

# *Ambivalent Change in CDS Spreads in 11 Euro Area Countries*

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## SUMMARY:

One of the macroeconomic consequences of the COVID-19 epidemic is that the global economy has seen a robust increase in the countries' gross external debt and the sovereign public debt that is part of it. Nor have the eurozone Member States escaped this effect. The increase in gross external debt and sovereign government debt also means that it has become theoretically more risky for investors to buy debt securities (typically bonds). Theoretically, however, it follows that as a result of the increase in risks in the country, CDS spreads had to rise as well. The study uses a correlation calculation to show that the development of the price of CDSs is more closely correlated with gross government debt than with gross external debt. Using hierarchical cluster analysis, the study groups the countries of the Eurozone. The basis for clustering is the close relationship between a country's gross government debt and its CDS spread over the period under review. A relevant conclusion of the study is that the increase in gross government debt was not followed by an increase in CDS spreads because the financial source of the increase in government debt was different from previous years.

KEYWORDS: CDS spread, gross government debt, gross external debt, correlation, hierarchical clustering

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Public debt must be distinguished from private sector debt (companies, households and banks), which have different macroeconomic roles and effects. Private sector debt and public debt, however, are similar to the extent that these debts should be kept at a sustainable level (Sutherland et al., 2012). The most commonly used debt category is Gross Government Debt (GGD), which expresses the value of debt accumulated by the general government sector. Debt may be owned by residents and non-residents alike and, depending on this, we can talk about internal and external debt. A country's Gross External Debt (GED) is made up of public and private sector external debt (Silva, 2020).

## INTRODUCTION AND OBJECTIVE

This study examines the impact of euro area Member States' gross government debt and their total gross external debt on the development of CDS spreads (Credit Default Swap).

CDSs guarantee the repayment of principal in the event of a bond default. The risk of a country's indebtedness is adequately expressed by the CDS spread. In terms of the sovereign bond market, CDS spread is seen by investors as one of the most important indicators of country risk. With the help of CDS, credit risk becomes partially or fully transferable. This gives the parties to a transaction the opportunity to diversify and separate counterparty risks.

The most popular product among credit derivatives is the so-called CDS or credit default swap. The subject of a CDS is always a reference debt instrument, typically a bond. A CDS is a derivative product in which two persons, the buyer of protection and the seller of protection, swap the credit risk of the product underlying the CDS. In the

agreement, the parties stipulate that, in case of default, the seller of protection assumes a contingent payment obligation to the buyer of protection. Under the swap, the buyer of protection pays premium (spread) at regular intervals to the seller of protection until the maturity date or a default event occurs. The amount of the spread is usually expressed as a percentage of the nominal value of the bond.

When a country's gross external debt and public debt increase, the risk of repaying them increases, which theoretically entails an increase in CDS spreads. The study will examine the extent of relationship between the dependent variable (CDS spread) and each of the two independent variables (gross government debt: GGD and gross external debt: GED). Based on the strength of the relationship with the independent variables, the study will answer upon which independent variable the CDS spread depends more strongly. After detecting that independent variable, the study will cluster eurozone countries according to the strength of the influence of the detected type of debt on the development of CDS spreads on their bonds issued.

The study will examine two hypotheses.

►H1: it is a statistical fact that the gross external debt of euro area Member States is of significantly higher amount and proportion than their gross government debt. From this fact it marginally follows that changes in CDS spreads depend more strongly on a country's gross external debt than on its gross government debt. The dependence may seem stronger because in terms of amount the former is always higher than the latter.

►H2: Due to the outbreak of the Covid-19 pandemic, GDP production fell, resulting in lower budget revenues for euro area Member States. To mitigate the negative economic effects of the pandemic, Member States have spent large sums of money, financing them from loans. As a combined result of the

above, gross government debt (GGD) and gross external debt (GED) also increased significantly. Theoretically, due to the increase in debt, CDS spreads also had to increase during the period under review.

## LITERATURE REVIEW

### Literature on gross government debt

Gross government debt corresponds to the cumulative amount of the general government deficit accumulated in the past. The portfolio accumulated over the past years of debt elements issued to finance the deficit is the public debt (Arena, 2010). The development of the public debt of a national economy is influenced not only by the general government deficit but also the economic growth and the real interest rate above the country's inflation (Velasco, 1993).

