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THE DETERMINANTS OF CDS: AN EMERGING MARKETS ANALYSIS

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CDS'LERİN BELİRLEYİCİLERİ: GELİŞMEKTE OLAN BİR PAZAR ANALİZİ

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- 5) Tüketici Fiyat Endeksi

PREFACE

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LIST OF ABBREVIATIONS

CDS	Credit Default Swap
CPI	Consumer Price Index
GDP	Gross Domestic Product
ADF	Augmented Dickey Fuller
IPI	Industrial Production Index
USD	US Dollar
TRY	Turkish Lira
BRL	Brazilian Real
RUB	Russian Ruble
INR	Indian Rupee
CNY	Chinese Yuan
BIST100	Borsa İstanbul Main Stock Exchange Index
BVSP	Bovespa (Brazilian Stock Exchange Index)
MOEX	Moscow Exchange Index
NIFTY50	Premier Stock Index of India
SSEC	Shanghai Composite Stock Index

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ABSTRACT

In this study we tried to analyze the relationship between CDS spreads and other financial and macroeconomic indicators such as stock index, foreign exchange rate, industrial production index and consumer price index. We focused on emerging markets, especially BRIC countries and Turkey. We applied unit root tests, cointegration tests, vector error correction models, vector autoregressive models and Granger causality tests.

Our results imply that the relationship between CDS spreads and other financial variables and macroeconomic variables are not homogeneous across countries. Nevertheless, a strong implication of the results is that the causality generally runs from financial variables, in particular stock index to CDS spreads.

Keywords: Credit Default Swap, Stock Index, Foreign Exchange Rate, Industrial Production Index, Consumer Price Index

ÖZET

Bu çalışmada CDS spreadleri ile hisse senedi endeksi, döviz kuru, sanayi üretim endeksi ve tüketici fiyat endeksi gibi diğer finansal ve makroekonomik göstergeler arasındaki ilişki incelenmiştir. Çalışmada BRIC ülkeleri ve Türkiye başta olmak üzere gelişmekte olan ülkelerin finansal piyasalarına odaklanılmıştır. Birim kök testleri, eşbütünleşme testleri, vektör hata düzeltme modelleri, vektör otoregresif modeller ve Granger nedensellik testleri uygulanmıştır.

Çalışma sonucunda CDS spreadleri ile diğer finansal ve makroekonomik değişkenler arasındaki ilişkinin ülkeler arasında homojen olarak gerçekleşmediği görülmektedir. Yine de, sonuçlar incelendiğinde genellikle finansal değişken hisse endeksi ve CDS spreadi arasında güçlü bir nedensellik görülmektedir.

Anahtar Kelimeler: Kredi Temerrüt Takası, Hisse Endeksi, Döviz Kuru, Endüstriyel Üretim Endeksi, Tüketici Fiyat Endeksi

INTRODUCTION

Country risk represents the riskiness of a sovereign in terms of not being able to do its payment obligations as promised. It is an important factor especially for pricing sovereign bonds. In financial markets, ratings given by rating agencies have huge importance in the pricing of bonds and other financial assets of a country since these ratings are used as a measure of country risk. These ratings are generally used as measures of country risk if they are assigned to sovereigns. Three rating agencies, namely Moody's, S&P and Fitch assign credit ratings to nearly every fixed income asset, including sovereign bonds. Table 1 presents the rating structure of rating agencies.

As Larrain et al (1997) state, econometric studies find out that changes in the ratings assigned by these agencies have considerable and significant effects on international financial markets. For example, when sovereign bonds are announced to be put under review with a negative outlook, the financial markets of that country are negatively and seriously affected.

The relationship between ratings and financial markets raises serious concerns on the developments of financial markets in emerging markets. Especially, falling from investment grade to non-investment grade has serious consequences. However, financial market participants have doubts on the reliability of rating agencies.

As Eijffinger (2012) points out, ratings have serious flaws for representing country risk adequately. Firstly, they are not in front of the market or they do not lead the market in terms of forecasting credit events. The foremost examples of this are global financial crisis of 2009 and Euro-zone sovereign debt crisis. Rating agencies downgraded problematic countries or corporates after the collapse in markets. Secondly, business model of rating agencies suffers serious conflict of interest, since they are paid by the institutions which are given ratings by these agencies. Lastly, current market structure of rating agencies is oligopolistic as three major agencies largely dominate the market. It is quite difficult for a new entrant to have

a place in this type of market. This also gives current agencies a huge strategic power for manipulating the markets.

Table 1 : Rating Structure of Rating Agencies

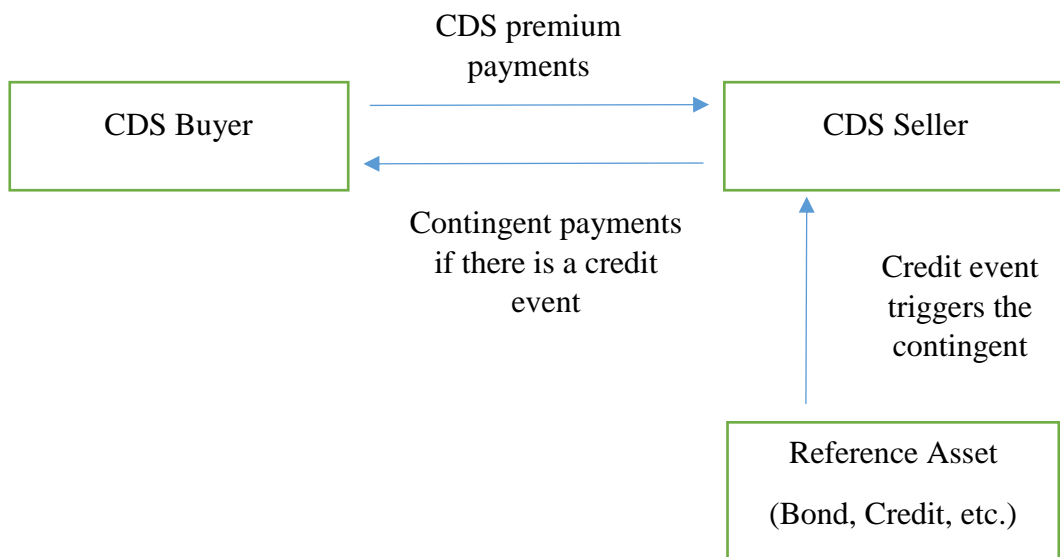
Moody's		S&P		Fitch		
Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	
Aaa	Prime 1	AAA	A-1+	AAA	F1+	Investment Grade
Aa1	Prime 1	AA+	A-1+	AA+	F1+	
Aa2	Prime 1	AA	A-1+	AA	F1+	
Aa3	Prime 1	AA-	A-1+	AA-	F1+	
A1	Prime 1	A+	A-1	A+	F1	
A2	Prime 1	A	A-1	A	F1	
A3	Prime 2	A-	A-2	A-	F2	
Baa1	Prime 2	BBB+	A-2	BBB+	F2	
Baa2	Prime 3	BBB	A-3	BBB	F3	
Baa3	Prime 3	BBB-	A-3	BBB-	F3	
Ba1	Not Prime	BB+	B	BB+	B	Non-investment Grade
Ba2	Not Prime	BB	B	BB	B	
Ba3	Not Prime	BB-	B	BB-	B	
B1	Not Prime	B+	C	B+	B	
B2	Not Prime	B	C	B	B	
B3	Not Prime	B-	C	B-	B	
Caa	Not Prime	CCC	C	CCC	C	
Ca	Not Prime	CC	C	CC	C	
C	Not Prime	C	C	C	C	
		D	D	D	D	

Source: Özman et al. (2018)

Market based country risk measures such as EMBI indices and CDS premiums do not suffer these problems. They largely reflect the views of the market participants and these views are not only views but judgments since they are used in pricing process. Moreover, these market instruments are traded and not under control of oligopolistic firms.

We first need to understand the structure of a CDS contract to have a grasp of its importance in the financial markets. In the following figure, the structure of a CDS transaction is presented.

Figure 1: Structure of a CDS Transaction



Source: Yenisu and Yenice (2018)

In a CDS transaction, CDS buyer pays regular payments (spreads) to CDS seller. The main reason for these payments is buying the protection for the case of a credit event. Definition of a credit event is explicitly written in a CDS contract and generally these definitions are detailed. The most obvious credit event is of course default, i.e. borrower not being able to pay the debt. When a credit event realizes, this triggers the contingent payments to be done by CDS seller to CDS buyer. As a result, CDS buyer has turned the underlying reference asset into a riskless asset by

buying CDS. If no credit event occurs until the maturity of the reference asset, since contingent payments are not triggered, CDS seller does not do any payments to CDS buyer.

Although the main features of a CDS contract are as summarized above, the details can be quite confusing, in particular in the determination of a credit event and the required payments. CDS contracts are not traded in exchanges since the details can vary from contract to contract. They are traded OTC (over-the-counter). The legal and institutional details of CDS contract are generally guided by the International Swaps and Derivatives Association (ISDA). (Augustin et al.,2014)

Credit Default Swaps (CDS) were introduced in 1990s as a credit derivative and CDS volumes increased thereafter until 2009 global financial crisis. After global financial crisis CDS volumes experienced a sizeable decline. According to Bank of International Settlements (BIS) total nominal amounts of CDS contracts decreased from 61.2 trillion USD in 2007 to under 10 trillion USD in 2017.

Despite the decline in nominal amounts, CDS continue to carry their importance in financial markets. CDS is basically an insurance against possible negative events, default at the most extreme. Buyer of a CDS insures himself/herself and pays a premium for this protection. Naturally, price of a CDS reflects important information such as riskiness of the underlying bond. Especially, sovereign CDS premiums are called as country risk premiums.

In this thesis, we try to understand the interaction between CDS and other macroeconomic and financial variables, especially for emerging markets. Firstly, we question whether there exists a long-term or equilibrium relation between CDS and these macroeconomic and financial variables. Next, we analyze the long-run and short-run dynamics using VEC model if there is cointegration. We also employ VAR model to understand which macroeconomic and financial variables have significance in forecasting CDS premiums and vice versa. Lastly, we utilize Granger causality tests to see whether the information in CDS premiums have

effects on macroeconomic and financial variables or the causality is in the reverse direction.

The literature review section surveys the papers and studies on the relationship between CDS and other macroeconomic and financial variables. Data and methodology sections present the data we employed for the analysis and the details of the methodology we use. Empirical results section summarizes our findings. The study ends with a brief conclusion.

1. LITERATURE REVIEW

Chan-Lau and Kim (2004) study stock prices, CDS values and bond spreads in emerging markets. As they state, CDS is like buying insurance against negative events such as default. As a result, it is not surprising that they find a long-term or equilibrium relationship between CDS values and bond spreads in emerging markets. However, they also state that bond spreads and CDS values may diverge due to several factors. Most important factors that may cause divergence between CDS and bond spread are liquidity and cheapest-to-deliver option. Their cointegration analysis reveals that CDS and bond spreads are cointegrated for emerging market economies excluding Turkey, Philippines and Mexico. CDS and stock markets are not cointegrated, in other words do not have a long-term relationship, except Russia. Their Granger causality analysis results are mixed, and they do not conclude with clear causality directions between CDS, bond and equity markets for the countries they studied.

Chan and others (2009) analyze the relationship between CDS and equity markets for Asian countries between 2001 and 2007. They firstly state that a strong negative correlation should be expected between CDS values and stock prices from a theoretic point of view. Their results coincide with these theoretical expectations. They find out that CDS and stock markets are negatively correlated. CDS and equity

markets are cointegrated for China, Korea and Thailand. When they analyze causality or price discovery, they find out that CDS markets lead stock prices in general. Nevertheless, there are also feedback mechanism from stock prices to CDS markets in some cases.

Aktug and others (2012) investigates the relationship between CDS and bond markets for 2001-2007 period. They find out that the long-term equilibrium relationship between bond markets and CDS markets has strengthened through time. They also find out that developments in bond markets lead changes in CDS markets for sovereigns. In other words, causality is from sovereign bond markets to sovereign CDS markets. They state that this is interesting because in corporate bond and CDS markets, the causality is in reverse direction.

In a comprehensive study, Doshi et al. (2017) models and estimates sovereign CDS premiums using both economic and financial variables. The paper covers twenty-eight countries, three CDS maturities and daily data for more than a decade. They state that their model fits the data well and the effects of variables on CDS premiums are largely consistent with economic theory. When stock market volatility and exchange rate volatility increase, CDS premiums tend to increase as expected. On the other hand, when stock market returns and interest rates increase, CDS premiums tend to decrease. The quantitative results tend to vary over countries and time. For instance, country risk premiums for Euro-zone increase in huge amounts during 2009 global financial crisis and Euro-zone debt crisis, more than model predictions, as markets turned into safe mode. They state that the study of sovereign CDS premiums are much more necessary than before as the latest global crises are oriented in developed countries and later spread to emerging countries.

Anton (2011) is another study analyzing emerging market sovereign CDS premiums. However, the focus of the study is Euro-zone debt crisis between 2008 and 2010. The results of the study must be interpreted with caution, since the period under investigation is subject to very uncertain and unexpected market events such as Lehman Brother collapse and Greece fiscal deficit problem. For economic fundamentals, the study employs government debt-to-GDP ratio, economic growth

rates in terms of Real GDP and general government deficit to GDP. The study finds out that investor risk appetite, spillover effect and rating downgrades have considerable and significant effects on CDS premiums for this period, whereas effects of economic variable are much less pronounced.

Some studies concentrating on corporate stock and CDS markets show that CDS spreads carry informative power for stock prices. Xiang and others (2017) study 174 non-financial investment grade firms in the US market for the period between 2005 and 2009. They show that a trading strategy based on CDS fluctuations result with higher rates of return than other trading strategies not using this information.

Forte and Pena (2009) is another study focusing on the relationship between CDS spreads, bond spreads and stock markets for corporates. Their results show that stock markets lead the bond spreads and CDS spreads. CDS spreads carry information for bond spreads as CDS spreads lead bond spreads. Thus, in terms of causality, changes in stock markets have effects on CDS spreads.

Greatrex (2008) also studies corporate CDS premiums by using monthly data for 333 firms for the period between January 2001 and March 2006. The study concludes that firm-ratings based CDS index, together with leverage and individual stock return volatility are the best predictors of CDS changes for corporates. These variables can explain nearly 80% of change in CDS premiums. On the contrary, interest rate variables and equity market variables do not have significant effects on CDS premiums.

Galil et al. (2013) analyze the determinants of corporate CDS premiums for 718 US firms for the period between 2002 and 2013. They try to evaluate the power of firm-specific factors to explain the CDS premiums for corporates and to understand whether there is room for market variables to effect CDS premiums after firm-specific factors are considered. Three explanatory variables are most important in their analysis and these are stock return, change in stock return volatility and change in median CDS premium in the rating class. Among these variables, the last one is a market variable. This result, that market variables are important for corporate CDS

premiums, is opposed to former empirical results (Consider for instance, Greatrex (2008)). Their analysis points out an additional important result that global financial crisis of 2009 structurally effected the pricing of CDS. After 2009, the explanatory power of models is higher for investment-grade firms than speculative-grade firms, contrary to pre-2009 period. This result shows that after the global financial crisis, investors became more risk averse and CDS premiums of speculative-grade firms became unstable.

