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Effectiveness of the Exchange Rate as a Channel of the Monetary Transmission Mechanism

A qualitative and quantitative analysis of the impact the exchange rate channel has on the monetary policy mechanism of Pakistan

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Abstract

Growing high inflation is a major cause of concern for governments, firms, and people. Recently we have seen how countries have been battling inflation, especially after the coronavirus pandemic. Where because of falling interest rates, falling aggregate demand, and increased money supply several global economies faced economic problems. Countries such as Pakistan that rely on imported goods to produce goods and services in their domestic economies are highly impacted by rising global commodity prices, depreciating exchange rates of their respective currencies, domestic and imported, and inflation.

Considering the described problems, this study will look at the impact of the exchange rate channel on Pakistan's inflation in the purview of the monetary transmission mechanism. This study will look at the effects on domestic inflation and the effectiveness of the monetary policy tools used in Pakistan and aim to present policy recommendations to curb these problems.

The study clearly shows that the exchange rate (as a channel of monetary transmission) has a significant impact on the monetary policy and inflation rate of Pakistan, but only in the short-run. In the long-run, the effects are insignificant and there are other channels which should be more focused on.

Introduction

A core economic objective of every government in the world is to stimulate sustainable growth in its economy, while simultaneously controlling inflation and minimising unemployment. To achieve these goals, monetary policy is one of the most effective tools a government has. Monetary policy achieves these economic objectives by controlling the money supply present in a country's economy by the central bank and adjusting the interest rate of short-term borrowing. The outcomes of a successful implementation of monetary policy include stable prices in the economy and general trust in the value and stability of a country's currency.

Monetary policy is the means through which the quantity of money present in a country and the channels through which new money is supplied are regulated. Through effective management of the money supply, a central bank aims to influence macroeconomic factors including inflation, consumption, and economic growth. Monetary policy decisions are multi-faceted and take into account a wide range of factors, such as:

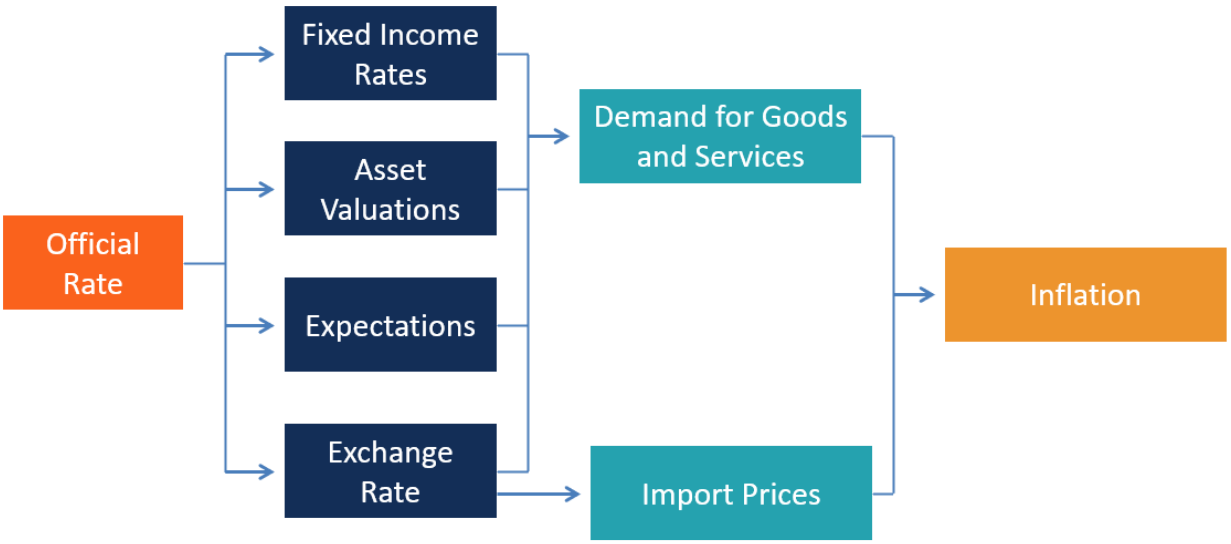
- short-term interest rates;
- long-term interest rates.
- velocity of money through the economy.
- exchange rates
- credit quality
- bonds and equities (Debt and corporate ownership)
- government versus private sector spending and savings.
- international capital flows of money on large scales.

