&P Global Reit Index) affecting on Türkiye's CDS spread in the 2003-2014 period. Using the Generalized Method of Moments (GMM), dynamic panel data and, Residual Linear Regression Model estimators the authors state that among the macroeconomic variables, the most effective variable on CDS is GDP. However, an increase in current account deficit can directly cause an increase in CDS spreads.

Ho's (2016) study concentrated on determinates on soverign CDS in eight emerging countries from April 2008 to February 2013. In study is assigned determinants on CDS as current account, external debt and, international reserves and these determinants are investigated short run and long run stationary panel data estimator method. In accordance with econometric estimator findings, while an increase in external debt

increases sovereign CDS spread in the long run, an increase in other variables (current account and international reserves) cause a decrease on sovereign CDS. The most interesting finding in the study is international reserves that the most strong effect on sovereign CDS.

Akçelik and Fendoğlu (2019) investigate country risk with dynamic panel fixed effect model for seven emerging market economies's macroeconomic variables (current account balance, international reserves, real annual GDP etc.) according to global risk appetite. Countries with strong domestic macroeconomic indicators bring about decrease CDS's premium. Namely, the stronger the current account balance, the international reserves and, the financial balance of country the lower the CDS premium.

## Empirical Application

The study aims to determine the relationship between the central government's external debt stock and CDS spread, as well as the relationship between the current account balance and CDS spread in Türkiye. Monthly data for the variables of central government external debt stock, current account balance, and CDS spread for the period of 2008:1-2023:3 were used to investigate the relationship between these variables. CDS, whose first application was designed by JP Morgan Inc in 1994 became widespread in the academic literature with the 2008 GFC, the Eurozone sovereign debt crisis in 2010-2011, and financial scandals (Augustin et al. 2016, p. 175-176). The study's timeframe has therefore been initiated from the year 2008. The data definitions and sources for the variables included in the study are presented in the table below;

**Tablo 2. Data Definitions and Sources**

| **Data Definition** | **Data abbreviations** | **Source** |
|---|---|---|
| Central Government External Debt Stock | Db | Republic of Türkiye Ministry of Treasury and Finance |
| Current Account Deficit | Crd | The Central Bank of the Republic of Türkiye |
| CDS Spread | Cds | Bloomberg.ht |

In the study aiming to determine the relationship between the variables presented in Table 1, a modern analysis method called wavelet coherence analysis was employed. The main reason for choosing this method is its ability to provide information and findings for each period included in the analysis time frame. Additionally, wavelet coherence analysis involves a high level of simulation, which means that it increases the dataset significantly, thereby enhancing the validity of the findings obtained from the analysis. The wavelet coherence analysis was conducted using the R Studio program.

The study aims to test two different hypotheses that may appear distinct but are closely related to each other. The first hypothesis states that there is a very low/non-existent interaction between the CDS spread and the central central government external debt stock in Türkiye. The second hypothesis suggests that as a rationale for this situation, there is a positive relationship between the CDS spread and the current account deficit in Türkiye. While the analysis was conducted within the framework of these two hypotheses, the reasons for formulating these hypotheses are discussed below.

