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THE RELATIONSHIP BETWEEN CREDIT DEFAULT SWAP SPREADS, EQUITY INDICES AND SECTOR EQUITY INDICES: AN EMPIRICAL STUDY ON ISTANBUL STOCK EXCHANGE

Abstract:

The link between stock prices and Credit Default Swaps (CDS) spreads is important for risk managers to make an investment decision. Furthermore, the choice of sector is important in the preference of the investors. The literature have different evidences as there is a powerful relation with the country CDS and the equity indices or not. This study aims to investigate the linkages between the CDS spreads and equity indices including the scope and diversity of sector. The sample of the study consists of BIST30, BIST100, BIST Bank and BIST Industry. The data of the study included the January 2013 and April 2014 were tried with weekly data range.

Keywords:

Credit Default Swaps, Equity Index, Sector Equity Index, BIST30, BIST100, Istanbul Stock Exchange, Vector Autoregression, Impulse Response, Variance Decomposition

JEL Classification: F21, F30, C58

Introduction

The link between stock prices and Credit Default Swaps (CDS) spreads is important for risk managers to make an investment decision. Furthermore, the choice of sector is important in the preference of the investors. The literature have different evidences as there is a powerful relation with the country CDS and the equity indices or not. This study aims to investigate the linkages between the CDS spreads and equity indices including the scope and diversity of sector. The sample of the study consists of BIST30, BIST100, BIST Bank and BIST Industry. The data of the study included the January 2013 and April 2014 were tried with weekly data range.

A credit default swap (CDS) is a financial swap agreement that the seller of the CDS will compensate the buyer in the event of a loan default or another credit event. A CDS is linked to a "reference entity". This reference entity is usually a corporation or a government. CDS spread is one of the payments that the buyer of the CDS makes to the seller regularly. If the reference entity defaults, the protection seller pays the buyer the par value of the bond in exchange for physical delivery of the bond, although settlement may also be by cash or auction. Although, investors can purchase a CDS, even buyers who do not hold the loan instrument and who have no direct insurable interest in the loan.

There are three main types of credit event/credit risk:

- Credit Default Risk: failure to pay, restructuring and bankruptcy;
- Credit Spread Risk: a rise in the credit spread;
- Downgrade Risk: a drop in the borrower's credit rating.

If the reference entity defaults, two kinds of settlement can occur:

- the investor (CDS buyer or insurance seller) delivers a defaulted asset to the CDS seller (or insurance buyer) for payment of the par value, which is known as physical settlement;
- CDS seller (or insurance buyer)pays the investor the difference between the par value and the market price of a specified debt obligation.

A stock index is a measurement of the value of a section of the stock market. It is computed from the prices of selected stocks . A stock index can be computed price-weighted, capitalization weighted or can be computed by geometric average. It is a tool used by investors and financial managers to describe the market, and to compare the return on specific investments.

The oldest stock index still in use is The Dow Jones Transportation Average (DJTA). DJTA was created on July 3, 1884, by Charles Dow, co-founder of Dow Jones & Company, as part of the "Customer's Afternoon Letter". The index is consisted of eleven transportation companies—nine railroads and two non-rail companies.

Literature

The literature of the subject is around three main issues as market integration, hedging and informational efficiency.

Pricing Models and Market Integration

Chan, Fung and Zang (2008) studied the dynamic relationship between sovereign CDS spreads and stock prices for seven Asian countries for the period from January 2001 to February 2007. They found a strong negative correlation between the CDS spread and the stock index for most Asian countries. A long-run equilibrium price relationship is found for China, Korea, and Thailand and CDS markets play a leading role in five out of seven countries. The stock market has a feedback effect for two countries and dominates price discovery for only one country. Therefore, equity investors should span the CDS market for incremental information.

Realdon (2008), tested a CDS pricing model in which a firm's default intensity is driven by the firm's stock price. They estimate and test the model using a quasi-maximum likelihood method on a sample of corporate credit default swap (CDS). Thus maximum likelihood estimation is employed even if the pricing model is solved through finite differences. In the majority of cases the model can explain at least 63% of the variation in CDS rates. Overall they conclude that, at firm level, CDS rates and default intensities seem to be driven by stock prices. At firm level CDSs can be regarded as equity derivatives and further research may explore the hedging of CDS positions using stocks.

