

## **DO PRIVATE SECTOR SHORT-TERM EXTERNAL DEBT HAVE IMPACT ON CREDIT DEFAULT SWAP PREMIUMS IN TURKEY? AN ANALYSIS WITH ASYMMETRIC THRESHOLD COINTEGRATION APPROACH**

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### **Abstract**

A country's capacity to pay short-term external debt, which reflects the fiscal strength of an economy against adverse shocks, is significantly taken into consideration by international investors in their decision making process. It has been seen that Turkey has experienced a gradually increasing private sector short-term external debt especially in the last twenty-year period. The objective of this study is to investigate the long-run relationship between private sector short-term external debt and CDS (credit default swap) premiums in Turkey for the period of 2000:Q4-2017:Q4 by using asymmetric threshold autoregressive (TAR) and momentum threshold autoregressive (M-TAR) procedures of Enders and Siklos (2001). The results indicate that CDS premiums and private sector short-term external debt in Turkey are cointegrated. After finding cointegration, the null hypothesis of symmetric adjustment is tested against the alternative of asymmetric adjustment and the evidence of symmetric adjustment is found, suggesting that the relationship between the private sector short-term external debt and CDS premiums has the same effect in expansion and contraction periods.

**Keywords:** Short-term external debt, cds premiums, asymmetric threshold cointegration

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# Türkiye’de Özel Sektör Kısa Vadeli Dış Borcunun CDS Primleri Üzerindeki Etkisi Nedir? Asimetrik Uyarılama Yaklaşımı Kullanılarak Yapılan Bir Analiz

## Öz

Ülke ekonomisinin olumsuz şoklara karşı mali gücüne işaret eden kısa vadeli dış borcunu ödeme gücü, karar alım süreçlerinde uluslararası yatırımcılar tarafından önemli ölçüde dikkate alınmaktadır. Türkiye’nin, özellikle son yirmi yıllık dönemde, özel sektör kısa vadeli dış borcunun kademeli bir şekilde arttığı görülmektedir. Bu çalışmanın amacı, 2000:Ç4-2017:Ç4 dönemi verilerinden yararlanılarak, özel sektör kısa vadeli dış borcu ile CDS (kredi temerrüt takası) primleri arasındaki uzun dönemli ilişkinin Enders ve Siklos (2001) tarafından geliştirilen TAR ve M-TAR yaklaşımları kullanılarak analiz edilmesidir. Analiz sonuçları, değişkenler arasında kointegrasyonun varlığına; dolayısıyla, CDS primleri ve özel sektör kısa vadeli dış borcu arasında uzun dönemli bir ilişkinin varlığına işaret etmektedir. Kointegrasyonun tespit edilmesini takiben, simetriklik-asimetriklik test edilmiş ve değişkenler arasında ilişkide simetrikliğin varlığına rastlanılmıştır. Bu sonuç, özel sektör kısa vadeli dış borcu ve CDS primleri arasındaki ilişkinin, genişleme ve daralma dönemlerinde aynı etkiye sahip olduğunu göstermektedir.

**Anahtar Kelimeler:** Kısa vadeli dış borç, cds primleri, asimetrik uyarılama

## 1. Introduction

The sustainability of external debt lead to problems for emerging market economies especially in the periods of increasing financial stress and the high ratio of short-term external debt increases the vulnerability of these economies against financial shocks. In Turkey, while the height of public debt in total external debt was outstanding in the period before 2000-01 Turkish Economic Crisis, private sector debt stock has an increasingly upward trend since 2002. The ratio of public debt and private sector debt to total debt are nearly 0,45 and 0,55 in 2000 and are nearly 0,30 and 0,70 in 2018, respectively. In the period of 2001-2018, in addition to increasing private sector debt to total external debt ratio, it has been

seen that the maturities have concentrated on short-term (Central Bank of the Republic of Turkey, 2019). When the interest rates are relatively low and the macro-financial environment is positive, the high ratios of short-term external debt do not create big problems in terms of an economy. On the other hand, it leads to a negative outlook in the periods of increasing financial stress and tightening liquidity conditions.