An increase in CDS spread raises the default risk in the central government's external borrowing in Türkiye and consequently increases the cost of eliminating this risk through a swap agreement. While this perspective may be correct when the justifications of the variables are not taken into account, considering the functioning of the economy opens up to different interpretations. In fact, the public sector is not the only segment that borrows in Türkiye, and statistically, a high relationship between these variables is not expected given the fiscal discipline in the public sector. On the other hand, changes in CDS spread do not always occur due to political stability, budget deficits, or inflation. The basis of CDS spread lies in a swap agreement, and in Türkiye, the borrowing needs of the public sector can vary due to reasons such as foreign exchange constraints or external debt interest payments. In other words, the foreign exchange inflows and outflows in the current account balance affect the borrowing needs of the public sector and indirectly influence the CDS spread. Swap agreements can also affect foreign exchange inflows and outflows. Considering the obligation of foreign investors to make investments in the Turkish Lira, swap agreements also play a role in the amount of direct and indirect foreign investments coming to Türkiye. To illustrate this, let's consider an example where interest rates in swap agreements involving Turkish Lira swaps increase. As the costs of foreign investors making investments in Türkiye indirectly rise, currency issues will begin to arise in Türkiye. If this issue persists and deepens in the long term, it will lead to disruptions in the current account balance and an increase in CDS spread. In light of this information, instead of expecting a relationship between the central government's borrowing needs and the CDS spread, it would be more accurate to expect a relationship between the CDS spread and the current account deficit. Therefore, the hypotheses in the study are formulated as *"There is no relationship between CDS spread and external debt"* and "*There is a positive relationship between CDS spread and the current account deficit."*

## Wavelet Coherence Analysis

Wavelet analysis, which is based on wavelets, transforms a specific variable, observation, or data into frequencies. A wavelet represents a limited version of a variable, observation, or data in the time and frequency dimensions with zero means. In other words, wavelet formation is a transformation process, and during this transformation process, a specific scale and frequency are used. By determining a lower and upper band for the frequency and creating a bandwidth, continuous oscillation is achieved. All of these processes aim to reveal the characteristics inherent in a variable, observation, or data from a statistical perspective (Grinsted et al. 2004, p. 562-564).

The wavelet method was developed by Morlet and Grossmann (1984) in their work titled Decomposition of Hardy Functions into Square Integrable Wavelets of Constant Shape, and thanks to Meyer's contributions, simultaneous analysis of two variables, observations or data became possible. In the analysis of two variables, observations, or data, after

performing separate transformation processes, cross-transformations are also applied. For cross-transformation, methods such as wavelet coherence and wavelet spectrum are used (Meyer, 1993, p. 1-5). In the study, the Morlet wavelet function was used for wavelet formation, and the wavelet coherence method was used for cross-transformation. The functions used for the transformation processes and cross-transformation are listed below.

I. Stage: Determination of the wavelet function, where m represents the scale dimension and ı represents the time dimension. The function is as follows (Pal and Mitra, 2019, p. 174):

$$\psi_{ı,m} = \frac{1}{\sqrt{m}}\psi(\frac{(t-1)}{m}), ı, m \qquad \in R, m \neq 0$$

II. Stage: Transformation of the previously determined function into Morlet wavelets, and the functions used are as follows (Memon et al. 2013, p. 105):

$$\text{WDb(ı,m)} = \int_{-\infty}^{\infty} Db_t \frac{1}{\sqrt{m}} \psi (\frac{(t-1)}{m}) d_t$$

$$\text{WCrd(ı,m)} = \int_{-\infty}^{\infty} Crd_t \frac{1}{\sqrt{m}} \psi (\frac{(t-1)}{m}) d_t$$

$$\text{WCds(ı,m)} = \int_{-\infty}^{\infty} Cds_t \frac{1}{\sqrt{m}} \psi (\frac{(t-1)}{m}) d_t$$

III. Stage: In this stage, the Morlet wavelet cross-transformation, or in other words, the simultaneous analysis, is performed for each variable, and the functions used are as follows:

$$W_{(Db,Cds)} = W_{Db}(ı,m)W_{Cds}(ı,m) \sim$$

$$R^2(ı,m) = \frac{IS(m^{-1} W_{DbCds}(ı,m))I^2}{S(m^{-1}IW_{Db}(ı,m)I^2)S(m^{-1}IW_{Cds}(ı,m)I^2)} \sim \text{All } R^2(ı,m) \text{ için } 0 \leq R^2(ı,m) \leq 1$$

$$W_{(Crd,Cds)} = W_{Crd}(ı,m)W_{Cds}(ı,m)$$

$$R^2(ı,m) = \frac{IS(m^{-1} W_{CrdCds}(ı,m))I^2}{S(m^{-1}IW_{Crd}(ı,m)I^2)S(m^{-1}IW_{Cds}(ı,m)I^2)} \sim \text{All } R^2(ı,m) \text{ için } 0 \leq R^2(ı,m) \leq 1$$

In the above functions, S represents the wavelet smoothing coefficient, and the value of R2(ı,m) approaching 1 indicates dependencies between the variables in the time series, while a value approaching 0 suggests no relationship between the variables in the time series.