Kapadia and Pu (2009) found that the cross-sectional variation in the level of integration between the equity and the credit default swap market is related to a range of proxies for informational sensitivity, liquidity, and idiosyncratic risk. The paper examine whether limits to arbitrage can explain the extent to the equity and credit markets are integrated. In the paper, the cross-sectional regression of the average five-year credit default swap spread on the firm's average debt ratio and stock return volatility gived an adjusted R2 of 61%. They found that equity and credit markets are more integrated when a firm's securities are more informational sensitive, are more liquid and have lower idiosyncratic risk.

Coudert and Gex (2010), estimated nonlinear Vector Error-Correction Model (VECM) and Vector Autoregressive (VAR) model. They considered 5-year maturity CDS premia and stock prices for 120 major US and European firms, and construct a generic 5-year bond for each of these firms.. First, the results show that the CDS market has a lead over the bond market, confirming previous results by Blanco et al.

(2005) and Zhu (2006), whereas the stock market tends to lead the CDS market. Second, we show that those markets were somewhat disconnected during the GM and Ford crisis, as their links were significantly loosened.

Firewald and others (2011) analyzed risk premia in credit and equity markets by exploring the joint cross-section of credit default swaps and stocks for 675 US firms from January 2, 2001 and April 26, 2010. Their findings thus suggest that the term structure of CDS spreads contains information about risk premia. CDS excess returns are predictable and, on average, a single factor extracted from a firm's term structure of CDS spreads captures 25% to 33% of the variation in the sub-samples and around 25%. They found a strong negative relation between CDS excess returns and contemporaneous equity excess returns. Their structural models imply that (risk-adjusted) excess returns in both markets are driven by the relation between a firm's risk-neutral and real-world default probability.

Corzo and others (2012) investigated the relationship between sovereign CDSs, sovereign bonds and equity markets for thirteen European countries during the period 2008-2011. The paper justify the connection between the sovereign debt market and the country's stock market and using a VAR analysis. The findings confirm the leading role of equity markets in incorporating new information during 2008-2009. After 2010 sovereign CDS markets took this role and led the process. There is evidence that during the years 2007-2009 the Spanish CDSs led the price discovery process, while the Italian and French CDSs took over in 2011. During 2010, sovereign CDS premiums become "delinked" although there is some evidence that the German CDSs took a sort of leading role in market co-movements.

Hedging

Caporin (2013), analyzed the availability of indices monitoring the equity market volatility, the VIX index, credit markets default risk, and CDS indices, allows for the construction of hedging strategies. The paper is in the view of an investor who wants to hedge the equity risk by taking positions either on the VIX index or on CDS indices. The analysis is based on 18 US sectorial indices. The empirical application shows that a hedging strategy based on CDS indices is more efficient than a strategy based on the VIX index.

Informational Efficiency

Zhang (2008) investigated CDS and stock price reactions to a variety of credit events including news of economic distress, financial distress, M&A, SEC probes or accounting irregularities, and leverage buyouts (LBO). The CDS spread shows a large spike of 37% to 96% depending on the event type on a single day and stays fairly flat the month after, supporting efficiency of the CDS market. The findings show that with the exception of LBO news, the stock market seems to reveal information about negative credit events before the CDS market.

Cornett et al. (2014) studied seasoned equity issuances by financial and nonfinancial companies between 2002 and 2013. They conducted an event-study analysis using daily CDS and stock market pricing data. The findings of the paper are that equity prices do not react to new issues in the pre-crisis period, but react negatively in the crisis. CDS prices respond to new, default-relevant information. Over the full sample period, cumulative abnormal CDS spreads drop in response to equity issuance announcements. The reactions are significantly stronger during the financial crisis when the federal government injected equity into financial institutions to ensure their viability.