International Monetary Fund (2014) defines the private sector external debt as follows. Accordingly, the institutional units and the financial instruments in which they enact, are classified into sectors and categories. The institutional sector classification divides the institutional units under sectors with specific economic priorities and functions: general government, central bank, deposit-taking corporations except the central bank, and other sectors: other financial corporations, nonfinancial corporations, and households and nonprofit institutions serving households. The first determination to evaluate the private sector's external debt position is whether a resident unit is in the private sector or not. In this respect, the public sector includes the general government, the central bank, and other units in the deposit-taking corporations, except for the central bank, and those sectors that are public sector corporations. Hence, the private sector comprises those units in the deposit-taking corporations, except for the central bank, and other sectors that are not public sector corporations.

The acceleration of private capital flows in the form of private sector external debt might be viewed as the entry of more risk-return sensitive mobile capital into the financial structure. Official mobile capital, such as IMF and World Bank lending, is organized and can not withdraw abruptly or suddenly. Private capital movements, on the other hand, are often volatile and subject to sustainability problems in the event of financial turbulences. If this private debt finance is

heavily embedded into the financial structure of the economy, it makes the financial system fragile and unstable. Most of studies in the academic literature indicate that during the booming periods, the private sector frequently accumulates private debt and transform the economy from robust to vulnerable and unsustainable (Matsumoto, 2007).

External debt is generally considered one of the fundamental macroeconomic factors that drive CDS (Credit Default Swap) premiums. When considered that CDS serves as insurance against default of external debt, it is generally observed that countries with high default risks have high CDS premiums at the same time. Increasing fragility of an economy leads to the problems in rollover of external debt and repayment of external debt increases foreign currency need and demand. In the volatile periods which capital flows slow, this can lead some problems. In fact, instead of the size of the external debt, the payment capacity is of great importance. In addition, the longer the maturity of external debt, the less the repayment problem faces an economy. CDS premiums are accepted as important determinants of borrowing cost and high levels of external debt lead to concerns when the recent high values of CDS premiums are taken into consideration.

An increase in CDS premiums poses a problem not only as these increases mean greater risk of default and lead to upward trend in borrowing costs but also they darken the investment environment for the country under financial stress and deteriorate the country's macroeconomic outlook. The sovereigns with high debt ratios experience difficulties in raising fund from markets and have problems in access to international funding given high CDS premiums. Because the risk perception of country worsens, banks and other financial institutions may face funding shortages and fail to meet reserve and capital requirements. Decreases in output, investment and consumption occur with resulting credit crunches and bankruptcies (Yuan and Pongsiri, 2015).

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In this study, we focus on short-term private sector external debt because one of the key issues in external debt is the country's capacity to pay short-term external debt. Emerging market economies including Turkey has experienced a gradually increasing private sector external debt in the last thirty years with the period of financial liberalization. When analyzed the data obtained from CBRT, it is seen that, while the private sector short-term external debt was 6.598.512.156 Million USD in the year of 2009, it has reached to 20.386.997.401 Million USD in the year of 2015 and it has been realized as 18.621.670.188 Million USD in the year of 2017 (CBRT, 2019).

CDS premiums are widely taken into consideration by both policy makers and investors particularly in the last ten-year period. One of the reasons is that it reflects more rapid and accurate information about the outlook of both companies and economies. For instance, CDS spreads increased to very high levels in the period of 2008-09 Global Financial Crisis, indicating that the possibility of defaults by financial institutions was increasing. On the other hand, in the same period, it was observed that credit ratings remained relatively unchanged. Therefore, CDS spreads has become a viable alternative to credit ratings in reflecting information, as they provide more information concerning increasing risks and they bring with more accurate conclusions regarding the credit risks of institutions. Their market-based nature and their simultaneously pricing according to the market conditions have great role in this result (Flannery et al., 2010). Most researchers argue that CDS premiums are efficient tools in transferring and managing credit risk because they have the ability to decrease adverse selection and monitoring costs. Moreover, they encourage greater market participation by allowing enhanced risk sharing. Investors, regulators and policy makers increasingly include CDS premiums into their analyses

(Augustin, 2014).