There are also various papers that specifically study the macroeconomic determinants of credit default swaps for Turkey and other emerging market economies. In all these studies, monthly or quarterly data for macroeconomic variables are employed. Their analysis covers generally more than a decade and they focus on long-term relationship between macroeconomic variables and CDS premiums. Ayaydın et al. (2018), Yenisu and Yenice (2018), Kırca et al. (2018), and Yılmaz and Ünlü (2018) try to understand the macroeconomic variables that underlie the CDS premiums for Turkey.

Ayaydın et al. (2018) use macroeconomic indicators in quarterly frequency for the period between 2009 and 2016. They state that CDS premiums are seen as reliable measures of country credibility and for this reason, understanding the determinants of CDS values is important. Their analysis yields that interest rates, economic growth rates, inflation rates, foreign debts and Borsa Istanbul Stock Exchange returns are all important determinants of CDS premiums.

Yenisu and Yenice (2018) investigate the effect of macroeconomic variables on Turkey's CDS premium, as the indicator of country risk. The macroeconomic variables used in their analysis are USD/TL exchange rate, interest rate and inflation rate. They use monthly data for the period between June 2008 and April 2018. Their analysis yields that there is a long run cointegration relationship between interest rate, exchange rate and CDS rates. On the other hand, no cointegration relationship is found between inflation rate and CDS premiums. They also state that causality is one-way from exchange rates and interest rates to CDS premiums. Thus, changes in exchange rates and interest rates have effects on CDS premiums.

Kırca et al. (2018) study the relationship between macroeconomic variables and CDS premiums for BRIC countries and Turkey. They use monthly data for the period between 2015 December to 2018 June. The main macroeconomic variables they employ are industrial production index (IPI) and consumer price index (CPI). Their results show that for the panel data, IPI has no significant effect on CDS premiums but CPI has significant effect on CDS premiums. However, when the analysis is realized on country level, the results are heterogeneous. When IPI increases, CDS premiums decrease for China, India and Turkey. On the other hand, for South Africa, increases in IPI causes an increase in CDS and this is an unexpected result. When we come to CPI, we see that increases in CPI translate into increases in CDS for Brazil, India, Russia and South Africa. The increase in CPI causes an increase in CDS for these countries except for India.

Yılmaz and Ünlü (2018) analyzes the relationship between CDS and macroeconomic variables of interest, namely current account balance and foreign exchange rate. They use monthly data and cover the period from 2011 to 2017. Their cointegration analysis yields that there is a cointegration relationship between these variables and as a result they employ VEC model to further investigate the dynamics of these variables. They find out that CDS spreads and foreign exchange rates adjust to restore the long-run equilibrium. The causality analyses reveal that not the current account balance but the foreign exchange rate has causal effects on CDS spreads.

Şahin and Altay (2016) focus their analysis on the relationship between CDS premium and unemployment, in case of Turkey. The study questions whether the CDS premiums have information on developments in unemployment. The results suggest that changes in CDS premiums of Turkey can be used to explain changes in unemployment in the long run. 10% increase in Turkey's CDS points results with 4.5% increase in unemployment figures.

Kılıcı (2017) is another study focusing on the relationship between CDS premiums and one macroeconomic variable, namely foreign debt to GDP for the case of Turkey. She uses quarterly data between the first quarter of 2000 and the second

quarter of 2018. She employs cointegration tests and Granger causality tests for the analysis. Her results show that there is a positive association between foreign debt to GDP and CDS premium for Turkey.

Özkaplan (2011) studies the CDS premiums of Turkey in terms of their relationship with financial indicators, namely Eurobond and Dow Jones indices, Istanbul Stock Exchange Index (ISE-100), and foreign exchange currency rates, USD/TL and Euro/TL in particular. The study employs Granger causality tests, multivariate regression and VAR model to understand the relationship between financial indicators and CDS premiums. The study uses only financial variables (macroeconomic variables are not included) and for this reason, daily data from March 3rd, 2002 to January 22nd, 2010 could be used. It is found that the CDS premiums of Turkey have a very significant relationship with Turkish government bonds and this is an expected result. On the other hand, the correlation between CDS premiums and foreign exchange rates is found low, which is an unexpected result. VAR model yields that lagged Eurobond, Dow Jones and Foreign exchange basket variables are statistically significant for forecasting CDS premiums. As a result, lagged values of financial variables such as Eurobond, Dow Jones, ISE-100 can be used to forecast CDS premium with VAR methodology. In causality tests, it is found that changes in Dow Jones index, Eurobond index and FX rates have causal effects on CDS premiums but changes in ISE 100 index have no causal effects on CDS premiums. Changes in CDS premiums have causal effects on Eurobonds, FX basket and ISE 100 index.

Özman et al. (2018) examines the relationship between CDS premiums, interest rates and foreign exchange rates for Turkey. Their analysis covers the period from 2005 to 2017 and uses monthly data. Regression analysis shows that increases in USD/TL rates and interest rates both increase CDS premiums. Their Granger causality analysis shows that changes in USD/TL exchange rate and interest rate have causal effects on CDS premiums. On the other hand, no causal effects from CDS to these two financial variables are found. Their analysis suggests that

causality runs from financial variables to CDS premiums for Turkey, not the other way around.

2. METHODOLOGY

2.1. COINTEGRATION ANALYSIS

Two or more series with unit roots can have a long-term or equilibrium relationship, in other words they can be cointegrated. In the unit root tests, we first check whether the series in the study have unit root and they are I(1). At second step, if they have unit root, we analyze whether these series have cointegration relationships.

We apply Johansen cointegration methodology for this analysis. Johansen's methodology firstly estimates coefficient matrix of the unrestricted VAR of variables and then applies trace and rank tests to see the number of cointegration relationships.

Consider k non-stationary variables, which are represented by y_t . Suppose these variables also interact with d deterministic variables represented by x_t . VAR structure also has shocks represented by ε_t . We may write unrestricted VAR model of order p in cointegration analysis as:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + B x_t + \varepsilon_t \quad (1)$$

This unrestricted VAR model can be transformed into the following model for estimation:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + B x_t + \varepsilon_t \quad (2)$$

Here $\Pi = \sum_{i=1}^p A_i - I$ and $\Gamma_i = -\sum_{j=i+1}^p A_j$ where I is the identity matrix. Johansen cointegration test is built on testing ranks by using traces or maximum eigenvalues.

The main idea is that if rank of Π (which is denoted by r) is smaller than k , then there exists cointegration relationship between these time series with unit roots.

2.2. VEC MODEL

Vector error corrections can be defined as VAR models applied to non-stationary series which have cointegration relationship. After evaluating the existence of cointegration equations between variables with Johansen cointegration analysis, we employ VEC model to analyze the relationship between variables for both short-run and long-run dynamics. The cointegration term is called as error correction term as it reflects the convergence to long-run equilibrium.

In our analysis, consider that CDS, stock index, currency, industrial production and consumer price index are cointegrated. We can focus on the case of Turkey to be specific. Consider that there are two cointegration relationships as following:

$$z_{1t} = cds_t - \beta_{10} - \beta_{11}usdry_t - \beta_{12}ip_t - \beta_{13}bist_t \quad (3)$$

$$z_{2t} = cpi_t - \beta_{20} - \beta_{21}usdry_t - \beta_{22}ip_t - \beta_{23}bist_t \quad (4)$$

VEC model builds on these cointegration relationships as using these equations as long-run equilibrium and deviations from these equations as errors. The whole representation of the VEC model can be written as following:

$$\Delta cds_t = \beta_{10} + \sum_{i=1}^n \beta_{1i} \Delta cds_{t-i} + \sum_{i=1}^n \gamma_{1i} \Delta usdry_{t-i} + \sum_{i=1}^n \delta_{1i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{1i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{1i} \Delta ip_{t-i} + \tau_1 z_{1,t-1} + \alpha_1 z_{2,t-1} + \varepsilon_{1t} \quad (5)$$

$$\Delta cpi_t = \beta_{20} + \sum_{i=1}^n \beta_{2i} \Delta cds_{t-i} + \sum_{i=1}^n \gamma_{2i} \Delta usdry_{t-i} + \sum_{i=1}^n \delta_{2i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{2i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{2i} \Delta ip_{t-i} + \tau_2 z_{1,t-1} + \alpha_2 z_{2,t-1} + \varepsilon_{2t} \quad (6)$$

$$\Delta usdry_t = \beta_{30} + \sum_{i=1}^n \beta_{3i} \Delta cds_{t-i} + \sum_{i=1}^n \gamma_{3i} \Delta usdry_{t-i} + \sum_{i=1}^n \delta_{3i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{3i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{3i} \Delta ip_{t-i} + \tau_3 z_{1,t-1} + \alpha_3 z_{2,t-1} + \varepsilon_{3t} \quad (7)$$

$$\Delta bist_t = \beta_{40} + \sum_{i=1}^n \beta_{4i} \Delta cds_{t-i} \sum_{i=1}^n \gamma_{4i} \Delta usdtry_{t-i} + \sum_{i=1}^n \delta_{4i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{4i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{4i} \Delta ip_{t-i} + \tau_4 z_{1,t-1} + \alpha_4 z_{2,t-1} + \varepsilon_{4t} \quad (8)$$

$$\Delta ip_t = \beta_{50} + \sum_{i=1}^n \beta_{5i} \Delta cds_{t-i} \sum_{i=1}^n \gamma_{5i} \Delta usdtry_{t-i} + \sum_{i=1}^n \delta_{5i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{5i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{5i} \Delta ip_{t-i} + \tau_5 z_{1,t-1} + \alpha_5 z_{2,t-1} + \varepsilon_{5t} \quad (9)$$

While estimating the VEC model, series in levels are used since in VEC models non-stationary but cointegrated variables can be used. In choosing the optimal number of lags to be used in the vector error correction models, we both used AIC and SC criteria. We compared AIC and SC values of VEC models with different lags and chose the models with minimum SC and AIC values.

2.3. VAR MODEL

At the next step, we apply VAR model to our variables. VAR model is mostly used for forecasting procedures. It is used for both estimating relationships between time series variables and conducting policy analysis by using the results of the VAR analysis.

The main feature of the VAR model is that it treats all variables are endogenous and determined by the model, rather than some of them being exogenous. This is advocated by the fact that in a dynamic system of equations with many variables, it is hard to defend exogeneity or predetermined structure of a variable since nearly every variable interacts with others. Of course some variables can be designed as exogenous but this is not necessary.

VAR model is a multivariate model and it includes more than one variable. For simplicity, assume that there are only two variables: x_t and y_t . The p th order VAR system of equations describe a dynamic system as following:

$$y_t = \beta_{11}y_{t-1} + \beta_{12}y_{t-2} + \dots + \beta_{1p}y_{t-p} + \beta_{21}x_{t-1} + \beta_{22}x_{t-2} + \dots + \beta_{2p}x_{t-p} + u_t \quad (10)$$

$$x_t = \delta_{11}y_{t-1} + \delta_{12}y_{t-2} + \dots + \delta_{1p}y_{t-p} + \delta_{21}x_{t-1} + \delta_{22}x_{t-2} + \dots + \delta_{2p}x_{t-p} + v_t \quad (11)$$

In this model β 's and δ 's are the parameters to be estimated and u_t and v_t are the exogenous shocks at time t .

To be specific, the VAR model estimated for countries is as following (here for the case of Turkey, other countries are similar):

$$\Delta cds_t = \beta_{10} + \sum_{i=1}^n \beta_{1i} \Delta cds_{t-i} + \sum_{i=1}^n \gamma_{1i} \Delta usdtry_{t-i} + \sum_{i=1}^n \delta_{1i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{1i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{1i} \Delta ip_{t-i} + \varepsilon_{1t} \quad (12)$$

$$\Delta cpi_t = \beta_{20} + \sum_{i=1}^n \beta_{2i} \Delta cds_{t-i} + \sum_{i=1}^n \gamma_{2i} \Delta usdtry_{t-i} + \sum_{i=1}^n \delta_{2i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{2i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{2i} \Delta ip_{t-i} + \varepsilon_{2t} \quad (13)$$

$$\Delta usdtry_t = \beta_{30} + \sum_{i=1}^n \beta_{3i} \Delta cds_{t-i} + \sum_{i=1}^n \gamma_{3i} \Delta usdtry_{t-i} + \sum_{i=1}^n \delta_{3i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{3i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{3i} \Delta ip_{t-i} + \varepsilon_{3t} \quad (14)$$

$$\Delta bist_t = \beta_{40} + \sum_{i=1}^n \beta_{4i} \Delta cds_{t-i} + \sum_{i=1}^n \gamma_{4i} \Delta usdtry_{t-i} + \sum_{i=1}^n \delta_{4i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{4i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{4i} \Delta ip_{t-i} + \varepsilon_{4t} \quad (15)$$

$$\Delta ip_t = \beta_{50} + \sum_{i=1}^n \beta_{5i} \Delta cds_{t-i} + \sum_{i=1}^n \gamma_{5i} \Delta usdtry_{t-i} + \sum_{i=1}^n \delta_{5i} \Delta bist_{t-i} + \sum_{i=1}^n \theta_{5i} \Delta cpi_{t-i} + \sum_{i=1}^n \rho_{5i} \Delta ip_{t-i} + \varepsilon_{5t} \quad (16)$$

In the estimation of a VAR model, variables should satisfy stationarity. For this reason, in the estimations differences of variables are used as expressed in the VAR model above. For choosing the optimal number of lags in VAR analysis, SC and AIC information criteria are used.

2.4. GRANGER CAUSALITY ANALYSIS

After VAR analysis, we apply Granger causality tests between CDS and other financial variables using the results of VAR estimation. In this step, we investigate in which direction causality runs. Do the changes in CDS cause changes in other financial variables or vice versa?

To apply Granger causality test between two variables, for instance x and y, firstly following set of regressions are run:

$$x_t = \sum_{i=1}^n \alpha_i x_{t-i} + \sum_{i=1}^n \beta_i y_{t-i} + u_{1t} \quad (17)$$

$$y_t = \sum_{i=1}^n \lambda_i x_{t-i} + \sum_{i=1}^n \delta_i y_{t-i} + u_{2t} \quad (18)$$

Main logic of Granger causality test lies on the assumption that if variable X (Granger) causes variable Y, then we can expect that changes in X should have significant effects on Y. In other words, past values of X can be used to predict the values of Y. Thus, if X Granger causes Y, coefficients of past values of X should be significant in the regression where Y is the dependent variable. Similar approach can be used to understand whether past or lagged values of Y have effects on X.

3. DATA

3.1. DATA DEFINITIONS

To understand the relationship between credit default swaps and main macroeconomic and financial variables, we collect monthly data.

In the study, we focus our analysis on emerging markets. Other than earlier studies, we do not use only macroeconomic or financial variables, but both. This approach has the advantage of being comprehensive. On the other hand, macroeconomic variables have a much lower frequency than financial variables. It is possible to have daily or even minute by minute data for exchange rates, stock indices and other financial variables but for macroeconomic variables this is not the case. For example, economic growth rates are announced in quarterly frequency for most of the countries. For this reason, we need to have a monthly frequency which constraints the number of observations in our data set.

