EFFECTS OF CREDIT DEFAULT SWAPS (CDS) ON BIST-100 INDEX[1]

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Abstract
The aim of this study is to determine whether there is an impact of credit default swaps on BIST-100 Index by using monthly data of 2005:12-2014:03. BIST-100 Index was used as a dependent variable and credit default swaps (CDS) were used as an independent variable. Unit root test was applied on each variable and bound test approach was adopted for co-integration according to the result of the test. Short and long term relationships of variables were analyzed using ARDL approach. According to the results, it was found that credit default swaps affected negatively on stock prices in the short term, however, it has no effects on the stock prices in long term.

Key words: *BIST-100, Credit Default Swaps, Bound Test.*

JEL Classification: *C01, C32, E44, G32*

I. INTRODUCTION

Credit risk is an essential and might be the most important risk type that has been present in finance, commerce and trade transactions from ancient cultures till today (Van Gestel & Baesens, 2008). CDS are insurance contracts issued by private companies against default (Credit Event) risk. With this contract, protection buyer acquires the right to sell the asset that is subject to protection over its nominal value and makes periodical payments to protection seller until the end of CDS contract. Occurrence of credit event usually requires an accrual (realization) payment by the protection buyer. Transfer is fulfilled either by physical delivery or by cash. If contract is established on physical delivery condition, protection buyer delivers the asset subject to protection to the protection seller at par (over its nominal value). If contract is established on cash delivery, market price of the asset subject to protection, that is the total return before the occurrence of credit event, is determined. This market value is subtracted from the nominal value of the asset to calculate the amount to be paid to protection buyer by the protection seller (Hull & White, 2000).

Section 2 deals with the relationship between CDS and stock prices. Section 3 reviews the earlier literature regarding the association between CDS and stock prices. Section 4 introduces the empirical results and interprets them. The paper concludes with the discussion of results, suggestions for policy makers and future studies.

II. THE RELATIONSHIP BETWEEN CDS AND STOCK PRICES

Credit risk is defined by Brown and Moles as "the potential that a contractual party will fail to meet its obligations in accordance with the agreed terms". Credit risk is also variously referred to as default risk, performance risk or counterparty risk. These all fundamentally refer to the same thing: the impact of credit effects on a firm's transactions. There are three characteristics that define credit risk:

1. Exposure (to a party that may possibly default or suffer an adverse change in its ability to perform)
2. The likelihood that this party will default (or the default probability) on its obligations
3. The recovery rate (that is, how much can be retrieved if a default takes place). (Brown and Moles, 2012)

Credit risk and default risk are used interchangeably. However, the commonly used terminology in the financial markets ascribe series of events as a credit event that can impact the possibility of repayment, such as bankruptcy, failure to pay, loan restructuring or repudiation, loan moratorium, and accelerated loan payments to name a few events (GARP).

In practice, "credit spread" is used as the basic indicator of credit risk. Spread is the difference between interest rates of valuable papers, such as treasury bonds of developed countries which do not carry default risk, and interest rates of developing country debt bonds or corporate bonds, which are full of default risk.

[1] Murat Eren's unpublished master's thesis subject was studied again with a different set of variables.

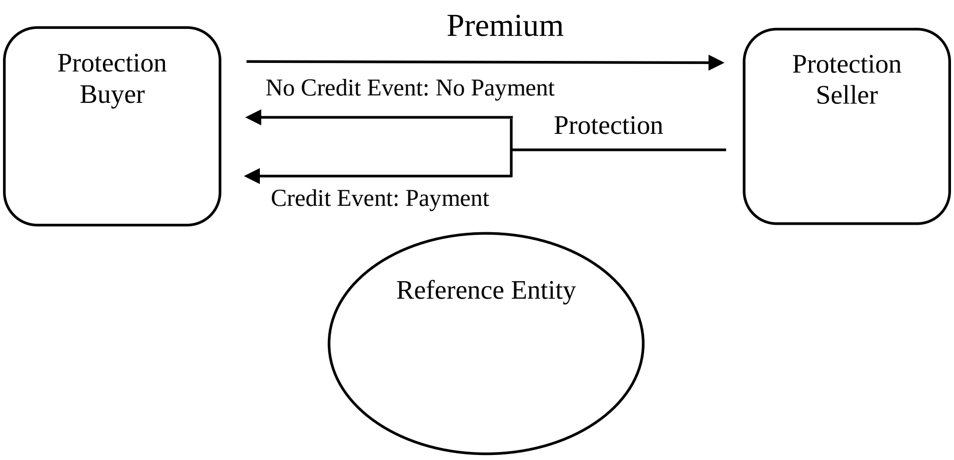
Most commonly used credit derivative products may be summarized under three topics:

- Credit (Default) Swaps: These are (bilateral) financial contracts. Protection buyer makes periodical payments usually determined as annual and base points. In case the credit event is realized, protection buyer makes the payment to credit buyer according to the reference asset. Credit event is determined between the parties by means of negotiation.
- Credit Option: These are credit derivatives used to eliminate negative developments in credits.
- Total Return Swaps: These are financial contracts which transfer credit risk between the parties. In contrast to CDS, these tools also guarantee the return of reference asset alongside with the reference asset itself (JP Morgan, 1999).

CDS transaction is the credit agreement which allows the transfer of default risk. One of the most frequently used instruments of the credit derivatives market, CDS also provides protection against damage that occurs in the next event of default of the reference asset (Ateş, 2004). Reference asset or obligation which is subject to CDS transaction is defined by reference document. “Reference Asset” is the issuer of debt, who can be a company, bank or government and “Reference Obligation” is the debt that is subject to CDS (Balı & Yılmaz, 2012). In this process, over the term of the CDS transaction, the protection buyer pays a certain premium to the protection seller periodically. The protection seller has to pay to the protection buyer upon occurrence of any event of default in reference asset. No payments are made by the protection seller to the protection buyer unless the default occurs (Ateş, 2004).

There are significant similarities between CDS contracts and insurance policies. However, CDS agreements are tradable out-of-contract, which means that financial institutions possessing the CDS contracts can buy and sell these contracts among themselves. In contrast, insurance policies are not traded.

In the light of information given above, overall functioning of credit default swaps can be summarized as follows:



(Weistroffer, Speyer, & Walter, 2009)

Figure 1. The Overall Functioning of Credit Default Swaps

In brief, CDS allows the transfer of potential losses incurred by the entity as a result of such credit events as being in default, bankruptcies and decrease of credit notes without being removed from the balance sheet (Karabıyık and Anbar, 2006).

Despite the trade in credit derivatives started in mid-1990s, credit derivatives market has grown rapidly. CDS is still seen as a new financial instrument in developing countries, although it has been used predominantly in London and New York. Turkey is one of the countries in where the credit derivatives market is not developed and the most important reason for not using CDS in Turkey is the lack of credit derivatives markets (Anbar 2006).

CDS indexes were launched in 2003. Investment banks J. P. Morgan and Morgan Stanley has established the first-ever index called Trac-x. Trac-x Index was built upon CDS related to 50 bonds which were classified as “investable bonds”. IBoxx Index was subsequently established by several banks from the USA and Europe (Balı & Yılmaz, 2012). These two major CDS indices were merged on 21 June 2004 to establish Dow Jones iTraxx Index. This new index has brought about new standards and contributed to improvement of liquidity, transparency and diversification of the market (Byström, 2005). There are two commonly accepted indices in credit derivatives market at the present: CDX and iTraxx. In CDX Index, reference entities consist of businesses operating in North America and developing countries. iTraxx, on the other hand, consists of businesses especially operating in Europe and Asia. Terms of maturity are also standardized in indices; exchanges can be made in major indices with 3, 5, 7, and 10-year terms (Balı & Yılmaz, 2012).

Core factor in determining CDS spreads is credit risk associated with the reference asset and investor can follow this risk through various channels. First, the investor can trust in ratings institutions that measures the reference institutions ratio of meeting its liabilities. Another way is to measure credit risk by using traditional accounting methods. Third alternative is to seek for market information on the credit risk. If information obtained from the market is acceptable then credit risk can be determined based on market prices. The most commonly-known method is stock-market based credit risk management or Merton (1974) model (1974). In this model, assets of a firm are taken as reference assets for its liabilities. Momentary default possibility of the firm can be demonstrated by data obtained from stock price volatility and balance sheet of the firm. Default possibility in Merton (1974) model is the non-linear function of stock prices of the firm, fluctuations in stock prices and financial leverage ratio. In 2002, a simplifying assumption was introduced to Merton model. In this simplified model, it was shown that default risk is a simple function of stock price volatility and leverage ratio. Since essential determinant of CDS price is the possibility of exposure of the reference asset to credit event and since this possibility depends on stock prices as well as volatility of returns of stocks of the reference asset according to Merton (1974) model, empirical relations between CDS market and stock market should be investigated (Byström, 2005).