As CDS premiums are intensively taken into consideration by researchers and investors and it is essential to understand which factors do have impacts on these, CDS premiums and the determinants of these credit derivatives have been widely studied in the literature. The factors can be stated as macroeconomic fundamentals including growth, current account deficit, inflation, external debt, real effective rate and financial factors including banking sector fragilities, stock index values and political risk factors as well. In this paper, of these variables, we focused on the long-run relationship between private sector short-term external debt and CDS premiums in Turkey over the period from 2000:Q4 through 2017:Q4 by using asymmetric threshold autoregressive (TAR) and momentum threshold autoregressive (M-TAR) procedures of Enders and Siklos (2001) to observe (if exists) asymmetric adjustment process and nonlinear long-run relationship between CDS premiums and private sector short-term external debt. To our best knowledge, there exists no previous study examining the long-run relationship between CDS premiums and private sector short-term external debt in Turkey by using asymmetric threshold cointegration method. If the true adjustment process is asymmetric, the power of asymmetric cointegration is much higher than the traditional cointegration tests with symmetric adjustment.

The study has the following structure: After the literature review in Section 2, Section 3 briefly outlines the asymmetric threshold cointegration methodology, Section 4 describes the data and gives empirical results. Finally, the last section outlines the main conclusions.

## **2. Literature Review**

In the literature, there are several studies analyzing the determinants of CDS premiums and focusing on external debt and

other macroeconomic and financial factors such as GDP growth, inflation, real exchange rate, current account deficit, risk-free rate, credit ratings, banking sector vulnerability and political-institutional strength (Brandorf and Holmberg, 2010; Eyssell et al, 2013; Anton, 2011; Csillik and Sagi, 2012; Wang et al, 2013; Clark and Kassimatis, 2015; Ho, 2016; Schwaab et al, 2016; Doshi et al, 2017; Cepni et al, 2017).

Brandorf and Holmberg (2010) analysed the impacts of macroeconomic indicators on sovereign credit default swaps (SCDS) for the countries in PIIGS Block for the period of 2004:Q1-2009:Q3. Their findings indicated that while unemployment was the most significant determinant of CDS premiums, inflation was the least significant variable. They also found that increasing government debt contributed to increase in CDS premiums. Eyssell et al (2013) studied how domestic factors such as the real interest rate, stock market returns and volatility, debt to GDP ratio, volatility index (VIX), default spread and a financial shock dummy variable do have impact on the behaviour of CDS premiums in China for the period of 2001:01-2010:10. They found that both global factors and country-specific factors were important determinants of China's SCDS premiums. The findings also indicated that the real interest rate, the China stock market index, the S&P 500 stock option volatilities, default spreads and the financial crisis dummy variable were the factors which had substantial explanatory power in explaining both levels and changes of SCDS premiums.

Anton (2011) investigated the determinants of emerging market economies SCDS in the period of 2008-2010 which covers the initial part of European Debt Crisis. After examining the global and country-specific factors and analyzing the spillover effects of sovereign debt crisis on the SCDS premiums by using data on five year SCDS for selected Eastern European countries, he found that

investors risk appetite, spill over effect, economic fundamentals and rating downgrades were determinants of SCDS of CEE countries. However, the debt to GDP ratio, the budget deficit to GDP ratio and the economic growth rate did not have significant impact on CDS premiums. Csillik and Sagi (2012) analyzed how the changes in CDS premiums might be related to the foreign exchange rates, indebtedness and stock index by applying data on Hungary's CDS spreads during the period of 2005-2011. After investigating the determinants of CDS Premium changes, they found that excessively indebted countries carried higher risk premia which was captured by CDS premiums. The findings indicated that in the countries with high debt to GDP ratios, a one percent increase in relative indebtedness has led to multiple effects on the countries' CDS spreads, depending on the country's relative indebtedness.