There is no exact rule in economics as to an optimal debt ratio for a given national economy. The numerical ratio of 60 percent in the Maastricht Treaty is the product of a conventional agreement, a kind of reference point. The only requirement concerning this level of public debt is that it is desirable to approach the rate set as a percentage of GDP at a 'satisfactory pace' (ECB, 2019).

Several studies have examined the level at which public debt starts to have a negative impact on the economic growth of a given national economy. Examining this, *Reinhart and Rogoff* (2010) concluded that public debt above 90 percent of GDP reduces the growth of a given national economy. In contrast, *Herndon et al.* (2010) found that there is little difference in the average and median GDP growth of countries with debt below or above the 90 percent threshold. Their conclusion is that public debt and GDP growth varied significantly across countries and periods.

On a high public debt, interest has to be paid from the state budget and, consequently, the primary balance of public finances decreases, or may even turn negative. Interest payment reduces the amount of funds allocated from the government budget to finance public projects (Checherita-Westphal and Rother, 2012; Pattillo et al., 2011).

Another study found a different conclusion on the relationship between gross government debt and economic growth. *Dawood et al.* (2021) examined the impact of total external debt, public debt, and private sector external debt on economic growth in developing and transition economies in Asia between 1995 and 2019. Total external debt had a significant and positive impact on economic growth, while public debt and private sector external debt had a negative impact on economic growth.

Analyses of debt sustainability consider not only the level of debt to be important, but also its structure and debt management. *Panizza* (2008) highlights that, in addition to total public debt, the development of the ratio of external and internal debt is also important. Furthermore, the author emphasizes the importance of the debt structure. For an analysis of the level of public debt, see the study authored by *Sávai and Kiss* (2017).

### Literature on gross external debt

The Gross External Debt (GED) indicator only takes into account the debt of domestic (resident) economic actors to foreign economic actors. The gross external debt indicator is a complex indicator that reflects a given economic situation and is able to show the combined indebtedness of all groups of economic actors.

External borrowing does not always mean a negative macroeconomic situation for a

country. If a country can achieve a higher return on an investment implemented from a loan than the cost of borrowing, then the loan will serve the economic growth well. External borrowing increases the capacity and output of a national economy, therefore, debt growth is acceptable and justified (Poirson et al., 2002; Pattillo et al., 2004).

Relying on their econometric estimation system (GMM) by using dynamic panel data, *Mohd-Daud and Podivinsky* (2012) found that the accumulation of external debt is accompanied with a slowdown in the economies of developing countries.

When analysing the subprime crisis, *Gros* (2011) makes a surprising statement when he argues that gross external debt is the key to the turmoil of Europe's economies. Consequently, the author finds the conclusions that focus only on public debt to be misleading.

Using the Generalized Method of Moments (GMM) estimation technique, *Adewale and Meyer* (2021) examined 30 SSA countries in the period 1985-2019 and concluded that SSA countries need to pursue external debt reduction strategies to reduce the negative impact on their economies.

Another study examined the impact of external debt on economic growth in a developing country in the period 1970-2009. Results show that external debt has a negative effect on growth, but this adverse effect can be mitigated or even reversed in the case of sound macroeconomic policies (*Razman-Ahmad*, 2014).

A study by *Balyuk and Balyuk* (2021) finds that the increase in the external debt of the world's most developed countries is one of the most serious problems in modern world economy and global finance. *Ferreira's* (2016) study examines causal links between growth in gross domestic product (GDP) and growth in three debt categories, namely public debt, foreign debt and private debt in EU countries.

The author has detected clear evidence that economic growth contributes to a reduction in public debt. *Misztal* (2021) found in his study that the results of most empirical studies suggest that gross public debt (and gross external debt) is affected by economic growth. For the relationship between gross external debt and public debt, see the study authored by *Pulay and Simon* (2019).

### Literature on factors influencing CDS spreads

In the early 2000s, CDS transactions became a dominant product in the credit derivatives market. In terms of market size, it peaked before the 2008 financial crisis, with estimated gross market turnover behind CDS agreements ranging from \$ 47 billion to \$ 726 billion and the number of transactions ranging from 4,000 to 52,000 over the past 10 years (DTCC, 2021).