Turkey, Brazil, Russia, India and China are examined for emerging markets. Brazil, Russia, India and China are among the largest emerging market economies and they are called as BRIC countries. They have a high representation power of emerging markets as they constitute a large portion of total GDP of emerging markets. Exact periods of data covered are presented in Table 2.

Table 2: Data Period Covered

Country	Variable	Period Covered
Turkey	5 Year CDS	March 2010 – September 2020
	Exchange Rate	March 2010 – September 2020
	Stock Exchange	March 2010 – September 2020
	Ind. Production	March 2010 – June 2020
	CPI	March 2010 – August 2020
Brazil	5 Year CDS	May 2010 – September 2020
	Exchange Rate	March 2010 – September 2020
	Stock Exchange	March 2010 – September 2020
	Ind. Production	March 2010 – July 2020
	CPI	March 2010 – July 2020
Russia	5 Year CDS	April 2010 – September 2020
	Exchange Rate	March 2010 – September 2020
	Stock Exchange	March 2010 – September 2020
	Ind. Production	March 2010 – July 2020
	CPI	March 2010 – July 2020
India	5 Year CDS	December 2015 – September 2020
	Exchange Rate	March 2010 – September 2020
	Stock Exchange	March 2010 – September 2020
	Ind. Production	March 2010 – December 2018
	CPI	March 2010 – July 2020
China	5 Year CDS	November 2014 – September 2020
	Exchange Rate	March 2010 – September 2020

Country	Variable	Period Covered
	Stock Exchange	March 2010 – September 2020
	Ind. Production	March 2010 – June 2020
	CPI	March 2010 – July 2020

The variables used in the analysis are as following:

CDS spread: CDS spreads are at the core of our analysis. We try to understand the relationship between CDS spread and other macroeconomic and financial variables. For all countries, 5-year CDS denominated in USD is used as CDS variable.

Exchange Rate: Exchange rate is one of the most important financial variables and it is included nearly all the studies in the literature review. To satisfy consistency throughout the study, exchange rates with respect to USD are used as the exchange rate variable.

Stock Market Index: Largest stock market index for each country is used as stock market variable. For Turkey, BIST100 is the capitalization weighted index of 100 companies in Istanbul Stock Exchange and its value is used as the stock index. MOEX is the capitalization weighted index of 50 large companies in Moscow Stock Exchange and its value is used as the stock index of Russia. BOVESPA is the index for 50 liquid and large company stocks in Sao Paulo Stock Exchange of Brazil and for this reason it is used as the stock index of Brazil. For India, Nifty 50 (NSEI) represents the Indian stock markets. Lastly, for China Shanghai Composite Stock Index (SSEC) is used as the main stock index.

Industrial Production: Economic growth rates important determinants of country risk. On the other hand, real GDP figures and economic growth rates are published in a quarterly frequency. On the other hand, industrial production indices are announced on a monthly basis in most of the countries and this index largely reflects and gauges the developments in economic activity. We use total industry production index for all countries in the analysis. All industrial production indices

are taken from website of St. Louis. Federal Reserve and they all have the base year as 2015.

Consumer Price Index: Inflation rates are among the most important macroeconomic variables and they are included in most of the studies analyzing CDS premiums. We use consumer price index for all items. To have consistency in data, we get all CPI data from the website of St. Louis. Federal Reserve and they all have the base year as 2015.

Descriptive Statistics for the data are presented in Table 3.

Table 3: Descriptive Statistics for Whole Data

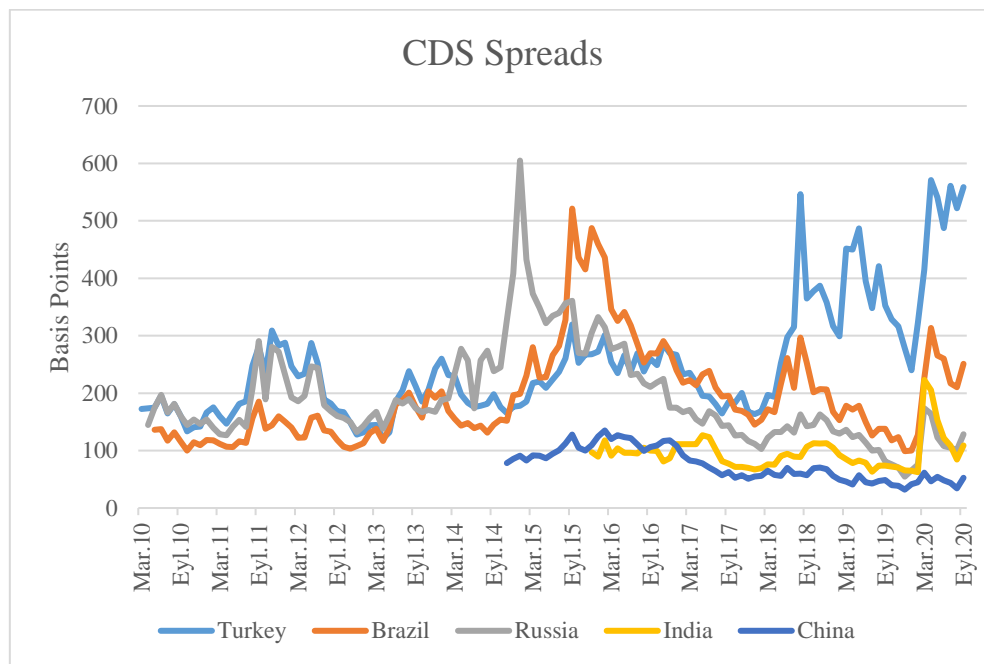
Country	Variable	Number of Observations	Mean	Standard Deviation	Min	Max
Turkey	CDS	127	250,960	102,061	121,130	571,020
	USDTRY	127	3,207	1,680	1,433	7,716
	BIST100	127	823,154	177,368	512,670	1195,290
	IPI	124	97,082	14,596	66,294	120,290
	CPI	126	107,847	32,881	67,613	181,365
Brazil	CDS	125	194,747	85,225	99,010	521,300
	USDBRL	127	2,947	1,029	1,549	5,611
	BVSP	127	67015,691	17816,788	40406,000	115645,300
	IPI	125	102,794	8,958	70,795	115,717
	CPI	125	98,659	17,160	71,456	124,091
Russia	CDS	126	190,991	84,555	54,610	604,990
	USDRUB	127	49,655	16,663	27,407	78,443
	MOEX	127	1886,703	492,919	1306,010	3076,650
	IPI	125	113,445	7,270	98,575	126,823
	CPI	125	95,210	19,065	64,910	123,837

Country	Variable	Number of Observations	Mean	Standard Deviation	Min	Max
India	CDS	58	96,459	29,394	62,414	222,978
	USDINR	127	61,325	8,985	44,210	75,605
	NIFTY50	127	8043,860	2281,667	4624,300	12168,450
	IPI	106	99,302	8,569	85,456	119,241
	CPI	125	97,282	17,666	65,030	128,530
China	CDS	71	75,187	28,366	31,954	135,050
	USDCNY	127	6,533	0,305	6,054	7,157
	SSEC	127	2798,364	509,570	1979,210	4611,740
	IPI	124	108,171	3,982	86,500	118,100
	CPI	125	99,785	6,705	85,886	113,700

In order to have a general view, the developments in the CDS spreads of these countries are presented in the following figure. Despite the observation that there are some simultaneous common trends, we see that CDS levels of each country follow a different path. Latest Corona virus pandemic has caused a hike in all CDS levels for emerging markets in our sample, although this increase is more limited in China for instance. This upward trend in CDS spreads due to pandemic is clearer especially after March 2020.

Throughout the analysis period, Brazil and Turkey have the highest CDS spreads compared to other countries. Turkey's CDS spreads have been the highest since March 2018 and continues to be the highest. Currently, Turkey is the only country in our sample with CDS spreads over 500 basis points. We also see that Russia's CDS spreads jumped over 600 basis points for a short period during 2014.

Figure 2: Developments in CDS Spreads



Source: Collected Data

3.2. UNIT ROOT TESTS

At first step, we evaluate whether the series used in the study are stationary or not. In econometric analysis, running regressions with non-stationary series can produce spurious results. Therefore, we need to check whether the series are stationary. Financial time series are mostly non-stationary and show trends evolving through time.

We employ Augmented Dickey Fuller (ADF) unit root test to control whether the series are stationary. ADF test is a generalized version of Dickey Fuller test and considers possible serial correlation.

Consider a standard AR(1) process which follows the equation:

$$x_t = \rho x_{t-1} + \delta y_t + \varepsilon_t \quad (19)$$

Subtracting x_{t-1} from both sides yields the following equation:

$$\Delta x_t = (\rho - 1)x_{t-1} + \delta y_t + \varepsilon_t \quad (20)$$

Dickey-Fuller test has the null hypothesis $H_0: \rho = 1$, in which case the process is non-stationary. One-sided alternative hypothesis of the Dickey-Fuller test is $H_a: \rho < 1$. The test simply applies a t-test but does not use standard t-distribution. Instead tabulated results for the test is used.

In ADF test additional lags of dependent variable are included and following regression is run for any time series x_t . The first stage of the ADF unit root test is running the following regression:

$$\Delta x_t = \alpha_1 x_{t-1} + \sum_j \beta_j x_{t-j} + e_t \quad (21)$$

After the regression is run, the t-statistic is compared with critical values of ADF test. When t-statistic is below the critical ADF test value, the null hypothesis of non-stationary is rejected.

3.2.1. Unit Root Test Results

ADF unit root test results for all series and their first differences for Turkey are presented in Table 4. While implementing unit root test in Eviews, intercept is included in the test equation and lag length is automatically selected using Schwarz Info Criterion.

As we see, test results reveal that the financial and the macroeconomic variables are non-stationary at levels. All series have a t-statistic bigger than critical values of ADF in all significance levels. Their first differences are stationary as their t-

statistic values are far less than even 1% significance level critical value. Thus, the series of Turkey are all I(1).

Table 4: ADF Test Results for Turkey

Variable	Level	t-statistic	0.01	0.05	0.10
CDS	Level	-1.715	-3.483	-2.884	-2.579
	1 st Difference	-13.169***	-3.483	-2.885	-2.579
USDTRY	Level	-1.706	-3.483	-2.884	-2.579
	1 st Difference	-10.124***	-3.483	-2.885	-2.579
BIST100	Level	-1.561	-3.483	-2.884	-2.579
	1 st Difference	-11.763***	-3.483	-2.885	-2.579
IPI	Level	-2.106	-3.485	-2.885	-2.580
	1 st Difference	-10.767***	-3.485	-2.885	-2.580
CPI	Level	3.872	-3.485	-2.885	-2.580
	1 st Difference	-3.487***	-3.486	-2.886	-2.580

*, **, *** denote 10%, 5% and 1% significance respectively.

ADF unit root test results for all series and their first differences for Brazil are presented in Table 5. CDS spreads have unit root when we apply 5% and 1% significance levels. First difference of CDS spreads are stationary for all significance levels.

Foreign exchange, BOVESPA index, industrial production and consumer price indices are all non-stationary at levels, as their t-statistics are over the associated ADF critical test values. First differences of these series are stationary according to ADF test as they have t-statistics lower than critical ADF test values for all significance levels. As a result, the series of Brazil used in this study are all integrated of order 1, i.e. I(1).

Table 5: ADF Test Results for Brazil

Variable	Level	t-statistic	0.01	0.05	0.10
CDS	Level	-2.291	-3.484	-2.884	-2.579
	1 st Difference	-11.199***	-3.484	-2.885	-2.579
USDBRL	Level	0.852	-3.483	-2.884	-2.579
	1 st Difference	-11.496***	-3.483	-2.885	-2.579
BVSP	Level	-1.084	-3.483	-2.884	-2.579
	1 st Difference	-9.909***	-3.483	-2.885	-2.579
IPI	Level	-1.749	-3.484	-2.885	-2.579
	1 st Difference	-8.836***	-3.485	-2.885	-2.580
CPI	Level	-0.632	-3.484	-2.885	-2.579
	1 st Difference	-6.008***	-3.484	-2.885	-2.579

*, **, *** denote 10%, 5% and 1% significance respectively.

ADF unit root test results for all series and their first differences for India are presented in Table 6. Null hypothesis of being non-stationary for CDS spreads can be rejected at 5% and 10% significance levels but cannot be rejected only at 1% significance levels. Thus, at 5% significance level, CDS spreads of India can be accepted as stationary but at 1% significance level they are not stationary.

Foreign exchange rate, NIFTY 50 stock index, industrial production and consumer price indices are all non-stationary at levels as their t-statistics are higher than associated ADF critical test values for all significance levels. As expected, when the first differences are taken, the null hypothesis of being non-stationary is rejected for all-time series of India.

Despite the fact that CDS spreads can be accepted as stationary at 5% significance level, we remain on the safe side by using 1% significance level and assume that all the time series of India employed in this study are non-stationary at levels but stationary at first differences. Thus, they are I(1).

Table 6: ADF Test Results for India

Variable	Level	t-statistic	0.01	0.05	0.10
CDS	Level	-3.537**	-3.550	-2.914	-2.595
	1 st Difference	-7.533***	-3.553	-2.915	-2.595
USDINR	Level	-1.313	-3.483	-2.884	-2.579
	1 st Difference	-11.340***	-3.483	-2.885	-2.579
NIFTY50	Level	-0.934	-3.483	-2.884	-2.579
	1 st Difference	-11.734***	-3.483	-2.885	-2.579
IPI	Level	0.236	-3.495	-2.890	-2.582
	1 st Difference	-11.244***	-3.495	-2.890	-2.582
CPI	Level	-0.393	-3.487	-2.886	-2.580
	1 st Difference	-6.855***	-3.487	-2.886	-2.580

*, **, *** denote 10%, 5% and 1% significance respectively.

ADF unit root test results for all series and their first differences for Russia are presented in Table 7. Non-stationarity of CDS spreads can be rejected at only 10% significance levels. Using lower significance levels of 5% and 1% significance levels, CDS spreads are non-stationary. When first difference is considered, CDS spreads are stationary as their t-statistic is lower than any associated ADF critical value for all significance levels.

USD/RUB currency rate, MOEX index, industrial production and consumer price indices of Russia are non-stationary time series at levels. Their t-statistics are higher than associated ADF critical values for all significance levels. When first differences are considered, null hypothesis of being non-stationary is rejected for all significance levels. Thus, we conclude that macroeconomic and financial variables of Russia have unit root and they are I(1).

Table 7: ADF Test Results for Russia

Variable	Level	t-statistic	0.01	0.05	0.10
CDS	Level	-2.621*	-3.483	-2.885	-2.579
	1 st Difference	-11.853***	-3.484	-2.885	-2.579
USDRUB	Level	-0.595	-3.483	-2.885	-2.579
	1 st Difference	-9.716***	-3.483	-2.885	-2.579
MOEX	Level	-0.072	-3.483	-2.885	-2.579
	1 st Difference	-9.581***	-3.484	-2.885	-2.579
IPI	Level	-1.957	-3.484	-2.885	-2.579
	1 st Difference	-11.684***	-3.484	-2.885	-2.579
CPI	Level	-0.609	-3.485	-2.885	-2.579
	1 st Difference	-5.275***	-3.485	-2.885	-2.579

*, **, *** denote 10%, 5% and 1% significance respectively.