Wang et al (2013) examined the causality relationships between Latin America SCDS premiums and other determinants of financial sovereign debt spreads. The findings of their analysis showed that country-specific financial variables including foreign exchange rates and lending spreads and global financial variables including VIX, ten-year U.S Treasury yields and TED spreads were important determinants for future movements of SCDS premiums. Clark and Kassimatis (2015) analysed the explanatory and forecasting power of macroeconomic fundamentals on emerging market economies SCDS premiums. They focused on a new group of macroeconomic factors regarding market values that reflected investor expectations about the future economic performance to explain premiums on emerging market economies sovereign debt. Their findings showed that improvement in macroeconomic indicators reduced SCDS spreads while increases in financial risk premium led to upward movement in premiums. They also found that higher correlation between the country's rate of return and the exchange rate led to decrease in spreads. The overall model they developed captured a significant part of the empirical variation in spreads.



Ho (2016) investigated the long-run determinants of SCDS premiums for eight emerging economies (Brazil, Malaysia, South Africa, Indonesia, South Korea, Mexico, Thailand and Turkey) during the period of 2008:Q4-2013:Q2 by using the Pooled Mean Group cointegration approach. In the analysis, the macroeconomic indicators as the current account, the external debt and the international reserves have been included as the determinants of SCDS premiums. The results of the analysis supported the existence of long-term relationship between these variables. According to the findings, while, the coefficients of the external debt, the current account and the international reserves were significant in the long-run for all countries; the short-run relationship seemed significant just for the external debt and the international reserves. Schwaab et al (2016) analyzed the dynamic properties of systematic default risk conditions for companies in different countries, industries and rating groups by employing a dynamic hierarchical factor model. After trying to estimate common components in corporate defaults in a group country for the period of 1980-2014 which covered both the 2008-09 Global Financial Crisis and 2010-14 Euro-Area Sovereign Debt Crisis, they found that macro and default-specific global factors were major sources of default clustering across countries.

Doshi et al (2017) attempted to specify and estimate no-arbitrage models for SCDS by assuming the country's default intensity depended on observable economic and financial factors by using a sample of twenty-eight countries. Their findings indicated that the impact of the economic and financial variables on spreads was consistent with economic intuition and while spreads increased as a function of stock market and exchange rate volatility, they decreased as a function of interest rates and stock market returns. They also found that the magnitudes of these impacts varied substantially across countries and over time. Cepni et al (2017) tried to identify

the macroeconomic factors leading to heterogeneity in the sensitivity of CDS premiums against changes in the global risk factors in emerging market economies by using the data belonged to 2005-2015 period and by employing fixed effect panel regression analysis. They found that public debt to GDP ratio and high foreign exchange reserves were the most important factors in explaining the sensitivity of CDS premiums. Accordingly, countries with low public debt and high foreign exchange reserves were less exposed to changes in global risk appetite. Furthermore, the results of the analysis indicated that the sensitivity to risk factors had significant impacts in terms of price stability and financial stability. Kilci (2019) analyzed the relationship between external debt to GDP ratio and CDS premiums in Turkey for the period of 2000:Q1-2018:Q2. Employing Fourier SHIN cointegration test and Fourier Granger causality test, which allow to take into account structural breaks in the analysis, found that there has been a positive relationship between external debt to GDP ratio and CDS premiums in the relevant period.

### 3. Methodology

This paper examines the long-run relationship between CDS premiums and private sector short-term external debt in Turkey by using asymmetric threshold cointegration test introduced by Enders and Siklos (2001). By considering asymmetric adjustment, Enders and Siklos (2001) suggest an extension to the Engle and Granger (1987) cointegration methodology which assumes linearity and symmetric adjustment. Engle-Granger cointegration test estimates the following equation by using ordinary least squares(OLS) estimation method as a first step:

$$y_i = \alpha + \beta x_i + \mu_i \quad (1)$$

Here,  $y_i$  and  $x_i$  are the individual  $I(1)$  time series,  $\alpha$  and  $\beta$  are the estimated parameters and  $\mu_i$  is an error term that may be serially

correlated. In the second step, the OLS estimate of  $\rho$  is obtained from the following regression equation:

$$\Delta \hat{\mu}_t = \rho \hat{\mu}_{t-1} + \sum_{i=1}^p \gamma_i \Delta \hat{\mu}_{t-k} + \varepsilon_t \quad (2)$$