Determining the CDS spread is essential for the parties to a transaction. CDS may also be defined as a credit insurance. When the subject of a transaction is a sovereign government bond, the 'annual insurance premium' includes the country's credit risk premium.

*Fontana and Scheicher* (2016) found that spreads on both CDSs and bonds positively correlate with the rate of the 'risk premium', but CDSs show a stronger correlation with country-specific credit risk factors.

*Tampakoudis et al.* (2019) attempted to identify the dominant market for CDSs in terms of price search during the period of economic crisis, thereby providing an insight into decision-making for investment institutions and central governments.

In their study, *Ammer and Cai* (2011) analyse the relationship between sovereign CDS spreads and bond yield spreads for

the gross public debt of nine emerging economies. The study was based on data for four years. For most of the countries in our sample, the authors found that sovereign CDS spreads and bond spreads are linked by a stable, linear long-term equilibrium relationship.

In their study, *Arce et al.* (2013) examined the extent to which CDSs and bond market prices reflect similar information about credit risk during the financial crisis of the European Monetary Union (EMU). The authors found that the differences between CDS and bond prices are most strongly related to counterparty risk, market liquidity, and funding costs.

*Coudert and Gex* (2013) examined the relationships between credit default swaps and bond spreads to determine which of the two markets is the leading market in the price discovery process. They found that in circumstances where there is a debt crisis and an increased risk aversion, these factors tend to feed the CDS market, increasing its liquidity and leading role in the underlying market.

*Sabkha et al.* (2019) examined the behaviour of individual national economies during the subprime crisis. The authors used new econometric approaches in their research with results detecting that each country showed different behaviours towards credit risk, which is relevant from the aspect of both portfolio managers and decision makers.

A study by *Hassan et al.* (2015) examined the relationship between the price discovery dynamics of sovereign credit default swaps (CDSs) and bond markets, as well as the degree of financial integration in emerging markets. One of the results of their analysis is that they found a positive correlation of 0.67 between the degree of financial integration and the strength of the relationship with bond market information. Another conclusion is

that changes in sovereign credit risk and bond yields are significantly influenced by common external (global) factors.

*Gorea and Radev* (2014) examined determinants of the common default risk of euro area countries in the period 2007–2011. Their conclusion is that countries with stronger trade ties to troubled economies generally had a higher expected risk of bond default.

## MATERIAL AND METHOD

The probability of default (bankruptcy) is less affected by more adaptive macroeconomic variables of current type (such as budget deficit, balance of payments, etc.) than by macroeconomic portfolio variables. The probability of default (bankruptcy) is determined more by less changing debt-type portfolio data. Examples for such debt-type portfolio data include the ratio of a country's Gross External Debt (GED), and the ratio of Gross Government Debt (GGD) to GDP. This rule has been confirmed by several studies. *Aizenman et al.* (2013) found that prior to the unforeseen subprime crisis, CDS spreads were low in the euro area. During the global crisis, especially in 2010, when the sharp rise in sovereign debt took place in euro area countries, CDS spreads rose robustly.

A similar conclusion is reached by *Noeth and Sengupta* (2012). According to the authors, it has become apparent since the subprime crisis that investors have become increasingly cautious about troubled euro area countries. CDS spreads continued to rise, reaching new peaks each quarter during the crisis.

Eurozone countries have relatively high debt levels and investors have little confidence that these countries will be able to meet their debt obligations on time. The relatively high level of CDS spreads in these countries is

essentially explained by their high debt levels. Credit spreads in high-risk countries are more sensitive to changes in global sentiment. The same degree of deterioration in the global business cycle will raise the likelihood of bankruptcy to a greater extent in countries that are already over-indebted.

Therefore, the basis of this study is provided by the correlation described above, namely that the evolution of CDS spreads is fundamentally explained by the development of portfolio-type debt indicators of a given national economy.

### Detailed presentation of the methodology

The methodological basis of the analysis is formed by the application of correlation calculations combined with hierarchical cluster analysis.