IV. Stage: Since the above functions are based on squared values, they do not include negative phase values. Therefore, in this stage, functions that include negative phase values are added, and the function including negative phase values is as follows.

$$\varphi_{DbCds}(ı, m) = \tan^{-1}(\frac{\aleph\{S(m^{-1}W_{DbCds}(ı,m))\}}{\rho\{S(m^{-1}W_{DbCds}(ı,m))\}}$$

$$\varphi_{CrdCds}(ı, m) = \tan^{-1}(\frac{\aleph\{S(m^{-1}W_{CrdCds}(ı,m))\}}{\rho\{S(m^{-1}W_{CrdCds}(ı,m))\}}$$

## Wavelet Coherence Analysis Findings

In wavelet coherence analysis, the above functions are applied sequentially, and the resulting images are obtained in the final stage through the ℵ visualization and ϱ operation operator. The obtained images illustrate the relationship between variables in terms of causality, correlation, and interaction. The colors in the resulting images represent the interaction between variables, while the arrow signs indicate causality and correlation. When the colors tend towards blue, it indicates a decrease in the interaction between variables, and when they tend towards red, it indicates an increase in the interaction. Right-pointing arrow signs represent a positive correlation while left-pointing arrow signs represent a negative correlation. On the other hand, upward-pointing arrow signs indicate that the second-order variable causally affects the first-order variable, while downward-pointing arrow signs indicate that the first-order variable causally affects the second-order variable.

**Figure 1.** Relationship between Central Government External Debt Stock and CDS Spread

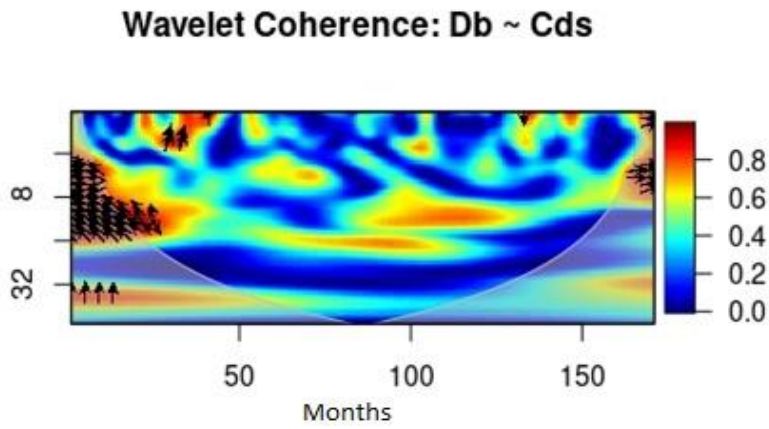



Figure 1 displays the findings regarding the interaction, relationship, and causality between the central government external debt stock and the CDS spread. Based on the findings, it can be observed that the interaction between the variables is very low or virtually non-existent. The colorings for the entire period are predominantly in blue, indicating a lack of significant interaction. However, arrow signs indicating causality and correlation are observed within limited periods. These arrow signs are observed during the first two years and the last six months. The direction of the arrow signs during these periods is leftward and upward. This indicates a low impact of the second-order variable on the first-order variable and a low negative correlation between the variables.