Broadly monetary policy is of two types; expansionary monetary policy, and contractionary monetary policy. Expansionary monetary policy is used when a government wants to stimulate its economy by reducing the interest rate of short-term borrowing and/or increasing the money supply. Contractionary monetary policy is used when inflation is high in an economy and to control it the government increases the interest rate of short-term borrowing and/or decreases the money supply. Other tools of monetary policy include the creation/availability of credit in an

economy to corporations and consumers and this tool is used accordingly by the government when pursuing a contractionary or expansionary monetary policy.

The monetary transmission mechanism is the collective process by which asset prices and general economic conditions are affected because of monetary policy decisions. These decisions are intended to influence the aggregate demand, interest rates, and amounts of money and credit to affect overall economic performance. The monetary transmission mechanism is the link between monetary policy and aggregate demand. The components of the monetary transmission mechanism include the interest rate channel, the exchange rate channel, the credit channel, the asset price channel, and the expectations channel. The monetary transmission mechanism is the link between monetary policy and aggregate demand, therefore by using the tools of the monetary transmission mechanism governments can influence the aggregate demand and have a tool to observe and study the implications of monetary policy decisions on the economy.

The following diagram illustrates the workings of the monetary transmission mechanism:



Source: https://corporatefinanceinstitute.com/resources/knowledge/economics/monetary-transmission-mechanism/

The diagram above shows a summarized working of the monetary transmission mechanism when in fact it is a much more complicated process. This diagram shows only the major

components of the monetary transmission mechanism as there are several other connecting micro components of it. This diagram is enough to explain the workings of the monetary transmission mechanism for the sake of our study, providing a simplified view that we will be able to quantitatively assess.

Literature Review

The literature available for our study mostly looks at the credit channel or other channels of the monetary transmission mechanism. Not much importance is placed upon the exchange rate channel of the monetary transmission mechanism. The available literature makes key economic assumptions such as sticky prices in the economy which means that prices across the three major markets; the money market, labor market, and goods market. All of these remain sticky in the long term which leads to the general equilibrium (Mishkin, 1995). The general equilibrium is a condition in which all the markets (which are the labor, money, and goods markets) are in equilibrium. However, in the short term, prices can be volatile for reasons because of inflation depending on the effects for each market (Taylor 1995).

For the purpose of our study, we shall be looking at the following variables and how they are defined throughout the breadth of the literature available to us:

Variable	Description
Consumer Price Index (CPI)	measures the overall change in consumer prices over time based on a representative basket of goods and services.
Interest Rate (Policy Rate)	is an interest rate that the monetary authority (i.e. the central bank) sets in order to influence the evolution of the main monetary variables in the economy
Gross Domestic Product (GDP)	is the total monetary or market value of all the finished goods and services produced within a country's borders in a specific period
Exchange Rate	the value of one currency for the purpose of conversion to another

To understand the impact and effectiveness of the exchange rate channel, it is important to note how the transmission of the monetary policy operates in Pakistan. For this purpose, we take a look at the SBP Working Paper Series #9. The paper takes an in-depth look at the monetary

transmission mechanism in Pakistan through a VAR model. The paper highlights that a tight monetary policy leads to a fall in local demand, leading to the price level experiencing an overall reduction. More importantly, between the asset price channel and the exchange rate channel, it is the former that holds more importance in the transmission mechanism. The paper also attempts to establish the link between the real and financial sectors of the economy and how they can be evaluated to precisely predict financial variable movement. The paper shows how the different channels all operate with their own mechanisms, such as how the interest rate channel affects the consumption, price level, and investment; credit channel controls credit creation through banks and affect consumer spending, etc. It is important to note that all these channels are not independent; there is significant overlap and they do influence each other to various degrees.