where  $\rho$  and  $\gamma_i$  are parameters for  $i=1, \dots, p$ ,  $p$  is the required number of lagged changes of  $\Delta \hat{\mu}_t$  and  $\varepsilon_t$  is a white noise error term. The lag length  $p$  is found by using some information criteria. If  $\hat{\mu}_t$  is stationary, the null hypothesis of no cointegration is rejected. In other words,  $y_t$  and  $x_t$  series are cointegrated with symmetric adjustment. The Engle and Granger (1987) cointegration methodology is extended by Enders and Siklos (2001) in a threshold structure for the error term  $\mu_t$  by using asymmetric threshold autoregressive (TAR) model (Tong, 1983). The TAR model specification for  $\mu_t$  can be written as follows:

$$\Delta \hat{\mu}_t = \rho_1 I_t \hat{\mu}_{t-1} + \rho_2 (1 - I_t) \hat{\mu}_{t-1} + \sum_{i=1}^p \gamma_i \Delta \hat{\mu}_{t-k} + \varepsilon_t \quad (3)$$

where  $I_t$  is the Heaviside indicator function such that:

$$I_t = \begin{cases} 1 & \text{if } \hat{\mu}_{t-1} \geq \tau \\ 0 & \text{if } \hat{\mu}_{t-1} < \tau \end{cases} \quad (4)$$

and  $\rho_1$  and  $\rho_2$  give the speed of adjustment coefficients in two regimes,  $\tau$  is the threshold value, and  $\varepsilon_t$  is a sequence of zero mean, constant variance, *iid* random variables. For stationarity of  $\hat{\mu}_t$ ,  $-2 < (\rho_1, \rho_2) < 0$  is a necessary condition. If  $-1 < \rho_2 < \rho_1 < 0$  for a threshold value close to zero, the adjustment process is different for

negative and positive shocks with the positive deviations from the threshold being more persistent than negative ones.

However, to capture the dynamic adjustment of  $\mu_t$  toward long-run equilibrium value, Equation (3) may not be sufficient. Enders and Siklos (2001) report that the different amounts of autoregressive decay can depend on whether the previous change in  $\mu_{t-1}$  is climbing up or falling down. They suggest replacing the level of previous period's residual ( $\mu_{t-1}$ ) with the change in the level of previous period's residual ( $\Delta\mu_{t-1}$ ). This gives following momentum threshold autoregressive (M-TAR) model:

$$\Delta\hat{\mu}_t = \rho_1 M_t \hat{\mu}_{t-1} + \rho_2 (1 - M_t) \hat{\mu}_{t-1} + \sum_{i=1}^p \gamma_i \Delta\hat{\mu}_{t-k} + \varepsilon_t \quad (5)$$

with the indicator function,

$$M_t = \begin{cases} 1 & \text{if } \Delta\hat{\mu}_{t-1} \geq \tau \\ 0 & \text{if } \Delta\hat{\mu}_{t-1} < \tau \end{cases} \quad (6)$$

For a threshold value close to zero, if  $|\rho_2| > |\rho_1|$ , increases in negative discrepancies from the threshold will be less persistent than the increases in positive discrepancies in the M-TAR model.

Enders and Siklos (2001) follow two sequential steps for testing asymmetric threshold cointegration in both TAR and M-TAR models. As a first step, the null hypothesis of no cointegration ( $\rho_1 = \rho_2 = 0$ ) is tested by using  $F$  statistic denoted by  $\Phi$ . Since the  $F$  statistic is nonstandard under the null, the corresponding critical values obtained from simulation can be seen in Enders and Siklos (2001). If the null hypothesis of no cointegration is rejected, in the second step, we test the null hypothesis of symmetric adjustment ( $\rho_1 = \rho_2$ ) against the alternative of asymmetric adjustment with the standard  $F$

statistic. Rejecting the null hypothesis of  $\rho_1 = \rho_2$  means the asymmetric adjustment.