The obtained findings contradict the general perception regarding the CDS spreads. Specifically, it is expected that an increase in the CDS spreads would make it more costly for the central government to borrow external debt, implying a negative correlation between the variables. However, this negative relationship between the variables was observed only within a limited period in the case of Türkiye, and subsequently, no

significant relationship was observed. One possible reason for this phenomenon could be a decrease in the central government's need for external borrowing. Another reason could be attributed to the inherent nature of the CDS spreads itself. CDS is ultimately a swap transaction. CDS, widely used as a credit swap, aims to transfer the risk of default on credit or debt to the swap counterparty. The default risk covered by swap agreements can vary due to reasons such as foreign exchange shortages, external debt interest payments, or the inability to borrow from the domestic market by the central government. Therefore, changes in the current account balance affect the borrowing needs of the central government and consequently, the CDS spreads. Additionally, it should be noted that the public sector is not the only borrower in Türkiye. The private sector also borrows from foreign markets, and its share in total debt is significant. This indicates that the CDS spreads are not solely influenced by the central government's external debt stock.

If we summarize the findings, the resulting conclusion, contrary to the general belief, is not inconsistent or illogical. This is because an important component influencing CDS spreads is not the borrowing requirement of the central government, nor does the borrowing requirement of the central government have a significant impact on CDS spreads. This situation arises from the low borrowing requirement of the central government in Türkiye. Although an increase in CDS spreads may incur additional costs for the central government's borrowing, the impact of the central government's borrowing requirement on CDS spreads is negligible. Therefore, the relationship between CDS spreads and the current account balance, which directly affects CDS spreads, has also been analyzed, and the findings are presented below.

**Figure 2.** Relationship between Current Account Balance and CDS Spread

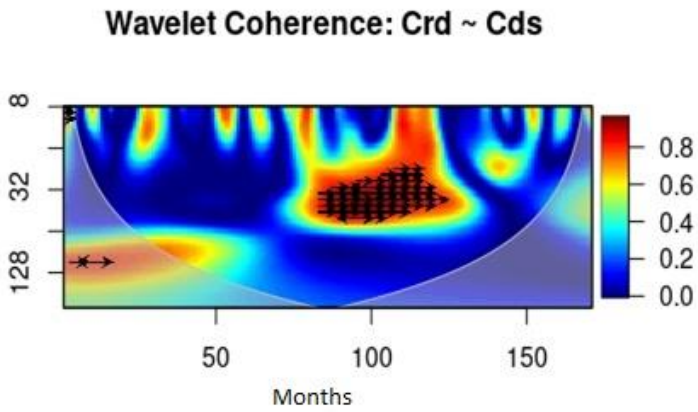



Figure 2 presents the interaction, relationship, and causality between the current account deficit and CDS spreads. The interaction between the variables is observed except for the last two years. On the other hand, the arrow signs appeared between 2014 and 2019, indicating a positive relationship between the variables. If we interpret the findings for the entire period, it can be stated that there is a relationship between the variables, and at times, the relationship involves a positive correlation. While it is not common to expect a

direct relationship between the current account deficit and CDS spreads in theory, the current account deficit is an indicator of international currency movement in a country. For countries with foreign exchange needs like Türkiye, changes in the current account deficit directly or indirectly affect CDS spreads.

It is reasonable to expect that CDS spreads are influenced by changes in the current account deficit, considering that CDS spreads are based on a swap transaction. Currency movements in the balance of payments affect the amount of foreign currency in Türkiye and, consequently, the exchange rate. Short-term investments in the balance of payments usually come to Türkiye through swap agreements, and financial investments in the domestic market are made in Turkish Lira. Additionally, the current account deficit reduces the amount of foreign currency in Türkiye, and assuming a constant demand for foreign currency, both the private and public sectors feel the need to borrow in foreign currency. While there can be further examples of interaction between the variables, changes in the current account deficit directly or indirectly affect credit swaps and, therefore, CDS spreads.