#### *Correlation between CDS spreads and gross debt types*

Correlation means reciprocal relationship. Of the three variables, GED and GGD are independent variables, and CDS spread is the dependent variable because a change in GED and GGD will affect CDS, but this relationship is not true the other way round. This relationship could theoretically be function-type, stochastic, or completely independent. Before analysing the relationship between dependent and independent variables, one may assume that this relationship will be stochastic due to being function-type, and complete independence may be ruled out. Correlation calculation is an appropriate procedure for examining stochastic relationships.

Using the data in *Table 1*, the calculation of correlation coefficients will be performed by an Excel application, but this will only be

the first procedure in the econometric analysis. In the second procedure, a hierarchical cluster analysis will be performed with correlation coefficients. Researchers often use these two methods for econometric analyses, see *Deltuvaite and Sineviciene (2014)*, *Urbankova and Krizek (2020)*.

In this study, a correlation analysis will be used first to examine empirical data, then selected variables will be examined in terms of their strength and the direction of their dependencies, followed by the effect of the independent variables on the dependent variable.

First, the strength of the relationship between Gross External Debt (GED) and CDS spreads will be examined, using correlation calculations. Then similar calculations will be used to measure the strength of the relationship between Gross Government Debt (GGD) and CDS spreads.

The Pearson correlation coefficient values obtained through these calculations will reveal the independent variable that shows a stronger relationship with CDS spreads. The independent variable showing the weakest correlation will be excluded from the examination further on. The hierarchical cluster analysis will continue with the independent variable showing the strongest relationship with CDS spreads.

#### Hierarchical cluster analysis of data for euro area Member States

The multidimensional statistical method of cluster analysis will be used to determine homogeneity between euro area member states.

The cluster analysis will be required for classifying the examined countries based on the strength of the relationship between the dependent and independent variables. The

Between Groups method will be used for clustering. Since there are a relatively small number of samples, the variable must be examined in the SPSS as to whether it shows a normal distribution. For this purpose, a Shapiro-Wilk test had been performed in advance, with Sig showing a value of 0.058. Because this value is higher than the 0.05 limit, the null hypothesis proved acceptable, and normal distribution was achieved.

This study uses the so-called partitioning method to classify euro area Member States into clusters. In the range from  $-1$  to  $1$  [ $(-1) - (-0,5)$ ;  $(-0,5) - (0)$ ;  $(0) - (0,5)$ ;  $(0,5) - (1)$ ], the four clusters offer suitable and sufficient classifications to express differences between Member States. Through this, the research aims to achieve that Member States classified into a cluster be as different as possible from countries classified into other clusters.

The classification of a Member State into a given cluster will not be affected by how high or low the country's economic output is. Moreover, no other macroeconomic indicators will be relevant. Only the correlation between the independent variables (GGD or GED) and CDS spread changes for the examined Member State will be relevant for classifying the given Member State into one of the four clusters.

## Data

The sources of data required for obtaining Pearson correlation coefficient values and performing the hierarchical cluster analysis include Eurostat (2021), WGB (2021) and World Bank (2021). The referred databases fail to include data for all euro area Member States in the reference period. This is explained by the fact that data on sovereign yields are not available or unreliable for several Eastern

European countries, namely Lithuania, Latvia, Estonia, Slovenia, and Slovakia.

CDS data and rating announcements for the three remaining countries (Cyprus, Malta and Luxembourg) are negligible in the euro area (WGB, 2021). The absence of these data is also confirmed by *Lotfi et al.* (2021).

Gross External Debt (GED) data are sourced from the World Bank (2021) data set, given in US dollars. These figures have been converted into euro; data source for exchange rates: ER UK (2021). Data source for Ireland, Q3 and Q4 2020, and Q1 2021: CD (2021). Data source for quarterly GDP figures: Eurostat (2021).

## EMPIRICAL RESULTS

### Results of correlation calculations

The Pearson correlation coefficient values show the extent to which CDS spreads, which express default risks of the examined Member States, were affected by the development of Gross Government Debt (GGD) and Gross External Debt (GED) over the period Q2 2018 – Q1 2021.

