Assessing the Effect of Demand, Monetary Policy and Exchange Rate Shocks on Economic Growth in Turkey

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Abstract

The effects of exchange rate shock, monetary policy shock and demand shock on economic growth is investigated in Turkish Economy for the period from 2005:M1 to 2015M10. Monthly data is used in the analysis. Results of the empirical tests prove that the growth in Turkey is associated with the exchange rate shocks, monetary policy shocks and demand shocks respectively in a decreasing scale. The policies such as volatile exchange rate policy and inflation targeting are also considerable in the period.

Keywords: Exchange Rate Shock, Monetary Policy Shock, Demand Shock, Structural VAR
JEL Classifications: E32, E52, F41

1. Introduction

Economic growth and the determinants of the growth are on the top of economical discussions in Turkey. The economic growth rate can be considered as the main determinant of the macroeconomic stability. Policies that support and lead the economic growth mostly focus on the structural reforms. To identify the determinants of economic growth is crucial in terms of increasing the efficiency of the policies. Even though there are many policies offered and implemented in the Turkish economy, economic growth is less than targeted and that fact makes the those policies questioned. That reality proves the necessity to identify the dynamics of the growth for policy makers. In our analysis, to identify the determinants and the intensity of those determinants of the growth, long term structural vector auto regression analysis is employed as it is very common in the literature. This study focus on the period from 2005:M1 to 2015M10. Data collected starts from 2005 according to the fact that inflation targeting policy started from 2005. We will focus on the determinants of the growth under inflation targeting policy. According to empirical results of the study, the policies targeting economic growth and their influences will be analyzed and some policy statements will be offered to policy makers.

In the second part of the study literature review will be investigated. Third part will give information about the methodology and in the last part the results of the empirical tests will be analyzed.

2. Literature Review

The studies that investigated the effects of the monetary policy on GDP can be classified in few headlines. Önder (2005), Çetin and Çetin (2007), Oktar and Dalyancı (2012) focused on the central bank independency and the policy instruments. Monetary policy shocks were studied by Çiçek (2005), expected and unexpected results of monetary shocks by Peker (2007), Aktaş et. al. (2009), Demiralp and Yılmaz (2010). They underline the fact that even monetary policy is a significant determinant of the GDP, during the crises periods it is

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less effective. According to Çiçek (2005) investment and foreign trade are the variables that are affected by monetary policy. Monetary policy instruments such as commodity prices and exchange rate increases the efficiency of the monetary policy on the GDP. Moreover, Aktaş et. al. (2009) studies more specifically and proves the relation between policy interest rate on bond and securities, and they argue that policy interest rate has no effect on stock market. Oppositely, Demiralp and Yılmaz (2010) argue that stock markets are affected from the interest rates from period to period. Peker (2007) in his conclusions supports Keynesian theory in terms of the relation between the output and the monetary policy instruments. Even there are many papers in this field; none of them focus on the causality relation from exchange rate parity and demand shocks to economic growth. Studies mostly investigated the effects of exchange rate on interest rate, (Karacan, 2010, Şimsek ve Kadılar 2006) import and export (Kar and Tatlıöz, 2008, Kansu ve Baydur, 2008) and investments (Sever et. al., 2008, Pazarlıoğlu and Günay, 2007). Empirical studies that questions the relation between inflation and economic growth mostly describes a negative relation (Çetin, 2004, Taban, 2008, Nas ve Perry, 2001). Those studies mainly accept the thesis that; the unexpected movements on inflation disturb the price mechanism and that will result the economic growth in a negative way. The relation between the inflation and the economic growth is not significant according to Bruno and Easterly (1998) in the long term, but there might be a negative significant relation between the variables in the short term, especially during the crises periods that are caused by high inflation.

