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12 May 2014

ON THE RELATIVE IMPORTANCE OF MONETARY TRANSMISSION CHANNELS

IN TURKEY

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Abstract

The main objective of this study is to provide additional evidence on the operation and relative importance of monetary transmission channels in Turkey. The results of the VAR analysis conducted using monthly data between January 2004 and November 2013 suggest that the traditional channels of interest rates, exchange rates, and credit do work in Turkish economy. However, the most striking finding of the study is the relative importance of exchange rate channel in the transmission of monetary policy decision into real economy. Variance decomposition analysis shows that the explained variance by real effective exchange rates is higher for all variables as compared to the variance explained by interest rates. However, interest rates seem to be still a useful tool to manage monetary policy given its role in controlling the changes in exchange rates. The granger causality analysis points into the fact that while interest rates have a role in leading the volatility of exchange rates, exchange rates have an impact on foreign debt holdings of banks and credit growth. On the other hand, foreign debt positions of banks and other sector firms together with credit growth granger causes industrial production. The study has some remarkable ramifications in terms of monetary policy design.

Keywords: Monetary transmission mechanism, monetary policy, interest rate channel, exchange rate channel.

Introduction

There is an ongoing and lively debate on optimal monetary policy since Friedman's well-known article on monetary policy was first published in 1970 (Taylor, 1995). From that time until today, a bulk of both theoretical and empirical research has massed concerning the optimal deployment of monetary policy tools to intervene with the general developments in macroeconomic environment. Although there are some

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remarkable differences among mainstream approaches to the issue, it is commonly accepted that monetary policy has an impact on aggregate macroeconomic outcome at least in the short run. [3] In accordance with this argument, the mechanism through which monetary policy decisions are transmitted into the realm of economic activities is still of great economic interest. Generally, the conventional transmission mechanisms proposed by the literature can be listed as the interest rate channel, exchange rate channel, the asset prices channel, and the credit channel (Mishkin, 1995).

Being the main conventional channel of monetary transmission, the interest channel works in the following way. As the real money supply increases (decreases), real interest rates will go down (up) boosting (decelerating) investment expenditures within an economy. Consequently, the aggregate outcome will rise (fall). On the other hand, the exchange rate channel has also a role in the process of affecting macroeconomic outcomes through monetary policy tools. Accordingly, as real money balances increase (decrease), interest rates will drop (rise) resulting in depreciation in the value of local currency so that foreign demand on domestic goods and hence the aggregate demand goes up (down). Given the intermediary role of bank lending for the development of economy, credit channel has also a significant stake in the transmission of monetary policy decisions into real economic activity. An expansionary (contractionary) monetary policy might result in the increased (decreased) amount bank deposits and a corresponding increase (decrease) in the amount of loans provided by banking sector. In this way investment expenditures and aggregate output will go up (down). A second explanation for the operation of credit channel is that an expansionary monetary policy will increase (decrease) the prices of assets that are used as collateral for loans. Accordingly, risks associated with adverse selection, moral hazard, and financial distress will decrease (increase) so that banking sector starts to lend more to both households and firms. As a result consumption, investment, and aggregate demand will boost (decelerate). Finally, a fourth channel is the asset prices channel the operation of which can be explained by referring to either the concept of Tobin's q or to the wealth effect on consumption. An increase (decrease) in money supply will lead corresponding decrease (increase) in the replacement cost of capital for firms relative to their market values. Correspondingly, the firms will be induced to issue more (less) capital and undertake (not undertake) new investment projects that will result in an increase (decrease) in investment spending. So, there will be an increase (decrease) in the final output. Alternatively an increase (decrease) in money supply will lead to an increase (decrease) in asset prices so that the real wealth of household that keeps those assets in their portfolios increase (decrease). This will result in rising (falling) amount of consumption spending and aggregate demand.

The results of the empirical research on monetary transmission mechanism display that the conventional channels proposed by main stream economics do work given across country macroeconomic developments. However, what differs in that empirical research is the relative importance of monetary transmission channels in transmitting monetary policy decisions into final output and general price level.

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[3] For a detailed discussion on mopnetary policy, please refer to Parasız (2000)

While interest rate channel is found to the most effective channel in several studies, bank lending channel is usually found to be at least as important as interest rate channel especially in countries with highly developed financial institutions and markets. In the case of asset price channels, while most of the studies focusing on countries with developed capital markets find remarkable evidence on the efficacy of asset price channel, very little amount of research has been done for emerging markets given the rather bank-based financial systems and less efficient capital markets in these countries.

Especially in the case of emerging markets, increasing number of studies focus on the effectiveness of foreign exchange channel on general macroeconomic outcomes. In addition to analyzing the effects of foreign exchange channel through trade relations among countries, the impacts of capital flows to those emerging markets have been gaining greater interest. According to International Monetary Fund (IMF) and the Institute of International Finance (IIF) data, over the last two decades, the amount of capital flowing into emerging markets has increased from almost zero levels to more than one trillion USD as of 2013. Especially, during early years of 2000s until 2007 and after 2008 global financial crisis, with the quantitative easing policies of the central banks in developed economies, the speed of capital placed into emerging market economies have boosted to historically high levels (Turhan, 2010). This accelerated integration with international capital markets have been making emerging markets much more prone to the risks associated with any possible reversals in the direction of the flows and in fact, what is happening since the FED's announcement of its tapering strategy in 22 May 2013 seems to be a realization of that risk.

An important side effect of this high level of global integration of emerging economies through capital flow channel has been related to the operation of exchange rate channel. With increasing amount of foreign liability balances held by emerging market banks and private sector companies, sustaining exchange rate stability has been gaining importance as a prior agenda item for authorities shaping the monetary policy framework.

Turkey, as one of the most remarkable emerging market economies with high degree of global integration, passed through a successful decade of macroeconomic development, price stability, and financial resilience. The country has grown by 5 percent on average annually in real terms with decreasing inflation and interest rates into one-digit levels. Given the structural reforms taking place in public sector and decreased fiscal dominance, the growth of the economy has mainly led by the initiative of private sector investments that are usually financed directly through foreign borrowing or through banking sector that has also got the opportunity to access global financial markets and to enjoy more favorable conditions thanks to decreased borrowing needs of public sector and increased credibility of the country (Kenç, Turhan, and Yıldırım, 2011). These opportunities however came at a cost. With increased net foreign currency debt positions both Turkish banking sector and private firms became more vulnerable to the excess volatilities that might emerge interest rates.