Stock, stock options and credit derivatives markets are liquid markets which give rapid responses to news about firms, macro events and market movements. In general, it is assumed that there is a negative relationship between stock prices and CDS spreads. However, although rarely observed, there may be a unilateral relationship between stock prices. Leveraged buyouts are typical examples of this situation.

There are two essentially different approaches for measuring country credit risk. Black and Cox (1976); Longstaff and Schwartz (1995); Merton (1974) are considered as the advocates of the first approach called "Structural Approach" (Keten, Başarır, & Kılıç, 2013). In structural credit risk models default event occurs with the dropping of firm's value under a threshold level and this situation is usually the increasing function of firm's leverage. Moreover, this model allows for a neutral risk evaluation through credit risk sensitivity tools by assuming a certain stochastic process for the firm's value (Alexander & Kaeck, 2008). "Reduced Form Approach" is the second basic approach which was developed by Das and Sundaram (2007); Duffie and Singleton (1999); R. Jarrow (2001); R. A. Jarrow, Lando, and Turnbull (1997); Unal, Madan, and Güntay (2003). According to this approach model parameters can be estimated from the market values of CDS or bonds and it can be said that these type of models are more suitable than structural models in evaluation of credit risk (Keten et al., 2013).

III. LITERATURE REVIEW

Relations between CDS and stock markets have also been subject of empirical studies. Using the data from 1963-1991 period, Fama and French (1993) have investigated determining risk factors of monthly stock returns and bond returns using data from the 1963 – 1991 period. They have determined that there are common risk factors that affect stock and bonds markets. Kwan (1996) has studied the synchronous relationship between stock prices of a certain firm and bond prices using weekly data from January 1986 – December 1990 period. As a result, Kwan (1996) has determined a negative relationship between stock returns and change in bond returns. Norden and Weber (2009) have investigated the relationship between stock markets, bond markets and CDS markets using data from the 2000- 2002 period. They have argued that stock returns cause changes in CDS and bond spreads and bond markets are more effective than bond markets on CDS markets. Moreover, CDS markets are more effective than bond markets for determination of stocks prices. Byström (2005) has examined relations between iTrax CDS index of European countries for different sectors using daily data from July 2004 – April 2005 period. Byström has determined that volatility in stock prices increases as volatility of CDS spreads increase. Alexander and Kaeck (2008) have analyzed iTraxx Europe index using 750 observations from June 2004 – June 2007 period. They have concluded that iTraxx Europe index is highly sensitive to stock volatility rather than stock returns. Balı and Yılmaz (2012) argue that CDS margins have a negative effect on IMKB-100 index and found a -0,7644 correlation coefficient between Stock index and CDS margins. Aktug, Vasconcellos, and Bae (2012) have studied the dynamic relationship between sovereign CDS and bond markets across 30 emerging markets using data from the 2001 – 2007 period. As a result they have suggested the bond markets play a significant role in the price discovery proses and CDS markets play dominant role on sovereign credit markets.

Fonseca and Katrin (2012) have investigated CDS spreads, realized volatility and stock returns on Australian, Japanese, Korean and Hong Kong CDS markets using weekly observations of September 2007 – December 2010 period.. Fonseca and Gottschalk have performed a regression analysis to identify determinants of the CDS spread and they have found results consistent with those of empirical literature for the US markets. According to results stock returns lead the other variables and realized volatility is the main contributor to the volatility spillover effects between the three asset classes. Ratner and Chiu (2013) have examined potential risk reducing benefits of CDS again in the U.S. stock market sectors from 2004 to 2011. They have utilized GARCH Dynamic Conditional Correlation (DCC) method to examine the time varying relationship between CDS and stock indexes. According to empirical analysis results CDS serve as an effective hedge against risk all stock sectors and also provide safe haven in times of financial crisis in a limited number of sectors. Keten et al. (2013)

have investigated global factors affecting CDS spreads of Turkey using data from the October 2000 – May 2013 period. Investigators have employed VAR analysis to estimate the relationship between Turkey's sovereign 5-year CDS spread and other financial variables considered to affect the CDS spreads. For this purpose they have used Brent oil price, Dow Jones index and the short and long term interest rates of the United States. Keten, Başarır and Kılıç have found a long term relationship between identified variables. Also, the results from the Granger causality test implies that there is only one-way causality from the U.S. long term interest rate to Turkish sovereign 5-year CDS spreads.