When discussing exchange rates, it is important to note that we need to take into account whether the exchange rates are fixed and floating. There is literature that focuses on looking at the impact exchange rates have on monetary policy mechanisms. Rogoff states that even though the choice between fixed and flexible exchange rates is a fundamental issue for many countries, it is essentially insignificant as only a very small number of fixed exchange rate economies have survived over the years. It should be noted that fixed rates are still technically viable, as most nations have the resources and means to reacquire their monetary bases. However, today's giant global capital markets magnify any weaknesses in a country's commitment to a fixed rate and leave little room for maneuver (Rogoff, 1995).

Controls on capital movements have been proposed both by proponents in of favor fixed exchange rates, as well as by some who believe controls can reduce the volatility of floating rates. Some argue that reviving restrictions on the capital-market is highly likely to result in profound costs on the global economy, with little to no positive return. Besides, there is no clear presumption that increased transaction costs will reduce volatility. Instead of limiting transaction by the use of taxes, it is far more efficient to develop and build an international framework that allows for safe expansion of hedging exchange-rate risks.

A broad range of empirical studies suggests that reducing domestic inflation and the instability it causes are better addressed through basic reform of domestic monetary policy institutions. But it is a mistake to presume that policy coordination implies exchange-rate stabilization. Policy

authorities should avoid pinning their credibility on a variable that can instantly and dramatically reflect shifting expectations about future events (Rogoff, 2010).

The literature also assumes rational expectations which means that people base their economic decisions and expectations on human perceptions of rationality, information currently available to them, and their past experiences (Mishkin, 1995). Rational expectation is a major assumption that economists make to study the effects and patterns of inflation at a microeconomic level as it affects the spending and buying patterns of consumers which subsequently the supply of goods and services by firms. Therefore, rational expectations are also a key assumption in the circular flow of the economic model as well.

Further, in our literature review, we found another key assumption made by researchers; perfect capital mobility. Perfect capital mobility entails that money will always be attracted to the place with the highest rate of return (Meltzer, 1995). This is an important economic assumption because it explains the phenomenon of hot money flows and its short-term and long-term effects on an economy. This assumption is also necessary as it explains the workings of the credit and exchange rate channel of the monetary transmission mechanism.

The general schematic that we obtained from the papers in our literature review is shown in the diagram below:

Where,

M is **money supply in an economy**,

I is **interest rate**,

E is **price expectations**,

NX is **net exports**,

Y is **GDP** or **Aggregate Output.**

The diagram above shows how the effect of a fall in money supply is shown as having a result of a fall in aggregate output which occurs because of subsequent changes in the interest rate, price expectations, and net exports.

Furthermore, we saw the main argument presented by the researchers which included the debate between financial market prices and financial market quantities. Where financial market prices include interest rates, bond yields, exchange rates etc. Financial market quantities include the money supply, bank credit, supply of government bonds, foreign-denominated assets, etc. Financial market prices are more preferred by econometric modelers due to data availability (Bernanke and Gertler, 1995).

Monetary Policy in the Shariah

Monetary mechanisms are closely interlinked with keeping an eye on and adjusting the interest rates in a country to promote economic growth. However, a major recent criticism of the classical monetary mechanism is that it has failed to achieve any of the goals it was supposed to achieve. This interest-based mechanism has failed to reflect the true growth of the economy and instead has had an adverse effect on employment, inflation, savings, exchange rate, and investment. Some even argue to say that the Interest rate mechanism has truly failed to reflect the real growth of an economy, and moreover has an adverse effect on inflation, employment, exchange rate, savings, and investment. A very prominent example of the failure of conventional interest rate-based monetary mechanism is the last global financial crisis of 2009, where factors such as "frictional reserve system, soaring low-quality debt financing, due to low-interest rate, and numb speculation" were all responsible for the collapse of the mortgage market in the US, leading to affect the global financial markets. (Asyraf et al, 2015). Qualitative evidence shows that this is not an isolated event; global financial markets have faced numerous financial crises in the past 100 years, which were either directly or indirectly caused by the failure of our conventional interest-based mechanism.

