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THE MACROECONOMIC EFFECTS OF SOVEREIGN RISK PREMIUM SHOCK: A CASE STUDY FOR TURKEY

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ABSTRACT

The macroeconomic effects of sovereign risk premium shocks in Turkey are investigated by employing Structural Vector Autoregression Model for the period 2005:12 - 2017:3. The model includes emerging market bond index plus Turkey (EMBI + TR) as an indicator of sovereign risk premium for Turkey. The empirical results of our analysis indicate that structural shocks in sovereign risk premium affect macroeconomic variables negatively in Turkey. One standard deviation shock in EMBI+TR results in devaluation of Turkish Lira, increase in price level, contraction in credit volume, decline in industrial production index and increase in current account balance. The impact of the negative changes in the sovereign risk premium on the exchange rate and the credit is higher compared to the other variables. It is concluded that results of variance decomposition analysis are consistent with the results of the impulse - response analysis and the impact of structural shocks in sovereign risk premium on credit is higher compared to other variables.

Keywords: *Sovereign Risk Premium, Structural Vector Autoregression Model, Emerging Market Bond Index*

JEL Codes: *G15, E31, E44, E51*

ÜLKE RİSK PRİMİ ŞOKUNUN MAKROEKONOMİK ETKİLERİ: TÜRKİYE ÖRNEĞİ

ÖZ

Ülke risk primi şokunun makroekonomik etkileri 2005:12- 2017:3 dönemi için Yapısal Vektör Otoregresyon Modeli kullanılarak incelenmiştir. Türkiye için ülke risk primi göstergesi olarak EMBI+TR kullanılan model nominal döviz kuru sepeti, tüketici fiyatları endeksi, tüketici kredileri, sanayi üretim endeksi ve cari açık bilançosunu içermektedir. Ampirik sonuçlar ülke risk priminde gözlenen yapısal şokların Türkiye'nin açık enflasyon hedeflemesi döneminde makroekonomik

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değişkenlerini olumsuz yönde etkilediğini göstermektedir. EMBI+ TR göstergesindeki bir standart sapmalık şok Türk Lirasında devalüasyona, fiyat seviyesinde artışa, kredi hacminde daralmaya, sanayi üretim endeksinde düşüşe ve cari açık bilançosunda artışa yol açmaktadır. Ülke risk priminin döviz kuru ve krediler üzerindeki olumsuz etkisi diğer değişkenler üzerindeki etkisine kıyasla daha fazladır. Ayrıca ülke risk primi şokları kredi daralması yaratmak suretiyle reel ekonomide küçülmeye ve cari açık bilançosunda artışa yol açmaktadır. Varyans ayrıştırmasının bulguları ile etki tepki analizinin sonuçları tutarlı olupülke risk priminde gözlenen yapısal şokların kredi üzerindeki etkilerinin diğer değişkenlere kıyasla daha fazla olduğu sonucuna varılmıştır.

Anahtar Kelimeler: *Ülke Risk Primi, Yapısal Vektör Otoregresyon Modeli, Yükselen Piyasalar Tahvil Endeksi.*

JEL Kodları: *G15, E31, E44, E51*

1. INTRODUCTION

Sovereign risk indicates the credit risk associated with the possibility of a government failing to honor its payment obligations. Sovereign risk premium constitutes a fundamental component of the cost of foreign financing especially for emerging and developing economies. Turkey with comparatively low domestic savings rates and persistently high current account deficit is a developing economy that rely heavily on foreign capital for financing growth. Hence an increase in sovereign risk premium in Turkey is expected to have negative impact on macroeconomic variables.