3. Methodology

Blanchard and Quah (1989) and also Beveridge and Nelson (1981) assumes the long term effect of the shocks on the variables can be ignored or zero. According to that assumption, the VAR model;

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + u_t \quad (1)$$

In the model Y_t 4x1 is the variable $(IPI_t, CPI_t, INT_t, REER_t)$ vector at time t. Due to the fact that our main test depends on a VAR model; all variables are expected to be stationary. In the A_i matrix, KxK strands for constant variable vector, p optimal lag length, u_t is the error term that are couched 4x1 format and with zero mean and the covariance matrix of the error terms are described as: $E(u_t u_t') = \sum u$. According to Breitung et al. (2004) error term u_t occur as a combination of the structural shocks (ε_t).

$$u_t = A^{-1} B \varepsilon_t \quad (2)$$

if u_t in the reduced form VAR will be replaced with the equation above,

$$AY_t = A_1^* Y_{t-1} + A_2^* Y_{t-2} + \ldots + A_p^* Y_{t-p} + B\varepsilon_t \quad (3)$$

In the model above, A_j^* stands for a 4x4 matrix considering j=1,2,…p, $(\varepsilon_t \sim 0, I_K)$ is a 4x1 unexpected structural shocks matrix. Structural shocks matrix in the model are described as : $\varepsilon_t = [\varepsilon_t^{IPI} \varepsilon_t^{CPI} \varepsilon_t^{INT} \varepsilon_t^{REER}]$. SVAR model will be as;

$$Au_t = B\varepsilon_t \quad (4)$$

If it is supposed that $B=I_K$ is the unit matrix, then the shocks will occur from the structural part, that is matrix A. If $A=I_K$ condition will exist, the shocks will result from VAR. Finally,

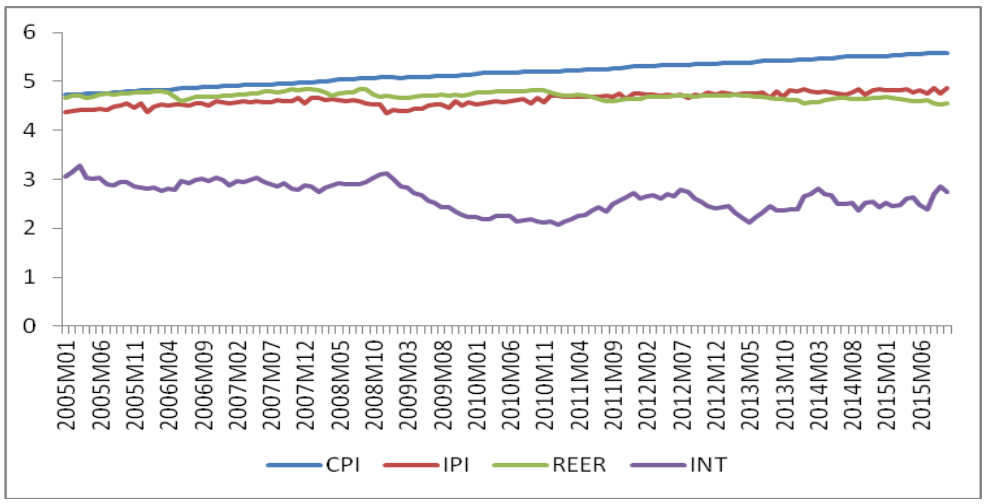
if the situation is as; $Au_t = B\varepsilon_t$ then restrictions will be available for both parts. In the long term SVAR model, restrictions can be applied to only A matrix, that is the structural part. Structural A matrix can be defined as;

$$\begin{array}{c} \\ IPI \\ CPI \\ INT \\ REER \end{array} \begin{array}{c} \begin{array}{cccc} IPI & CPI & INT & REER \end{array} \\ \begin{bmatrix} C(1) & 0 & 0 & 0 \\ C(2) & C(5) & 0 & 0 \\ C(3) & C(6) & C(8) & 0 \\ C(4) & C(7) & C(9) & C(10) \end{bmatrix} \end{array} \quad (5)$$