The Equity Indices Dataset

We used daily prices of BIST 100 Index, BIST 30 Index and Sector Indices and Sub-Sector Indices.

BIST 100 Index is used as the main index for Istanbul Stock Exchange Equity Market. It consists of 100 stocks selected among the stocks of companies traded on the National Market and the stocks of real estate investment trusts and venture capital investment trusts traded on the Collective Products Market. BIST 100 index automatically covers BIST 30 and BIST 50 stocks.

BIST 30 Index consists of 30 stocks selected among the stocks of companies traded on the National Market and the stocks of real estate investment trusts and venture capital investment trusts traded on the Collective Products Market.

Sector Indices and Sub-Sector Indices are consist of the stocks of companies traded on Istanbul Stock Exchange markets, except Investment Trusts.

Calculation Method and Adjustment of Istanbul Stock Exchange Equity Indexes

Latest price data are used in the index calculations. BIST Indices are calculated as free float market capitalization weighted.

The following formula is used in the calculation of indices:

$$E_t = \frac{\sum_{i=1}^{n} F_{it} * N_{it} * H_{it} * K_{it}}{B_t}$$

E_t = Value of the index at time t

n = Number of constituent stocks

F_{it} = Price of the stock "i" at time t

N_{it} = Total number of shares of stock "i" at time t

H_{it} = Free float ratio used in index calculation of the stock "i" at time t

K_{it} = Divisor of the index at time t

B_t= = Coefficient of the stock "i" at time t

Adjustment:

If there occurs any change in the numerator of the index formula due to the events listed below, the divisor of the index will also be adjusted to ensure continuity in the index value. The adjusted divisor of the indices is calculated using the following formula:

$$B_{t+1} = \left(1 + \frac{\Delta PD}{PD_t}\right) * B_t$$

B_{t+1} = Adjusted divisor to be used on day t+1

ΔPD = Change in the total Weighted Free Float market value of the stocks due to the events described below

PD_t= Total Weighted Free Float market value of the stocks on day “t”

B_t = Divisor on day t

If capital increases and/or dividend payments of the traded companies are realized in a currency other than Turkish Lira, Turkish Lira equivalents, calculated by using exchange rates of the last business day before ex-date, are used in index adjustments.

The Credit Default Swap Dataset

The CDS spreads of Turkey are taken from Bloomberg. The five-years spreads are used because these contracts are the most liquid and constitute over 85 percent of the entire CDS market.

Methodology

We used vector autoregression (VAR) model which is an econometric model used to capture the linear interdependencies among multiple time series. We chose this model, because in VAR, the researcher does not need to specify which variables are endogenous or exogenous all are endogenous (Brooks).

VAR is applied to the stable time series. Firstly, we run the unit root tests for the sample. In the results we saw that all of the five time series have unit root and become stable in the first differences. After that we run the VAR lag order selections. With the lag order decisions we run the VAR models.

Empirical Results

Table 1: The Results of the Unit Root Tests

	Schwarz			Akaike			Fixed			PhilipsPerron			KPSS	
	Lag	T_stat	Prob.	Lag	T_stat	Prob.	Lag	T_stat	Prob.	Bandwidth	T_stat	Probability	Bandwidth	LM-Stat
										1	-2.5788156	0.1027	5	0.062093
BIST30	0	-2.511006	0.1106	2	-2.828736	0.0600								
BIST30_d	0	-8.076872	0.0000	1	-4.766112	0.0002	4	-3.531181	0.0104	1	-8.076912	0.0000	2	0.067003
BIST100	0	-2.518485	0.1158	2	-2.787864	0.0657				1	-2.583858	0.1015	5	0.069689
BIST100_d	0	-7.990944	0.0000	1	-4.708241	0.0003	3	-4.101350	0.0019	1	-7.990537	0.0000	2	0.068117
BISTBank	0	-2.247302	0.1921	2	-2.498254	0.1207				3	-2.545057	0.1098	5	0.064314
BISTBank_d	0	-8.013495	0.0000	1	-4.727708	0.0002	3	-3.793028	0.0049	2	-8.023288	0.0000	1	0.088563
BISTChem	0	-2.657994	0.0870	0	-2.657994	0.0870				2	-2.703875	0.0788	5	0.117149
BISTChem_d	0	-8.711608	0.0000	0	-8.711608	0.0000				8	-9.012741	0.0000	10	0.133526
BISTInd	0	-2.654266	0.0877	0	-2.654266	0.0877				0	-2.654266	0.0877	5	0.081029
BISTInd_d	0	-8.480615	0.0000	0	-8.480615	0.0000				3	-8.479586	0.0000	5	0.0684426
										1	-2.6522156	0.0880	5	0.0834463
TURKEY	0	-2.614956	0.0952	0	-2.614956	0.0952								
TURKEY_d	0	-8.390286	0.0000	0	-8.390286	0.0000				7	-8.511827	0.0000	8	.0.134162