The empirical literature provides significant evidence for the relationship between sovereign risk premia and macroeconomic variables. Part of the literature that deals with the sovereign credit ratings focus on the determinants of ratings such as Afonso (2003), Bissoondoyal-Bheenick (2005) and Afonso, Gomes and Rother (2011) and identify GDP per capita, real GDP growth, external and public debt levels as the main determinants of sovereign debt ratings. Another line of studies in the literature investigate the relationship between sovereign credit ratings and sovereign bond yields such as Reisen and von Maltzan (1999) conduct an event study for 29 emerging markets between the period 1989-1997 and detect a two way causality between sovereign credit ratings and government bond yields. Afonso, Furceri, Gomes (2012) also conduct an event study analysis for EU countries and conclude that government bond yield spreads respond significantly to changes in sovereign credit ratings. Higher sovereign risk is directly associated with surges in the cost of funding. Hence the literature is rich in studies that focus on the effect of sovereign risk premia on bank funding conditions.

In addition to its direct channel of influence via interest rates in emerging economies, sovereign risk also plays a crucial role in destabilising dynamics both in the financial sector and on the fiscal sector as proven during the sovereign crises observed in the Euro Area in 2010 (Castro and Mencia,

2014).For instance Acharya, Drechsler and Schnabl (2011), employ credit default swaps (CDS) rates on European sovereigns and banks between 2007 and 2011 and conclude that increased sovereign credit risk negatively effects the financial sector by eroding the value of its government debt guarantees and bond holdings. Neri and Ropele (2013) employ FAVAR model for some of the EU countries - both core and peripheral- between the period January 2008 to September 2012 and demonstrate that rise in sovereign risk premia reduces industrial production growth and credit to the private sector and increase unemployment.

Tiryaki (2011) investigates various specifications of the relationship between the country spread and the domestic macroeconomic variables and argue that fluctuations in country spreads do account for output volatility although less than that of found in Neumeyer and Perri (2005). Kılınç and Tunç (2014) analyze the effects of risk premium shocks along with interest rate shocks, external shocks of commodity prices and global demand and conclude that positive risk premium shocks indicated by EMBI+TR cause depreciation, an increase in inflation and decrease in domestic activity with some lag. Notably Kılınç and Tunç (2014) argue that the impact of risk premium shocks is more pronounced compared to the same size interest rate shocks. Varlık (2017) investigates the effect of sovereign risk premium shocks on banking system in Turkey covering the period January 2004 - June 2015 and concludes that structural shocks in sovereign risk premium have significant impact on devaluation of the Turkish Lira (TL), decline in financial stock prices and the banking system soundness index as well as increase in interbank overnight interest rates and credit-deposit interest rate spread. Although there are studies that deal with the impact of sovereign risk premia from various perspectives, number of studies that deal with the quantification of the impact of solely sovereign risk premium shocks on macroeconomic performance in Turkey are limited.

Emerging Market Bond Index Plus (EMBI+)[1] developed by J. P. Morgan Chase and recognized widely as an indicator of sovereign risk premium in emerging markets is used to identify sovereign risk premium shocks in Turkey. The Turkish sovereign spread measured by EMBI+TR increase during periods of sudden stops of capital flows and the TL depreciates as shown in Özatay (2014).Turkey is an open developing and emerging economy which relies on international borrowing for financing growth. Hence an increase in sovereign risk premium is expected to have negative impact on sustainability of international capital flows and macroeconomic performance in Turkey. Therefore the macroeconomic effects of sovereign risk premium shocks in Turkey are investigated by employing Structural Vector Autoregression (SVAR) Model for the period 2005: 12 - 2017:3 in this paper.

[1] EMBI+TR is the gap between the 10- year US dollars denominated Turkish treasury bonds and the 10 – year US treasury bonds. An increase in this index points to an increase in risk perception hence this is an important indicator of the risk perception for Turkey.

The paper is organised as follows. Section 1 introduces the subject and presents a brief literature review. Section 2 provides the details of the model and the data. Section 3 outlines the empirical results and Section 4 concludes.

2. DATA AND ECONOMETRIC ANALYSIS

A Structural Vector Autoregression (SVAR) Model is estimated for the period 2005:12-2017:03 in order to investigate the macroeconomic effects of sovereign risk premium shock. The time period chosen includes explicit inflation targeting era in Turkey which is characterized by a period in domestic economy associated with macro-financial structural reforms and a strong commitment towards international financial linkages. Also the period investigated covers the global financial crisis that had crucial direct and secondary spillover effects on sovereign risk premia especially in emerging and developing economies as well as around the globe.