4. Empirical Findings

When considering the variables for the analysis, Peersman (2002) is followed. Instead of GDP Industry Production Index (IPI) is used as a proxy variable in the model. Other variables in the model are; Real Exchange rate (REER), Short Term Nominal Interest Rate (INT) that represent the Central Bank monetary policy and Consumer Price Index (CPI). The period in the analysis is from 2005:M1 to 2015M10. All data was gathered from the International Finance Statistics (IFS) that is announced by International Money Fund (IMF). The data in the analysis starts from the date that Turkish Central Bank launched the open inflation targeting policy. In order to avoid variance problem, natural logarithms of the all variables were taken and considered in the model. Seasonality problem is eliminated via Moving Average Method.

Graph 1. The Variables in Monthly Data



The monthly data belong to CPI, IPI, REER, INT are shown in the Graph-1 above. The Consumer Price Index (CPI) that represents the demand shock effects has a growing trend in the selected period. The trend in CPI also can be considered as a sign of the inflation persistence. Industrial Production Index (IPI) that represents the supply shocks in the model and the Real Exchange Rate (REER) has a comparatively more volatile trend in a parallel tight band. The most volatile variable in the model is the Interest Rate (INT) that represents the monetary policy shocks. INT variable has a decreasing trend after September 2008 due to the world crises and that decrease was parallel to most of the EU economies. The decreasing trend ends after November 2010.

Table 1: Descriptive Statistics of the Variables

	Mean	Max	Min	Standard Deviation	Skewness	Kurtosis	Jarque-Bera
IPI	4.634	4.873	4.361	0.128	-0.219	2.137	5.078 (0.078)
INT	2.636	3.281	2.082	0.292	0.145	1.903	6.975 (0.030)
CPI	5.168	5.585	4.737	0.246	-0.066	1.877	6.916 (0.031)
REER	4.706	4.848	4.518	0.070	-0.107	2.655	0.855 (0.651)

Note: Values within the parenthesis are the probability values

According to the descriptive statistics the biggest standard deviation ratio belongs to interest rate, as it was commented in Graph 1. On the other hand, if the skewness ration that shows the asymmetry in probability distribution of the sample is taken into consideration, all variables but tended to the left but the interest rate. The Kurtosis ratio is also meaningful and all variables behave in the same direction and they are leptokurtic. According to Jarque-Bera test null hypothesis is accepted in %10 significance level for IPI, for INT and CPI again null hypothesis is accepted in %5 significance level and rejected for REER. Only REER does not have a normal distribution. VAR (vector auto regression) will be employed in order to investigate the dynamic relations among the variables. Before VAR analysis, all the variables should be checked if they are stationary. Dickey-Fuller (1981, ADF) and Phillips-Perron (1988, PP) unit root tests that ignore structural breaks will be implied for that purpose.

Table 2. ADF (1979, 1981) and PP (1988) Unit Root Test Results

		Variables	ADF	PP		*Variables*	ADF	PP
Levels	*Constant*	**IPI**	-1.551 (1) [0.504]	-2.140 (4) [0.229]	*First Differences*	**IPI**	-24.835 (0) [0.00]***	-25.401 (4) [0.00] ***
		INT	-2.036 (0) [0.270]	-2.036 (0) [0.270]		**INT**	-11.112 (0) [0.00] ***	-11.110 (2) [0.00] ***
		CPI	-0.548 (0) [0.876]	-0.589 (10) [0.867]		**CPI**	-10.106 (0) [0.00] ***	-10.196 (12) [0.00] ***
		REER	-2.610 (1) [0.093]*	-1.993 (1) [0.289]		**REER**	-8.727 (1) [0.00] ***	-8.199 (8) [0.00] ***
	Constant +Trend	**IPI**	-2.645 (1) [0.261]	-6.283 (7) [0.00]***		**IPI**	-24.745 (0) [0.00] ***	-25.334 (4) [0.00] ***
		INT	-1.852 (0) [0.673]	-1.895 (1) [0.651]		**INT**	-11.168 (0) [0.00] ***	-11.178 (3) [0.00] ***
		CPI	-2.574 (0) [0.292]	-2.733 (5) [0.225]		**CPI**	-10.088 (0) [0.00] ***	-10.380 (13) [0.00] ***
		REER	-3.699 (1) [0.025]**	-3.152 (2) [0.099]*		**REER**	-8.761 (1) [0.00] ***	-8.170 (9) [0.00] ***