The underlying motive of this study is to investigate whether the rising foreign debt holdings of Turkish banking sector and private firms have any implications for the operation of monetary transmission mechanism. Generally, studies on monetary transmission mechanism in Turkey highlight the importance of traditional interest rate channel and bank lending channel and there is little evidence concerning the efficacy of exchange rate channel by referring to capital flows (Basci, et al, 2007; Brooks, 2007). Indeed, this study aims to fill this gap. By focusing on relative importance of various transmission channels, the study provides empirical evidence supporting the hypothesis that foreign exchange channel and the stability of exchange rate has been playing a significant role in the transmission of monetary policy decision into real outcomes.

The study is organized as follows; the first part introduces a literature review on the basic notions of monetary transmission mechanism and on the empirical studies conducted to investigate the operation of monetary transmission in developed and emerging market economies including Turkey. The second part provides a brief summary of the developments in Turkish economy during the last decade upon which the basic arguments of the study are built. The third chapter investigates the contribution of various monetary transmission channels to the explanation of the changes in industrial production and inflation via a Vector Auto Regression (VAR) model for the monthly data between January 2004 and November 2013. Finally, the last chapter concludes the study with the analysis of basic results and policy implications.

I. Review of the Literature on Monetary Transmission Mechanism

Literature on the operation of monetary transmission might be analyzed based on a developed versus emerging market classification. The main reason for such a classification is the level of financial system development, especially the development of capital markets. Considering the empirical work done on developed markets, the studies usually result in that the four main channels of monetary transmission, namely the interest rate channel, credit channel, foreign exchange channel and asset prices channel. (Bernanke and Gertner, 1995; Taylor, 1995; Perez, 1998; Barth and Ramey, 2001; Morsink and Bayoumi, 2001; Fuertes, et al, 2010; Fratzsher, 2008; Ciccarelli, et al, 2013).

On the other hand the literature on the monetary transmission mechanism in emerging markets proposes mixed results concerning the efficacy and relative importance of various channels. For insatance Tahir (2012) provides evidence on the relative effectiveness of various monetary transmission channels in Brazil, Chile and Korea suggesting the relatively higher importance of exchange rate and share prices channels over conventional interest rate and credit channels for industrial production. Montes and Machado (2013) highlight the increased importance of credit channel and credibility on monetary transmission in Brazil. Fan and Jianzhou (2011) investigate the monetary transmission mechanism in China concluding that bank lending has been the leading channel of monetary transmission while the roles of interest and exchange rate channels have improved and the role of asset prices channel has lost its efficacy after 2001. Palakkeel (2007) analyzes the dynamics of monetary transmission mechanism in India stating that the wealth adjustments of households and other economic agents can help in explaining the operation of monetary

transmission. Son, et al (2010) points into the increased importance of spillovers from international capital markets channel in explaining the operation of monetary transmission mechanism in Korea. Tai, et al (2012) using data concerning seven Asian countries finds that the interest rate pass-through to retail banking activities is rather slower in most of the countries except Malaysia displaying the rather less efficient markets in those countries and lower degree of integration among them. Loo and Poon (2003) compare the relative efficacy of monetary transmission channels in Malaysia and find that credit channel is the leading channel followed by exchange rate and interest rate channels. On the other hand, the asset prices channel is found to be the least effective one. Ogbulu and Torbira (2012) analyze the monetary transmission in Nigeria finding effective bank lending channel. Bonga-Bonga (2010) shows the operation of interest rate channel, in South Africa, while Abdel-Baki (2010) provides evidence on the increased efficacy of interest and exchange rate channels in Egypt after the implementation of banking sector reforms. Mukherjee and Bhattacharya (2011) take a different perspective and investigate the relationship between financial development and the efficacy of monetary transmission mechanism through interest rate channel. In emerging markets that implement inflation targeting, financial development is found to have significant negative impact on the interest rates elasticity of private consumption while no significant impact is detected on the interest rate elasticity of investment. On the other hand, in MENA countries planning inflation targeting, financial development has a positive impact on the interest rate elasticities of both private consumption and investment. Finally, Mohanthy and Turner (2008) elaborate on the development of monetary transmission mechanism in 24 emerging market countries summarizing the common macroeconomic trends in these countries between 1998 and 2008. Accordingly, reduced fiscal dominance, inflation, increased central bank independency, greater global integration and strengthened interest rate channel are found to be some major tendencies observed in emerging markets.

As respect with the transmission mechanism in Turkey, Başçı, et al (2007) displays that the efficacy of monetary transmission mechanism has improved after the reforms following 2001 economic crisis. The study also point into the significance of EU accession process for long-term capital flows and increased efficacy in monetary policy due to inflation targeting and lessened fiscal dominance. Brooks (2007) empirically explains that banking sector in Turkey can mediate the impacts of monetary policy through adjustments in liquidity positions. Özşuca (2012) provides a detailed description of bank lending channel in Turkey since the first liberalization of the capital account in 1988. The study concludes that banking channel worked well in Turkey with an increased efficacy after the structural reforms being established following 2001 crisis. Erdoğan and Yıldırım (2008 and 2010), Erdoğan and Beşballı (2009) provide evidence on the operation of exchange rate, interest rate, and credit channel in Turkey.

Studies summarized above point into the fact that traditional channels of monetary transmission mechanism does to a large extent work in both developed and emerging market countries. One important issue is the increased global integration of emerging markets and associated increase in the efficacy of exchange rate channel not only due to the increased trade relations but also given the accelerated amount of

capital flows to those countries. In Turkish case, there is an obvious need for analyzing empirical evidence on the relative importance of monetary transmission channels by referring to the boosted global integration and increased capital flows so that the changing nature of monetary transmission is understood more properly and necessary policy implications are extracted.

II. Background: Accelerated Global integration of Turkish Economy during the Last Decade

After the deteriorating experience of 2001 crisis Turkish economy has passed through a period of structural reforms during the last decade. Strongly supported by the relatively stable political environment and EU accession process both public and banking sector has been restructured together with the strengthened central bank independency. The impact of implemented fiscal and monetary policies has been reflected on the growth of final output (Turhan, 2008). Total GDP has grown by 5% on average from 2004 to the second quarter of 2013. Following a similar trend industrial production has gone up by 5.1% on average during the same period. With the exception of global financial crisis period, Turkish economy has been able to generate positive growth rates on each year between 2004 and 2013 (Graph 1).