Table 2: VAR Lag Order Selections

	Lag	LogL	LR	FPE	AIC	SC	HQ
BIST30 CDS	0	-852.7720	NA	8.11e+09	28.49240	28.56221	28.51971
	1	-814.5805	72.56378*	2.60e+09	27.35268	27.56212*	27.43461*
	2	-810.2550	7.930088	2.57e+09	27.34183	27.69089	27.47837
	3	-805.7658	7.930890	2.53e+09*	27.32553*	27.81421	27.51668
	4	-803.7931	3.353608	2.71e+09	27.39310	28.02141	27.63887
	5	-802.5023	2.108344	2.98e+09	27.48341	28.25134	27.78379
	6	-800.1944	3.615711	3.17e+09	27.53981	28.44736	27.89481
BIST100 CDS	0	-839.7583	NA	5.26e+09	28.05861	28.12842	28.08592
	1	-799.3465	76.78245	1.56e+09	26.84488	27.05432*	26.92680*
	2	-794.0842	9.647443*	1.50e+09	26.80281	27.15187	26.93934
	3	-789.5095	8.082054	1.47e+09*	26.78365*	27.27233	26.97480
	4	-787.6556	3.151605	1.59e+09	26.85519	27.48349	27.10095
	5	-786.5063	1.877165	1.75e+09	26.95021	27.71814	27.25059
	6	-784.1034	3.764579	1.86e+09	27.00345	27.91100	27.35844
BISTBANK CDS	0	-898.5543	NA	3.73e+10	30.01848	30.08829	30.04578
	1	-856.6107	79.69289*	1.05e+10*	28.75369*	28.96312*	28.83561*
	2	-854.0817	4.636497	1.11e+10	28.80272	29.15178	28.93926
	3	-850.5720	6.200380	1.13e+10	28.81907	29.30775	29.01022
	4	-847.2627	5.625857	1.16e+10	28.84209	29.47039	29.08785
	5	-845.7739	2.431670	1.26e+10	28.92580	29.69372	29.22618
	6	-843.9536	2.851838	1.36e+10	28.99845	29.90600	29.35345
BIST INDUSTRY CDS	0	-825.8586	NA	3.31e+09	27.59529	27.66510	27.62260
	1	-781.6956	83.90977	8.67e+08	26.25652	26.46595*	26.33844
	2	-775.6558	11.07290*	8.11e+08*	26.18853*	26.53759	26.32506*
	3	-772.0661	6.341891	8.23e+08	26.20220	26.69088	26.39335
	4	-769.3013	4.700106	8.60e+08	26.24338	26.87168	26.48914
	5	-766.4492	4.658488	8.97e+08	26.28164	27.04957	26.58202
	6	-764.5518	2.972505	9.67e+08	26.35173	27.25928	26.70672

* indicateslagorderselectedbythecriterion

LR: sequentialmodified LR test statistic (each test at 5% level)