Notes: The figures in parenthesis denote the lag length selected by the Schwarz criterion. ***, **, and * denote statistical significance at the 1%, 5% and 10% level of significance, respectively. Values within the brackets shows the probability ratios. For the ADF test: The results of Dickey Fuller test in the case of zero lag length and lag length chosen due to SIC criteria. For the ADF test, the Mac Kinnon(1996) critical values for with constant -.3.485, -2.885 at the 1 %, and 5 % levels. The critical values for with constant and trend -4.035, -3.447 at the 1 % and 5 % levels, respectively. For the PP test: Values in the parenthesis show bandwidths obtained according to Newey-West using Bartlett Kernel criteria. For the PP test Mac Kinnon (1996) critical values for with constant -3.483, -2.884 at the 1 % and 5 % levels. The critical values for with constant and trend -4.033, -3.446 at the 1 % and 5 % levels, respectively.

According to Dickey-Fuller (1981) and Philllips ve Perron (1988) test results none of the variables are stationary in the level. If the first differences of the variables are considered,

both of the tests approve that variables are stationary in all cases. To continue with SVAR analysis, the first differences of the variables will be considered. While designing the SVAR model, trend variable and seasonality dummies are implicated. The mentioned trend variable and dummies are expected to result with more robust outputs in the test. In the SVAR model the optimal lag length that overcomes autocorrelation is calculated as 4.

Table 3. Long Term Structural VAR Test Results (SVAR)

	IPI	CPI	INT	REER
Supply Shock	C(1) 0.028491 (0.000)***	0	0	0
Demand Shock	C(2) 0.000710 (0.091)*	C(5) 0.004679 (0.000)***	0	0
Monetary Policy Shock	C(3) -0.019479 (0.014)**	C(6) 0.017371 (0.025)**	C(8) 0.086270 (0.000)***	0
Exchange Rate Shock	C(4) 0.014115 (0.000)***	C(7) -0.003152 (0.2148)	C(9) -0.016956 (0.000)***	C(10) 0.022683 (0.000)***

Notes: ***.** and * represent %1, %5 and %10 significance levels if the series are significant statistically.