Graph 1: Quarterly Growth Rates and Change in Industrial Production Index (YoY, %)
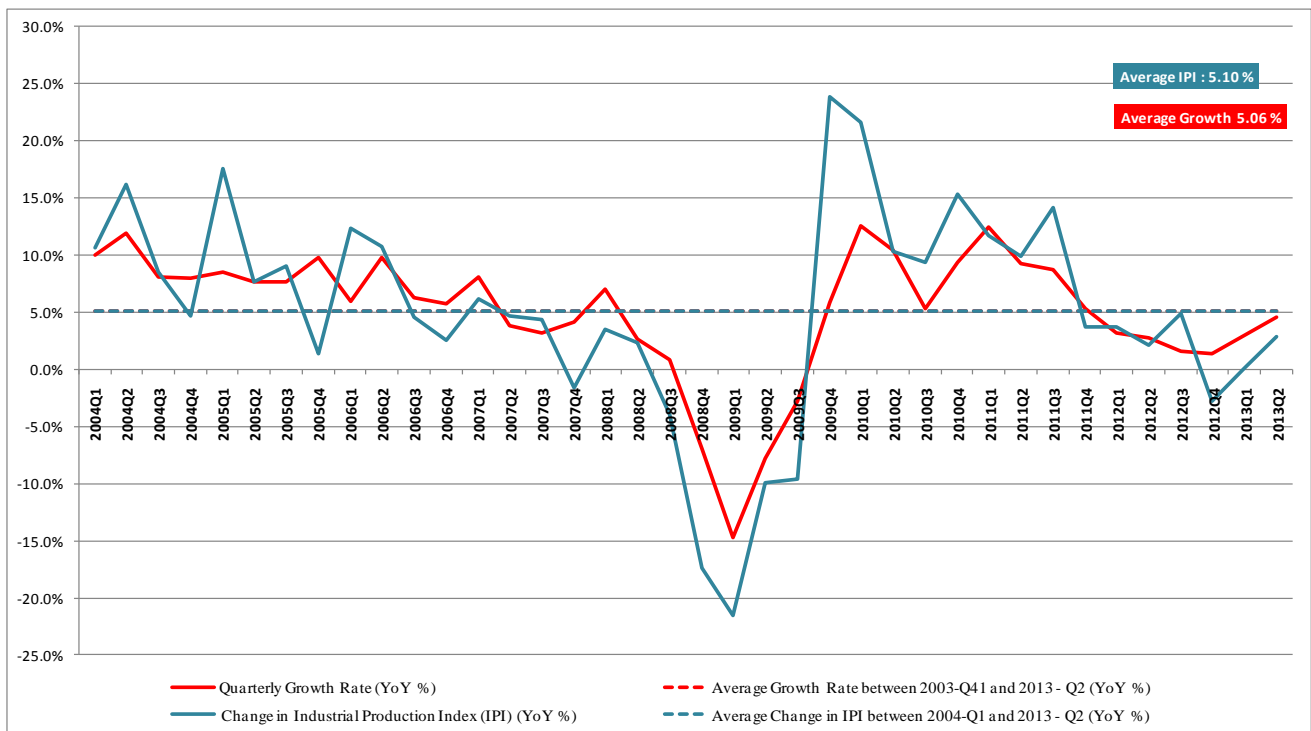
Source: TSI

As regard to the components of GDP, the household consumption has accounted for 70% of total GDP on average for the period covering 2004 to 2013. However, there is a remarkable point here. While the ratio of household consumption to GDP was over 70% before the global financial crisis, it has dropped to around 67% level after the crisis. Physical capital investments made after 2010 seem to be one of the main reasons underlying this change. The ratio of physical capital investments to total GDP was around 23%

before the crisis. During the global crisis period, the ratio of total physical capacity investments to GDP increased to above 24% levels. As of the end of the third quarter of 2013, the share of total physical capital investments was nearly 25%. Observing the fact that proportion of the publicly made physical capital investments remained relatively fixed at around 3.5% level, the private sector investments account more than 80% of all physical capacity expenditures. On the other hand, net exports' contribution to overall GDP has been negative at around 2.8% level on average between 2004 and 2013 (Graph 2).

Graph 2: Composition of GDP by Major Expenditure Items
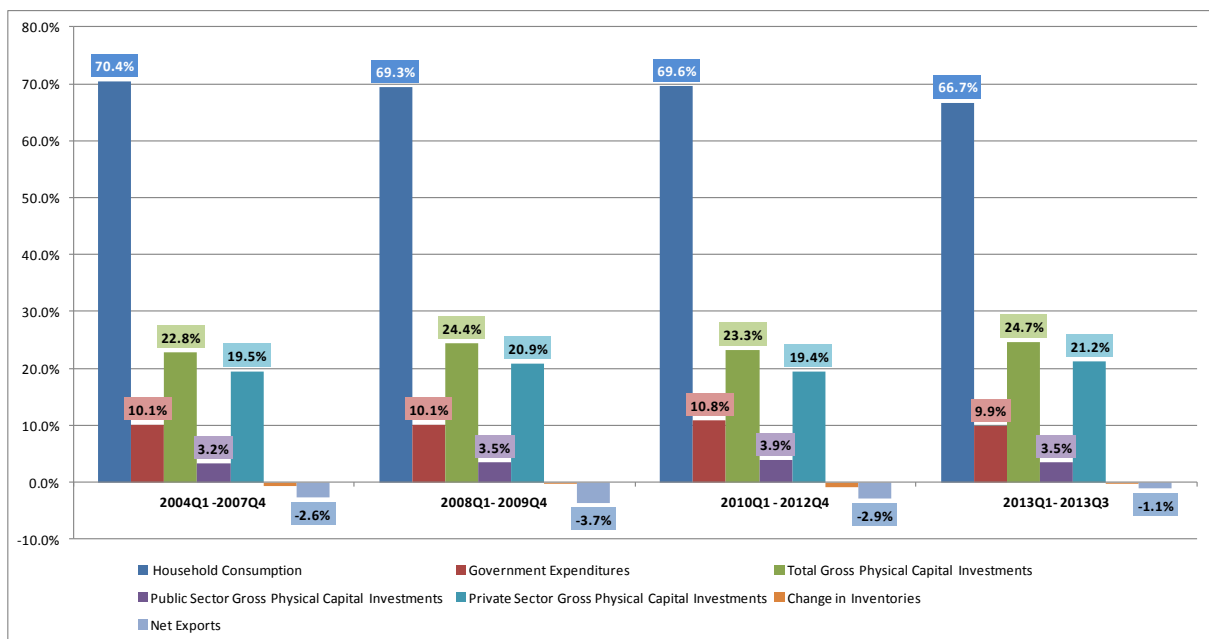
Source: CBRT

One of the main basic elements of this private sector based growth was the accelerated global integration of Turkish economy and success in using the opportunities provided by global liquidity conditions. Both short term portfolio investments and long term direct investments together with private sector and banking sector borrowing abroad contributed to the performance of Turkish economy during the last decade. Portfolio investments towards Turkey have also accelerated after 2004 growing from 9.4 USD billions to about 38 USD billions as of 2012 and around to 21.2 USD billions as of November 2013 (Graph 3). Furthermore, total amount of liabilities in capital account has more than doubled from 14.7 to 32.8 USD billions between 2004 and the November of 2013. Before the global financial crisis, about 70% of this amount was the debt generated by Turkish non-bank private sector abroad. However, after 2010, banks started to dominate while the debt generated by non-bank sectors diminished. Between January and November of 2013, Turkish banks have been able to generate around 29 USD billions debt abroad. This amount corresponds to 90% of total foreign funds generated during that period (Graph 4).