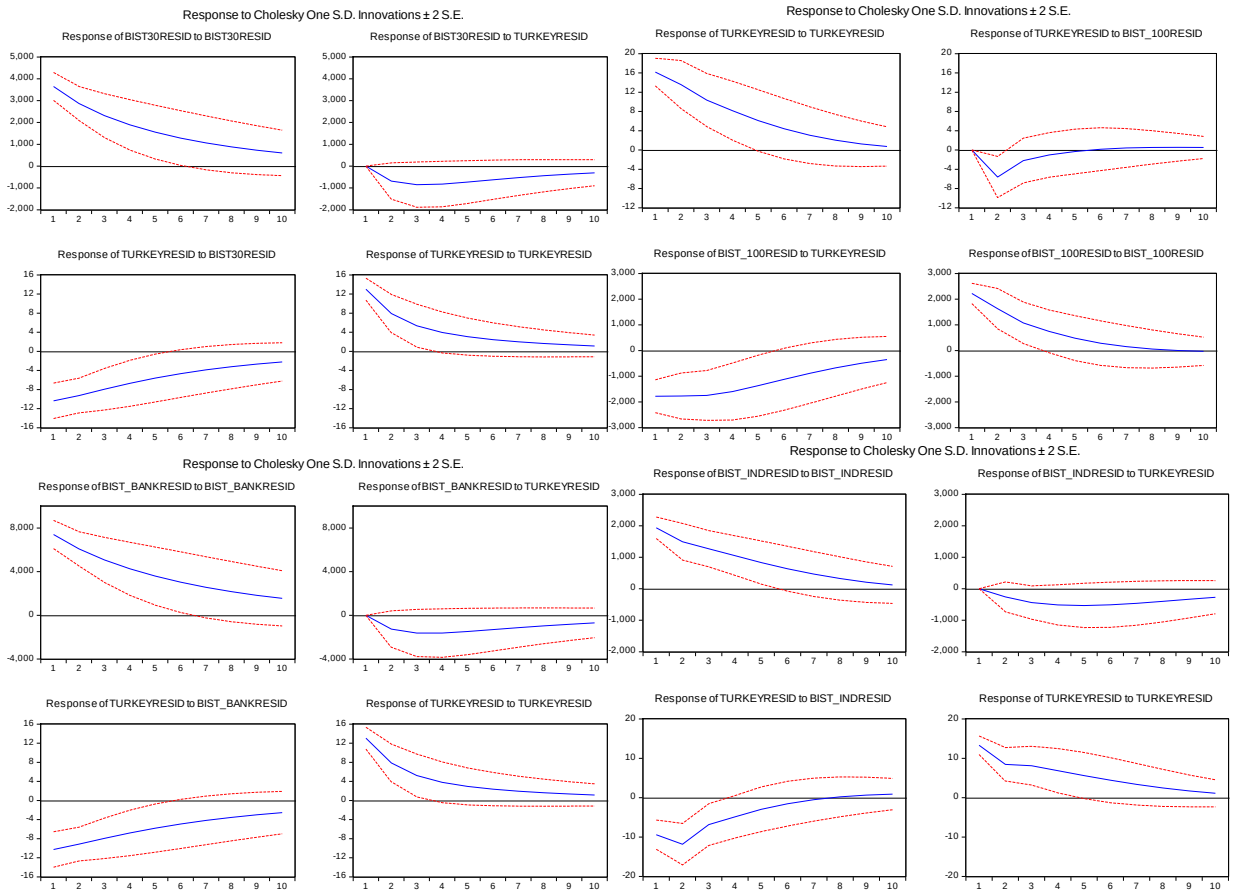
FPE: Final predictionerror

AIC: Akaikeinformationcriterion

SC: Schwarzinformationcriterion

HQ: Hannan-Quinninformationcriterion

Figure 1: Impulse Response Analysis



In the figure 1, there are the results of the impulse response tests. From the figure, we reach to the continuing results:

When there is one standard deviation's shock is applied to TURKEY CDS, BIST30 decreases 3 weeks, then it approaches to zero until 10 weeks.

When there is one standard deviation's shock is applied to BIST30, TURKEY CDS immediately decreases in the first week, then it approaches to zero until 5 weeks.