Eyssell, Fung, and Zhang (2013) have studied determinants of CDS spreads in China from January 2001 to December 2010. Eyssell et al. (2013) have determined that Chinese stock market, real interest rate of China, S&P 500 stock option volatilities and default spreads and the non-North American global stock market factor have significant explanatory power on CDS spreads. According to empirical analysis, China's domestic factors were more relevant in explaining the CDS spread in the earlier years, while the impact of global factors has become increasingly important in recent years, particularly during the global crisis. Within a VAR model controlling for exogenous variables, they have found that Chinese sovereign CDS spread changes lead to stock returns. Hilscher, Pollet, and Wilson (2013) have used daily and weekly data for CDS contracts for almost 800 firms for the period 2001- 2007 to examine cross-market predictability. They have found that equity returns lead to credit protection returns at daily and weekly frequencies, while credit protection returns do not lead equity returns. They have also found that credit protection returns respond more quickly during salient news events compared to days with similar equity returns and turnover.

Ismailescu and Phillips (2013) have analyzed determinants and effects of CDS trading initiation in the sovereign bond market. According to the results CDS trading initiation is decreases in a country's ability to service foreign Debt and more likely following increases in local equity index volatility, index spreads for regional and global CDS markets, or depreciation of the local currency relative to the US dollar. Eren (2014) investigated macroeconomic factors and CDS effects on BIST-100 Index by using monthly data from December 2005 – March 2014 period. Eren has used BIST-100 Index as dependent variable and credit default swaps, money supply, foreign trade equilibrium, industrial production index, consumer price index, interest rates and exchange rates as independent variables. According to ARDL approach results, it is concluded that CDS positively affected stock prices in the long term, however, it has negative effects on stock prices in short term. Yenice and Hazar (2015) have examined the interaction of CDS, with the stock exchanges of developing countries. For this aim 5-year CDS premiums belonging to Turkey, Argentina, Brazil, Indonesia, Malaysia and China were obtained on a daily basis between April 2009 and April 2014 and were compared with stock exchange index same period. In empirical analysis regression curve estimation models have used. According to the results relationships between CDS and stock exchanges were insignificant in 2 of 6 countries while significant relationships were found in other countries.

IV. EMPIRICAL RESULTS

Stock prices and CDS data from December 2005- March 2014 period were used in the study. Stock price data were obtained from BIST-100 website while CDS data which measures the risk of 5-year bonds of Turkey were obtained from Bloomberg. Data were used in logarithmic form in the study. Results of Unit Root Test Analysis are given in Table 1.

Table 1. Results of ADF unit root test *

		ADF (level)	ADF (firs difference)
Variables		Fixed Trend	Fixed Trend
L(SP)		-2.158752	-9.694038***
L(CDS)		-2.797397	-10.02152***
Critical Value	%1	-4.053392	-4.055416
	%5	-3.455842	-3.456805
	%10	-3.153710	-3.154273

*** represents 1% significance level. Maximum lag length is taken as 3.

As it can be seen from Table 1, series have become stationary after taking first differences. Co-integration test was employed to observe long-term relations between variables after obtaining ADF test results.

Investigating the Existence of a Long-term Relationship

Bound Test approach was deemed suitable for investigating whether there is co-integration relationship between the selected independent variable and stock index.

When the ARDL Model was constructed for the studied variables, following equation was obtained:

$$\Delta LSP_t = \alpha_0 + \alpha_1 LSP_{t-1} + \alpha_2 LCDS_{t-1} + \sum_{i=1}^{m} \alpha_{3i} \Delta LSP_{t-i} + \sum_{i=0}^{m} \alpha_{4i} \Delta LCDS_{t-i} + e_t \quad (1)$$

In applying Bound Test method, lag length should be determined first (Table 2).