Graph 3: Portfolio Investments from Abroad (USD Billions)
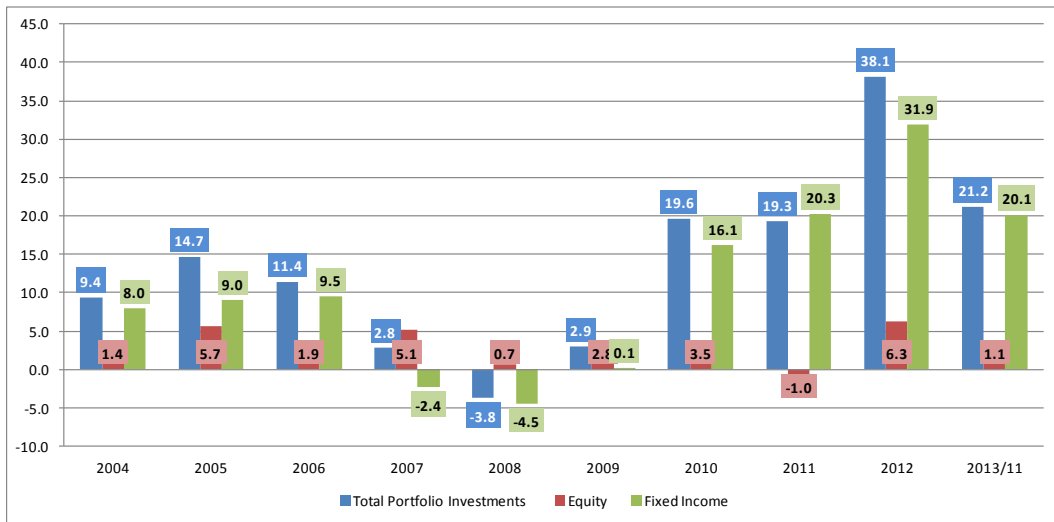
Source: CBRT

Graph 4: Capital Account Items by Sectors
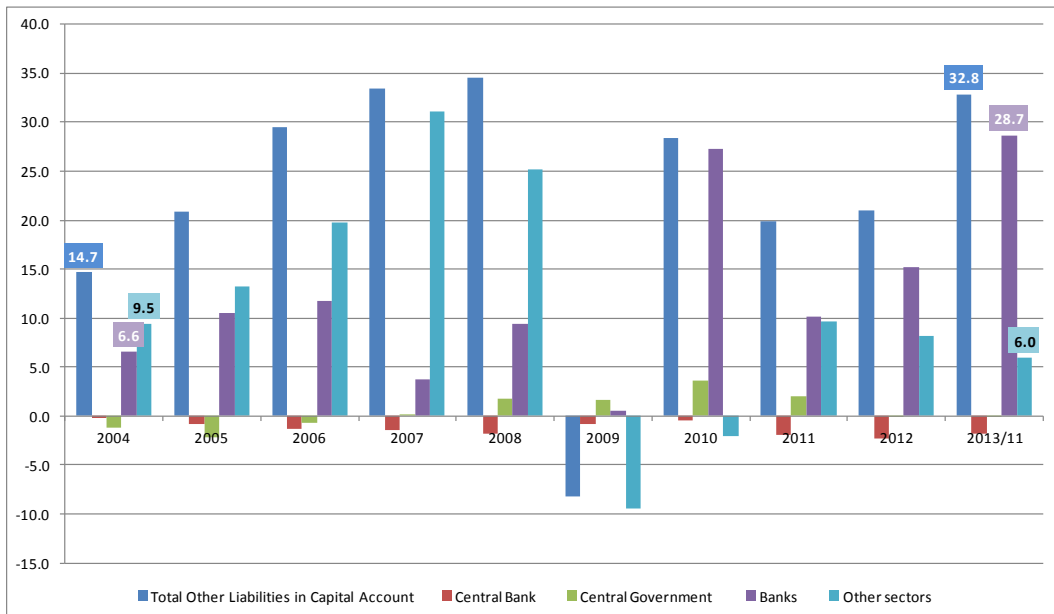
Source: CBRT

Under such conditions, a question whether volatility in exchange rate makes Turkish economy much more vulnerable as compared to possible fluctuations in interest rates emerges as a focal point to be considered in shaping monetary policy in order for sustaining financial and economic stability without deviating from the goal of price stability. In fact, the rest of the study focuses on this question and tries to investigate possible effects of exchange and interest rate changes on the stability and performance of Turkish private sector firms and general economy given the recent outlook of the balance sheets.

III. A VAR Analysis of the Monetary Transmission Mechanism in Turkey

In this section, a VAR model is built in order to investigate the relative importance of various transmission channels using monthly data between January 2004 and November 2013. The constructs and instrumental variables employed within the analysis are summarized on the table below.

Table 1: Variables of the VAR Model

Construct	Instrumental Variable	Abbreviation
Exchange Rate	Logarithm of Real Exchange Rate based on CPI Index	LogRealFX
Interest Rate	The monthly change in the weighted average interest rate on the government bonds with two years or less maturity (BIST Data)	Interest
Foreign Debt of Banks	Monthly change in the "banks" items of the capital account of Balance of Payments	Banks
Foreign Debt of Other Sector Firms	Monthly change in the "other" item of the capital account of Balance of Payments	Others
Credit Channel	Monthly change in the Banking Sector Credits	Credit growth
Real Output	Monthly change in the year-on-year Industrial Production Index	IPI Change
Inflation	Monthly change in the year-on-year CPI Index	Inflation

The model used for analysis can be defined as;

$$Y_{it} = \alpha + \sum b_{it-n} Y_{it-n} + \varepsilon_t$$

In this model;

"i" refers to the variables of the analysis listed on Table 1.