When there is one standard deviation's shock is applied to TURKEY CDS, BIST100 decreases 2 weeks, then it approaches to zero until 5 weeks.

When there is one standard deviation's shock is applied to BIST100, TURKEY CDS immediately decreases in the first week, then it approaches to zero until 6 weeks.

When there is one standard deviation's shock is applied to TURKEY CDS, BISTBANKS decreases 3 weeks, then it approaches to zero until 10 weeks.

When there is one standard deviation's shock is applied to BISTBANKS, TURKEY CDS immediately decreases in the first week, then it approaches to zero until 5 weeks.

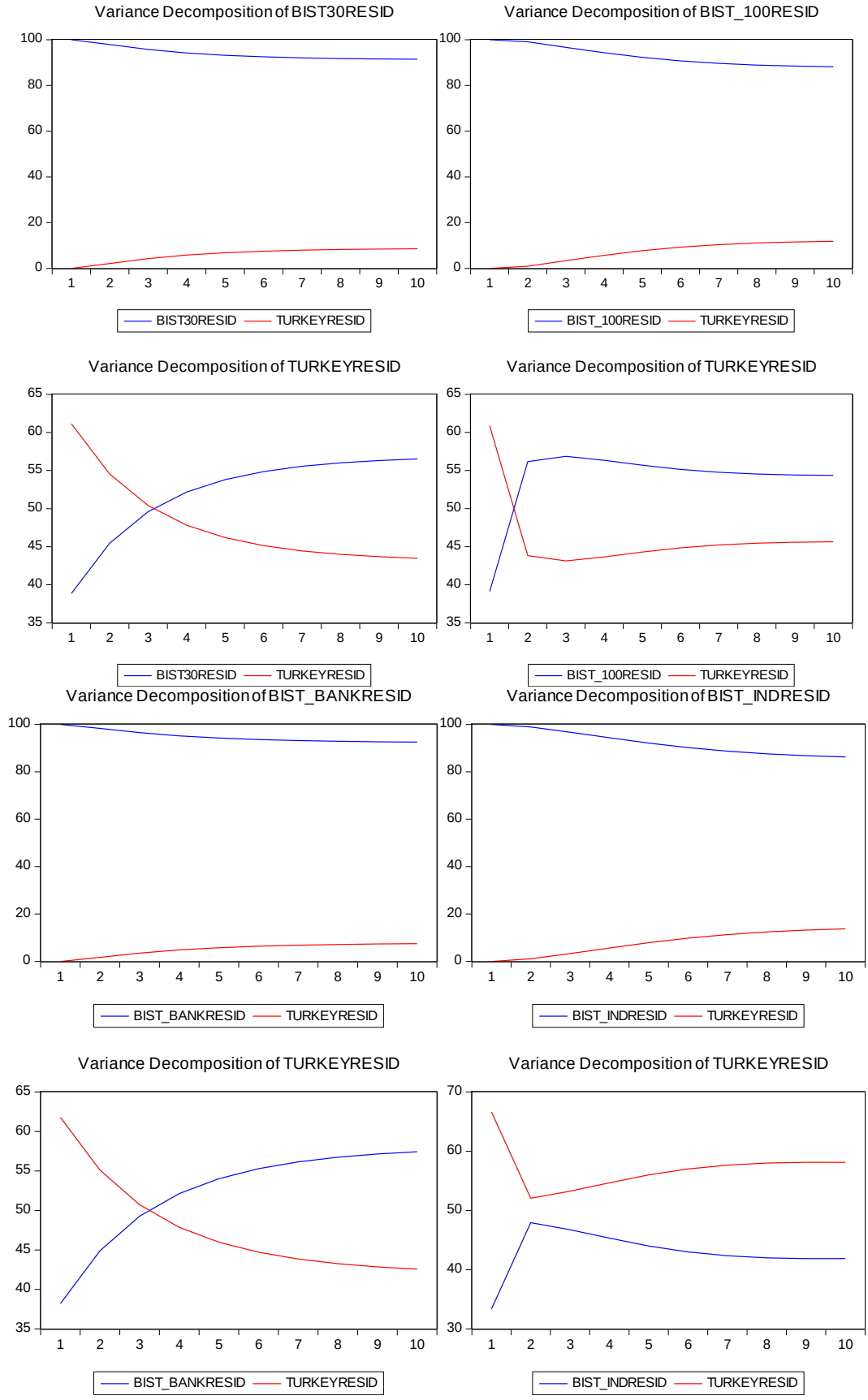
When there is one standard deviation's shock is applied to TURKEY CDS, BIST INDUSTRY decreases 5 weeks, then it approaches to zero until 10 weeks.