For the 11 countries examined, the weighted average of correlation coefficients between CDS spreads and GGD is  $-0.29$  and the same value for GED is  $-0.14$ . Pearson correlation averages suggest that Member States' CDS spreads show a moderate negative relationship with the GGD variable and a weak negative relationship with the GED. The medium to weak strength and negative direction of the relationship is reflected in the fact that CDS spreads were steadily declining, despite a steady rise in Gross Government Debt and Gross External Debt.

Correlation calculations provided the answer to one of the main questions of the study. The development of CDS spreads

showed a stronger relationship with Gross Government Debt (GGD, where  $r=-0.29$ ) than with Gross External Debt (GED, where  $r=-0.14$ ).

The strength of the relationship between euro area CDS spreads and GGD as well as GED is illustrated in *Figure 1*.

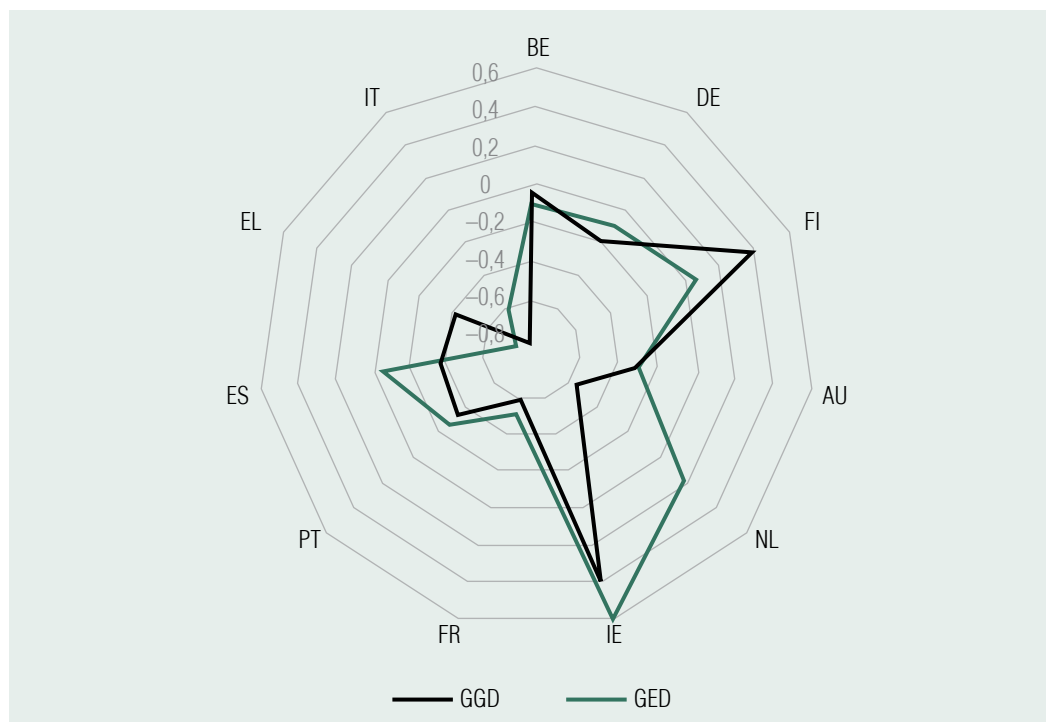
However, there was a turning point in the development of values for the dependent and independent variables, taking place in Q1 2020. This was the time when the panic-like consequences of the Covid-19 pandemic appeared in both real economies and money markets. In all countries of the world economy (including the eurozone Member States), government measures led to factory lockdowns, discontinuation of services and

difficulties in supply. Production disruptions and the economic downturn jeopardized the stability of corporate finances, productivity growth stalled and lost revenue threatened many indebted companies with insolvency. Non-public macroeconomic actors were forced to borrow more and more. Gross External Debt in all euro area countries grew dynamically. There were only two countries with declining Gross External Debt – the Netherlands and Ireland. However, data cited also show that these two countries rank at the top in terms of the Gross External Debt-to-GDP ratio.

The Member States introduced various economic protection measures that increased their budget spending. However, increased

Figure 1

**THE STRENGTH OF THE RELATIONSHIP BETWEEN EURO AREA CDS SPREADS AND GGD AS WELL AS GED**



Source: own edited



expenditures could not be financed from tax increases, so States typically obtained financial resources from bond issues. However, loans and credits taken out by governments increased Member States' indebtedness.