"n" is the optimal lag length in the equation

Two iterations of the above model are applied employing E-views software. In the first iteration the ranking of the variables is as follow;

LogRealFX-Banks – Others – Credit growth – Ipi Change - Inflation – Interest

On the other hand, for the sake of testing the effect of any shock in interest rate on other variables another iteration of the model is implemented following the below ranking;

Interest - Banks – Others – Credit growth – Ipi Change - Inflation –LogRealFX

III.1 Determination of optimal lag length for the analysis

Table 2: Different Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: LOGREALFX BANKS OTHERS CREDITGROWTH IPICHANGE INFLATION INTEREST
Exogenous variables: C
Date: 01/30/14   Time: 16:34
Sample: 1 119
Included observations: 109

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1527.024	NA	3952.479	28.14723	28.32007*	28.21733
1	-1434.275	171.8846	1774.370*	27.34449*	28.72720	27.90523*
2	-1394.896	67.91847	2139.222	27.52103	30.11362	28.57242
3	-1355.823	62.37359	2636.945	27.70318	31.50563	29.24521
4	-1304.573	75.23041*	2666.604	27.66188	32.67421	29.69456
5	-1264.320	53.91652	3419.705	27.82238	34.04458	30.34571
6	-1213.069	62.06557	3761.535	27.78108	35.21315	30.79505
7	-1170.339	46.25748	5159.238	27.89613	36.53808	31.40076
8	-1132.626	35.98331	8452.339	28.10323	37.95505	32.09850
9	-1078.489	44.70022	11499.46	28.00897	39.07066	32.49489
10	-1012.654	45.90326	14813.08	27.70008	39.97164	32.67664

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

To determine optimal lag various criteria can be employed such as sequential modified LR statistic, Final prediction error, Akaike information criterion, Schwarz information criterion, Hannan-Quinn information criterion. Three of these information criteria display that the optimal lag length to be one. On the other hand, sequential modified LR statistic indicates a four-lag model as the optimal one, while the Schwarz information criterion implies for a model with no lag.

In order to decide for the lag length structure models with one lag and four lags are iterated and the correlograms of residuals are analyzed for the availability of any autocorrelation. Depending on this analysis it is found out that the number of residuals whose correlations exceeds 2 standard deviation criterion is less when a four lag model is employed. Therefore, the analysis is continued with a four-lag structure.

III.2. Test for Stationarity and No Serial Correlation among Residuals

For a VAR model to work and to avoid any possibility of spurious regression, all variables within the equation should satisfy the condition of stationarity. In order to test whether variables in the equation satisfy this assumption, unit root tests are employed for each individual variable and it is found that the variables have no unit root at the very first level.

Inverse Roots of AR Characteristic Polynomial
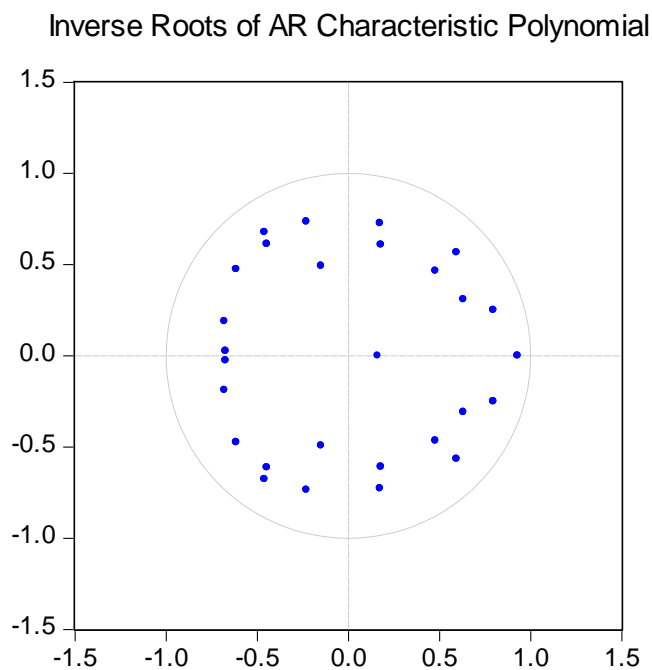
In addition, the above graph displays the inverse roots of AR Characteristics polynomial and all of the inverse roots remain within the unit circle. This indicates that the assumption of stationarity is satisfied for the constructed model.

Another assumption of the VAR model to be fulfilled is the non-availability of serial autocorrelations among residuals. The below table summarizes the results of LM Tests with null hypothesis of no serial autocorrelation among error terms at lag order h. Until the lag of 12, the null hypothesis cannot be rejected showing that there is no significant autocorrelation among residuals when a four-lag model is employed as it is the case for this analysis.

VAR Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 02/07/14   Time: 16:09
Sample: 1 119
Included observations: 115

Lags	LM-Stat	Prob
1	57.85420	0.1809
2	68.45577	0.0345
3	48.60162	0.4892
4	63.12889	0.0845
5	46.08577	0.5920
6	55.77251	0.2353
7	35.98314	0.9169
8	35.11652	0.9323
9	40.93124	0.7871
10	59.20852	0.1507
11	41.80295	0.7573
12	88.49426	0.0005

Probs from chi-square with 49 df.

III.3. Analysis of the Results

The Annex I of the text includes a table concerning the granger causality results across variables that are significant at least at 10 percent level. Based on these results, the granger causality relation between variables is depicted on Figure 1.

The granger causality results display that interest rate changes lead changes in real effective exchange rates. On the other hand, changes in real effective exchange rate granger cause changes in foreign debt of banking sector and credit growth. While the foreign debt of banking sector and other sectors drive the changes in each other, they also together with credit growth granger cause the changes in industrial production. Credit growth has also impact on both the changes in real effective exchange rates and interest rates.