Lastly, ADF test results for variables of China are presented in the following table. Non-stationarity cannot be rejected even at 10% significance level for all variables of China. Critical ADF test values are always lower than t-statistics at levels. When first differences are taken, t-statistics are lower than associated ADF critical test values and non-stationarity is rejected. We conclude that all of the time series of China are I(1).

Table 8: ADF Test Results for China

Variable	Level	t-statistic	0.01	0.05	0.10
CDS	Level	-1.217	-3.527	-2.904	-2.589
	1 st Difference	-8.956***	-3.529	-2.904	-2.590
USDCNY	Level	-1.780	-3.483	-2.885	-2.579
	1 st Difference	-8.301***	-3.483	-2.885	-2.579
SSEC	Level	-2.659*	-3.483	-2.885	-2.579
	1 st Difference	-8.745***	-3.484	-2.885	-2.579

Variable	Level	t-statistic	0.01	0.05	0.10
IPI	Level	-0.860	-3.484	-2.885	-2.579
	1 st Difference	-9.114***	-3.486	-2.886	-2.580
CPI	Level	-1.156	-3.484	-2.885	-2.579
	1 st Difference	-7.858***	-3.485	-2.885	-2.580

*, **, *** denote 10%, 5% and 1% significance respectively.

We end this subsection with a brief summary. Unit root test results reveal that all of the time series used in this study are non-stationary at levels but stationary when first differences are taken, using 1% significance level. This means that on regression analyses and VAR model studies, differences rather than levels should be used in order to prevent misleading and spurious results.

4. EMPIRICAL RESULTS

4.1. COINTEGRATION TEST RESULTS

In this subsection, we present the empirical results of cointegration tests. In the application of the test, intercept (no trend) and test VAR option is chosen as the cointegration test specification. We also checked whether different trend options could change the results by getting summary of all trend assumptions.

In the following table (Table 9) Johansen cointegration test results for Turkey are presented. According to test results, no cointegration relationship and at most 1 cointegration relationship null hypotheses are rejected at 5% significance level. Both trace test statistics and max eigenvalue test statistics are over 5% critical values and corresponding p-values are lower than 0.05 for no cointegration and at most 1 cointegration. These results yield that CDS and other macroeconomic and

financial variables are cointegrated for Turkey and there are at least two cointegration relationships between CDS, USDTRY, BIST100, industrial production and consumer price indices. These results indicate that there exists a long-run equilibrium price relationship between CDS and other macroeconomic and financial variables.

Table 9: Johansen Cointegration Test Results for Turkey

Hypothesized number of CEs	Trace Test		Eigenvalue Test	
	Trace Statistic	p-value	Max Eigenvalue statistic	p-value
None	96.526***	0.0001	40.649***	0.0067
At most 1	55.877***	0.0074	31.091**	0.0170
At most 2	24.787	0.1692	13.659	0.3937
At most 3	11.128	0.2038	10.114	0.2046
At most 4	1.0142	0.3139	1.014	0.3139

*, **, *** denote 10%, 5% and 1% significance respectively.

Johansen cointegration test results for Brazil are presented in the following table (Table 10). Both trace test and eigenvalue test indicate no cointegration relationship for the variables in case of Brazil. All p-values are larger than significance level of 5% and as a result, we fail to conclude that there is a cointegration relationship among these variables at 5% significance level. Cointegration is found only when either no intercept or trend in CE and VAR option or intercept (no trend) in CE - no intercept in VAR option is selected.

Table 10: Johansen Cointegration Test Results for Brazil

Hypothesized number of CEs	Trace Test		Eigenvalue Test	
	Trace Statistic	p-value	Max Eigenvalue statistic	p-value
None	55.172	0.4118	25.782	0.3342
At most 1	29.390	0.7495	12.648	0.9035
At most 2	16.742	0.6591	8.746	0.8523
At most 3	7.996	0.4659	7.959	0.3829
At most 4	0.037	0.8467	0.037	0.8467

*, **, *** denote 10%, 5% and 1% significance respectively.

Johansen Cointegration analysis results for India are presented below (Table 11). According to test results, no cointegration relationship and at most 1 cointegration relationship null hypotheses are rejected even at 1% significance level, which indicates a strong evidence for cointegration. Both trace test statistics and max eigenvalue test statistics are over 5% critical values and corresponding p-values are lower than even 0.01 for no cointegration and at most 1 cointegration. As a result, CDS and other macroeconomic and financial variables are cointegrated for India and there are at least two cointegration relationships between CDS, USDINR, NIFTY50, industrial production and consumer price indices. There exists a long-run equilibrium price relationship between CDS and other macroeconomic and financial variables. Results for India are quite similar to those of Turkey.

Table 11: Johansen Cointegration Test Results for India

Hypothesized number of CEs	Trace Test		Eigenvalue Test	
	Trace Statistic	p-value	Max Eigenvalue statistic	p-value
None	156.756***	0.000	70.835***	0.000
At most 1	85.920***	0.000	56.231***	0.000
At most 2	29.690*	0.051	16.757	0.184
At most 3	15.495	0.117	9.355	0.258
At most 4	3.841*	0.059	3.578*	0.059

*, **, *** denote 10%, 5% and 1% significance respectively.

Johansen Cointegration analysis results for Russia are presented in the following table (Table 12). Both trace test and eigenvalue test indicate no cointegration relationship for the variables in Russia. All p-values are larger than significance level of 5% and as a result, we fail to conclude that there is a cointegration relationship among these variables at 5% significance level. Further analyzing the results for other deterministic trend assumptions, cointegration is found only when no intercept and no trend option is selected. To sum up, Johansen cointegration test results for Russia, we fail to conclude that CDS and other macroeconomic and financial variables are cointegrated at 5% significance level.

Table 12: Johansen Cointegration Test Results for Russia

Hypothesized number of CEs	Trace Test		Eigenvalue Test	
	Trace Statistic	p-value	Max Eigenvalue statistic	p-value
None	61.779	0.185	22.424	0.575
At most 1	39.355	0.246	20.358	0.317
At most 2	18.997	0.493	11.027	0.645
At most 3	7.970	0.469	5.321	0.701
At most 4	2.649	0.104	2.649	0.104

*, **, *** denote 10%, 5% and 1% significance respectively.

Finally, Johansen Cointegration analysis results for China are presented below (Table 13). According to test results, no cointegration relationship null hypothesis can be rejected at even 1% significance level and at most 1 cointegration relationship null hypothesis can be rejected only at 10% significance level. Together these results imply cointegration of CDS and other variables for China. Both trace test statistics and max eigenvalue test statistics are over 5% critical values and corresponding p-values are lower than even 0.01 for no cointegration null hypothesis. As a result, CDS and other macroeconomic and financial variables are cointegrated for China. There exists a long-run equilibrium price relationship between CDS and other macroeconomic and financial variables for China.

Table 13: Johansen Cointegration Test Results for China

Hypothesized number of CEs	Trace Test		Eigenvalue Test	
	Trace Statistic	p-value	Max Eigenvalue statistic	p-value
None	94.852***	0.000	50.358***	0.000
At most 1	44.494*	0.100	25.917*	0.081
At most 2	18.577	0.524	12.814	0.470
At most 3	5.763	0.723	4.152	0.843
At most 4	1.612	0.204	1.612	0.204

*, **, *** denote 10%, 5% and 1% significance respectively.

Johansen Cointegration test results reveal different results for the countries analyzed. For India, Turkey and China there exists cointegration relationship at 5% significance level. However, number of the cointegration relationships are different

across countries. For Russia and Brazil, no cointegration relationship is found between CDS and other macroeconomic and financial variables.

4.2. VEC MODEL RESULTS

In this subsection, we present the results of VEC models. Firstly, we need to state that we will not be able to apply VEC model for Brazil and Russia since Johansen cointegration tests could not establish a cointegration relationship between CDS and other macroeconomic and financial variables. For this reason, we apply VEC model for Turkey, India and Russia respectively.

The results of the VEC model for Turkey are presented in the following table (Table 14). SC suggests number of lags as 1. We impose no restrictions on VEC model estimation.

Table 14: VEC Model Estimation Results for Turkey

Cointegrating Eq:	CointEq1				
TR_CDS(-1)	1.000000				
TR_CPI(-1)	-5.687530*** (1.68017) [-3.38510]				
TR_FX(-1)	30.67902 (30.1862) [1.01633]				
TR_IPI(-1)	-1.285969 (0.86681) [-1.48357]				
TR_STOCK(-1)	0.638106*** (0.07362) [8.66775]				
C	-127.1882				
Error Correction:	D(TR_CDS)	D(TR_CPI)	D(TR_FX)	D(TR_IPI)	D(TR_STOCK)
CointEq1	-0.296819** (0.11373) [-2.60990]	0.007685*** (0.00217) [3.54811]	-0.001374** (0.00052) [-2.62328]	0.036974*** (0.01060) [3.48764]	-0.017355 (0.14999) [-0.11571]

D(TR_CDS(-1))	-0.241167 (0.16228) [-1.48616]	-0.009204*** (0.00309) [-2.97834]	0.000836 (0.00075) [1.11886]	-0.015903 (0.01513) [-1.05134]	0.175715 (0.21401) [0.82104]
D(TR_CPI(-1))	1.148494 (3.48788) [0.32928]	0.244694*** (0.06642) [3.68390]	-0.009226 (0.01606) [-0.57438]	-0.421271 (0.32513) [-1.29570]	-2.927613 (4.59996) [-0.63644]
D(TR_FX(-1))	19.18920 (27.6443) [0.69415]	4.452125*** (0.52645) [8.45684]	0.085607 (0.12731) [0.67243]	-2.796944 (2.57691) [-1.08539]	-5.837079 (36.4584) [-0.16010]
D(TR_IPI(-1))	-0.929004 (1.02954) [-0.90235]	0.018196 (0.01961) [0.92809]	0.007670 (0.00474) [1.61769]	-0.070259 (0.09597) [-0.73209]	-0.473954 (1.35779) [-0.34906]
D(TR_STOCK(-1))	-0.236600** (0.10123) [-2.33720]	0.000149 (0.00193) [0.07751]	0.000191 (0.00047) [0.40878]	0.011335 (0.00944) [1.20121]	0.016542 (0.13351) [0.12390]
C	2.594039 (5.13251) [0.50541]	0.515266*** (0.09774) [5.27167]	0.043487* (0.02364) [1.83981]	0.857610* (0.47844) [1.79253]	7.083366 (6.76895) [1.04645]
R-squared	0.200277	0.584439	0.121187	0.214989	0.024096
Log likelihood	-625.2395	-141.9959	31.18841	-335.7546	-659.0033

*, **, *** denote 10%, 5% and 1% significance respectively.

According to VEC estimation, cointegration equation has significant coefficients for estimation of CDS, consumer price index, foreign exchange rate, and industrial production index. As expected, coefficient of cointegration equation is negative for estimation of CDS since cointegration equation 1 is as following:

$$z_{1t} = cds_t - 30.679 usdtry_t - 1.286 ipi_t + 0.638 bist_t - 5.688 cpi_t - 127.188$$

When deviation gets higher, difference in CDS gets smaller to maintain long-run equilibrium.

These results regarding the coefficients of cointegration equations suggest that long-run equilibrium relationship between CDS and other variables carries importance in the changes of these variables as a system.

Coefficient of lagged difference in stock is negative and significant for estimation of difference in CDS. As expected, when stock index increases more, difference in CDS levels gets smaller. Coefficient of lagged difference in foreign exchange rate is positive for the estimation of difference in consumer price index. When the losses in Turkish Lira become higher, consumer price index growth, i.e. inflation is higher. This is also an expected result. An unexpected result is the negative and significant coefficient of lagged difference in CDS for the estimation of consumer price index.

The VEC model results for India are presented in the following table (Table 15). The number of cointegration equations is selected as 2. The number of lags is selected as 1 in line with SC criterion.

Table 15: VEC Model Estimation Results for India

Cointegrating Eq:	CointEq1	CointEq2			
IND_CDS(-1)	1.000000	0.000000			
IND_CPI(-1)	0.000000	1.000000			
IND_FX(-1)	-4.449752*** (0.95317) [-4.66838]	-0.746601*** (0.08323) [-8.97056]			
IND_IPI(-1)	10.88480*** (1.37259) [7.93013]	-0.045647 (0.11985) [-0.38087]			
IND_STOCK(-1)	-0.033747*** (0.00496) [-6.79846]	-0.002684*** (0.00043) [-6.19245]			
C	-667.2897	-27.86403			
Error Correction:	D(IND_CDS)	D(IND_CPI)	D(IND_FX)	D(IND_IPI)	D(IND_STOCK)
CointEq1	-0.169029 (0.13396) [-1.26183]	0.010986 (0.01111) [0.98920]	-0.041236*** (0.01350) [-3.05556]	-0.087618*** (0.01567) [-5.59059]	8.761350** (4.44299) [1.97195]
CointEq2	-5.773281*** (2.42474) [-2.38099]	-0.275475 (0.20102) [-1.37039]	0.029055 (0.24428) [0.11894]	-0.310282 (0.28369) [-1.09375]	84.71698 (80.4227) [1.05340]
D(IND_CDS(-1))	-0.283225 (0.20159) [-1.40494]	-0.003270 (0.01671) [-0.19567]	0.019775 (0.02031) [0.97369]	0.052897** (0.02359) [2.24274]	5.074177 (6.68634) [0.75889]

D(IND_CPI(-1))	-1.486125 (2.66169) [-0.55834]	0.236959 (0.22066) [1.07385]	0.461992* (0.26815) [1.72288]	0.492385 (0.31141) [1.58115]	41.42786 (88.2817) [0.46927]
D(IND_FX(-1))	-1.458052 (2.59202) [-0.56252]	0.004702 (0.21489) [0.02188]	-0.214470 (0.26113) [-0.82131]	-1.051710*** (0.30326) [-3.46803]	18.54536 (85.9710) [0.21572]
D(IND_IPI(-1))	-0.307310 (1.28055) [-0.23998]	0.018876 (0.10616) [0.17781]	0.109078 (0.12901) [0.84551]	0.175422 (0.14982) [1.17089]	-47.63280 (42.4726) [-1.12150]
D(IND_STOCK(-1))	-0.004901 (0.00864) [-0.56756]	0.000199 (0.00072) [0.27743]	-0.000697 (0.00087) [-0.80093]	-0.002046** (0.00101) [-2.02511]	0.109933 (0.28643) [0.38380]
C	1.994971 (2.08328) [0.95761]	0.241553 (0.17271) [1.39859]	-0.087883 (0.20988) [-0.41873]	0.395309 (0.24374) [1.62186]	83.85648 (69.0974) [1.21360]
R-squared	0.313806	0.176945	0.390936	0.617428	0.287635
Log likelihood	-128.6974	-41.54475	-48.36665	-53.60114	-251.2525

*, **, *** denote 10%, 5% and 1% significance respectively.

