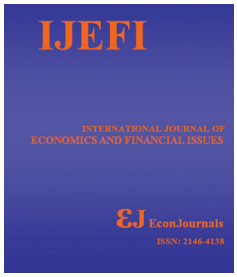

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2018, 8(4), 177-184.

Causal Relations among Macroeconomic Variables under Various Exchange Rate Levels: An Implementation of Threshold Vector Autoregression Model

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ABSTRACT

The paper examines interaction between selected macroeconomic determinants such as exchange rates, stock exchange market indexes, gold prices, money supply and inflation rates. Considering a nonlinear relationships in various macroeconomic indicators, a threshold vector autoregression (AVR) model is implemented. The data covers a period from 2003:01 to 2017:07. The results of the analysis points out the relationship between those macroeconomic indicators above and below the specific threshold value for exchange rate. The estimations indicate that policy maker may use monetary variables as policy variable for the stability of this system if they do not ignore the level of exchange rate.

Keywords: causal Relations, Threshold Vector Autoregression Model, Exchange Rate Transmission
JEL Classifications: C32, E31, E44

1. INTRODUCTION

As known that there is a strong correlation among financial markets, macroeconomic indicators and the fiscal policies. There are various studies that appeal the interaction between among several macroeconomic determinants. The are many A number of recent literature studies that employs different tests to indicate the a causal relation between among economic indicators such as employment, economic growth, exchange rates, stock market indices, inflation rates etc. The empirical findings are not consistent in terms of financial stability of the economies and the time lags. This empirical research examines the relationships in between selected macroeconomic determinants such as exchange rates, stock market indexes, gold prices, money supply and inflation rates. Considering a nonlinear relationship thus a threshold vector autoregression (TVAR) model is implemented.

VAR models are widely used in recent literature. The standard VAR model is designed to capture the linear dependence of *yt* on its own lags. This model is linear in the slope parameters as well as linear in the lagged model variables. More generally, however, the conditional mean may be nonlinear in the lagged variables and/or the model parameters.

Threshold models allow the model coefficients to evolve from one regime to another when some model variable exceeds a prespecified threshold value. For example, the central bank may tighten monetary policy only if the inflation rate exceeds a certain level. Our data covers a period from 2003:01 to 2017:07. We determine exchange rate as the threshold variable and estimate the threshold value for this system. Thus, the system we analyzed shows the interrelations between these variables for the values exceeding the threshold value and staying below of the threshold value. Our test results indicate a level of TL3.35/$ that acts as the threshold. The outputs point various occasions according to each exchange rate level for various threshold values.

2. LITERATURE REVIEW

There is a number of literature that indicates the relationships among macroeconomic factors. In this research we employ TVAR to figure out the interelation among exchange rates, stock

market index, gold prices, money policy (M2) and inflation for the Turkish markets. USD/TL rates are modelled as threshold and each of the underlying parameter is estimated for being above or below of this treshold. Therefore, this section examines related literature that depicts the determinants of each macroeconomic parameter modelled in this research. Hence, the determinants such that stock market index, exchange rate, gold prices, money supply and inflation used in the study are briefly explained below.

2.1. Stock Markets

Financial markets are a key factor in producing strong economic growth because they contribute to economic efficiency by diverting financial funds from unproductive to productive uses (Durusu-Ciftci et al., 2016). Dorodnykh (2014) combines relevant determinants of stock markets and also discusses these factors. This study employs a multistage statistical data analysis using correlation and cluster analyses to investigate the presence of integration trend between existing stock markets and a multivariable logit regression examines the determinants of stock market integration. This paper demonstrates that financial harmonization, cross-membership-agreements, for-profit corporate structure, trading engine and regional integration are important drivers of stock exchange integration. By contrast, high size of stock exchange market has negative impact on the likelihood of successful merger.

Basci and Kasraca (2013) employs VAR model to examine the relations between BIS100 index and exchange rates, gold, import and export values for the periods of January 1996–October 2011. After stationary tests, one standard deviation shock is given for each series. It is determined as of the second default of exchange and it explains 31% by share indices. Lee (1992) investigates interractions between asset returns, real activity, and inflation using USA data for the post-war period. They employ a multivariate VAR approach. Their evidence indicates that stock returns show Granger-causally prior and help explain the real activity. Also, they state that inflation explains little variation in the real activity.