When considering the findings of the study as a whole, it can be said that the results are in line with expectations for Türkiye. Credit swaps are not solely determined by the central government's borrowing requirements, and also the borrowing requirements of the central government in Türkiye are not high. The findings support this notion. On the other hand, although CDS spreads have become an economic indicator in recent times, it is not accurate to solely associate them with external borrowing. The functioning of the financial system in the international arena is more complex. When a foreign investor wants to invest in Türkiye, they usually enter into a swap agreement and invest in Turkish Lira. Even an increase in swap rates related to the Turkish Lira can affect the inflow of foreign currency to the country and, indirectly, CDS spreads. Furthermore, the private sector is the main driver of economic activities in Türkiye, and its foreign exchange needs are higher compared to the public sector. The default risk of the private sector also applies to foreign currency borrowing, thus impacting CDS spreads. Moreover, there is no need for the private sector to borrow directly for this effect. As a financial institution banks' borrowing foreign currency from abroad and providing liquidity to the private sector in the domestic market will also produce the same results.

## Discussion

Debt ratios are commonly used indicators to analyze potential debt problems in a country. These ratios provide a first and direct assessment of the burden created by the country's debt. However, they are called "static" solvency analysis because they provide a snapshot of the situation at a particular point in time. These indicators provide valuable information about a country's debt situation but for a comprehensive analysis of solvency, it is important to consider other dynamic factors and trends. Because a static analysis is insufficient to determine the cost of borrowing needs that may occur in the future. This is because a static analysis is insufficient to determine the cost of future borrowing needs.

Debt ratios and other financial indicators offer important data to understand a country's debt management strategies and sustainability. However, it is necessary to consider all this information and adopt a long-term perspective for a thorough understanding of a country's real payment capacity.

CDS contracts based on emerging market sovereign debt continue to dominate the country's CDS market. It is often mentioned that contracts referencing the government debts of significant emerging market countries like Brazil, Mexico, and Türkiye are among the most actively traded in the global country CDS market. However, concerns regarding debt-to-GDP ratios and fiscal deficits that emerged partly due to the high costs of economic downturns and stabilizing national financial systems following the Global Financial Crisis (GFC) likely increased investors' interest in relevant CDS contracts.

In addition to increasing the interest in CDS contracts due to the global financial crisis, the elimination of default risk by CDS from the perspective of the lender has made CDS an important variable in international borrowing. CDS, by its structure, is a type of swap agreement. The underlying element of the agreement arises from a debt or credit transaction, and the party seeking to insure the debt or credit risk transfers the risk to a third party through a swap agreement. Although this transfer mechanism may seem simple, its determinants are quite complex. This is because external borrowing is a financing method used for multiple reasons, such as foreign exchange demand, external debt interest payments, or budget deficits. Moreover, the private sector can resort to external borrowing for various reasons.

Although CDS spreads express the default risk in a debt relationship, they lose their significance in conditions where there is no borrowing need. Therefore, CDS spreads are influenced by both the borrowing needs and other financing methods. If we consider the case of Türkiye, the CDS spread creates an additional cost for both the public and private sectors in their borrowing. Indeed, these sectors' borrowing needs are also influenced by the current account balance and other financing methods. Considering that the current account balance generally shows a deficit, a continuous need for foreign currency is observed. Economic actors obtain foreign currency from the domestic or international markets in various ways for transactions requiring foreign currency. As some of these transactions are realized through external borrowing, changes in the current account balance naturally affect CDS spreads.

Besides, increasingly complex financial instruments provide parties with alternative financing methods. Currency swap agreements provide a solution to the parties' needs in different currencies instead of establishing a debt relationship. However, the challenge lies in the fact that the principal obtained through a swap agreement can be used to purchase the relevant currency in the spot market and engage in another swap agreement. This process increases the demand for foreign currency in the domestic market but does not result in a real inflow of foreign currency from the international market. Of course, exchange rates, interest rates, and margins are important determinants of these transactions. When examined from a macro perspective, it becomes evident that there are many variables influencing the CDS spread, which may initially appear as a simple variable.