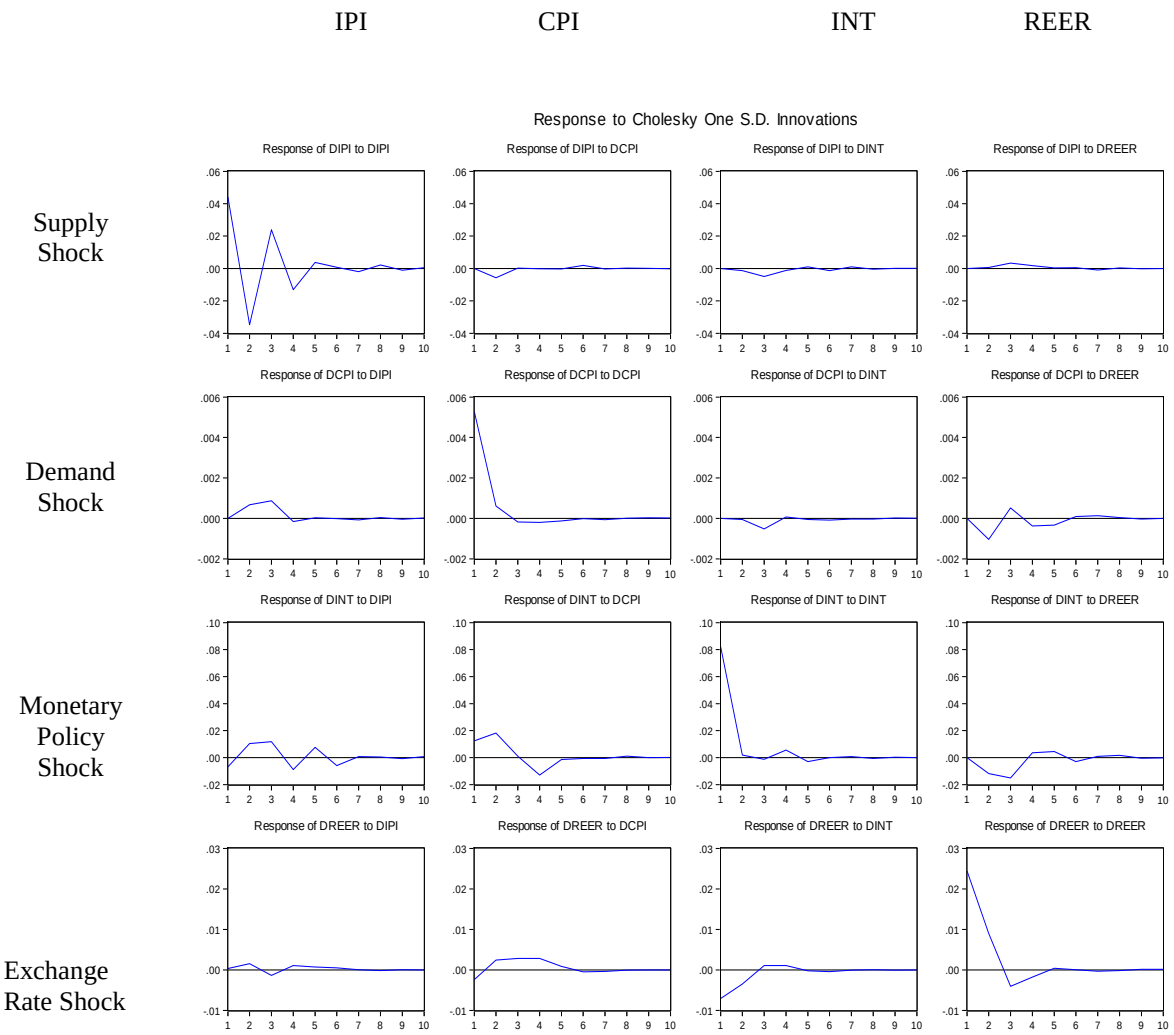
Coefficients in the table describes the followings; C(1)= 0.028491 supply shocks, C(2)=0.000710 demand shocks, C(3)= -0.019479 monetary policy shocks and C(4)=0.014115 exchange rate shocks. Exchange rate shocks and demand shocks results as a growth in the economy. On the other hand, monetary policy shock in the economy has a negative effect on economic growth. As before mentioned economic growth is represented via industry production index. Among the variables the strongest determinant of the industry production index is monetary policy shocks and the weakest is demand shocks. Monetary policy shocks as the most important variable in the model has a negative effect on economic growth.

According to Oktar and Dalyancı (2012) the decrease in the interest rate results in a capital outflow in the short run and the national currency depreciates. That will result in an increase in exports and decrease in imports; this situation will lead to economic growth. About the exchange rate, it will be fair to reference J curve hypothesis that also explains the exchange rate export relation in a parallel way. The fact that the coefficient values decreases starting from exchange rate shocks will affect the economic growth in a decreasing scale. That situation can be considered as the priority of the central bank is price stability; not economic growth. This hypothesis is also proved with the fact that central bank follows inflation targeting rule.