Table 2. Determination of Lag Length for Bound Test

LAG	AIC	SC	LM1	LM2	LM3
1	-2.664246	-2.505983	0.180165 (0.6712)	6.574973 (0.3619)	9.833693 (0.6305)
2	-2.627832	-2.415485	2.851270 (0.0913)	7.688901 (0.2618)	11.44620 (0.4911)
3	-2.606513	-2.339394	1.369199 (0.2419)	6.106801 (0.4113)	10.36891 (0.5836)
4	-2.571425	-2.248830	0.082664 (0.7737)	5.756902 (0.4510)	9.414386 (0.6672)
5	-2.567852	-2.189063	0.716436 (0.3973)	5.948508 (0.4290)	11.47720 (0.4885)
6	-2.544641	-2.108924	0.162368 (0.6870)	4.793208 (0.5706)	17.50128 (0.1317)
7	-2.508289	-2.014896	1.278406 (0.2582)	6.702840 (0.3492)	18.29771 (0.1069)
8	-2.467025	-1.915188	0.041690 (0.8382)	9.659268 (0.1398)	22.44195 (0.0329)
9	-2.446484	-1.835419	3.013572 (0.08269)	13.30549 (0.0384)	20.28396 (0.0619)
10	-2.421464	-1.750371	0.323038 (0.5698)	16.52489 (0.0112)	21.09996 (0.0489)
11	-2.388885	-1.656944	7.756050 (0.0054)	11.00105 (0.0883)	16.37080 (0.1748)
12	-2.475116	-1.681491	0.198403 (0.6560)	2.558139 (0.8619)	16.62374 (0.1643)
13	-2.452776	-1.596609	0.498520 (0.4802)	4.905511 (0.5560)	10.12755 (0.6048)
14	-2.422174	-1.502588	0.274539 (0.6003)	3.268768 (0.7744)	12.22401 (0.4279)
15	-2.381514	-1.397612	0.026511 (0.8707)	11.06853 (0.0863)	17.01547 (0.1490)
16	-2.418442	-1.369306	0.925410 (0.3361)	11.63857 (0.0705)	20.19732 (0.0634)

It can be seen from Table 2 that according to LM(1), LM(2) and LM(3) tests, there is no autocorrelation in error terms in all lags except the 9th lag. However, since absolute values of AIC and SC values are greater at the 1st lag, 1st lag was preferred among all lags.

After determining the proper lag length for the model, F and t tests were applied to 1st period lags of variables in order to check for the existence of autocorrelation. F and t tests were based on the study of Pesaran, Shin, and Smith (2001). Wald test was applied to determine F statistic. Findings of the applied tests are shown in the Table 3. Calculated F statistical values shows that there is no autocorrelation between variables in the long-term.

Table 3. F and t Statistics Calculated in Bound Test and Critical Boundary Values of F and t Statistics

k value	F value			t value		
1	1.68			-1.35		
Critical Boundary Values of F and t statistics*						
	10% critical value		5% critical value		1% critical value	
	Lower Boundary	Upper Boundary	Lower Boundary	Upper Boundary	Lower Boundary	Upper Boundary
F	2.45	3.52	2.86	4.01	3.74	5.06
t	-2.57	-2.91	-2.86	-3.22	-3.43	-3.82

Note: F value is the F statistics of coefficients of lagged level variables obtained through zero restriction (Wald Test) in Equation 14. t, is the (α_1) t statistic value of coefficient of LSP_{t-1} obtained by linear deterministic Least Squares Method (LSM). "k" represents the number of independent variables in the model. F critical values are taken from Table CI (iii) in Pesaran et al. (2001) and t critical boundary values are taken from Table CII(iii) Case III in Pesaran et al. (2001).

Short-term Analysis

Short-term relations between variables were analyzed in this section of the study and following results were found (Table 4).

Table 4. Short-Term Estimation Results

Variable	Coefficient	Standard Error	t-statistics	p-value
C	0.005949	0.004757	1.250459	0.2142
DLCDS	-0.388433	0.038296	-10.14288	0.0000
AR(1)	-0.327949	0.097385	-3.367549	0.0011
R^2 = 0.476971	**F(P)= 43.32(0.0000)**	**$\sum e^2$ = 0.371201**	**$\bar{R}^2$ = 0.465959**	
DW = 1.988469	**s = 0.062509**	**$\overline{DLSP}$ = 0.004563**		

According to these findings, 38.84% of the change in stock prices is caused by credit default risk. Moreover, the negative sign of the coefficient shows that CDS negatively affect stock prices in the short-term, as expected.

V. CONCLUSION

Stock prices change due to factors that may be grouped under two sets. First set contains micro factors such as those caused by firm ratios while the second set includes macro factors. This study basically focuses on the effect of CDS on BIST-100 index using monthly data from 2005:12-2014:03 period.

Looking at the effects of CDS on the index, it was seen that although CDS have no effect on stock prices in the long-term, the effect of CDS on stock prices in the short-term is negative, as argued by Balı and Yılmaz (2012) in their study on Turkey. The reason for this is considered to be momentary responses of CDS. That is, CDS data reflect all economic and political risk factors associated with a certain country and they change momentarily. An investor who will make an investment decision based on country risk primarily checks that country's CDS data. Since the investment decision is based on momentary data, general validity of the effects of change in CDS on the index is rather seen in the short-term than long-term.

Monthly data from the above-mentioned period were used in this study which investigates the relationship between credit default swaps and stock prices. Due to CDS are effective on stock prices only in the short-term, it would be helpful to use data collected in shorter intervals and to research causality relations between variables in further studies on the subject.

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