Cheung and Lilian (1998) explains long-term relation between stock markets, oil prices, money supply and GDP for Canada, Germany, Italy, Japan and USA. Their findings indicate a long-run relation between stock indeces and macroeconomic factors. Theophano and Sunil (2006) find a negative effect of inflation and money supply on stock market. They employ bivariate VAR models for the data for a period of 1990–1999. Rad (2011) using unrestricted VAR model from 2001 to 2007 examines the relationship between Tehran stock exchange (TSE) price index, consumer price index (CPI), free market exchange rate, and liquidity (M2). According to impulse response function findings, TSE responds weakly to the changes in CPI, free market exchange rate, and liquidity (M2).

2.2. Exchange Rates

There are various studies that figure out the factors influence exchange rates. Harberger (2004), for instance, examines the effect of economic growth on real exchange rate. His findings perform no evidence that relates economic growth and real exchange rate. Simon (1997) estimates the relation between exchange rates and current account. Simon (1997) proposes that exchange rate and current account are the key factors that deteoriate the small economies. Due and Sen (2006) examine the interactions between the real exchange rate, capital flows, fiscal and monetary policy indicators and the current account surplus for India for the period 1993 and 2004. They employed quarterly data. Their estimations indicate that the variables are cointegrated and each Granger causes to the real exchange rate. Husain et al. (2004) indicate that financially developed economies seem to have advantages of having flexible exchange rates. On the other hand, less developed and poorer countries that have a little access to international funds is expected to face low inflation and higher durability associated with the fixed exchange rate regime. They find no significant relationship between economic performance and exchange rate regime for developing economies. They also indicate that developed economies may succed to grow slightly higher without experiencing higher inflation rates in flexible exchange rate regime.

2.3. Gold Prices

Gold is one of the primary investment alternatives in the volatile market conditions. Once a speculative era occurs in the markets; exchange rates fluctuate that influence interest rates; gold is perceived as a secure investment tool. However, it is essential not only to know its price, but also the factors that influence it when deciding to invest in gold. In order to identfy these factors, it enables investors to explain the fluctuations in gold markets. Therefore, identifying the indicators is a great interest of speculators and investors committing a long-term capital investment. Gold prices, however, are influenced by large variety of factors compared to other instruments. These factors determine the level of supply and demand in the gold market and, consequently, its price. Hence, short- and long-term determinants of gold price may be determined.

In the short term these factors may be the purchasing power of USD, the level of interest rates, seasonality, the official sector, political events, media information and press releases. In the long-term these factors may be an increase in the world population, investment demand, the volume of mining production, and the raw materials cycle. The foregoing factors influence the development of supply and demand in the gold market, thereby determining each change in its price.

Many researchers point out that there exist relationships between long run determinants and gold price as studied in this paper. A strong positive correlation between gold and crude oil is found by Zhang and Wei, 2010. Mining costs and expenditures on gold exploration which does not lead to successful discoveries are stated as a cause of probable production level decrease and rising gold prices (Müller and Frimmel, 2010). Leading gold producers don't have significant impact on world gold prices (Sjaastad and Scacciavillani, 1996). Increase in investment demand driven by the fear of investors against inflation is an important determinant of gold price rush (Demidova- -Menzel, Heidorn, 2007). Growing population of China, India and Middle East is the main source of demand for gold jewelry and has an important impact on gold price (Schiemenz, 2011).

2.4. Money Policy

Many studies point that demand for money has a crucial impact on macroeconomic conditions. Therefore, there are many researches stating the indicators which influence monetary policies. Ferraresi et al. (2013) examine that how credit markets are effected by fiscal policies in USA. They employ a TVAR model on US quarterly data for the period 1984–2010. The credit conditions are set as the yield spread between BAA-rated corporate bond and 10-year treasury constant maturity rate which capture the premium for external financing. They find that the response of output to fiscal policy shocks is stronger and more reactive when the economy is in the "tight" credit regime.

Laidler and Parkin (1975) propose that many studies find a relation between nominal interest rates and expected inflation. On the other hand, Friedman (1956) discusses that physical goods can be substitutes for money which may reshape a portfolio of pyhsical assets instead of money. Hence, the yields on real assets may also be included in financial models. Baba et al. (1988) also indicate that many researches also point that inflation level can exert significant influence on demand for money.

2.5. Inflation

Since inflation is a kind of crucial economic phenomenon, many researchers are keen on figuring out the determinants of inflation based on different techniques and time period. The variables that are commonly modelled are money supply, exchange rate, interest rate and GDP. Some studies indicate that the money supply is a significant determinant of inflation (Bashir et al., 2011, Bandara, 2011, Adu and Marbuah, 2011). On the other hand, Kim (2001) and Altowaijri (2011) found no evidence that relates money supply and inflation.