The fact that there is a negative correlation between monetary policy shocks and supply shocks make us remember the finding out of Rhee and Rich (1995) that underlines the asymmetric relation between the output and the price level. That assumption results in a situation that contractionary monetary policies are more efficient compared to expansionary monetary policies. The effect of the monetary policies on the inflation is another subject and in the table above Coefficient C(6)=0.017371 explains the effect of the monetary policy shocks on consumer price index. In the literature many papers argue that there is a negative relation between the inflation and the growth rates. In our model the coefficient that is related to that relation is C(2)=0.000710 and it is positive. Dotsey and Sarte (2000) explains that case in cash in advance model. The increase in monetary base will lead to uncertainty in inflation rates and that will cause an uncertainty on the expected return rates on money. The decrease in the real money demand will lead to a decrease in the consumption that will increase the

savings. Then the savings will trigger the investments and the economy will grow via that mechanism.

Graphic 2. Impulse-Response Function of SVAR Model



A shock arises from exchange rate results as a negative effect on monetary policy and total demand. Monetary policy shock has a negative influence in economic growth and has a positive influence on total demand and exchange rate. Among these mentioned shocks, the longest effect is from monetary policy to total demand and last in 3 months. According to Sims and Zha (2006) and Peersman (2002) monetary authorities can monitor the exchange rate and interest rates instantly but consumer price index and industry production index are monitored in a postponed term.

When graph 2 is considered as a whole, the first shock in the system is exchange rate shock. The policy or motto that Central Bank follows in order to decrease the volatility is to change the interest rates and that mechanism states the flow from exchange rate shocks to monetary policy shocks. Moreover, Peersman (2002) states that the changes in the inflation expectations forces central banks to adopt the interest rates. Fisher Effect (1930) explains the causality from monetary policy shocks to demand shocks. On the other hand Berument (2007) argues that the effects of exchange rate shocks and the price index shocks are

permanent but the output shocks are temporary. Peng (1995), MacDonald and Murpy (1989), Dutt and Ghosh (1995) argues that the volatile exchange rate regime and the other anti-inflation policies weakens the relation between monetary policy and the price index.

The separation among the asymmetries such as expected and unexpected, condition asymmetry, positive or negative asymmetry adds value on the empirical researches especially in terms of policy suggestions. (Castillo, Monotoro, 2008). According to Graph 2 the first shock in the system is exchange rate shock. The fact that exchange rate shock generally occur as external shocks, they can be defined as unexpected shocks. Such unexpected shocks has an effect on the output in the short run but in the long run that effect is not valid anymore.

5. Conclusion and Policy Implications

The fact that Turkish economy experienced chronical inflation and unsustainable growth problems for long decades, open inflation targeting, as a monetary policy, was implied starting from 2005 in Turkey in order to get over such problems. In this research, the effects of demand, exchange rate and monetary policy shocks on economic growth were questioned for the period after open inflation targeting policy up to day. Augmented Dickey-Fuller (1981) unit root test and Blanchard and Quah (1989) long term structural vector auto regression methods are employed. According to unit test results, the variables have unit roots in the level. To continue with the structural vector auto regression model, the first differences of the variables are considered in the model. The employed test, Structural vector auto regression method suggests outputs for both the co-integration among the variables and the reasons of the shocks.

According to the test results, Economic growth is mainly affected from the exchange rate shocks, monetary policy shocks and demand shocks in a decreasing order. In the selected period, inflation targeting that aims the price stability does not have significant effects on economic growth. There are three main outcomes from the test results. First; the price stability eliminated the effect of the inflation on economic growth. Also the facts that demand shocks do not have a significant effect on supply shocks can be considered as a success of inflation targeting. Secondly, the shock on monetary policy has a negative effect on supply shocks. Lastly the exchange rate shocks that are considered as external shocks has a positive effect on the supply shocks with respect to J curve hypothesis.

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