Because of this, there are many who are calling for alternative measures to conventional monetary mechanisms. One such alternative is found in the Islamic Shariah. In the Islamic Shariah, interest rates are considered unlawful and unethical. As a result, other measures are used to monitor and control the money demand and money supply in the economy so that a stable local currency can be maintained. This can also allow the government to achieve higher income, sustainable growth, stability, lower inflation, and lower unemployment (Asyraf, 2015).

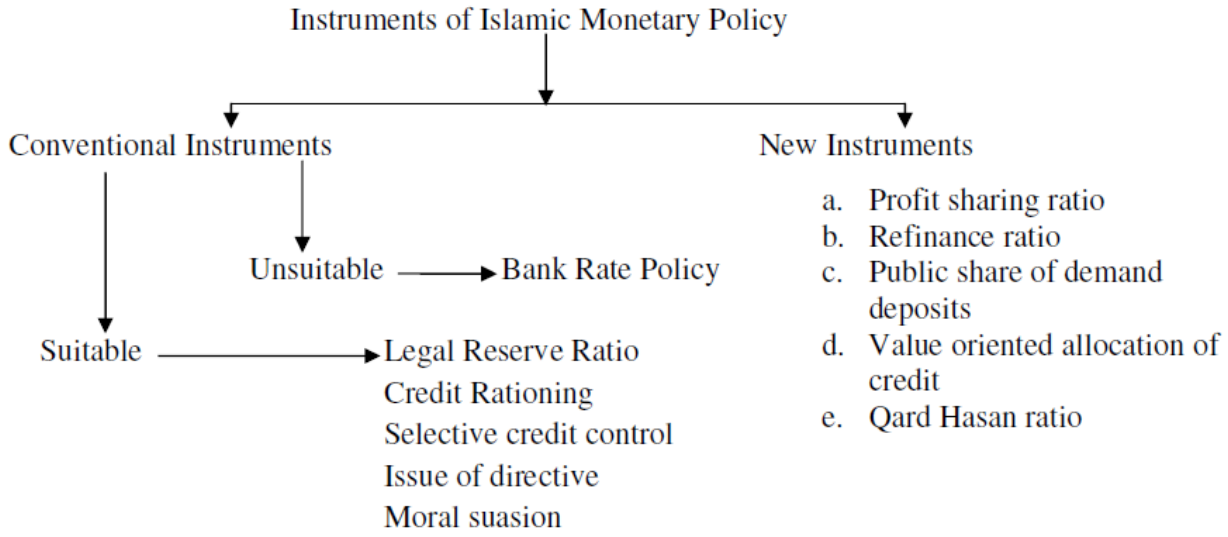
To achieve these goals, a new Islamic framework can be proposed in which both money supply and money demand can be controlled in line with the principles of the Shariah. Money demanded in an economy can be regulated using a strategy that depends on a number of instruments, most particular of which are (Chapra, 1992);

1. A socially-agreed filter mechanism

2. An established system that incentivizes the individual to make his best effort not just in his own favor, but that of the society as well
3. Reorganizing and restructuring the economy with the goal of understanding and realizing the aim of the system despite the scarcity of resources
4. Provide the government with a strong and positive role in the economy

The aforementioned elements in an Islamic economic system will not only help reduce the instability in the aggregate money demand but will also serve to influence money demand in such a way that will result in improved efficiency and equity. This increased stability will also lead to even further stability in the velocity of money (Asyraf, 2015).