Bandara (2011), Adu and Marbuah (2011), Aurangzeb and Haq (2012), Khan and Gill (2010) explain exchange rate as a factor that triggers a rise in inflation. Adu and Marbuah (2011), Greenidge and Dianna (2008) finds evidence that inflation is influenced by nominal interest rates whereas Khan and Gill (2010) found significant relation. Some studies defines GDP as one of the indicators that effect inflation such as Aurangzeb and Haq (2012). They found negative correlation between GDP and inflation.

Kane and Rosenthal (1982) states that the short term interest rates have crucial impact on inflation. Gjerde and Saettem (1999) implemented a VAR model methodology for Norway using interest rate, inflation, industrial production index, exchange rate and oil prices as model variables to examine how each variable is affected and in what degree. The empirical findings point that interest rate affect significantly the inflation. Allen and Mapfumba (2006) concluded that the gap of the neutral and real interest rate is the primary determinant of the inflation movement.

Hossain and Mitra (2017) conduct several tests to investigate the determinants of inflation in USA over the period 1978–2014. They model the variables as unemployment rate, long-term interest rate, trade openness, budget deficit, money supply, economic growth rate and exchange rate. Their results indicate short-run unidirectional causalities from interest rate, trade openness, economic growth rate and exchange rate to inflation rate, from interest rate to unemployment rate, from economic growth rate to trade openness, and from unemployment rate, trade openness, budget deficit, economic growth rate and exchange rate to money supply.

3. DATA AND ECONOMETRIC METHODOLOGY

Istanbul stock exchange (ISE) indices, exchange rate (EXR), gold price (GOLD), money supply (M2) and inflation (CPI) are used as model variables in this study. The data are obtained from Central Bank of Turkey and analyzed for the period of 2003:01–2017:07.

In this paper the TVAR approach is used as referenced by Balke (2000). This method chosen for to get the information about the asymmetric effects of macroeconomic variables on economy in various exchange rate regimes.

Thus, Balke (2000) model is applied and a threshold VAR model estimated and tested for the presence of threshold effects. Finally, it is checked out whether impulse responses reveal signs of asymmetric shocks across separate regimes identified by this threshold model.

The TVAR model has the following specification;

$$Yt = A^1 Y_t + B^1(L)Y_{t-1} + (A^2 Yt + B^2(L)Y_{t-1})I\left[v_{t-d} > \gamma\right] + U_t \quad (1)$$

Where Yt is a n × 1 vector of endogenous variables, I is the indicator function which is equals 1 when $v_{t-d} > \gamma$ and 0 if $v_{t-d} \leq \gamma$. $B^1(L)$, $B^2(L)$ are lag polynomial matrices, Ut are structural disturbances, v_{t-d} is the threshold variable, n × 1 vector of endogenous variables denoted as Yt is; $Y_t = \{BIST_t, EXR_t, GOLD_t, M2_t, CPI_t\}$ and constant term is also (5 × 1) vector of constant terms. The indicator function equals 1 when exchange rate is higher than the threshold value. The lag value noted as "d" is equals to 1 for this study.

In first step we estimated TVAR model and tested for the differences of the regimes. This test procedure is known as Wald test. Three main test types are revealed in Balke (2000) study which is named as sup-Wald, avg-Wald and exp-Wald tests. Nonlinear impulse – response functions are defined as;

$$NIRF = E\left(Y_{t+k} | U_t, \Omega_{t-1}\right) - E\left(Y_{t+k} | \Omega_{t-1}\right) \quad (2)$$

Where Y_{t+k} is a vector of variables and Ω_{t-1} is the information set available before the time of shock t.

We assumed that value of domestic currency effected by macroeconomic variables and exchange rates. The exchange rate, as the value of domestic currency, affects this system but also has exogenous impacts in it. From this point of view we select the exchange rate variable as threshold variable. This variable is also the most important linkage between macroeconomic variables and the financial indicator BIST.

4. ECONOMETRIC RESULTS

The first step of our analysis is to determine the time series determinants for the period of 2003:M2-2017:M7. Percentage change transformation is used for all variables. We used Caner and Hansen (2001) test for testing the nonlinear especially TAR structure. In second stage the unit root process is tested. Whole variables are stationary in levels. In second stage we used TVAR model as in the study of Balke (2000). Table 1 below indicates KPSS, ADF and PP test statistics the indicators under different significance levels.