When there is one standard deviation's shock is applied to BIST INDUSTRY, TURKEY CDS immediately decreases in the first week, then it continues to decrease until in the middle of two weeks. Then it approaches to zero until 7 weeks.

Table 3: Summary of The Impulse Response Tests

1 Standard Deviation Shock applied to (Impulse);	The Response to the shock of;	First Response	Time of Turning to zero
TURKEY CDS	BIST30	Decrease 3 weeks	10 weeks
BIST30	TURKEY CDS	immediately decreases in the first week,	5 weeks
TURKEY CDS	BIST100	Decrease 2 weeks	5 weeks
BIST100	TURKEY CDS	immediately decreases in the first week,	6 weeks
TURKEY CDS	BISTBANKS	Decrease 3 weeks	10 weeks
BISTBANKS	TURKEY CDS	immediately decreases in the first week,	10 weeks
TURKEY CDS	BIST INDUSTRY	Decrease 5 weeks	10 weeks
BIST INDUSTRY	TURKEY CDS	immediately decreases in the first week,	10 weeks

Figure 2: Variance Decompositions of BIST30, BIST100, BISTBANK, BISTINDUSTRY and TURKEY CDS



In the figure 2, there are the results of the variance decomposition tests. From the figure, we reach to the continuing results:

More than 90% of the variance of BIST30 is composed of its own variance. 45% of the variance of Turkey CDS can be explained by its own. The variance of BIST30 can explain 55% of the variance of Turkey CDS in a decreasingly grow rate.

90% of the variance of BIST100 is composed of its own variance. 45% of the variance of Turkey CDS can be explained by its own variance and more than 55% by the variance of BIST100 in the first two weeks. After three weeks it decreases and approaches to 55%.

Nearly 95% of the variance of BIST Banks is composed of its own variance. Variance of BIST Banks can explain 55% of the variance of Turkey CDS with a decreasingly grow rate in 10 weeks.

Nearly 85 % of the variance of BIST INDUSTRY is composed of its own variance. 45% of the variance of Turkey CDS can be explained by its own variance and more than 55% by the variance of BIST INDUSTRY in the first two weeks. After two weeks the variance that explained by the BIST INDUSTRY's variance decreases and approaches to 55%.

Table 4: Summary of the Variance Decompositions of The Equity Indices

	EQUITY INDEX	***TURKEY CDS***	***Reach the Highest composition, explaining by CDS.***
BIST30	*90*	*10*	*10 weeks*
BIST100	*90*	*10*	*10 weeks*
BIST BANKS	*95*	*5*	*10 weeks*
BIST INDUSTRY	*85*	*15*	*10 weeks*

Conclusion

Equity indexes impulses are more effective on CDS's then the impulses of CDS's on equity indices. The response of BIST BANK to the shocks on CDS is quicker than the response of BIST INDUSTRY to the shocks on CDS. Besides, the two sector equity indices have the same impact on TURKEY CDS.

The equity index's variance's decompositions are mostly composed of their own variances. Whereas Turkey CDS's variance is highly can be explained by equity indices' variances'. These findings supports Realdon (2008), CDS rates and default intensities seem to be driven by stock prices and Coudert and Gex (2010) that the stock market tends to lead the CDS market.

Especially BIST100 and BIST INDUSTRY's variance's explanations are both high and quick. These findings supports that the scope and sector of the equity indices are important for the investors when diversifying their portfolio, or hedging with CDS's, or making a decision to invest in a foreign market.

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