This naturally leads us to the question of how will the central bank operate in such an Islamic economy? Ironically, the role of the central bank in an Islamic economy is more or less the same as that of a modern economy. The most important function of a central bank is to regulate the supply of money according to the needs of the economy. The central bank in an Islamic economy serves not just this purpose but also strives for a measure of safety and to ensure sagacious banking. The following are the policy instruments that can be utilized in an Islamic framework;



Source: Islamic monetary policy: Is there an alternative of interest rate? (2015)

A very good example of the successful implementation of such a system is Malaysia. Malaysia has been successful in developing arguably the strongest Islamic money market in the world. The Islamic Inter-Bank Money Market (IIMM) was established in Malaysia in 1994, that served as a short-term intermediary with the sole purpose of providing a consistent means of short-term investments based on the principles of Shariah.

Malaysia's success in the establishment of a monetary policy that is free from the volatility of interest rate mechanisms shows the development of a sustainable Sharia-based framework is indeed viable. It is no longer a purely theoretical concept and there are numerous financial markets and institutions which are now actively working towards the creation of Islamic tools of monetary management policy.

Central Bank Autonomy

Theories pertaining to monetary policy are often concerned with the effects of monetary instruments on macroeconomic variables' stability and growth. As of late, there have been many such theories that are focused on the structure of bodies that are instrumental to policy development and their impact on the macroeconomy. A very important development in international economic politics in recent decades is the increase in central bank autonomy. Research suggests that the majority of central banks in the modern world enjoy substantially higher levels of independence than two decades ago or earlier (Cukierman, 2008).

There are many explanations as to why countries would want to allow their central banks to operate independently. One such reason for the implementation of central bank autonomy and reforms suggests that the objective is to reduce high inflation that results due to the time-inconsistency of monetary policy (Rogoff, 1985). Other theories suggest that central bank autonomy is implemented when the government debt is relatively high, especially in less developed countries, as a means of indicating creditworthiness to foreign investors (Maxfield, 1997). It is also argued that the observed negative correlation between inflation and central bank autonomy is not causal, as both are determined by the financial opposition to inflation, suggesting that central bank autonomy has been adopted in countries where the financial sector plays an influential part (Posen, 1993). Some researchers further argue that the extent of central bank autonomy can also be used to determine the level of political stability in a country.

The International Monetary Fund (IMF) advocates for central bank autonomy and accountability. This is because central bank autonomy is imperative for sustainable economic growth as it encourages price and financial sector stability. Throughout the literature, central bank autonomy and central bank independence are used interchangeably. However, it is preferred to use the term “autonomy”, as autonomy is used in the context of operational freedom, whereas “independence” can indicate the absence or lack of institutional constraints. In order to operate efficiently, a central bank must have clearly defined objectives, along with sufficient authority to achieve these said objectives, all the while being autonomous to remain credible. At the same time, to

ensure checks and balances, it must also be held accountable for the authority delegated to it. Reforming the legislative framework for a central bank—often after a crisis—can help boost the credibility of monetary policy. This reduces the perceived inflation bias and thus the real interest rate, which advances sustainable economic growth. (Lybek, 2004)

Effective central bank governance deals with the notion that the tasks and goals set for an institution are performed efficiently and effectively. This leads to better utilization of scarce resources, which is imperative for establishing a good track record. While the concept of central bank autonomy has prevailed, the last decade has focused more on accountability and transparency, but recently, the focus has moved toward good governance (Schiffman, 2004). Central bank autonomy may help countries achieve lower average inflation, cushion the impact of political cycles on economic cycles, enhance financial system stability, and boost fiscal discipline without any real additional costs or sacrifices in terms of output volatility or reduced economic growth (Lybek, 2004).

In order to analyze how central bank autonomy has a profound impact on world economies, IMF carried out a worldwide analysis of central bank autonomy trends. In their research, the IMF calculated autonomy indexes for 163 central banks, representing 181 countries. The results from this study empirically showed that a majority of banks in advanced economies enjoy greater central bank autonomy which allows them to set price stability as one of the main objectives of monetary policy. Furthermore, their autonomy is reflected in their ability to set the policy rate without the need to extend direct credit to the government. Finally, there is divergence among central banks with regard to financial supervision.