2.1. Data

Emerging markets that face higher cost of financing in global financial markets are characterized with higher sovereign risk premia. (Özatay et al., 2007). In other words sovereign risk premia reflects the perception of financial risks in emerging and developing economies. An increase in sovereign risk premium is expected to deteriorate risk perception about a country and hence contract capital inflows to the country and produce upward pressure on interest rates, devaluate the domestic currency, create inflationary pressure and limit the credit available to consumers and decline the demand via its limiting effect on credit and eventually decline growth in real economy. In this respect the endogeneous variables included in the model are sovereign risk premium indicated by EMBI+TR, nominal exchange rate basket (EXCBSK), consumer price index (CPI), consumer credit (CRDT), industrial production index (IP) and the ratio of current account balance to GDP (CAB/ GDP)[2]. As interest rates and default risk are systematically correlated with exchange rate devaluations (Arellano, 2004) the nominal exchange rate basket is included as an endogenous variable. The exogeneous variables included in the model are FED policy interest rate (FED), Chicago Board Options Exchange Volatility Index (VIX) and a dummy variable for 2008 Global Financial Crises (DUMMY). Since sovereign spreads are significantly affected by the volatility risk premium embedded in the VIX index (Longstaff et al. 2011) the VIX index is included as an exogenous variable. All the variables included in the model except the CAB/GDP are in logarithmic form.

The endogeneous variables CRDT, EXCBSK, IP, CPI, CAB/GDP are obtained from the Turkish Central Bank's Electronic Data Distribution System (EVDS), the variable EMBI+TR is

[2] One period lag of GDP is used following Varlık and Berument (2016) in order to avoid multicollinearity hence impact of other variables on current account balance via GDP is controlled. Because monthly GDP series do not exist, quarterly data is transformed into monthly data by making use of the interpolation method in Litterman (1983).

obtainedfromtheThomson Reuters Data Stream database and the VIX index is obtained from Chicago Board Options Exchange database.

2.2. Econometric Analysis: Spesification of the SVAR Model

Endogeneous and exogeneous shocks are identified in order to empirically investigate the macroeconomic effects of sovereign risk premia in Turkey. The exogeneous shock variables are FED policy interest rate and the VIX index. The endogeneous shock variables are sovereign risk premium, nominal exchange rate basket, consumer price index, consumer credit, industrial production index and the ratio of current account balance to GDP. Also a dummy variable is included to indicate the Global Financial Crises of 2008.

Restrictions are required to identify the structural shocks in the variables of the SVAR model. By following Ying and Kim (2001), six variable SVAR model can be shown as:

$$Y_t = \sum_{i=0}^{\infty} A_i U_{t-i} = A(L)U_t \quad (1)$$

The equation (1) can be explained as;

$$Y_t = (EMBI + TR_t, EXCBSKT_t, CPI_t, CRDT_t, IP_t, \frac{CAB}{GDP_t}); \quad (2)$$

$$U_t = u_t^{EMBI+TR}, u_t^{EXCBSKT}, u_t^{CPI}, u_t^{CRDT}, u_t^{IP}, u_t^{CAB/GDP}; \qquad A(L) = \sum_{i=0}^{\infty} A_i L^i \quad (3)$$