Regarding the direction and dynamics of these relations, the combined impulse response function graphs that are included within Annex I and II of the text are analyzed. In the first impulse response analysis, real effective exchange rate enters into the equation as the first variable, while in the second one the change in interest rates is selected as the first variable. Given the significant granger causality relationships among variables, the results of the impulse response function analysis can be summarized as follows;

Figure 1: The Monetary Transmission Mechanism extracted from the VAR Model
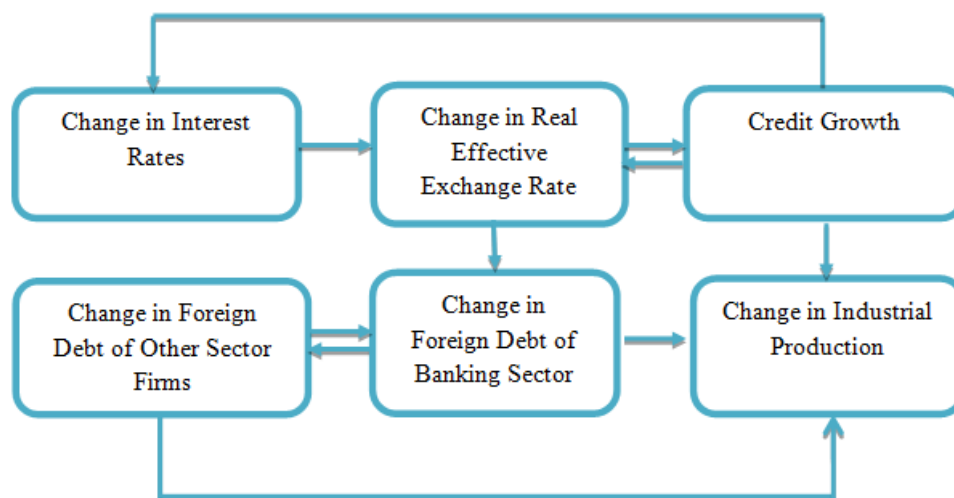
First of all, a sudden shock in interest rates decreases the changes in real effective exchange rates for the next two months. In other words, any volatility increase within interest rates will be followed by a reduced volatility in the real value of the local currency. Sudden shocks to interest rates and consequent volatility in market interest rate triggers a downward trend in credit growth. Sudden shocks to interest rates decreases the changes in foreign debt position of banking sector and other sector firms until the end of third month after the shock. A change in industrial production gives a reverse response to the increased volatility in interest rates during the very first period following a sudden shock. Accelerated volatility in interest rates slows down inflation during the six months following a sudden shock.

On the other hand, the impact of the shocks in real exchange rate differs across variables. Any shock in real exchange rate increases the changes in the foreign debt position of banking sector fostering the volatility in credit growth and interest rates for the following two months after the shock. In the first month afterwards, a shock in real exchange rate leads a downward trend in industrial production.

A shock in credit growth, i.e. an unexpected increase in the volatility of credit growth, there is a slight decrease in the change of industrial production.

On the other hand, the variance decomposition analysis conducted using real effective exchange rate as the initial variable points out to the following results. In the first analysis where changes in real effective exchange rate is taken as the first variable, up to 11% of the variation in banking sector foreign debt position, 1.5% of the variation in other sectors' foreign debt position, more than 10% of the variation in credit growth, more than 3% of the variation in industrial production, more than 3% of the variation in inflation, and around 22% of the variation in interest rates is explained by the changes in real effective exchange rate.

According to the second analysis results, where changes in interest rates is taken as the first variable within model, more than 3% of the variation in banking sector foreign debt position, less than 1% of the variation in other sectors' debt position, around 8% of the variation in credit growth, slightly above 1% of the variation in the changes in industrial production, around 5% of the variation in inflation, and around 26% of the variation in real effective exchange rate is explained by changes in interest rates.

A remarkable result of the variance decomposition analysis is that foreign debt position of banking sector and other sectors together explain more than 15% of the variation in industrial production, around 15% variation in credit growth, and around 10% of the variation in inflation. Credit growth, itself, explains more than 3% of the variation in industrial production and around 6% of the variation in inflation.

IV. Conclusion

Turkey has passed through a period structural change in macroeconomic environment during the last decade. While the fiscal dominance of 1990s has been overcome thanks to successful fiscal policies on the government side, the reformed structure of the central bank that provided the monetary policy and operational independence in coping with chronic inflation problem paved the way for inflation rates to be pulled down to one digit levels. In addition, given the decreased borrowing needs of the government interest rates have also fallen to historically lowest levels. Furthermore, the reforms, consolidation, robust regulation and supervision policies implemented enabled the banking sector to strengthen its structure in providing its traditional role as intermediaries between deposit owners and the real economy. Under such an environment Turkey has achieved to grow at 5% level on average for the period between 2004 and the third quarter of 2013. More striking is the fact that the main source of the dynamism within the economy and main driver of the growth has been the investments made by the private sector firms rather than the expenditures made by the government. Turkish economy and financial sector has also managed to overcome the adverse impacts of the global financial crisis with rather small injuries. Despite the negative growth rates in 2008 and 2009, Turkey has grown in each quarter of the past decade. In fact, it has been one of the fastest growing economies of the globe in 2010 and 2011.

In addition, Turkish economy has become more globally integrated during past decade. The total trade volume has increased from 150 USD billion levels to 400 billion levels between 2004 and 2013. Putting aside the chronic energy problem, the semifinal and capital goods imported by Turkish private sector has been the main driver of the gaps in foreign trade. On the capital account side, given the decreased borrowing need of the government until the global financial crisis and after 2010, Turkish banking sector and other private firms have exploited the rather cheap borrowing opportunities existed in global financial markets and balance sheets of those firms started to bear remarkable amount of foreign currency

denominated debt. The speed of global integration of Turkish private sector and the balance of payment related concerns seem to make Turkish economy more prone to the developments in global macroeconomic environment and the volatilities in exchange rates. The purpose of this study is to test the hypothesis whether this structural change in the Turkish economy has resulted in any change in the relative importance of monetary transmission channels.

In order to test this hypothesis a VAR analysis has been conducted using the variables of real effective exchange rate, the change in the foreign debt positions of banks and other private sector firms, credit growth, industrial production, inflation and interest rates. The results of the VAR analysis suggest that the traditional channels of interest rates, exchange rates, and credit do work in Turkish economy. However, the most striking finding of the study is the relative importance of exchange rate channel of in the transmission of monetary policy decision into real economy. Variance decomposition analysis shows that the explained variance by real effective exchange rates is higher for all variables as compared to the variance explained by interest rates. However, interest rates seem to be still a useful tool to manage monetary policy given its role in controlling the changes in exchange rates. The granger causality analysis points into the fact that while interest rates have a role in leading the volatility in exchange rates, volatility in exchange rates have impact on foreign debt holdings of banks and credit growth. On the other hand, the foreign debt positions of banks and other sector firms together with credit growth granger cause industrial production.

These results have important ramifications regarding the shaping of monetary policy. As an emerging market, Turkey is an economy with accelerated global integration through international trade, open capital account enabling, floating exchange rate regime, net negative foreign exchange position on the private sector balance sheets, increased foreign debt on the balance sheets of banking sector, net positive foreign exchange position on the balance sheets of households.