The coefficients of cointegration equation 1 are significantly negative for the estimation of differences in industrial production and foreign exchange rate. The coefficient of cointegration 1 for estimation of difference in CDS is negative as expected but not significant. The cointegration equation 1 is as following:

$$z_{1t} = cds_t - 4.450 usdinr_t + 10.885 ipi_t - 0.034 nifty_t - 667.290$$

The coefficient of cointegration equation 2 is significantly negative for the estimation of differences in CDS levels of India. The coefficient of cointegration 2 for estimation of difference in consumer price index is negative as expected but this coefficient is not significant. The cointegration equation 2 is as following:

$$z_{2t} = cpi_t - 0.747 usdinr_t - 0.046 ipi_t - 0.003 nifty_t - 27.864$$

In the VEC estimation, most of the coefficients of lagged differences of variables have insignificant coefficients. Coefficient of lagged difference of foreign exchange rate is significantly negative for the estimation of difference in industrial production

index. As the difference in foreign exchange rate gets higher, i.e. Indian currency loses its value faster, industrial production growth gets smaller.

Similarly, coefficient of lagged difference of stock index is significantly negative for the estimation of difference in industrial production index. As the difference in stock index gets higher, industrial production growth gets smaller. This is an unexpected result as the share prices increase, investment and production is expected to increase.

Coefficient of lagged difference in CDS is significantly positive for the estimation of difference in industrial production index. When CDS premiums rise faster, the industrial production growth gets smaller. This is also an unexpected result. To sum up, the VEC models of India are not quite promising in terms of fitting theory.

The VEC model results for China are also presented in the next table (Table 16). The number of lags is chosen 1 according to AIC and SC criteria. The number of cointegration equations is 1 from Johansen cointegration test. The cointegration equation is as following:

$$z_{1t} = cds_t + 15.654 cpi_t + 24.783 usdcny_t + 24.105 ipi_t + 0.048 ssec_t - 4575.159$$

Table 16: VEC Model Estimation Results for China

Cointegrating Eq:	CointEq1
CHI_CDS(-1)	1.000000
CHI_CPI(-1)	15.65361*** (3.09272) [5.06145]
CHI_FX(-1)	24.78325 (40.4055) [0.61336]
CHI_IPI(-1)	24.10492*** (3.24888) [7.41946]
CHI_STOCK(-1)	0.048414** (0.02328)

	[2.07980]				
C	-4575.159				
Error Correction:	D(CHI_CDS)	D(CHI_CPI)	D(CHI_FX)	D(CHI_IPI)	D(CHI_STOCK)
CointEq1	-0.022639 (0.02435) [-0.92971]	0.004648*** (0.00159) [2.91818]	-0.000107 (0.00024) [-0.45050]	-0.035918*** (0.00587) [-6.11769]	-0.402661 (0.59199) [-0.68019]
D(CHI_CDS(-1))	-0.257435* (0.14341) [-1.79516]	0.002038 (0.00938) [0.21725]	-0.001037 (0.00140) [-0.73846]	-0.026395 (0.03458) [-0.76337]	2.780540 (3.48632) [0.79756]
D(CHI_CPI(-1))	0.703072 (2.11147) [0.33298]	0.093425 (0.13811) [0.67645]	-0.025893 (0.02067) [-1.25249]	0.121552 (0.50910) [0.23876]	30.13813 (51.3317) [0.58712]
D(CHI_FX(-1))	21.21248 (13.8173) [1.53521]	-0.739004 (0.90379) [-0.81767]	0.286562** (0.13528) [2.11825]	2.070174 (3.33150) [0.62139]	-358.1971 (335.912) [-1.06634]
D(CHI_IPI(-1))	-0.675134 (0.57288) [-1.17849]	-0.064722* (0.03747) [-1.72720]	-0.008349 (0.00561) [-1.48858]	0.455391*** (0.13813) [3.29690]	14.92307 (13.9272) [1.07150]
D(CHI_STOCK(-1))	-0.003279 (0.00550) [-0.59564]	-0.000398 (0.00036) [-1.10419]	1.47E-05 (5.4E-05) [0.27197]	-0.000220 (0.00133) [-0.16548]	0.270948** (0.13383) [2.02463]
C	-1.127893 (1.16166) [-0.97094]	0.166171** (0.07598) [2.18693]	0.012559 (0.01137) [1.10426]	-0.089606 (0.28009) [-0.31992]	-2.832196 (28.2409) [-0.10029]
R-squared	0.148197	0.181704	0.135096	0.401935	0.109184
Log likelihood	-232.7603	-52.77303	72.57647	-138.8752	-443.3614

*, **, *** denote 10%, 5% and 1% significance respectively.

The coefficient of cointegration equation 1 is negative as expected for the estimation of difference in CDS but it is insignificant. The coefficient of cointegration equation 1 is significantly positive for estimation of difference in consumer price index and significantly negative for the estimation of difference in industrial production. The coefficients of lagged differences do not have significance except for the estimation of the difference of their own variables for China.

4.3. VAR MODEL RESULTS

In this section, the VAR model results are explained and impulse response functions which are significantly different than zero are analyzed.

Table 17: VAR Model Results for Turkey

	D(TR_CDS)	D(TR_CPI)	D(TR_FX)	D(TR_IPI)	D(TR_STOCK)
D(TR_CDS(-1))	-0.439108*** (0.14701) [-2.98690]	-0.004079 (0.00287) [-1.42375]	-8.01E-05 (0.00068) [-0.11828]	0.008753 (0.01400) [0.62517]	0.164142 (0.18840) [0.87126]
D(TR_CPI(-1))	-1.909641 (3.36646) [-0.56726]	0.323868*** (0.06561) [4.93604]	-0.023382 (0.01551) [-1.50774]	-0.040329 (0.32063) [-0.12578]	-3.106417 (4.31415) [-0.72005]
D(TR_FX(-1))	14.33392 (28.2641) [0.50714]	4.577826*** (0.55087) [8.31013]	0.063132 (0.13020) [0.48488]	-2.192138 (2.69195) [-0.81433]	-6.120959 (36.2207) [-0.16899]
D(TR_IPI(-1))	-0.915992 (1.05500) [-0.86824]	0.017859 (0.02056) [0.86856]	0.007730 (0.00486) [1.59059]	-0.071880 (0.10048) [-0.71536]	-0.473193 (1.35199) [-0.35000]
D(TR_STOCK(-1))	-0.374372*** (0.08852) [-4.22938]	0.003716** (0.00173) [2.15411]	-0.000447 (0.00041) [-1.09661]	0.028497*** (0.00843) [3.38020]	0.008487 (0.11344) [0.07482]
C	6.675378 (5.00944) [1.33256]	0.409602*** (0.09763) [4.19524]	0.062379*** (0.02308) [2.70314]	0.349211 (0.47711) [0.73193]	7.321996 (6.41964) [1.14056]
R-squared	0.152909	0.538948	0.068599	0.131958	0.023983
Log likelihood	-628.7497	-148.3327	27.64321	-341.8877	-659.0104

*, **, *** denote 10%, 5% and 1% significance respectively.

For Turkey, according to VAR model results, coefficient of lagged difference in stock index is significantly different than zero for difference in CDS, difference in industrial production and consumer price index. Coefficient of lagged difference in foreign exchange rate is significantly different than zero for difference in consumer price index. As depicted in the following impulse response functions, when a positive change in BIST100 is realized, CDS levels tend to decline and industrial

production and consumer price index tend to increase. The effect of the change in stock index in these variables reaches its maximum in second quarter and vanishes after third quarter. As expected when USD/TRY currency rate shows an increase and Turkish Lira loses her value, then consumer price index tends to increase. The effect of a change in foreign exchange rate on consumer price index reaches its maximum on second quarter and continues for a year.

Figure 3 : Significant Impulse Response Functions for Turkey

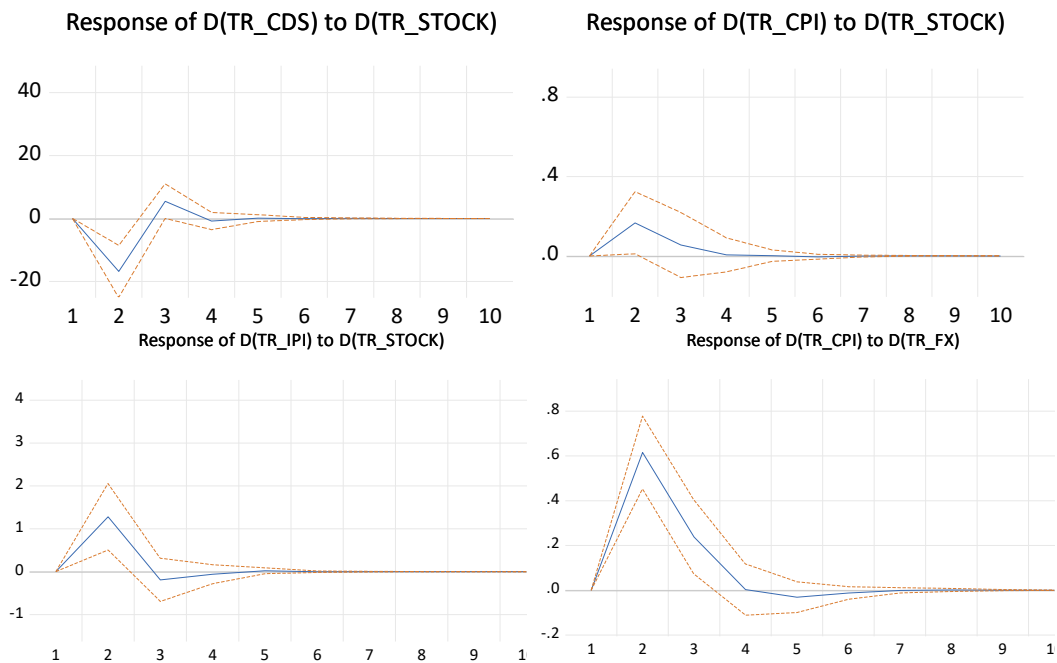


Table 18: VAR Model Results for Brazil

	D(BR_CDS)	D(BR_CPI)	D(BR_FX)	D(BR_IPI)	D(BR_STOCK)
D(BR_CDS(-1))	-0.321941*** (0.12597) [-2.55564]	0.001068 (0.00107) [0.99411]	2.91E-05 (0.00058) [0.05003]	0.009731 (0.01007) [0.96665]	7.823525 (18.2935) [0.42767]
D(BR_CPI(-1))	-4.191001 (9.17887) [-0.45659]	0.543504*** (0.07830) [6.94106]	-0.018278 (0.04241) [-0.43101]	-0.385701 (0.73349) [-0.52584]	-759.5086 (1332.94) [-0.56980]
D(BR_FX(-1))	23.18431	-0.109192	-0.210881	-1.756452	1327.340

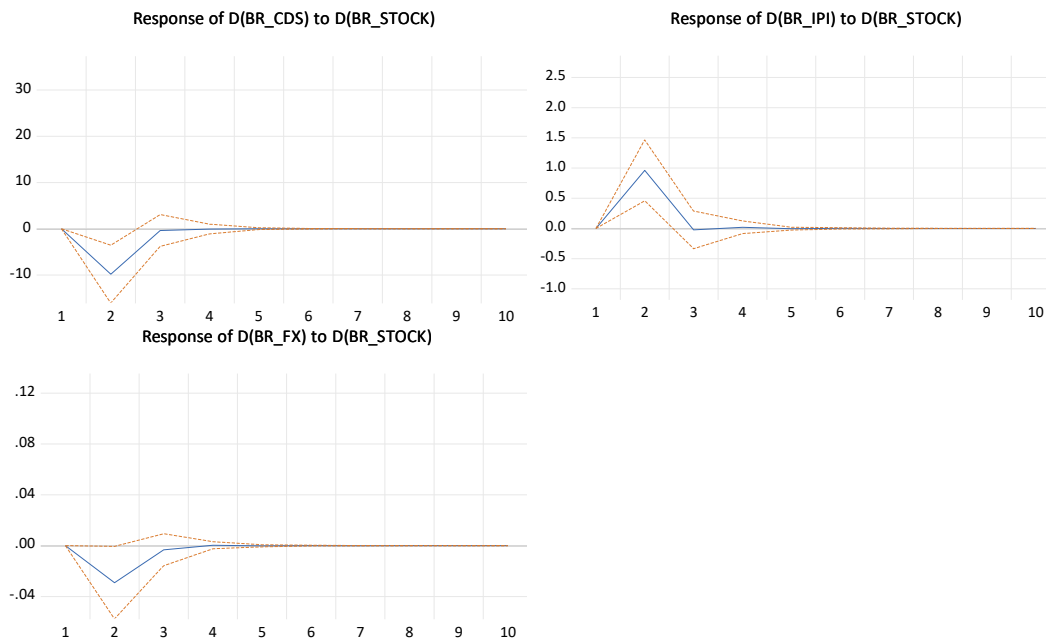
	(32.2205) [0.71955]	(0.27487) [-0.39726]	(0.14887) [-1.41659]	(2.57478) [-0.68218]	(4679.00) [0.28368]
D(BR_IPI(-1))	-1.340812 (1.11369) [-1.20394]	-0.001146 (0.00950) [-0.12061]	-0.004506 (0.00515) [-0.87574]	-0.126293 (0.08900) [-1.41908]	100.2465 (161.727) [0.61985]
D(BR_STOCK(-1))	-0.002755*** (0.00086) [-3.21115]	4.37E-06 (7.3E-06) [0.59744]	-8.17E-06** (4.0E-06) [-2.06014]	0.000270*** (6.9E-05) [3.93381]	0.153679 (0.12459) [1.23352]
C	2.480725 (5.11762) [0.48474]	0.198299*** (0.04366) [4.54219]	0.043434 (0.02364) [1.83696]	-0.073147 (0.40896) [-0.17886]	604.7847 (743.171) [0.81379]
R-squared	0.140530	0.300574	0.045059	0.203232	0.021009
Log likelihood	-591.7874	-15.33409	58.86766	-286.0398	-1194.154

*, **, *** denote 10%, 5% and 1% significance respectively.

According to VAR model results for Brazil, coefficient of lagged difference in stock index is significantly different than zero for estimation of differences in CDS, foreign exchange rate and industrial production index. When the difference in stock index changes is positive, then CDS levels decrease, industrial production decreases and USDBRL currency rate decreases, i.e. Brazilian Real appreciates. A positive change in stock index effects CDS, foreign exchange rate and industrial activity positively.

According to significant impulse response functions, after a positive change in stock index, changes in CDS decline significantly and this effect reaches its maximum in second quarter. When a positive change in stock index occurs, changes in industrial production index are also effected positively and this effect is at its maximum in second quarter. In the third quarter, the effect of change in stock on industrial production disappears.