The matrix $A_i$that denotes the impulse- response matrix of the endogeneous variables to the structural shocks has $(\mathrm{n}^2 + \mathrm{n})/2$ elements. $(\mathrm{n}^2 - \mathrm{n})/2$ restrictions in line with the economictheory shall be imposed on the $A_i$matrix in order to identify the long run structural shocks. The restrictions imposed on the A_i matrix enable the observation of structural shocks. Since there are 6 endogeneous variables $(n^2 - n)/2 = 15$ restrictions are imposed. The matrix form of long-run restrictions of the SVAR model is defined in equation (2) below:

$$\begin{bmatrix} EMBI + TR_t \\ EXCBSKT_t \\ CPI_t \\ CRDT_t \\ IP_t \\ CAB/GDP_t \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ * & 1 & 0 & 0 & 0 & 0 \\ * & * & 1 & 0 & * & 0 \\ * & * & * & 1 & 0 & 0 \\ * & * & 0 & * & 1 & 0 \\ * & * & * & * & * & * \end{bmatrix} \begin{bmatrix} u_t^{EMBI+TR} \\ u_t^{EXCBSKT} \\ u_t^{CPI} \\ u_t^{CRDT} \\ u_t^{IP} \\ u_t^{CAB/GDP} \end{bmatrix} \quad (4)$$

The assumptions underlying the long term restrictions can be explained as:

1. It is assumed that *EMBI+TR* affect other endogeneous variables but are not affected by them simultaneously as indicated by $a_{21} \neq a_{31} \neq a_{41} \neq a_{51} \neq a_{61} \neq 0$ in the matrix.

2. *EXCBSKT* is assumed to affect all the endogeneous variables (*CPI, CRDT, IP, CAB/GDP*) except *EMBI+TR* simultaneously as indicated by $a_{32} \neq a_{42} \neq a_{52} \neq a_{62} \neq 0$in the matrix.

3. *CPI* is assumed to affect *CRDT* and *CAB/GDP* as indicated by$a_{43} \neq a_{63} \neq 0$.

4. *CRDT* is assumed to affect *IP* and *CAB/GDP* hence$a_{54} \neq a_{64} \neq 0$ on the restriction matrix above.

5. The variable *IP* is assumed to affect *CPI* and *CAB/GDP* simultaneously as indicated by $a_{35} \neq a_{65} \neq 0$.

6. The variable *CAB/GDP* is assumed to be affected by all the endogenous variables in the long-run except itself.

Various unit root tests such as Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), Kwiatkowski-Phillips-Schmidt-Shin (KPSS) ve Narayan ve Popp (NP) are employed to check if the series are stationary as non-stationary series may lead to spurious regression problem in VAR models (Enders, 1995). Table 1 summarizes the results obtained for each variable.

Table 1. Summary of Results of Stationarity Tests

Variable	**Stationary Test Techniques and Results**				**Remarks**
	ADF	PP	KPSS	NP	
EMBI+TR	I(1)	I(1)	I(1)	I(1)	Logarithmic differenced in model and adjusted for seasonality.
EXCBSKT	I(1)	I(1)	I(1)	I(1)	Logarithmic differenced in model.
CPI	I(1)	I(1)	I(1)	I(1)	Logarithmic differenced in model.
CRDT	I(1)	I(1)	I(1)	I(1)	Logarithmic differenced in model and adjusted for seasonality.
IP	I(1)	I(1)	I(1)	I(1)	Logarithmic differenced in model and adjusted for seasonality.
CAB/GDP	I(0)	I(0)	I(0)	I(0)	At level in model and adjusted for seasonality.
FEDINT	I(1)	I(1)	I(1)	I(1)	Logarithmic differenced in model.

VIX	I(1)	I(1)	I(1)	I(1)	Logarithmic differenced in model.
DUMMY	Included for the period 2009M10-2009M12				

Note: It is used the 1% and 5% level of significance.

Unit root tests indicate that EXCBSK, CPI, FEDINT and VIX variables are stationary at first difference. Therefore, these variables have been log differenced.Also the variables EMBI+TR, CRDT and IP are deseasonalized and log differenced. The variable CAB/GDP is adjusted for seasonality but found to be stationary at level.

The dummy variables for the crisis is used between the period 2009:10- 2009:12. CPI is used instead of other alternative price indices such as the GDP deflator following the most widespreadly recognized inflation target of central banks as in Goodhart and Hofmann (2008).