We used TVAR model for estimation of macroeconomic system that brings together the market returns of ISE, gold prices, exchange rates, money supply and CPI variables. This type of estimation method gives us the chance to choose exchange rate as threshold variable. This selection helps to analyze the interactions of other macroeconomic variables subject to the level of threshold variable. The estimated threshold value for the model studied is determined to be 3.35 TL per USD. When the exchange rate is above this threshold value, the first regime realized and this regime is dominated at 22.1% of the period analyzed. Additionally, the second regime dominates and it is persisted at 77.9% of the period if the exchange rate is below the threshold level.

In the first TVAR equation the market return of ISE (BIST) is negatively affected by the gold prices in each period but the impact of this affect is (negatively) stronger in first regime. The different effects of exchange rate on BIST in various regimes also reveal in the first equation. During the first regime exchange rate negatively affects BIST but in second regime this effect turns to be positive and there exists a very weak relation. A similar relation is also faced in M2 variable. The money supply negatively affects BIST in the first regime but the relationship between M2 and BIST is positive in the second regime.

The TVAR equation for gold shows that BIST and CPI variables affect the exchange rates negatively in both regimes. However, the relative strength of this effect differs for different regimes. The exchange rate variable has positive effect on gold prices either in the first and the second regime. Only the money supply has different effects on gold prices in different regimes. In the first regime, where the exchange rate is greater than the threshold value, money supply affects gold prices negatively and in the second regime this effect turns to be positive.

The third equation shows that exchange rate is negatively affected by BIST but the Gold price positively affects the exchange rates. For all variables the first regime has stronger effect on the exchange rates. The money supply and inflation have different effects in the regimes. In the first regime money supply has a strong positive effect on the exchange rates but a weak negative effect in the second regime. Also, inflation has different effects in signs in the different regimes.

The fourth equation shows a stronger effect of variables in the second regime on money supply. The way of effects on money supply differs for BIST and CPI. Both have negative effect on money supply in the first regimes but positive effect in the second regime. Gold prices and exchange rate variables have positive effect on M2 in both regimes.

The last equation shows a positive effect of BIST and M2 on CPI. Gold prices and exchange rates have negative effect on CPI although they show a positive effect on CPI in the second regime.

$$BIST = \begin{cases} \underset{(3.11)}{3.18} - \underset{(0.19)}{0.43}BIST_{t-1} - \underset{(0.25)}{0.074}\text{GOLD}_{t-1} - \underset{(0.58)}{0.76}EXR_{t-1} - \\ \underset{(1.018)}{0.48}M2_{t-1} + \underset{(2.009)}{1.14}CPI_{t-1} \qquad v_{t-1} \geq \gamma \\ \underset{(1.04)}{1.96} - \underset{(0.103)}{0.008}BIST_{t-1} - \underset{(0.15)}{0.02}\text{GOLD}_{t-1} + \underset{(0.32)}{0.0014}EXR_{t-1} + \\ \underset{(0.12)}{0.20}M2_{t-1} - \underset{(0.96)}{0.27}CPI_{t-1} \qquad v_{t-1} < \gamma \end{cases} \tag{3}$$

$$GOLD = \begin{cases} \underset{(2.18)}{-0.69} - \underset{(0.13)}{0.013}BIST_{t-1} - \underset{(0.17)}{0.29}\text{GOLD}_{t-1} + \underset{(0.41)}{0.69}EXR_{t-1} - \\ \underset{(0.71)}{1.52}M2_{t-1} - \underset{(1.41)}{0.64}CPI_{t-1} \qquad v_{t-1} \geq \gamma \\ \underset{(0.61)}{1.61} - \underset{(0.06)}{0.02}BIST_{t-1} - \underset{(0.09)}{0.03}\text{GOLD}_{t-1} + \underset{(0.19)}{0.19}EXR_{t-1} + \\ \underset{(0.07)}{0.11}M2_{t-1} - \underset{(0.57)}{0.32}CPI_{t-1} \qquad v_{t-1} < \gamma \end{cases} \tag{4}$$

$$EXR = \begin{cases} \underset{(1.95)}{-0.52} - \underset{(0.12)}{0.069}BIST_{t-1} + \underset{(0.16)}{0.22}\text{GOLD}_{t-1} + \underset{(0.37)}{0.17}EXR_{t-1} + \\ \underset{(0.64)}{0.56}M2_{t-1} - \underset{(1.26)}{1.17}CPI_{t-1} \qquad v_{t-1} \geq \gamma \\ \underset{(0.46)}{0.54} - \underset{(0.04)}{0.06}BIST_{t-1} + \underset{(0.06)}{0.08}\text{GOLD}_{t-1} + \underset{(0.14)}{0.12}EXR_{t-1} - \\ \underset{(0.06)}{0.02}M2_{t-1} + \underset{(0.42)}{0.012}CPI_{t-1} \qquad v_{t-1} < \gamma \end{cases} \tag{5}$$