In Pakistan, Central bank autonomy has been an important topic of discussion. The SBP Act 1956 does not clarify the primary objective of the institution; whether it is to stimulate economic growth or regulate the monetary system of Pakistan. As a part of IMF’s conditions, the country's upper house of parliament passed the SBP Amendment Law 2021 which was backed by the International Monetary Fund (IMF) to give the central bank more independence in decision-making. The new legislation, passed by 43 votes to 42, was one of the numerous conditions by the IMF for the revival of a stalled $6 billion funding program. According to the bill, the State

Bank of Pakistan will get independent powers to control price stability and monetary policy decisions, along with guaranteed tenure for its governor. This proposed bill makes it clear that the primary objective of the central bank is to achieve domestic price stability, along with the regulation of the credit and monetary system of Pakistan. The secondary objective is the stability of the country's financial system. This will allow the SBP to have its focus on growth in the long-run (SBP Amendment Act, 2021).

State Bank autonomy is a development that seems to give the SBP the autonomy and responsibility it needs to operate efficiently, as it will insulate the country from any and all sorts of political shocks and interference. But many critics like Dr. Nadeem Ul Haque (Vice-Chancellor of Pakistan Institute of Development Economics) and Dr. Asfaque Hassan Khan argue that with this autonomy it is also important that the institution has goal independence, as there is a chance that the independence being granted may only be good for the conduct of its policy given the currently available instruments. Targets need to be defined so that autonomy can be used to pursue those targets without external interference. Failure to do so could risk bringing institutional disparity in the system.

An independent Central Bank is vital to the economy of a country as it is free from any sort of political interference. It has the freedom and tools necessary to keep the long-term goals of the nation in mind and work accordingly. While Pakistan is now taking the necessary steps to decouple its central bank from the political unrest in the country, it is also important to ensure that this newfound autonomy comes with necessary checks and balances to ensure that the SBP does not steer away from its mandated goals.

Methodology

Choice of Variables

In our selection and treatment of variables, we have tried following the methodology used by State Bank Working Paper No. 109. However, we have not incorporated any exogenous variables in our short form VAR model. Furthermore, we have restricted our study to studying the short run effects of monetary policy shocks through the exchange rate channel only. In this way, we want to study the effectiveness of this channel only. For that reason, we have incorporated four different time series in our model as endogenous variables.

For our analysis, we have taken PKR to the USD exchange rate as opposed to the nominal effective exchange rate used by Hussain, Hussain & Haider (2022) in working paper 109. The nominal effective exchange rate (NEER) is a weighted average of exchange rate for a basket of currencies, not just the US dollar. However, the weight assigned to US dollar in NEER is 52%, which makes the US dollar the most dominant currency in the basket and the most useful in Pakistan's context. As a result, we have only taken the US dollar into account rather than a basket of currencies.

As a proxy to monetary policy, we have taken the cut-off yield of 6 month treasury bill rates. Hussain, Hussain and Haider have reasoned that t-bills are no more representative of government's monetary policy. Rather, they have taken call money rates as a proxy for monetary policy. However, t-bills have been traditionally used as the most suitable proxy for monetary policy such as in Mahmood-ul-Hassan Khan's (2008) study. It is important to mention that the determination of even the yield of t-bill is not solely determined by monetary policy stance. Rather they are determined by a number of factors such as market demand conditions, government financing requirements as well as central bank's monetary policy stance (Khan,2008). Therefore, our usage of this specific interest rate does not mean that the central bank itself is using this rate as a target of its monetary policy. This simply means that the change in interest rate reflects the change in monetary policy stance and we are simply using this fact to facilitate our analysis.

Furthermore, we have used prices (interest rate) rather than money quantity (M2). Taylor (1995) argues that using money quantities leads to issues in econometric modeling due to measurement problems.

We have not used discount rates because in the early years, discount rates were announced every six months. This does not allow us to use discount rates in our model due to discretized data.