Figure 4 : Significant Impulse Response Functions for Brazil



For India, lag length selection criteria offer different results. SC suggests to use no lags whereas AIC suggests five lags. Using AIC criterion and five lags, VAR model results of India show that coefficients of lagged differences in stock index are significant for estimation of differences in CDS and differences in foreign exchange rate. Coefficients of lagged differences in foreign exchange rate have significant coefficients for estimation of differences in CDS. Coefficients of lagged difference in consumer price index are significant for estimation of differences in CDS and differences in foreign exchange rate. Lastly, second lag of difference in CDS level is significant for estimation of difference in foreign exchange rate. However, when impulse response functions are analyzed, only significant response is the response of difference in stock index to difference in consumer price index. Overall, VAR analysis of India gives mixed results.

Table 19: VAR Model Results for India

	D(IND_CDS)	D(IND_CPI)	D(IND_FX)	D(IND_IPI)
D(IND_CDS(-1))	-0.114755 (0.27280) [-0.42066]	-0.026720 (0.04066) [-0.65723]	0.004095 (0.04178) [0.09801]	0.001404 (0.05795) [0.02423]
D(IND_CDS(-2))	0.069089 (0.18997) [0.36368]	0.025820 (0.02831) [0.91196]	-0.072884*** (0.02910) [-2.50489]	-0.022858 (0.04036) [-0.56640]
D(IND_CDS(-3))	-0.399244 (0.25003) [-1.59681]	-0.017642 (0.03726) [-0.47345]	-0.001117 (0.03829) [-0.02917]	-0.016320 (0.05311) [-0.30726]
D(IND_CDS(-4))	-0.079750 (0.27442) [-0.29062]	0.021124 (0.04090) [0.51651]	0.063786 (0.04203) [1.51762]	-0.014873 (0.05830) [-0.25513]
D(IND_CDS(-5))	-0.018058 (0.29504) [-0.06121]	0.049789 (0.04397) [1.13231]	-0.005435 (0.04519) [-0.12027]	-0.057651 (0.06268) [-0.91980]
D(IND_CPI(-1))	-3.494198 (4.11308) [-0.84953]	-0.407654 (0.61299) [-0.66503]	-0.127635 (0.62997) [-0.20261]	-0.072322 (0.87377) [-0.08277]
D(IND_CPI(-2))	-2.115848 (4.54835) [-0.46519]	-0.210014 (0.67786) [-0.30982]	-1.002026 (0.69663) [-1.43838]	-0.293214 (0.96624) [-0.30346]
D(IND_CPI(-3))	-5.289604 (4.57843) [-1.15533]	-0.425029 (0.68234) [-0.62290]	-0.294819 (0.70124) [-0.42042]	0.809867 (0.97263) [0.83266]
D(IND_CPI(-4))	-7.762482** (3.43995) [-2.25657]	-0.058048 (0.51267) [-0.11323]	-1.154854** (0.52687) [-2.19192]	0.513155 (0.73077) [0.70221]
D(IND_CPI(-5))	-11.94464*** (3.86335) [-3.09178]	-0.041311 (0.57577) [-0.07175]	0.615347 (0.59172) [1.03993]	0.393686 (0.82072) [0.47969]
D(IND_FX(-1))	-2.163692 (2.44715) [-0.88417]	-0.081734 (0.36471) [-0.22411]	0.663505 (0.37481) [1.77025]	0.110973 (0.51986) [0.21347]
D(IND_FX(-2))	5.542715 (4.62359) [1.19879]	0.595802 (0.68907) [0.86465]	1.011953 (0.70816) [1.42900]	0.608962 (0.98222) [0.61999]
D(IND_FX(-3))	3.903279 (4.55160) [0.85756]	0.650376 (0.67834) [0.95878]	0.431437 (0.69713) [0.61888]	-1.210444 (0.96693) [-1.25185]

D(IND_FX(-4))	10.70398*** (2.85741) [3.74605]	-0.615555 (0.42585) [-1.44548]	0.038907 (0.43764) [0.08890]	0.907574 (0.60702) [1.49514]
D(IND_FX(-5))	2.127624 (3.75698) [0.56631]	0.318193 (0.55991) [0.56829]	0.295356 (0.57542) [0.51328]	-0.527596 (0.79812) [-0.66105]
D(IND_IPI(-1))	1.356862 (1.83246) [0.74046]	-0.119098 (0.27310) [-0.43610]	0.045128 (0.28066) [0.16079]	-0.148041 (0.38928) [-0.38029]
D(IND_IPI(-2))	-0.732830 (1.77946) [-0.41183]	0.191157 (0.26520) [0.72081]	-0.010135 (0.27254) [-0.03719]	-0.747443** (0.37802) [-1.97725]
D(IND_IPI(-3))	1.900674 (1.60830) [1.18179]	-0.178490 (0.23969) [-0.74467]	-0.193786 (0.24633) [-0.78669]	-0.403598 (0.34166) [-1.18128]
D(IND_IPI(-4))	1.227519 (1.61676) [0.75925]	-0.028196 (0.24095) [-0.11702]	0.024774 (0.24763) [0.10005]	-0.122054 (0.34346) [-0.35537]
D(IND_IPI(-5))	-2.651221 (1.79348) [-1.47826]	0.111768 (0.26729) [0.41816]	0.281835 (0.27469) [1.02600]	-0.584012 (0.38100) [-1.53284]
D(IND_STOCK(-1))	-0.004250 (0.01526) [-0.27852]	0.001880 (0.00227) [0.82672]	0.004168 (0.00234) [1.78327]	0.002126 (0.00324) [0.65580]
D(IND_STOCK(-2))	0.007100 (0.01624) [0.43707]	0.002301 (0.00242) [0.95048]	0.003009 (0.00249) [1.20953]	1.29E-05 (0.00345) [0.00372]
D(IND_STOCK(-3))	0.021778 (0.01673) [1.30194]	0.001464 (0.00249) [0.58730]	0.002066 (0.00256) [0.80644]	0.000342 (0.00355) [0.09612]
D(IND_STOCK(-4))	0.028999*** (0.01233) [2.35231]	-0.000432 (0.00184) [-0.23500]	0.004017** (0.00189) [2.12735]	0.000615 (0.00262) [0.23482]
D(IND_STOCK(-5))	0.023461** (0.01107) [2.11971]	0.000440 (0.00165) [0.26670]	0.001144 (0.00170) [0.67508]	-0.002322 (0.00235) [-0.98770]
C	-0.225815 (4.46252) [-0.05060]	0.023120 (0.66506) [0.03476]	-1.095324 (0.68349) [-1.60255]	0.529584 (0.94800) [0.55863]
R-squared	0.905649	0.736615	0.866096	0.888193
Log likelihood	-77.98694	-18.97580	-19.82283	-29.96449

*, **, *** denote 10%, 5% and 1% significance respectively.

Figure 5 : Significant Impulse Response Functions for India

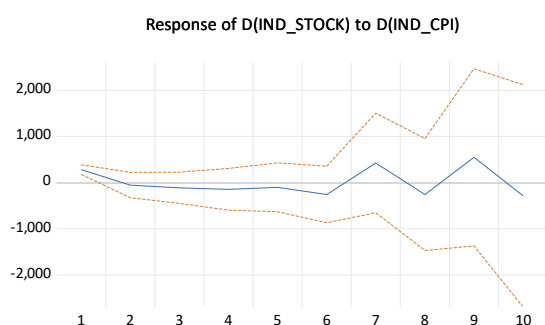


Table 20: VAR Model Results for Russia

	D(RUS_CDS)	D(RUS_CPI)	D(RUS_FX)	D(RUS_IPI)	D(RUS_STOCK)
D(RUS_CDS(-1))	-0.258469** (0.12660) [-2.04162]	0.001268 (0.00112) [1.12981]	-0.006549 (0.00968) [-0.67642]	0.000698 (0.00400) [0.17477]	-0.070403 (0.30315) [-0.23224]
D(RUS_CDS(-2))	-0.330796*** (0.12206) [-2.71014]	-0.000244 (0.00108) [-0.22574]	-0.013812 (0.00933) [-1.47971]	0.010063*** (0.00385) [2.61164]	0.193384 (0.29228) [0.66164]
D(RUS_CPI(-1))	21.45796 (11.5957) [1.85051]	0.723938*** (0.10277) [7.04460]	1.442972 (0.88677) [1.62722]	-0.244837 (0.36604) [-0.66887]	40.46106 (27.7668) [1.45718]
D(RUS_CPI(-2))	-34.36624*** (10.8595) [-3.16463]	-0.163178 (0.09624) [-1.69553]	-2.442307*** (0.83047) [-2.94088]	-0.160216 (0.34280) [-0.46737]	-28.94550 (26.0037) [-1.11313]
D(RUS_FX(-1))	0.801705 (1.72505) [0.46474]	0.012567 (0.01529) [0.82200]	0.100139 (0.13192) [0.75907]	-0.033508 (0.05446) [-0.61533]	3.934478 (4.13076) [0.95248]
D(RUS_FX(-2))	4.841931*** (1.70832) [2.83433]	0.036315*** (0.01514) [2.39865]	0.200517 (0.13064) [1.53485]	-0.148040*** (0.05393) [-2.74520]	-3.012153 (4.09069) [-0.73634]
D(RUS_IPI(-1))	3.515272 (2.77239) [1.26796]	0.054768** (0.02457) [2.22907]	0.265154 (0.21202) [1.25063]	-0.116088 (0.08752) [-1.32647]	5.809558 (6.63867) [0.87511]
D(RUS_IPI(-2))	-3.342137 (2.80442) [-1.19174]	-0.026895 (0.02485) [-1.08215]	-0.367043 (0.21447) [-1.71143]	0.221359*** (0.08853) [2.50044]	-4.030170 (6.71539) [-0.60014]
D(RUS_STOCK(-1))	-0.143399***	-0.000351	-0.005631	0.002156	0.072610

	(0.04250)	(0.00038)	(0.00325)	(0.00134)	(0.10176)
	[-3.37442]	[-0.93312]	[-1.73261]	[1.60689]	[0.71355]
D(RUS_STOCK(-2))	0.080425	0.000355	0.004029	0.004308***	-0.194988
	(0.04329)	(0.00038)	(0.00331)	(0.00137)	(0.10367)
	[1.85773]	[0.92424]	[1.21699]	[3.15219]	[-1.88092]
C	4.133469	0.193270***	0.765364	0.304715	8.492883
	(5.12468)	(0.04542)	(0.39191)	(0.16177)	(12.2714)
	[0.80658]	[4.25550]	[1.95293]	[1.88361]	[0.69209]
R-squared	0.257425	0.586551	0.167249	0.236711	0.103059
Log likelihood	-598.7732	-26.93363	-287.7061	-180.6412	-704.4308

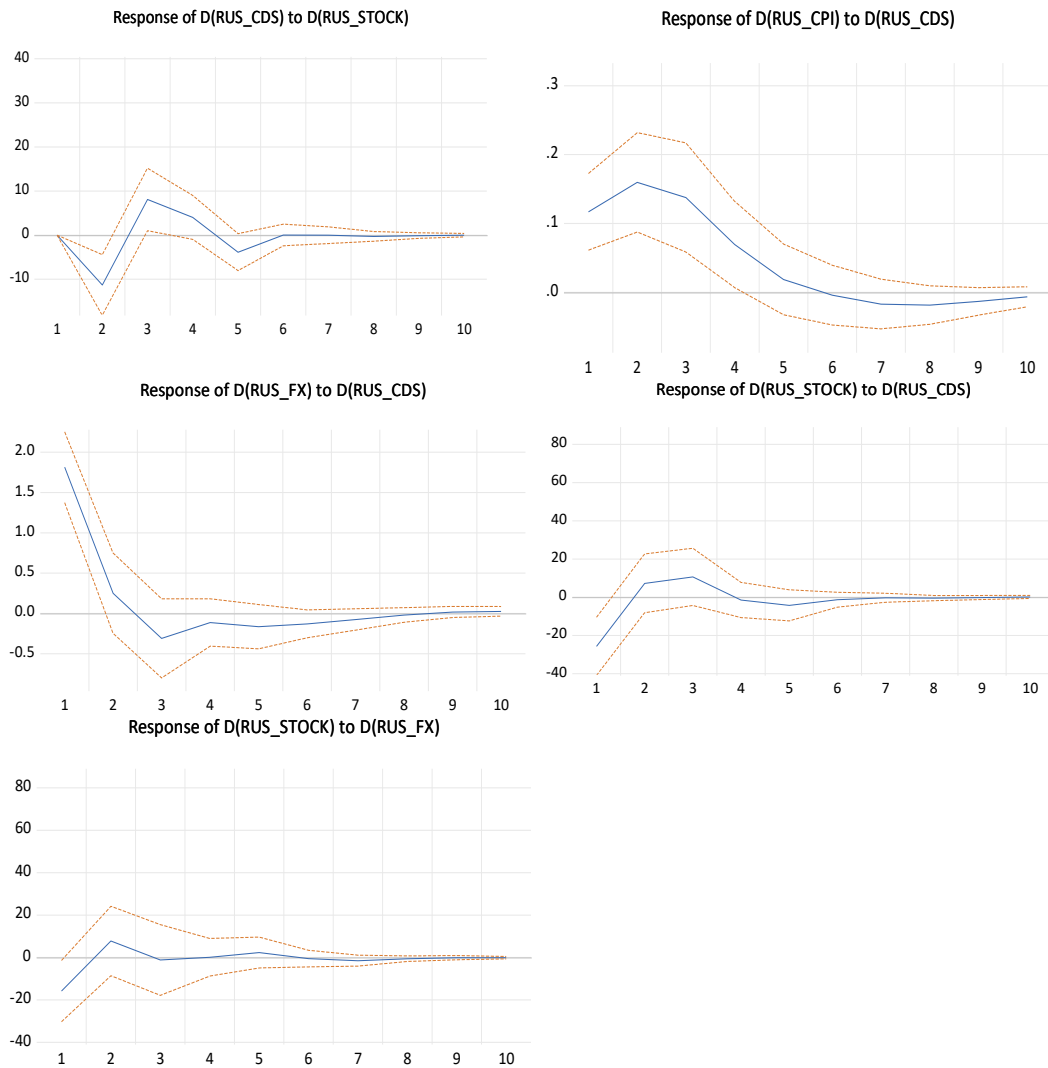
*, **, *** denote 10%, 5% and 1% significance respectively.

For Russia, to apply VAR model, lag length selection criteria offer different results. SC suggests to use one lag whereas AIC suggests two lags. Using AIC criteria and applying two lags, VAR model results suggest that coefficients of lagged differences in stock index have significant values for estimation of differences in CDS levels and industrial production index. Coefficients of lagged differences in industrial production index have significant values for estimation of differences in consumer price index. Coefficients of lagged differences in foreign exchange rate have significant values for estimation of differences in CDS levels, industrial production and consumer price indices. Coefficients of lagged differences in consumer price index have significant values for estimation of differences in CDS levels and foreign exchange rate. Lastly, lagged differences of CDS levels have significant coefficients for estimation of differences in industrial production index.