$$M2 = \begin{cases} \underset{(0.64)}{0.86} - \underset{(0.04)}{0.007}BIST_{t-1} + \underset{(0.05)}{0.11}\text{GOLD}_{t-1} + \underset{(0.12)}{0.16}EXR_{t-1} - \\ \underset{(0.21)}{0.056}M2_{t-1} - \underset{(0.41)}{0.55}CPI_{t-1} \qquad v_{t-1} \geq \gamma \\ \underset{(0.71)}{1.35} + \underset{(0.06)}{0.18}BIST_{t-1} + \underset{(0.10)}{0.205}\text{GOLD}_{t-1} + \underset{(0.22)}{0.439}EXR_{t-1} - \\ \underset{(0.08)}{0.058}M2_{t-1} + \underset{(0.65)}{0.676}CPI_{t-1} \qquad v_{t-1} < \gamma \end{cases}$$

(6)

$$CPI = \begin{cases} \underset{(0.32)}{0.65} + \underset{(0.02)}{0.035}BIST_{t-1} - \underset{(0.026)}{0.04}\text{GOLD}_{t-1} - \underset{(0.06)}{0.019}EXR_{t-1} + \\ \underset{(0.011)}{0.164}M2_{t-1} - \underset{(0.21)}{0.0587}CPI_{t-1} \quad v_{t-1} \geq \gamma \\ \underset{(0.09)}{0.44} + \underset{(0.008)}{0.01}BIST_{t-1} + \underset{(0.012)}{0.02}\text{GOLD}_{t-1} + \underset{(0.026)}{0.044}EXR_{t-1} + \\ \underset{(0.01)}{0.004}M2_{t-1} + \underset{(0.08)}{0.28}CPI_{t-1} \quad v_{t-1} < \gamma \end{cases}$$

(7)

The generalized impulse-response functions are also estimated and shown below. One and two standard deviation of shocks are utilized. These shocks symbolize the small and large shocks on the variable under consideration.

The first figure shows the responses of BIST to the shocks to other variables. A positive shock to gold prices leads to a temporary positive increase on BIST but after the third period it tends to lose its effect and fades in a few periods. Also, the negative shocks to gold prices have negative impact on BIST till the third period. The effect of a positive shock to exchange rate leads to a higher negative impact than a positive shock. The effect of negative 1SD shock fades about over four periods but 2SD shock has persistent effect on BIST. Contrary to negative shocks, positive shocks have a smaller and temporary but again opposite impact on BIST. This type of opposite impact on BIST is also observed for money supply variable. Positive shock to M2 has negative, negative shock has positive effect on BIST. The positive and negative shock on CPI leads to an impact on BIST in same direction but the permanence of these shocks are relatively stronger. The effect of negative and positive shocks leads to fade over six periods (Figure 1).

Figure 2 shows the response of exchange rates to different shocks for the variables in this system. A positive shock to BIST leads to a temporary negative effect where a negative shock leads a temporary positive effect on exchange rates. A similar effect is observed for CPI. A shock to CPI leads to a negative effect on the exchange rates. This shock takes the minimum value in the second period but it reaches nearly zero in the sixth period. As for positive shock, a negative shock to CPI leads to a positive effect to exchange rates. Gold prices also have similar but shorter effect on EXR. Conversely, money supply shocks have impact on exchange rates in same direction.

Figure 3 shows the response of gold prices for the given shocks to other variables. Only the effect of a shock to exchange rate leads to bidirectional response. A positive shock to exchange rates leads to a temporary positive effect on gold prices and this effect tends to turn to a negative impact after the third period. Also, a negative shock to exchange rate leads to a negative response of gold prices but also this effect tends to turn to a positive impact after the third period. Giving positive shocks to other variables leads to temporary negative responses and negative shocks lead to temporary positive responses. CPI and M2 variables have four and three periods of impacts on gold prices while a shock to BIST leads to a shorter impact on response of gold prices.