This study is not intended to detail all the negative economic effects of the Covid-19 pandemic. For more details on these effects, see the following studies: *Vitenu-Sackey and Barfi* (2021), *Song and Zhou* (2020).

CDS spreads stagnated in 2018, declined slightly but steadily in 2019, and rose robustly in Q1 2020. The panic triggered by Covid-19 increased the risk of debtors defaulting, which also affected the development of CDS spreads.

Price increases took place in all examined euro area Member States, but to varying degrees. Measuring the increase in CDS spreads over the period Q4 2019 to Q1 2020, the following order of increase, in percentage, becomes clear: Portugal (+163), Germany (+156), Spain (+145), Austria (+122), Ireland (+105), France (+100), and Greece (+82).

The effects of the panic soon passed, with CDS spreads recovering to previous levels in Q2 2020.

### Background and results of hierarchical clustering

The study answered the first question, namely that changes in CDS spreads are more strongly related to Gross Government Debt than to Gross External Debt. In other words, the probability of a bankruptcy is more strongly expressed by a country's Gross Government Debt than its Gross External Debt. Gross External Debt must therefore be excluded from the cluster analysis, and clustering must be based on the extent to which Gross Government Debt and CDS spreads move together.

Before performing the hierarchical clustering, it was necessary to test whether the correlation coefficient values related to Gross Government Debt follow a normal distribution. Results of the Shapiro-Wilk test performed in the context of GGD: Sample size ( $n$ ):11; Average ( $\bar{x}$ ):-0.239909; Median:-0.2983; Sample Standard Deviation ( $S$ ):0.367558; Sum of Squares:1.350986;  $b$ :1.112712; Skewness:0.754068; Excess kurtosis:-0.122192;  $P$ -value: 0.295892. Based on results data, the correlation data follow a normal distribution.

The normality test of correlation values for Gross Government Debt is shown in *Figure 2*.

In the following part the study examines the differences between individual Member States, using hierarchical clustering. The basis for distinction is to identify the euro area member states that can be classified into a cluster based on the strength of the relationship between CDS spreads and Gross Government Debt. The test was performed using a hierarchical clustering algorithm. The clustering is illustrated in *Figure 3*:

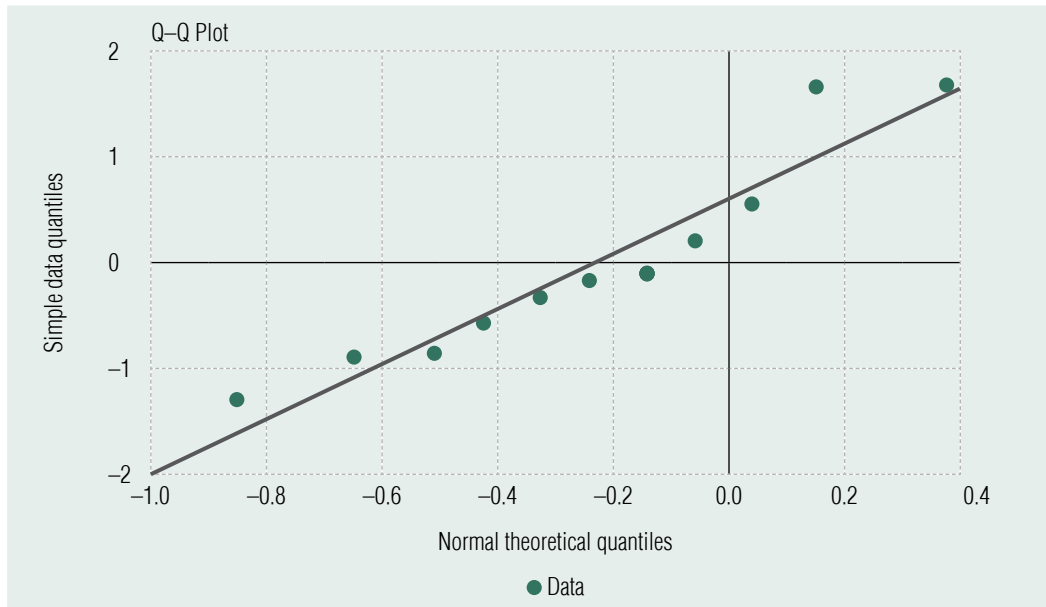
Eurozone countries could be clustered based on the strength of relationship between a country's Gross Government Debt and CDS spread.