#### 4. Data and Empirical Results

This paper uses quarterly CDS premiums (5 year) and private sector short-term external debt over the period from 2000:04 through 2017:04, obtained from Bloomberg and CBRT EVDS, respectively, to examine the long-run relationship between CDS premiums and private sector short-term external debt in Turkey. The seasonality is removed from the data by using X12 seasonal adjustment procedure. Before the analysis, we take the natural logarithms of the series. The labels of the logarithmic and seasonally adjusted CDS premiums and external debt series are LCDS and LFD, respectively. As a first step of the analysis, unit root properties of the LCDS and LFD series are investigated by using Ng and Perron (2001) unit root tests and the results are tabulated in Table 1.

**Table 1: Ng and Perron unit root test results**

Series	$MZ_\alpha$	$MZ_t$	$MSB$	$MP_t$
<i>LCDS</i>	-11.090	-2.339	0.210	8.293
$\Delta LCDS$	-27.415 <sup>a</sup>	-3.694 <sup>a</sup>	0.134 <sup>a</sup>	0.920 <sup>a</sup>
<i>LFD</i>	-7.013	-1.742	0.248	13.166
$\Delta LFD$	-25.168 <sup>a</sup>	-3.526 <sup>a</sup>	0.140 <sup>a</sup>	1.041 <sup>a</sup>

**Notes:** a indicates rejection of the unit root null hypothesis at the 1% significance level. The corresponding critical values for the unit root tests can be found in Ng and Perron (2001).

According to the results in the table, we cannot reject the unit root null hypothesis for CDS premiums and external debt series,

however, the null hypothesis can be rejected at the 1% significance level when first differences of the series are taken. Having verified that both series are integrated of order one,  $I(1)$ , we test whether there exists any long-run relationship between CDS premiums and private sector short-term external debt by using Engle and Granger (1987) cointegration method. We estimate the following model for this purpose:

$$LCDS_t = \alpha + \beta LFD_t + \mu_t \quad (7)$$

where  $LCDS$  is the logarithm of the seasonally adjusted CDS premiums,  $LFD$  is the logarithm of the seasonally adjusted private sector short-term external debt and  $\mu_t$  is the error term. If  $\mu_t$  is stationary, this means that  $LCDS$  and  $LFD$  series are cointegrated with symmetric adjustment. The results of the Engle and Granger (1987) cointegration test are reported in the second column of the Table 2 which gives the values of the adjustment coefficients  $\rho_1$  and  $\rho_2$ , the number of lagged changes  $p$ , the estimated threshold values  $\tau$ , the  $\Phi$  statistics for the null hypothesis of no cointegration ( $\rho_1 = \rho_2 = 0$ ) versus the alternative of cointegration and the F statistics for the null hypothesis of symmetric adjustment ( $\rho_1 = \rho_2$ ). Since the cointegration test of Engle and Granger (1987) considers the symmetric adjustment, the values except  $\rho_1$  and  $p$  are unavailable (NA) for second column of the table.

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**Table 2: Cointegration test results**

	Engle and Granger	TAR	MTAR
$\rho_1$	-0.551 <sup>a</sup> (-5.283)	-0.512 <sup>a</sup> (-4.196)	-0.494 <sup>a</sup> (-4.481)
$\rho_2$	NA	-0.599 <sup>a</sup> (-4.133)	-0.738 <sup>a</sup> (-4.001)
$p$	2	2	2
$\tau$	NA	-0.203	-0.212
$\Phi$	NA	14.184 <sup>a</sup> [9.819]	15.121 <sup>a</sup> [10.659]
$F_{STATISTIC}$	NA	0.272 [10.086]	1.564 [11.597]

**Notes:**  $\rho_1$  and  $\rho_2$  are the adjustment coefficients corresponding to the above threshold and below threshold cases, respectively. The  $t$  statistics for  $\rho_1$  and  $\rho_2$  are in parantheses.  $p$  indicates number of the lagged changes chosen by Schwarz criterion.  $\tau$  is the estimated threshold value.  $\Phi$  tests the null hypothesis of no cointegration ( $\rho_1 = \rho_2 = 0$ ) and follows a non-standard distribution.  $F_{STATISTIC}$  tests the null hypothesis of symmetric adjustment ( $\rho_1 = \rho_2$ ) and follows standard  $F$  distribution. For  $\Phi$  and  $F_{STATISTIC}$ , the simulated critical values corresponding to our application are calculated by using 10.000 simulations and the values are reported in brackets. <sup>a</sup> denotes the significance at the 1% significance level.