Figure 4 shows the response structure of money supply to shocks on other variables. For all variables shocks lead to responses in the same direction. A positive shock to BIST has a negative starting impact on M2 but leads to a positive impact till the end of second period. After second period the response turns to conversely and reaches the stability condition about in the seventh period. Negative shock also leads to a similar impact to M2. A shock to

Figure 1: Responses of BIST variable

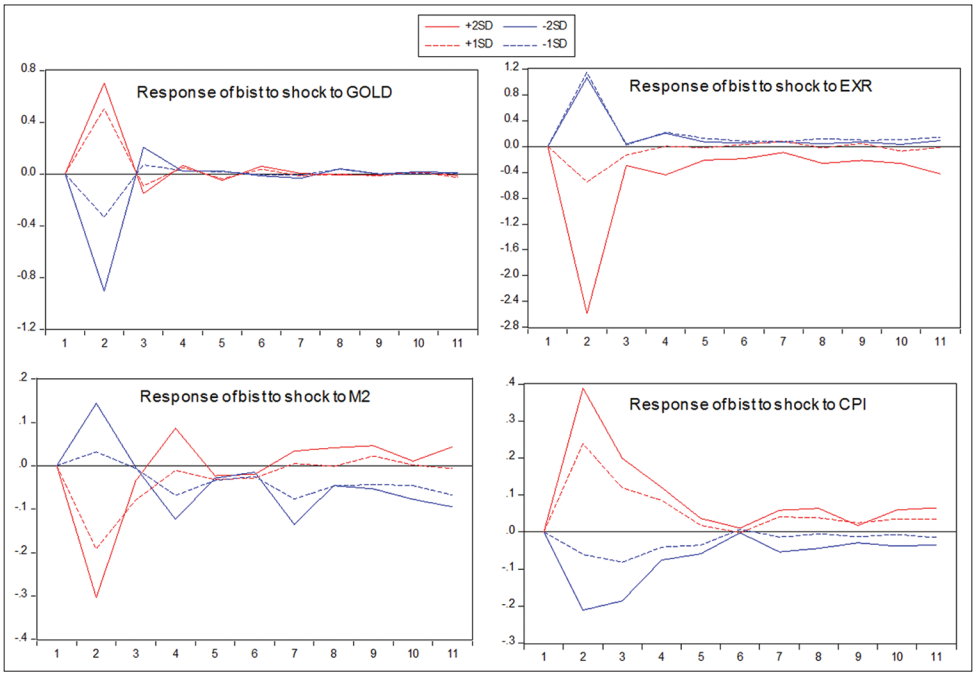


Figure 2: Responses of exchange rate variable

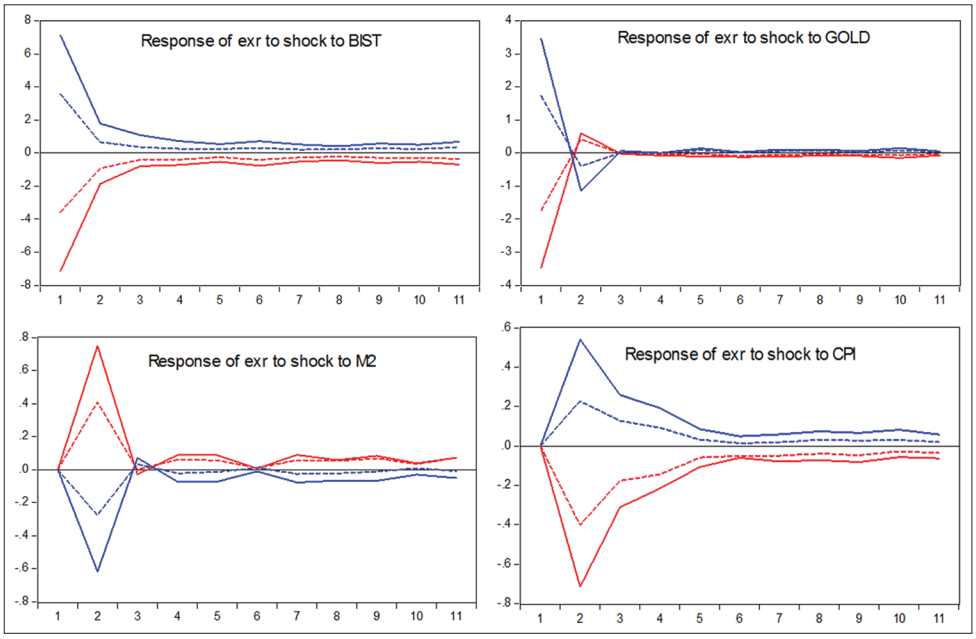


Figure 3: Responses of gold variable

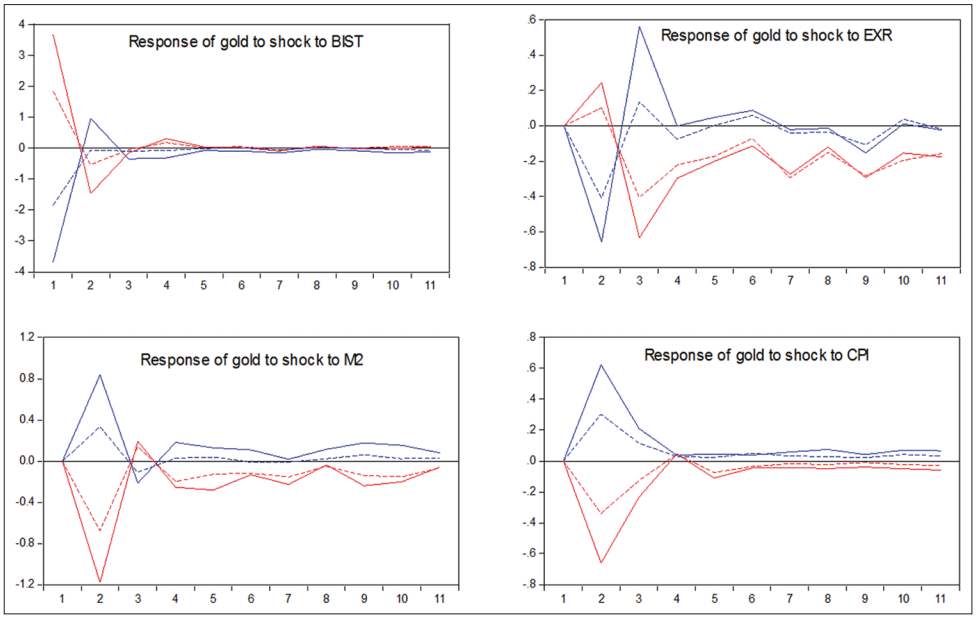


Table 1: Unit root tests

Factors	KPSS	ADF	PP	Caner-Hansen BTT (P) (lag)
EXR	0.37 (2)	−11.66 (0)	−11.65 (2)	27.32 (0.00) (5)
BIST	0.19 (2)	−13.56 (0)	−13.55 (2)	27.17 (0.0)(5)
GOLD	0.458 (3)	−14.91 (0)	−14.91 (0)	29.23 (0.05)(5)
M2	0.54 (4)	−13.69 (0)	−13.68 (4)	275.7 (0.02) (10)
CPI	0.15 (37)	−5.08 (13)	−16.02 (90)	32.34 (0.0) (5)

The numbers in ( ) denotes the selected lag length. The critical values for KPSS test for significance level 10%, 5% and 1% are, 0.347, 0.463, 0.739. The critical values for ADF and PP test for significance level 10%, 5% and 1% are, −2.576, −2.879, −3.471. Newey West and Bartlett Kernel are used for selecting the lag length in KPSS and PP test. BTT used for Caner and Hansen (2001) Bootstrap Threshold Test

gold and exchange rates leads to similar responses of M2. Both positive and negative shocks leads to bidirectional response and these responses fade nearly in the third period.

Figure 5 shows the response of CPI for the given shocks to other variables. A positive shock to gold prices, money supply and BIST leads to a negative impact on CPI but this impact leads to stabilization response in later periods. The opposite of this type response is also valid for shocks on gold and M2 but a negative shock to BIST leads to great amount of response to CPI. Positive and negative shocks to exchange rate leads to bidirectional and shorter effect on CPI.

5. CONCLUSION

This study aims to analyze the relationship between selected monetary variables as such stock market index, exchange rates, gold price, money supply and CPI. The interrelation among these variables is analyzed using TVAR model. This model is chosen