Member States falling into Cluster 1 (range: -1.0 to -0.5): Italy, France, the Netherlands. These are the euro area Member States with the strongest reverse (negative) relationship between Gross Government Debt and CDS spreads over the period under review. All three countries saw a significant increase in Gross Government Debt, while their CDS spreads fell even more sharply (Netherlands: 1.5 and -19 percent; France: 15 and -37 percent; and Italy: 18 and -65 percent).

Member States falling into Cluster 2 (range: -0.5 to 0.0): Germany, Belgium, Greece, Spain, Portugal, Austria. These are

Figure 2

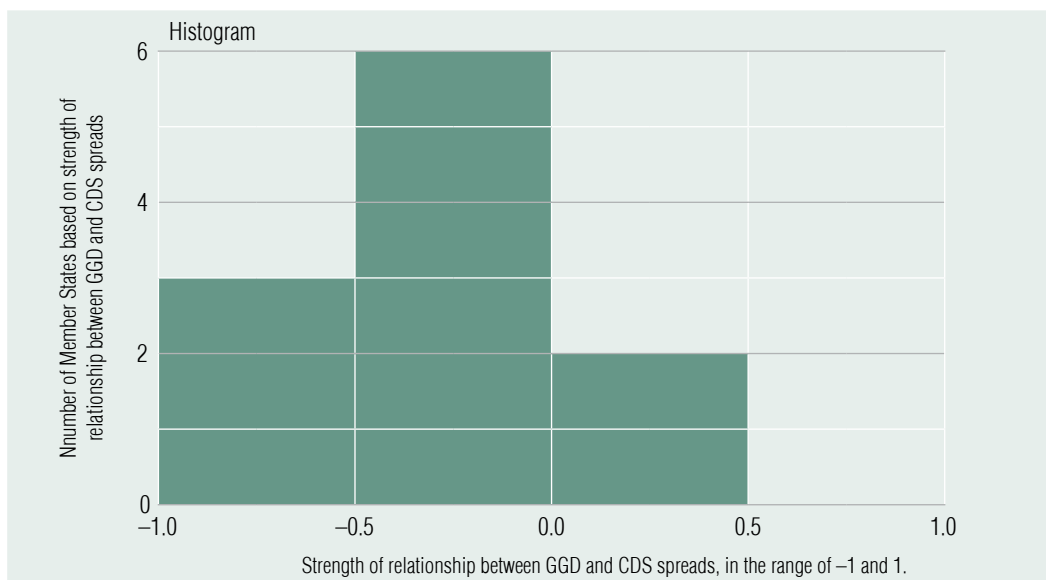
**NORMALITY TEST OF GROSS GOVERNMENT DEBT CORRELATION VALUES**



Source: own edited

Figure 3

**CLUSTERING OF EURO AREA MEMBER STATES BASED ON THE STRENGTH OF RELATIONSHIP BETWEEN CHANGES IN GGD AND CDS SPREADS**



Source: own edited

the euro area Member States with moderately strong reverse (negative) relationship between Gross Government Debt and CDS spreads over the period under review. Gross Government Debt increased in all six Member States, while their CDS spreads fell even more sharply (Germany: 13 and -17; Belgium: 14 and -40; Greece: 15 and -77; Spain: 27 and -52; Portugal: 9 and -71; Austria: 14 and -29 percent).

Member States falling into Cluster 3 (range: 0.0 to 0.50): Finland and Ireland. These are the euro area Member States with a moderately strong but positive relationship between Gross Government Debt and CDS spreads over the period under review. Both countries had positive correlation coefficients, 0.3849 for Finland and 0.3940 for Ireland. Finland's situation is explained by the fact that its Gross Government Debt increased by 17 percent, but its CDS spread remained unchanged. Ireland's first class ranking is explained by the fact that it was the only euro area country with a steady decline in Gross Government Debt over the period under review. For Ireland, the decline in Q1 2021 is 7.5 percent from 68 percent of GDP at the beginning of the period (down to 60.5 percent). This decline in public debt was accompanied with a decline in CDS spreads.