Under such conditions, the CBRT has the ultimate goal of sustaining price stability that is determined by law. Given the historical track record, it can be alleged that the CBRT has fulfilled this responsibility quite successfully during the past decade. However, especially since the beginning of the global financial crisis in 2007, as it is the case for almost every economy, the CBRT also considers the goal of sustaining financial stability and in order to achieve this goal the CBRT has to choose among a possible mix of policy tools. From this respect the selection of optimal policy tool mix has become a critical question especially in the recent term to fine tune monetary policy practice. Mainly, there are two possible ways of action that the CBRT might deploy. On the one hand there are conventional tools, mainly policy interest rates, the application of which result in higher interest rate and lower exchange rate volatility. On the other hand, there are unorthodox tools that mainly focus on decelerating internal demand in order for sustaining price stability and in fact the main policy tool that the CBRT has used to choose was the unorthodox ones since 2010. These letter tools usually result in lessened interest rate volatility and higher exchange rate volatility. As mentioned above, within an economy where the net foreign exchange position of the private

sector firms is negative whereas the net foreign exchange position of households are positive a monetary policy through this unorthodox tools will result in the lessened investment spending and exports of private sector firms that is to some extent balanced with increased household consumption spending.

The results of this study suggest that in Turkish case exchange rate volatility has at least influential on industrial production and financial stability as interest rates in relative terms. Therefore, for a central bank that is credible enough and has a quite good track record in sustaining price stability, the employment of conventional monetary tools might be an alternative as well in order to preserve financial and economic stability. Given the foreign exchange positions on balance sheets of banks, private sector firms and households, the deployment of conventional tools might result in higher interest rate but at the same time it will reduce foreign exchange volatility so that that the balance sheets and investment spending of private sector is not adversely affected. In fact, the developments within emerging markets after the FED's announcement of its tapering strategy in May, 2013 once more highlighted the importance of considering the volatility in exchange rates when designing monetary policy bringing the utilization of conventional tools onto the agenda of central banks.

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Impulse Response Analysis Using LogRealFX as the first Variable

Response of LOGREALFX to Cholesky One S.D. Innovations

Response of BANKS to Cholesky One S.D. Innovations

Response of OTHERS to Cholesky One S.D. Innovations

Response of CREDITGROWTH to Cholesky One S.D. Innovations

Response of IPICHANGE to Cholesky One S.D. Innovations

Response of INFLATION to Cholesky One S.D. Innovations

Response of INTERESTCHANGE to Cholesky One S.D. Innovations

Variance Decomposition Analysis Using LogRealFX as the first Variable

Variance Decomposition of LogRealFX							
Period	S.E.	LogRealFX	Banks	Others	CreditGrowth	IPI	Inflation	Interest
1	0.011	100.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.014	70.84	1.71	6.59	9.23	4.25	1.05	6.33
12	0.014	68.88	2.02	6.65	9.80	5.19	1.22	6.25

Variance Decomposition of Banks							
Period	S.E.	LogRealFX	Banks	Others	CreditGrowth	IPI	Inflation	Interest
1	1610.07	0.96	99.04	0.00	0.00	0.00	0.00	0.00
6	1943.84	11.35	74.92	5.63	1.64	2.88	3.27	0.30
12	1999.20	11.48	71.70	6.41	2.24	4.19	3.60	0.38

Variance Decomposition of Others							
Period	S.E.	LogRealFX	Banks	Others	CreditGrowth	IPI	Inflation	Interest
1	1139.26	0.01	6.09	93.91	0.00	0.00	0.00	0.00
6	1588.19	1.60	8.58	80.09	2.54	6.46	0.05	0.66
12	1710.27	1.46	11.61	76.27	2.65	7.18	0.18	0.65

Variance Decomposition of Credit Growth							
Period	S.E.	LogRealFX	Banks	Others	CreditGrowth	IPI	Inflation	Interest
1	0.03	2.80	4.37	1.37	91.46	0.00	0.00	0.00
6	0.04	9.97	10.92	3.83	66.36	3.62	1.19	4.10
12	0.04	10.23	10.48	4.92	63.87	4.46	1.77	4.27

Variance Decomposition of IPI Change							
Period	S.E.	LogRealFX	Banks	Others	CreditGrowth	IPI	Inflation	Interest
1	0.06	0.98	0.69	2.52	4.34	91.47	0.00	0.00
6	0.08	2.95	13.46	4.71	3.75	72.94	1.39	0.79
12	0.08	3.18	13.69	5.43	3.75	71.45	1.64	0.86

Variance Decomposition of Inflation								
Period	S.E.	LogRealFX	Banks	Others	CreditGrowth	IPI	Inflation	Interest
1	0.87	0.02	0.01	0.09	0.01	1.93	97.95	0.00
6	1.01	1.87	5.92	2.40	5.51	6.37	77.27	0.65
12	1.02	2.54	6.60	2.46	5.84	6.87	74.91	0.76

Variance Decomposition of Interest								
Period	S.E.	LogRealFX	Banks	Others	CreditGrowth	IPI	Inflation	Interest
1	1.19	26.90	0.77	0.26	3.52	1.23	4.87	62.46
6	1.41	22.55	6.84	5.44	7.50	2.64	4.05	50.99
12	1.43	22.34	6.88	5.50	7.97	3.53	4.05	49.73

Analysis of Granger Causality

Null Hypothesis	F-Statistic	Prob.
LOGREALFX does not Granger Cause BANKS	3.34605	0.0127
CREDITGROWTH does not Granger Cause LOGREALFX	4.98955	0.0010
LOGREALFX does not Granger Cause CREDITGROWTH	3.01567	0.0212
INTEREST does not Granger Cause LOGREALFX	2.05822	0.0915
OTHERS does not Granger Cause BANKS	3.01808	0.0211
BANKS does not Granger Cause OTHERS	2.70531	0.0342
BANKS does not Granger Cause IPICHANGE	2.66633	0.0363
OTHERS does not Granger Cause IPICHANGE	2.29388	0.0641
CREDITGROWTH does not Granger Cause IPICHANGE	2.59099	0.0408
CREDITGROWTH does not Granger Cause INTEREST	3.4879	0.0102

ANNEX II:

Impulse Response Analysis Using Interest as the first Variable

Response of INTERESTCHANGE to Cholesky
One S.D. Innovations

Response of BANKS to Cholesky
One S.D. Innovations

Response of OTHERS to Cholesky
One S.D. Innovations

Response of CREDITGROWTH to Cholesky
One S.D. Innovations

Response of IPICHANGE to Cholesky
One S.D. Innovations

Response of INFLATION to Cholesky
One S.D. Innovations

Response of LOGREALFX to Cholesky
One S.D. Innovations
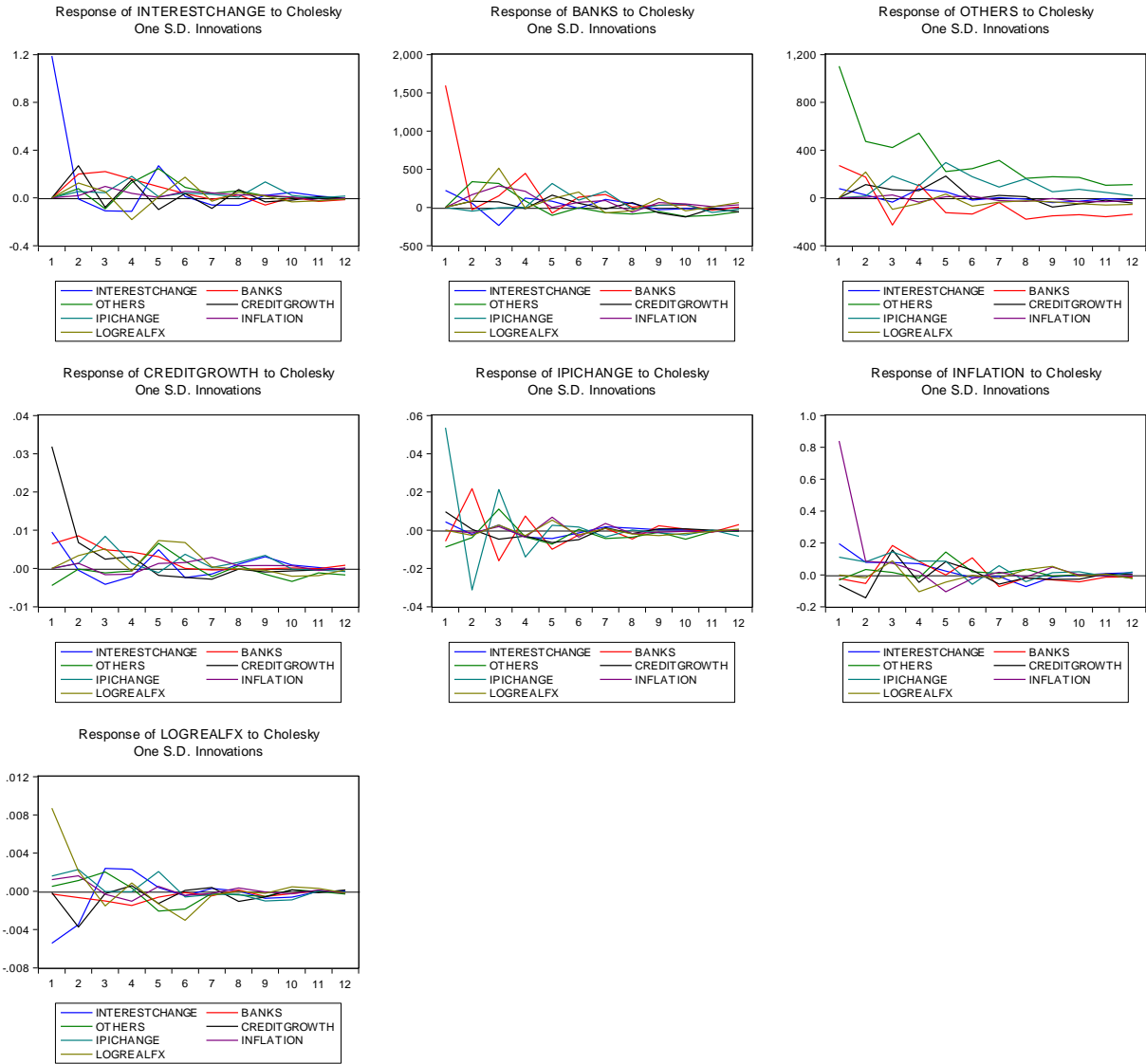
Variance Decomposition Analysis Using Interest as the first Variable

Variance Decomposition of Interest Change							
Period	S.E.	Interest	Banks	Others	Credit Growth	IPI	Inflation	LogRealFX
1	1.19	100.00	0.00	0.00	0.00	0.00	0.00	0.00
6	1.41	76.31	6.21	4.98	5.67	1.97	0.71	4.15
12	1.43	74.45	6.30	5.09	6.19	2.86	0.85	4.25

Variance Decomposition of Banks							
Period	S.E.	Interest	Banks	Others	Credit Growth	IPI	Inflation	LogRealFX
1	1610.07	1.90	98.10	0.00	0.00	0.00	0.00	0.00
6	1943.84	3.44	73.80	6.07	1.09	2.91	4.12	8.57
12	1999.20	3.63	70.58	6.83	1.77	4.07	4.37	8.75

Variance Decomposition of Others							
Period	S.E.	Interest	Banks	Others	Credit Growth	IPI	Inflation	LogRealFX
1	1139.26	0.46	5.66	93.88	0.00	0.00	0.00	0.00
6	1588.19	0.65	8.03	80.14	2.12	6.44	0.09	2.53
12	1710.27	0.65	10.99	76.28	2.21	7.05	0.21	2.59

Variance Decomposition of Credit Growth							
Period	S.E.	Interest	Banks	Others	Credit Growth	IPI	Inflation	LogRealFX
1	0.03	7.76	3.53	1.70	87.01	0.00	0.00	0.00
6	0.04	8.34	9.76	4.02	63.91	5.24	0.64	8.09
12	0.04	8.74	9.37	5.15	61.53	5.84	1.18	8.18

Variance Decomposition of IPI							
Period	S.E.	Interest	Banks	Others	Credit Growth	IPI	Inflation	LogRealFX
1	0.06	0.62	1.09	2.53	2.97	92.79	0.00	0.00
6	0.08	1.07	15.15	4.61	3.10	73.83	1.30	0.94
12	0.08	1.12	15.34	5.37	3.11	72.34	1.55	1.17

Variance Decomposition of Inflation							
Period	S.E.	Interest	Banks	Others	Credit Growth	IPI	Inflation	LogRealFX
1	0.87	5.00	0.07	0.14	0.51	1.63	92.64	0.00
6	1.00	5.57	5.57	2.37	5.88	5.75	72.70	2.15
12	1.02	5.94	6.25	2.46	6.19	6.14	70.41	2.57

Variance Decomposition of LogRealFX							
Period	S.E.	Interest	Banks	Others	Credit Growth	IPI	Inflation	LogRealFX
1	0.01	26.89	0.07	0.24	0.02	2.32	1.35	69.10
6	0.01	26.65	2.06	6.79	8.00	6.21	2.89	47.38
12	0.01	26.26	2.28	6.85	8.56	7.01	2.94	46.08