3. EMPIRICAL RESULTS of ECONOMETRIC ANALYSIS

The impulse responses of the structural shocks are analyzed. Graph 1 includes impulse response functions that indicate how an expansionary sovereign risk premium shock affects macroeconomic variables for 18 periods (months) during the open inflation targeting period in Turkey. Each panel in graph 1 indicates the response of macroeconomic variables to a one standard deviation positive structural shock. The value zero indicates that the shock has no effect on the macroeconomic variables in which case the variables continues on the path with no sovereign risk premium shock. Any other positive or negative value indicates that the macroeconomic variable is below or above the natural path of the macroeconomic variable.

Panel A indicates the response of the variable EMBI+TR to a one standard deviation positive structural shock of itself. The increase in EMBI+TR in response to a one standard deviation positive shock in itself is statistically significant for the first two months.

Panel B, indicates that the nominal exchange rate basket (EXCBSK) increases significantly in response to a one standard deviation positive structural shock in sovereign risk premium for the first three months which indicates the devaluation of the TL in response to an increase in sovereign risk premium as expected.

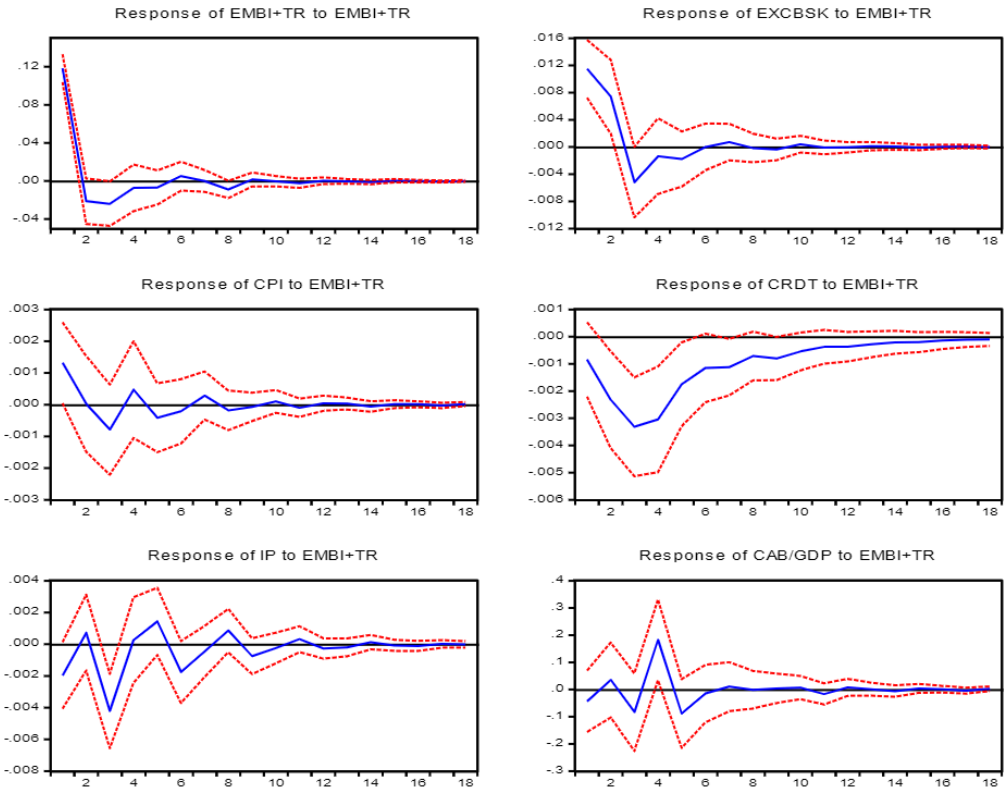
Panel C indicates that the CPI increases in response to a sovereign risk premium shock. The response of the CPI to a one standard deviation sovereign risk premium shock is statistically significant for the first month only.

Panel D indicates that the consumer credits (CRDT) decline from the beginning of the second period till the end of the fifth period in response to a one standard deviation structural shock.