No euro area countries fell into Cluster 4 (range: 0.5 to 1.0). Theoretically, a robust decline in both Gross Government Debt and CDS spreads would have been required for a Member State to fall into this cluster. However, no such euro area Member States were detected by the analysis in the period under review.

## DEBATE AND DISCUSSION

Researchers may apply several methodologies to examine the relationship between the

macroeconomic variables analysed above. These options represent methodological freedom for researchers. Some researchers use indicators other than the independent variables (GGD and GED) used in this study to explain the development of CDS prices. *Rashid et al.* (2017), for example, used the following variables: exchange rates, interest rates, exports, imports, foreign exchange reserves, and inflation. The researchers concluded that exchange rates and exports have no effect on CDS spreads.

*Liu and Morley* (2012) found the exact opposite compared to the previous conclusion. The researchers' findings show that sovereign CDS markets need to take into account exchange rate risks. Although this varies from country to country depending on the exchange rate regime, there is evidence that the exchange rate has a decisive effect on CDS spreads. However, according to the researchers there is little evidence that the interest rate would have any effect on CDS spreads. This fact suggests that the international environment is at least as important as domestic factors.

As for the methodological and theoretical implications of the paper, it uses a new approach in both areas. These results may be important for policymakers because the Central Bank of the euro area will have limited ability in future to purchase assets as it was done during the Covid-19 period. The methodological limitation of the analysis was that debt data appear in statistics only at quarterly intervals.

A future direction for research could be to attempt to identify additional macroeconomic variables that can robustly influence CDS spreads. Another research target on this topic could be the time when the euro area Central Bank stops purchasing assets for financing public debt. Such a period will represent a completely different perspective in the examination of CDS spreads.

## CONCLUSIONS

This study was intended to shed light on novel research perspectives for different types of debt and CDSs. It used a standard analysis to determine the strength of the relationship between Gross Government Debt and debt-dependent CDS spreads. The research also considered the impact of the Covid-19 pandemic on Gross Government Debt and CDSs. The benefit of the research is that so far few studies have examined the relationship between these two macroeconomic indicators. Contrary to previous approaches, portfolio data for debt have been taken into account in the development of CDS spreads. The analysis found that of the macro-variables, Gross Government Debt showed a stronger relationship with CDS spreads over the period under review. Therefore, the first hypothesis was not fulfilled. The assumption could not be confirmed also for the reason that CDS spreads are set individually for bonds representing private sector debt, which is part of Gross External Debt.

The second hypothesis was not fulfilled either, as the increase in the public debt of euro area Member States was not followed by an increase in CDS spreads. On the contrary, CDS spreads decreased in the period from Q2 2018 to Q1 2021. Theoretically, CDS spreads should have risen due to rising public debt in euro area countries. However, this increase did

not occur, presumably, because a significant part of the government securities financing the increase in public debt was purchased by the ECB. (All major central banks opted for quantitative easing last year. In the ten largest economies, central banks purchased bonds worth \$3.5 trillion through asset purchases. Most central banks continued to buy bonds in 2021 (Nordea Bank, 2021). As a result of this acquisition process, by the end of 2022 the ECB may hold 32–36 percent of the public debt of euro area member states (MNB, 2021). Although Gross Government Debt in Member States increased through Central Bank bond purchases, investors did not find this increase in debt to be risky. This is explained by the fact that, as debt instruments were purchased by the Central Bank, it will not increase the risk for investors who had previously invested in government bonds.

Moreover, interest expenditure, as a share of GDP, also declined in the euro area from 1.6 percent to 1.3 percent between 2019 and 2022, which is explained by government bond yields declining despite rising debt issuance. Thus, current credit ratings did not change either, and the one-off increase in bankruptcy risk premiums (CDS) did not continue after Q1 2020, despite a dynamic rise in public debt. Following the panic, CDS spreads in euro area countries gradually returned to their previous levels, before declining further in the period under review. ■

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