Figure 4: Responses of M2 variable

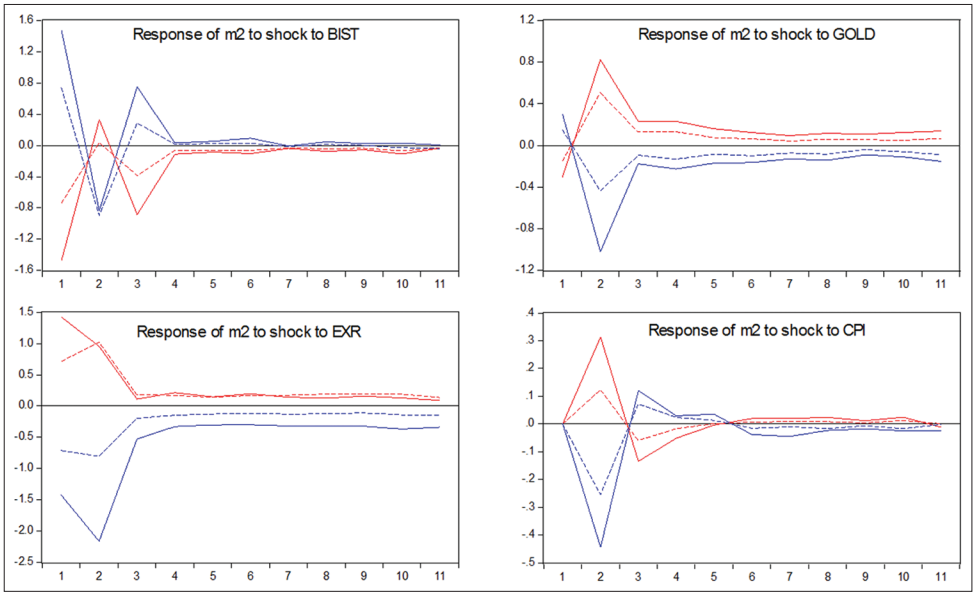
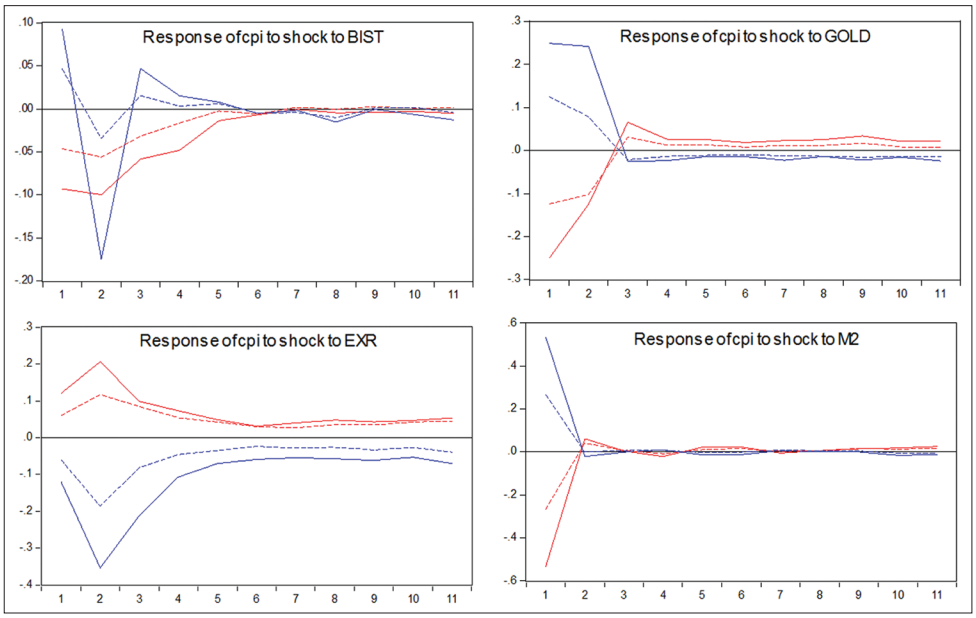


Figure 5: Responses of consumer price index variable



by employing a test for nonlinear structure of these variables for the period of 2003–2017. The estimation technique TVAR also gives us the opportunity of selecting a threshold variable which dominates the relations between these variables.

We select the exchange rate variable as the threshold variable. Selecting exchange rate as threshold variable helps us to understand the interrelations between these variables for specific values of TL/USD level. The estimated model describes the transmission mechanism of exchange rate level on monetary variables and BIST for the period of 2003–2017 for Turkey. Estimated threshold level for the system in this period is 3.35TL/USD. One of the most important implications of this study is expressing the different interrelations of macroeconomic variables in various regimes. For instance, the effects of M2, exchange rate and CPI on BIST have different effects in different regimes. Furthermore, the effect of gold on BİST is negative in both regimes but the size of this effect is different. Similarly, M2 have different effects on gold prices in different regimes. For money supply CPI and BIST have different effects and exchange rate and gold prices have also different effects on CPI. All these impacts are valid when we take the levels of exchange rate into account. Especially for the emerging markets the level of exchange rate is important but this study shows the effect of the exchange rate on macroeconomic variables for different levels. This system of equation puts forth the opposite effects of the level of exchange rate.

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