Engle and Granger (1987) cointegration test results indicate that the null hypothesis of no cointegration is rejected at the 1% significance level, giving a long-run relationship between CDS premiums and private sector short-term external debt for Turkey. Since the cointegration test of Engle and Granger and its extensions have low power if adjustment to the equilibrium is asymmetric, we also apply TAR and M-TAR type threshold cointegration models to examine the possibility of asymmetric adjustment towards long-run equilibrium. The results of TAR and M-TAR type asymmetric threshold cointegration tests are given in third and fourth columns of the Table 2, respectively.

Regarding the TAR type cointegration, the point estimates of  $\rho_1$  and  $\rho_2$  satisfy the necessary and sufficient conditions ( $-2 < (\rho_1, \rho_2) < 0$ ) and the threshold value is calculated as -0.203. Since the threshold value is close to zero and  $-1 < \rho_2 < \rho_1 < 0$ , the positive deviations from the threshold are more persistent than negative deviations from the threshold. The  $\Phi$  statistic (14.184) indicates that the null hypothesis of no cointegration ( $\rho_1 = \rho_2 = 0$ ) is rejected at the 1% significance level. After finding that CDS premiums and private sector short-term external debt series are cointegrated, the next step is to test the null hypothesis of symmetric adjustment against the alternative of asymmetric adjustment. Based on calculated  $F_{STATISTIC}$  (0.272), the null hypothesis of symmetric adjustment cannot be rejected. This result means that there is no evidence of asymmetric adjustment for cointegrated CDS premiums and private sector short-term external debt for Turkey.

When we give our attention to the M-TAR type cointegration results in the fourth column of the Table 2, it is seen that the point estimates of  $\rho_1$  and  $\rho_2$  satisfy the necessary and sufficient conditions ( $-2 < (\rho_1, \rho_2) < 0$ ). The estimated threshold value (-0.212) is very close to zero and  $|\rho_2|$  (0.738) is bigger than  $|\rho_1|$  (0.494). These results indicate that increases in negative discrepancies from the threshold will be less persistent than the increases in positive discrepancies. Since the calculated  $\Phi$  statistic (15.121) is bigger than the corresponding critical value, we reject the null hypothesis of no cointegration ( $\rho_1 = \rho_2 = 0$ ) and find evidence of cointegration between CDS premiums and private sector short-term external debt. After finding cointegration, the null hypothesis of symmetric adjustment is tested against the alternative of asymmetric adjustment. According to the results in the table, the evidence of



symmetric adjustment is found between CDS premiums and private sector short-term external debt for Turkey.

## **5. Conclusion**

This paper examines the long-run relationship between credit default swap premiums and private sector short-term external debt in Turkey over the period from 2000:04 through 2017:04 by using asymmetric threshold autoregressive and momentum threshold autoregressive procedures of Enders and Siklos (2001). In empirical analysis, the threshold autoregressive and momentum threshold autoregressive models are used by considering the argument that omitting the presence of nonlinear components, like threshold effects in long-run relationship, may lead to wrong inferences regarding the existence of cointegration. As a first step, unit root properties of the series are examined by using Ng and Perron (2001) unit root test. Having verified that both series are integrated of order one, we test whether there exists any long-run relationship between CDS premiums and private sector short-term external debt by using asymmetric threshold autoregressive and momentum threshold autoregressive procedures of Enders and Siklos (2001) in addition to Engle and Granger (1987) cointegration test. The results indicate that CDS premiums and private sector short-term external debt in Turkey are cointegrated, supporting the evidence of the long-run relationship. After finding cointegration, the null hypothesis of symmetric adjustment is tested against the alternative of asymmetric adjustment and the evidence of symmetric adjustment is found. Therefore, we can conclude that the relationship between the private sector short-term external debt and CDS premiums has the same effect in expansion and contraction periods.

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