Significant impulse response functions of VAR model are presented in the following figure for Russia. These results reveal that there is a positive difference in stock index, CDS levels tend to decrease and risk premium falls for Russia. When there is a positive difference in CDS levels, inflation and foreign exchange rate tends to increase and stock index tends to decline. Lastly, when foreign exchange rate increases and Russian Ruble loses value, stock index tends to decrease. Changes in CDS effect CPI over a year whereas the effect on foreign exchange continues two quarter. Effect of CDS on stock index lasts one quarter. Effect of

changes in stock index on CDS and effect of foreign exchange rate on stock index also lasts one quarter.

Figure 6 : Significant Impulse Response Functions for Russia



According to VAR model results of China, coefficients of lagged differences of foreign exchange have significance in estimation of differences of changes in consumer price index. Other coefficients do not have significance in VAR estimation.

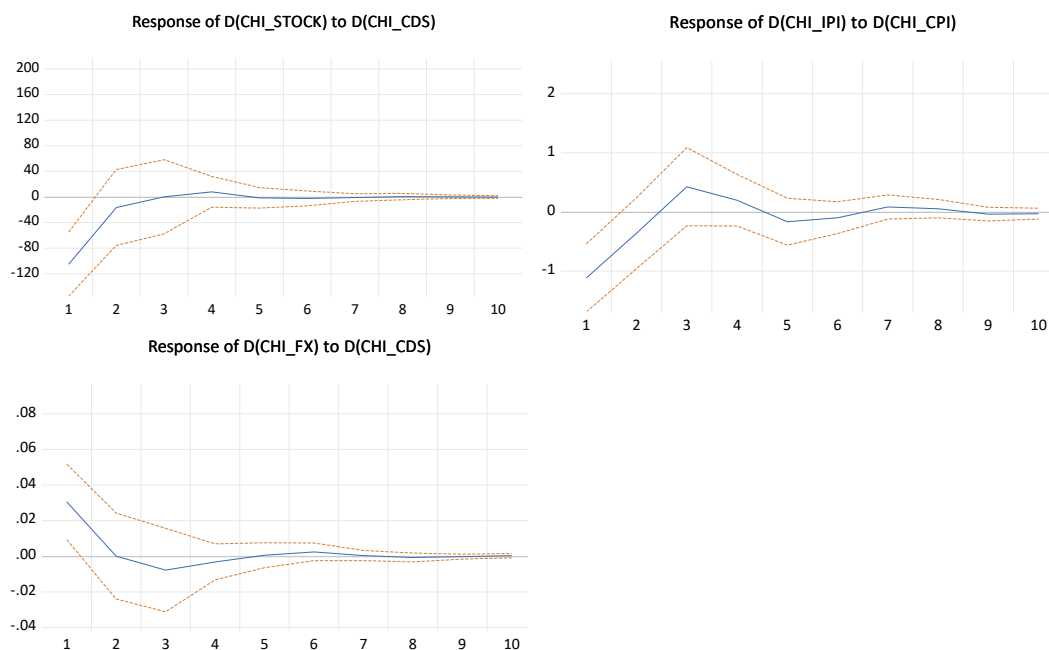
Table 21: VAR Model Results for China

	D(CHI_CDS)	D(CHI_CPI)	D(CHI_FX)	D(CHI_IPI)	D(CHI_STOCK)
D(CHI_CDS(-1))	-0.248166 (0.15342) [-1.61754]	-0.004966 (0.01001) [-0.49608]	-0.000967 (0.00155) [-0.62247]	-0.020145 (0.04322) [-0.46612]	3.580429 (3.81053) [0.93961]
D(CHI_CDS(-2))	0.108401 (0.14485) [0.74835]	-0.012115 (0.00945) [-1.28171]	-0.000933 (0.00147) [-0.63636]	0.025021 (0.04081) [0.61318]	-1.321754 (3.59770) [-0.36739]
D(CHI_CPI(-1))	0.065901 (2.15145) [0.03063]	0.230367 (0.14039) [1.64091]	-0.026622 (0.02179) [-1.22189]	-0.683453 (0.60607) [-1.12769]	17.83638 (53.4354) [0.33379]
D(CHI_CPI(-2))	2.247370 (2.23219) [1.00680]	-0.068467 (0.14566) [-0.47005]	0.001247 (0.02260) [0.05517]	0.004429 (0.62881) [0.00704]	12.54099 (55.4409) [0.22620]
D(CHI_FX(-1))	27.01298* (14.6198) [1.84770]	-1.577764* (0.95400) [-1.65384]	0.308687** (0.14805) [2.08499]	2.431047 (4.11842) [0.59029]	-272.5717 (363.112) [-0.75066]
D(CHI_FX(-2))	-19.60418 (14.5465) [-1.34769]	2.673959*** (0.94922) [2.81702]	-0.043306 (0.14731) [-0.29398]	-2.297410 (4.09778) [-0.56065]	13.16483 (361.291) [0.03644]
D(CHI_IPI(-1))	-0.912436* (0.48374) [-1.88620]	-0.002642 (0.03157) [-0.08370]	-0.009347* (0.00490) [-1.90809]	-0.035173 (0.13627) [-0.25811]	8.599361 (12.0147) [0.71574]
D(CHI_IPI(-2))	0.688556 (0.50825) [1.35476]	0.019314 (0.03317) [0.58236]	0.003455 (0.00515) [0.67124]	-0.465491*** (0.14317) [-3.25122]	-4.722702 (12.6234) [-0.37412]
D(CHI_STOCK(-1))	-0.008250 (0.00633) [-1.30255]	-0.000635 (0.00041) [-1.53559]	1.63E-06 (6.4E-05) [0.02538]	-0.000182 (0.00178) [-0.10206]	0.378447*** (0.15731) [2.40571]
D(CHI_STOCK(-2))	0.005486 (0.00577) [0.95128]	0.000662* (0.00038) [1.75849]	1.01E-06 (5.8E-05) [0.01728]	-0.001143 (0.00162) [-0.70363]	-0.185651 (0.14323) [-1.29616]
C	-1.370440 (1.26424) [-1.08400]	0.115599 (0.08250) [1.40125]	0.011917 (0.01280) [0.93083]	0.056268 (0.35614) [0.15799]	-1.282675 (31.3999) [-0.04085]
R-squared	0.218899	0.258288	0.156230	0.256555	0.153667
Log likelihood	-226.6687	-49.25320	71.84826	-144.3198	-435.4704

*,**,*** denote 10%, 5% and 1% significance respectively.

Impulse response functions of VAR model for China which are significantly different than zero are presented in the following figure. When difference in CDS level is positive, change in stock index of China decreases and change in foreign exchange rate of China increases, i.e. Chinese Yuan depreciates. When difference in consumer price index increases, change in industrial production decreases, which implies that greater increases in inflation effects industrial growth negatively.

Figure 7 : Significant Impulse Response Functions for China



4.4. GRANGER CAUSALITY TEST RESULTS

Pairwise Granger causality test results for the variables in Turkey are presented in the following table (Table 22). We see that changes in CDS spreads together with changes in foreign currency rate affect changes consumer price index at 5% significance level. Also, changes in stock index lead changes in CDS spreads and changes in industrial production index at 5% significance level. Using 10% significance level, changes in CDS affect changes in industrial production index.

These results point out that financial variables might lead or have causal effects on macroeconomic variables for Turkey. Changes in stock index unidirectional cause changes in CDS. Changes in CDS and foreign exchange rate together drive consumer price index and industrial production index.

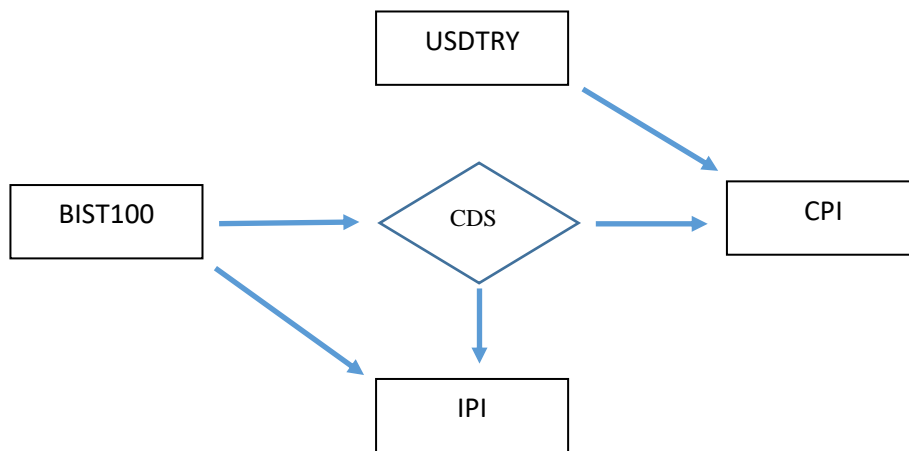
Table 22: Granger Causality Test Results for Turkey

Null Hypothesis:	Obs	F-Statistic	Prob.
D_TR_CPI does not Granger Cause D_TR_CDS D_TR_CDS does not Granger Cause D_TR_CPI	122	1.27719 9.18469***	0.2856 2.E-05
D_TR_FX does not Granger Cause D_TR_CDS D_TR_CDS does not Granger Cause D_TR_FX	123	1.68331 0.30684	0.1744 0.8204
D_TR_IPI does not Granger Cause D_TR_CDS D_TR_CDS does not Granger Cause D_TR_IPI	120	0.52503 2.47629*	0.6660 0.0650
D_TR_STOCK does not Granger Cause D_TR_CDS D_TR_CDS does not Granger Cause D_TR_STOCK	123	6.14128*** 0.32530	0.0007 0.8071
D_TR_FX does not Granger Cause D_TR_CPI D_TR_CPI does not Granger Cause D_TR_FX	122	34.8131*** 1.00414	4.E-16 0.3937
D_TR_IPI does not Granger Cause D_TR_CPI D_TR_CPI does not Granger Cause D_TR_IPI	120	0.57430 1.96172	0.6331 0.1238
D_TR_STOCK does not Granger Cause D_TR_CPI D_TR_CPI does not Granger Cause D_TR_STOCK	122	1.48158 1.31932	0.2233 0.2716
D_TR_IPI does not Granger Cause D_TR_FX D_TR_FX does not Granger Cause D_TR_IPI	120	1.47543 1.34562	0.2250 0.2632
D_TR_STOCK does not Granger Cause D_TR_FX D_TR_FX does not Granger Cause D_TR_STOCK	123	1.58214 0.94221	0.1975 0.4227
D_TR_STOCK does not Granger Cause D_TR_IPI D_TR_IPI does not Granger Cause D_TR_STOCK	120	8.18563*** 0.91383	6.E-05 0.4367

*, **, *** denote 10%, 5% and 1% significance respectively.

Directions of Granger causality for Turkey are summarized in the following figure.

Figure 8 : Interaction of Variables for Turkey



Results of pairwise Granger causality tests for Brazil are presented in the following table (Table 23). At 5% significance level, changes in stock index of Brazil Granger cause changes in CDS levels of Brazil, changes in industrial production and changes in currency rate. Thus, changes in stock index levels are important for changes in foreign exchange rate, industrial production and CDS levels. Changes in foreign exchange rate Granger causes changes in CDS levels and changes in industrial production at 5% significance level. Using 10% significance level, changes in foreign exchange rate also Granger cause changes in consumer price index. Changes in Brazil CDS have no Granger causality effects on other variables at 5% significance level, but only at 10% significance level have Granger causality on consumer price index. At 5% significance level, changes in consumer price index have Granger causality effects on industrial production and at 10% significance level, changes in consumer price index have Granger causality effects on stock index. No Granger causality effects of industrial production index is found for Brazil.

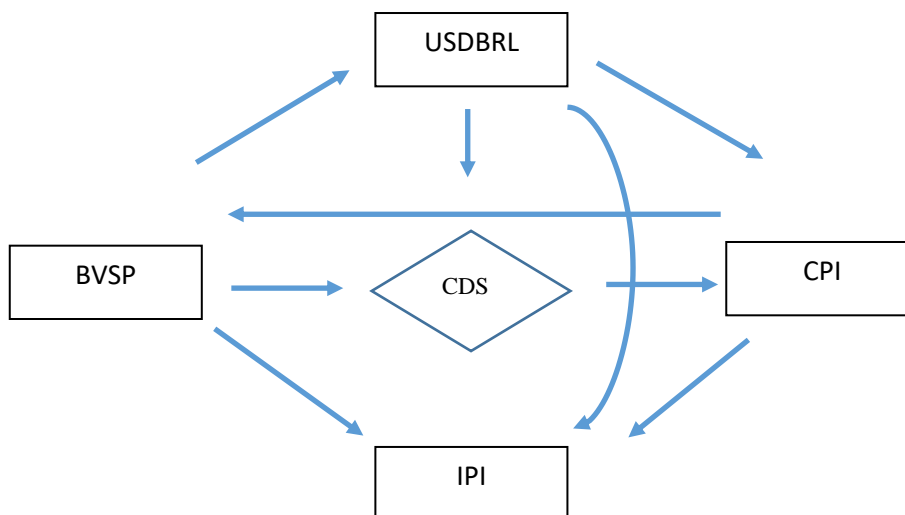
Table 23: Granger Causality Test Results for Brazil

Null Hypothesis:	Obs	F-Statistic	Prob.
D_BR_CPI does not Granger Cause D_BR_CDS	118	0.70297	0.5916
D_BR_CDS does not Granger Cause D_BR_CPI		2.40582*	0.0539
D_BR_FX does not Granger Cause D_BR_CDS	120	2.57951**	0.0412
D_BR_CDS does not Granger Cause D_BR_FX		0.62241	0.6475
D_BR_IPI does not Granger Cause D_BR_CDS	118	1.17555	0.3256
D_BR_CDS does not Granger Cause D_BR_IPI		1.82646	0.1289
D_BR_STOCK does not Granger Cause D_BR_CDS	120	5.51264***	0.0004
D_BR_CDS does not Granger Cause D_BR_STOCK		0.39234	0.8138
D_BR_FX does not Granger Cause D_BR_CPI	120	2.31936*	0.0614
D_BR_CPI does not Granger Cause D_BR_FX		0.46583	0.7607
D_BR_IPI does not Granger Cause D_BR_CPI	120	0.24698	0.9110
D_BR_CPI does not Granger Cause D_BR_IPI		2.65049**	0.0369
D_BR_STOCK does not Granger Cause D_BR_CPI	120	1.63167	0.1713
D_BR_CPI does not Granger Cause D_BR_STOCK		2.24659*	0.0685
D_BR_IPI does not Granger Cause D_BR_FX	120	0.47542	0.7537
D_BR_FX does not Granger Cause D_BR_IPI		4.74510***	0.0014
D_BR_STOCK does not Granger Cause D_BR_FX	122	4.00071***	0.0045
D_BR_FX does not Granger Cause D_BR_STOCK		0.53141	0.7129
D_BR_STOCK does not Granger Cause D_BR_IPI	120	8.19718***	8.E-06
D_BR_IPI does not Granger Cause D_BR_STOCK		0.79374	0.5317

*, **, *** denote 10%, 5% and 1% significance respectively.