As observed in Panel E industrial production index (IP) declines from the beginning of the second period till the end of the fourth period in response to a one standard deviation sovereign risk premium shock which indicates a contraction in the real economy due to increased risk perception.

Panel F indicates that the current account deficit (CAB/GDP) in Turkey increases at the fourth period in response to a one standard deviation sovereign risk premium shock.

Graph 1. Response Functions of Macroeconomic Variables to Structural One S.D. İnnovations to EMBI+TR Shock



The results obtained from the variance decomposition are consistent with the results of the impulse response analysis. Table 2 that demonstrates the results of the variance decomposition explains the relative importance of each shock in the SVAR model. The empirical results indicate the percentage of the estimated error term variance during the 18 months in response to each shock in the SVAR model. The explanatory power of the inner dynamics of the EMBI+TR on the sovereign risk premium shocks is very high and remains high despite the gradual decline in time while the explanatory power of the other variables increases. The gradual increase in the explanatory power of other endogenous variables indicate that sovereign risk premium shocks affect the macroeconomic variables with considerable lags of 3 to 6 month periods.

The empirical results indicate that negative perceptions regarding sovereign risk affect credits more negatively compared to other endogenous variables.

Table 2. Variance Decomposition of EMBI+TR

Period	S.E.	EMBI+TR	EXCBSKT	CPI	CRDT	IP	CAB/GDP
1	0.1185	100.00	0.00	0.00	0.00	0.00	0.00
3	0.1274	92.74	0.44	0.38	5.78	0.05	0.58
6	0.1308	88.77	1.36	0.53	6.03	1.68	1.60
9	0.1315	88.31	1.43	0.62	6.03	1.96	1.63
12	0.1316	88.23	1.46	0.62	6.03	1.99	1.64
15	0.1316	88.22	1.47	0.62	6.03	1.99	1.64
18	0.1316	88.21	1.47	0.63	6.03	1.99	1.64

4. CONCLUSION

The determinants of sovereign risk include availability of foreign currency reserves, balance of payments, anticipation of economic growth as well as a complex combination of other economic and political factors. A deterioration in sovereign risk premium is expected to affect macroeconomic indicators as well. Considering the bilateral nature of the relationship between the sovereign risk premium and macroeconomic variables, handling the simultaneity issue remains a challenge. Although the literature is abundant in studies emphasizing the importance of sovereign risk in business cycles of emerging and developing countries there is limited empirical evidence regarding the quantifiable effects of a sovereign risk premium shock on macroeconomic dynamics in Turkey.

This paper aims to demonstrate the crucial role played by sovereign risk premium shocks on macroeconomic indicators in Turkey. An SVAR model covering the period 2005:12 - 2017:3 is employed and dynamic effects of sovereign risk premium shocks in Turkey are analyzed. According to the empirical results sovereign risk premium shocks significantly affect exchange rates, consumer price index, credit, industrial production and current account balance over the open inflation targeting period in Turkey. Sovereign risk premium shocks lead to contraction in real economy via reduction in available credit. Exchange rates and consumer credit is found to be more vulnerable to negative perceptions associated with sovereign risk compared to other variables analyzed in the paper. Increase in sovereign risk premium results in devaluation of the Turkish Lira (TL), increase in price level, contraction in credit volume, decline in industrial production index and increase in current account balance.Hence the regulatory framework regarding the management of sovereign risk should be handled prudentially especially within a dynamic macroeconomic general equilibrium setting.

The ongoing vulnerability to external shocks as well as financial and political instability in Turkey indicates that the sovereign risk premium shocks will continue to have pronounced effects on macroeconomic indicators in the near future. Therefore the policymaker should be on alert for the impact of sovereign risk premium shocks and be well equipped with a set of policy tools to destabilize the effects thereof.

Considering the significant costs associated with volatility of interest rates, the perceptions on the sovereign risk often indicated by EMBI+ signal a remarkable source of vulnerability for emerging and developing economies like Turkey and hence further studies on various aspects of the sovereign risk premia seems of special value.

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