Until recent times in Türkiye, similar scenarios were observed due to the demand for foreign currency and the high liquidity of the Turkish lira in the global market. However, in recent periods, despite the existence of foreign currency demand, the decrease in Turkish lira liquidity has brought Türkiye to a level where it could engage in similar practices. In the recent past, swap rates reached significantly high levels. Another factor that complicates this equation is the domestic interest rate of the Turkish lira. During periods when interest rates are relatively high compared to other countries, Türkiye

becomes an attractive destination for currency swap agreements. Therefore, during periods of declining interest rates, foreign currency becomes more costly.

Taking into account Türkiye's foreign exchange demand, it is expected that the changes in these complex components will naturally affect CDS spreads. Furthermore, these changes can sometimes have a greater impact on CDS spreads than on debt and credit obligations. In fact, when analyzing the findings from the conducted studies, it has been determined that changes in the current account deficit have been influencing CDS spreads for a long time, while there is no relationship between the central government's external debt stock and CDS spreads. Credit default swaps, with their components being debt and default, have become an indicator affected by changes outside of their own components.

**Conclusion**

While real markets have led to the formation and development of financial markets in the past, today financial markets have come to a position that directs the real markets. Changes in the financial markets can deeply affect the real markets with the speed and globalization in the field of information and communication. While this interaction becomes more complex day by day, one of the important financial instruments affecting cash flows in real markets is credit default swaps. CDS spread, which is accepted as the ratio of the borrowing cost in an economy, is a variable that is taken into account by the lender and creates an additional cost by the borrower, as it offers dynamic debt analysis instead of a static debt analysis. Considering that international debt relations have accelerated in the last century, the CDS spread and its determinants have gained importance.

Although CDS spreads technically serve as insurance for default risk in a debt or credit relationship, there are many factors that influence this risk component. Factors such as currency issues, interest rates, and the presence of alternative financing methods directly or indirectly affect CDS spreads. In Türkiye, CDS spreads are influenced by various factors, and the high volatility of CDS spreads further emphasizes the importance of the subject.Based on this importance, the study has examined the relationship between CDS spreads and the central government's external debt stock, as well as the variables that can be considered as factors influencing CDS spreads, focusing specifically on the current account deficit.

Studies in the literature consider the CDS spread as an outcome variable and generally focus on its relationship with borrowing. The unique aspect of this study lies in its emphasis on the clearing process within the theoretical framework of CDS when investigating the correlation between central government external debt stock and the current account deficit, setting it apart from existing literatüre in this regard. One of the primary contributions of this study to the existing literature is its assertion that the fundamental clearing processes of CDS spreads can be subject to the influence of other macroeconomic variables. Beyond examining the connection between borrowing and the CDS, this study has also delved into the relationship between the CDS spread and the current account deficit variable, which is theoretically associated with it. The CDS, which is fundamentally based on the clearing process, can technically be influenced by other macroeconomic variables such as inflation or interest rates. Furthermore, this context underscores the study's constraints, as it has exclusively focused on central government external debt stock and current account deficit variables while neglecting other possible

macroeconomic variables associated with the CDS. This aspect underscores the study's prospects for further development.

Upon examining the analysis findings presented in the study, it was determined that there was no significant relationship between CDS spreads and the central government's external debt stock, except for a short-term relationship observed after the 2008 global financial crisis. On the other hand, a positive relationship was identified between CDS spreads and the current account deficit. A debt relationship should be observed with a ratio that is technically a cost factor. The obtained findings, although technically interesting, indicate that in Türkiye, CDS spreads are more influenced by factors outside the components related to CDS spreads themselves. This means that the CDS spreads in Türkiye are influenced more by factors other than the specific components that constitute CDS spreads. In other words, in Türkiye, CDS spreads are more influenced by factors such as exchange rates, interest rates, and margins rather than other components. Indeed, the study has identified a positive relationship between the current account variable, which serves as an indicator of these factors, and CDS spreads in Türkiye.


| | |
|---|---|
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