Directions of Granger causality for Brazil are presented in the following figure. Similar to that of Turkey, in general financial variables have Granger causal effects on macroeconomic variables. Stock index Granger causes all other variables except CPI and foreign exchange rate Granger causes all other variables except stock index. Again similar to Turkey, stock index Granger causes CDS levels and CDS levels Granger cause consumer price index.

Figure 9 : Interaction of Variables for Brazil



Results of Granger Causality tests for India are presented in the following table (Table 24). At 5% significance level, the only Granger causality that cannot be rejected is from changes in industrial production to changes in foreign exchange rate. Changes in industrial production index Granger cause changes in stock index at 10% significance level. Another Granger causality at 10% significance level is from consumer price index to foreign exchange rate.

Table 24: Granger Causality Test Results for India

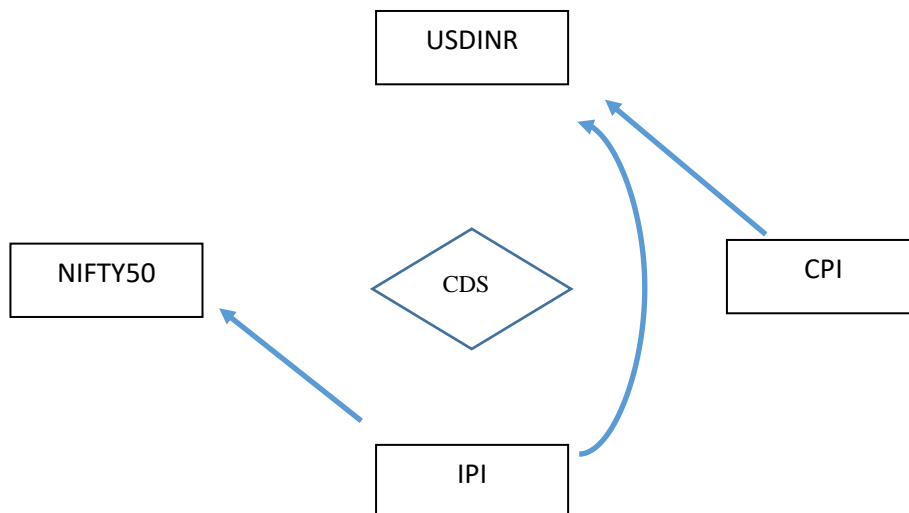
Null Hypothesis:	Obs	F-Statistic	Prob.
D_IND_CPI does not Granger Cause D_IND_CDS	51	0.93308	0.4541
D_IND_CDS does not Granger Cause D_IND_CPI		0.67549	0.6127
D_IND_FX does not Granger Cause D_IND_CDS	53	0.47225	0.7558
D_IND_CDS does not Granger Cause D_IND_FX		0.14235	0.9654
D_IND_IPI does not Granger Cause D_IND_CDS	32	1.76027	0.1713
D_IND_CDS does not Granger Cause D_IND_IPI		0.57500	0.6836
D_IND_STOCK does not Granger Cause D_IND_CDS	53	1.25590	0.3017
D_IND_CDS does not Granger Cause D_IND_STOCK		1.85125	0.1361
D_IND_FX does not Granger Cause D_IND_CPI	120	0.37135	0.8286
D_IND_CPI does not Granger Cause D_IND_FX		2.10076*	0.0855

D_IND_IPI does not Granger Cause D_IND_CPI	101	0.56132	0.6913
D_IND_CPI does not Granger Cause D_IND_IPI		0.31141	0.8697
<hr/>			
D_IND_STOCK does not Granger Cause D_IND_CPI	120	0.54178	0.7054
D_IND_CPI does not Granger Cause D_IND_STOCK		0.51229	0.7268
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D_IND_IPI does not Granger Cause D_IND_FX	101	3.38073**	0.0126
D_IND_FX does not Granger Cause D_IND_IPI		1.25419	0.2938
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D_IND_STOCK does not Granger Cause D_IND_FX	122	0.88261	0.4768
D_IND_FX does not Granger Cause D_IND_STOCK		0.36175	0.8354
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D_IND_STOCK does not Granger Cause D_IND_IPI	101	1.13247	0.3462
D_IND_IPI does not Granger Cause D_IND_STOCK		2.46909*	0.0501

*, **, *** denote 10%, 5% and 1% significance respectively.

The Granger causality directions in the following figure suggest that, unlike Brazil and Turkey, macroeconomic variables have Granger causal effects on financial variables. No Granger causality effect is found from or to the CDS levels in India.

Figure 10 : Interaction of Variables for India



Results of pairwise Granger causality tests for Russia are presented in the following table (Table 25). At 5% significance level, null hypothesis of no Granger causality can be rejected from stock index to CDS and industrial production index. In

addition, Granger causality from stock index to foreign exchange cannot be rejected at 10% significance level. Changes in foreign exchange rate Granger cause changes in industrial production and consumer price index at 5% significance level. At 10% significance level, changes in industrial production index Granger cause changes in foreign exchange rate. No granger causality from CDS levels or consumer price index to other variables is found at 5% or 10% significance levels.

Table 25: Granger Causality Test Results for Russia

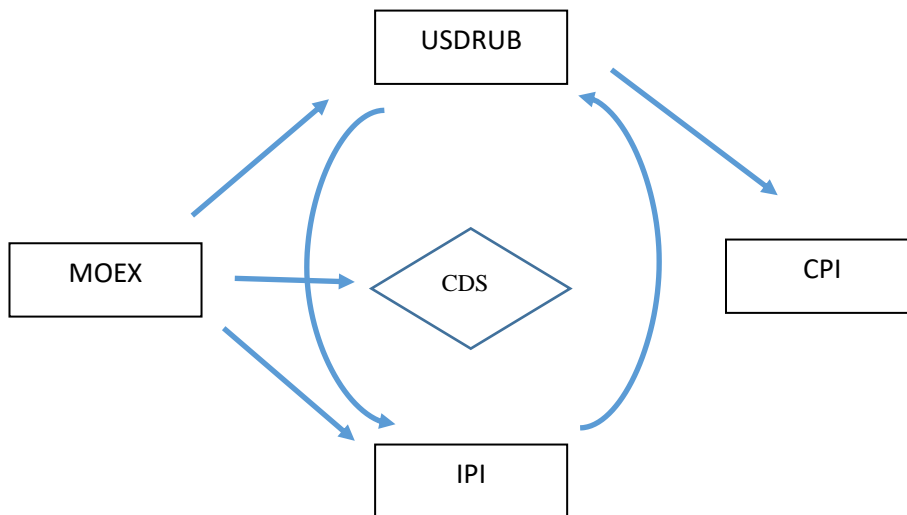
Null Hypothesis:	Obs	F-Statistic	Prob.
D_RUS_CPI does not Granger Cause D_RUS_CDS	119	1.18200	0.3228
D_RUS_CDS does not Granger Cause D_RUS_CPI		1.80415	0.1331
D_RUS_FX does not Granger Cause D_RUS_CDS	121	1.50004	0.2070
D_RUS_CDS does not Granger Cause D_RUS_FX		1.38633	0.2432
D_RUS_IPI does not Granger Cause D_RUS_CDS	119	1.11466	0.3533
D_RUS_CDS does not Granger Cause D_RUS_IPI		1.60918	0.1770
D_RUS_STOCK does not Granger Cause D_RUS_CDS	121	3.20240**	0.0157
D_RUS_CDS does not Granger Cause D_RUS_STOCK		0.95039	0.4378
D_RUS_FX does not Granger Cause D_RUS_CPI	120	3.34555**	0.0126
D_RUS_CPI does not Granger Cause D_RUS_FX		1.10585	0.3575
D_RUS_IPI does not Granger Cause D_RUS_CPI	120	1.30470	0.2727
D_RUS_CPI does not Granger Cause D_RUS_IPI		0.67996	0.6073
D_RUS_STOCK does not Granger Cause D_RUS_CPI	120	1.44609	0.2236
D_RUS_CPI does not Granger Cause D_RUS_STOCK		1.62621	0.1727
D_RUS_IPI does not Granger Cause D_RUS_FX	120	2.08367*	0.0877
D_RUS_FX does not Granger Cause D_RUS_IPI		2.46241**	0.0493
D_RUS_STOCK does not Granger Cause D_RUS_FX	122	2.15500	0.0786
D_RUS_FX does not Granger Cause D_RUS_STOCK		1.25488	0.2920
D_RUS_STOCK does not Granger Cause D_RUS_IPI	120	3.55789***	0.0090
D_RUS_IPI does not Granger Cause D_RUS_STOCK		1.63575	0.1703

*, **, *** denote 10%, 5% and 1% significance respectively.

The summary of Granger causality is presented in the following figure. Russia shows a similar pattern to Turkey and India. Changes in financial variables, which

are stock index and foreign exchange rate, Granger cause changes in macroeconomic variables and CDS levels in Russia.

Figure 11 : Interaction of Variables for Russia



Lastly, results of Granger Causality tests for China are presented in the following table (Table 26). At 5% significance level, the only Granger causality that cannot be rejected is from changes in industrial production to changes in foreign exchange rate. Changes in industrial production index Granger cause changes in consumer price index only at 10% significance level.

Table 26: Granger Causality Test Results for China

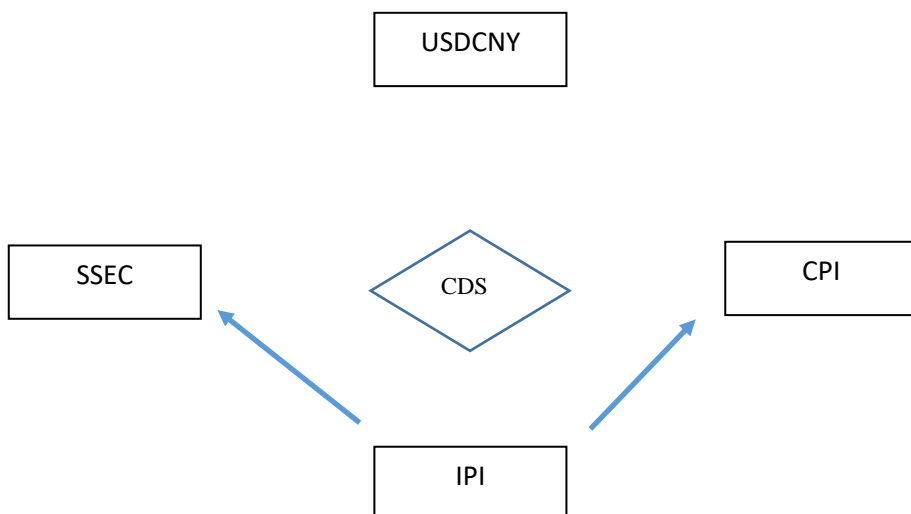
Null Hypothesis:	Obs	F-Statistic	Prob.
D_CHI_CPI does not Granger Cause D_CHI_CDS	64	0.92291	0.4573
D_CHI_CDS does not Granger Cause D_CHI_CPI		0.59699	0.6663
D_CHI_FX does not Granger Cause D_CHI_CDS	66	0.87697	0.4835
D_CHI_CDS does not Granger Cause D_CHI_FX		1.16968	0.3338
D_CHI_IPI does not Granger Cause D_CHI_CDS	63	1.94934	0.1155
D_CHI_CDS does not Granger Cause D_CHI_IPI		0.49330	0.7406

D_CHI_STOCK does not Granger Cause D_CHI_CDS	66	1.53322	0.2048
D_CHI_CDS does not Granger Cause D_CHI_STOCK		0.56930	0.6859
<hr/>			
D_CHI_FX does not Granger Cause D_CHI_CPI	120	1.82165	0.1297
D_CHI_CPI does not Granger Cause D_CHI_FX		0.18102	0.9478
<hr/>			
D_CHI_IPI does not Granger Cause D_CHI_CPI	119	2.24887*	0.0684
D_CHI_CPI does not Granger Cause D_CHI_IPI		0.89142	0.4717
<hr/>			
D_CHI_STOCK does not Granger Cause D_CHI_CPI	120	0.69225	0.5988
D_CHI_CPI does not Granger Cause D_CHI_STOCK		0.77590	0.5431
<hr/>			
D_CHI_IPI does not Granger Cause D_CHI_FX	119	3.21258**	0.0155
D_CHI_FX does not Granger Cause D_CHI_IPI		0.44718	0.7742
<hr/>			
D_CHI_STOCK does not Granger Cause D_CHI_FX	122	0.82690	0.5107
D_CHI_FX does not Granger Cause D_CHI_STOCK		0.64605	0.6308
<hr/>			
D_CHI_STOCK does not Granger Cause D_CHI_IPI	119	0.78577	0.5368
D_CHI_IPI does not Granger Cause D_CHI_STOCK		0.43785	0.7810
<hr/>			

*, **, *** denote 10%, 5% and 1% significance respectively.

The following figure summarizes the Granger causality analysis results for China. The figure is similar to that of India. Macroeconomic variables, especially industrial production Granger causes stock index and consumer price index. No causality from or to CDS levels in China is found in China by employing Granger causality analysis.

Figure 12: Interaction of Variables for China



5. CONCLUSION

Market based country risk measures such as CDS premiums reflect the views and risk perceptions of the market participants on a specific country. Moreover since they are traded and have prices, they are not under control of a few rating companies. For these reasons, since their introduction in 1990s, they are seen as important financial variables and their trading volume had a growth trend.

In this thesis, we tried to shed light on the interaction between CDS and other macroeconomic and financial variables. Our focus was emerging markets, BRIC countries plus Turkey in particular.

Unit root tests revealed that CDS spreads, foreign exchange rates, stock indices, industrial production indices and consumer production indices all have unit roots for these countries and thus they are non-stationary. After taking first differences, they turn out to be stationary. For this reason, we used differences in VAR analysis and levels in VEC models.

Our cointegration analysis found out that these series are cointegrated for Turkey, India and China but no evidence was found for cointegration for Brazil and Russia. The number of cointegration equations was found two for Turkey and India. For China, the number of cointegration equations was found one.

VEC model results for Turkey, India and China revealed that there is adjustment to long-run equilibrium as the coefficients of cointegration equations was found significant for some of the variables. For Turkey, when stock index increases more, difference in CDS levels gets smaller as expected. When the losses in Turkish Lira become higher, consumer price index growth, i.e. inflation is higher. This is also an expected result. An unexpected result is the negative and significant coefficient of lagged difference in CDS for the estimation of consumer price index. VEC model results of India and China did not conclude promising results. Regarding India, when CDS premiums rise faster, the industrial production growth gets smaller. This

was an unexpected result. The coefficients for lagged differences of variables did not have significance also for China.

VAR models using lagged differences in general had results in line with the theory and the literature. According to impulse response functions, increases in stock price changes are associated with a decrease in difference of CDS premiums for Turkey, Brazil and Russia. Increases in changes of CDS spreads are associated with an increase in difference of foreign exchange rates and a decrease in stock index returns for Russia and China.

Granger causality analysis results also revealed that changes in stock prices and foreign exchange rates lead the changes in CDS and the macroeconomic variables. For Turkey, Brazil and Russia one-directional Granger causality was detected from stock prices to CDS spreads. One-directional Granger causality from CDS spreads to consumer price index was also detected for Turkey and Brazil.

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