Next, we take the Consumer Prices Index as a measure of inflation. A notable point in this regard is that around one-third of the CPI basket consists of food, which makes it harder to control inflation through traditional monetary policy tools.

Finally, to account for GDP, we have taken the Large Scale Industrial Production Index because GDP data is not available in the required frequency.

All the time series data is collected on monthly frequencies from March 1991 to Feb 2022.

The summary statistics for the entire data is given in Table1 of Appendix.

Analyzing and Preprocessing Data

Figures 1-4 gives us an overview of the general trend and seasonality in the data.

CPI has an increasing trend along with steadily increasing variance. This means that the different components of the time series are multiplicative in nature.

We see a similar pattern in Exchange Rate and Large-Scale Industrial Production Index.

All three of these series were log transformed so that the multiplicative components could become additive components and later differencing the series could be successfully used to make the data stationary. All three of the transformed series are plotted and shown in figures 5-7.

T-Bill rates do not show any visible trend. However, there seems to be some seasonal component.

The series were tested for unit roots using Augmented Dicky Fuller Test. All of them were non-stationary at level.

Granger Causality Test

To better understand the relationship between our variables, we have applied the Granger Causality Test. Its results are shown in Table 2 of Appendix.

This test lets us know whether one variable has any impact on another variable. An important thing to note here is that we are not talking true causality as causal inference is outside the scope of our study. Rather, Granger Causality only tests whether a variable is useful in forecasting another variable.

From our model, we can see that the results generated are in line with what literature and theory suggest;

- Interest Rate granger-causes inflation
- Inflation granger-causes all other variables
- Exchange Rate granger-causes all other variables
- GDP Granger causes inflation and exchange rate.

First Difference

Next, we differenced the series and plotted them. The plots are shown in figures 8-11. We can visually determine that the series have become stationary after the first difference.

The Augmented Dicky Fuller Test also confirms this visual inspection. Table 3 shows the results of the test at level and first difference.

Model

VAR Model Specification

The general form for our VAR model is as follows:

$$Y_t = \beta Y_{t-i} + \varepsilon_t$$

where; Y_t is a column vector of our variables

Y_{t-i} is a matrix of all the lag variables where i is the number of lags.

β is the coefficient matrix

ϵ_t is the error vector

The order *p* of our VAR model is specified using Akaike Information Criterion (Table 4). Using this criteria, we have chosen a VAR(3) model.

Results

Figures 12-15 portray Impulse Response Functions for the forecast of the next 10 periods.

The initial positive shock to CPI occurs after the first period and this effect lasts till the third period and by the third period this effect converges to zero and eventually dies out.

Initially, CPI receives a negative shock because of changes in IPILSM till the first period. After the first period CPI receives a positive shock, this effect declines after the second period with a slight uptick after the fourth period and the trend converges to zero after the tenth period.

The first shock to CPI occurs in the initial period which quickly dies out by the first period. There is a slight upward effect on income in the third period and declines right after it and eventually the shock dies out by the fourth period.

The first shock to CPI occurs after the initial period and this shock is aggravated and hits its peak till the second period. The shock declines after the second period and eventually converges to zero after the tenth period.

TBR receives a negative shock after the initial period and then a positive shock after the first period which reaches its peak till the third period and begins to decline afterwards and eventually converges to zero after the tenth period.

TBR faces a negative shock after the initial period which lasts till the second period. A positive shock occurs after the second period which drastically dies out and converges to zero after the eight period.

TBR receives a positive shock after the initial period and this effect reaches its bottom at the second period and then declines. This effect dies down and converges to zero after the tenth period.

TBR receives a negative shock right after the initial period and sharply declines towards the first period. Then there is a slight uptick after the second period which dies down till the fourth period and converges to zero till the sixth period.

IPILSM receives a negative shock right after the initial period. This negative shock begins to decline after the second period and then eventually dies out and converges to zero till the tenth period.

IPILSM receives a negative shock right after the initial period which approaches to zero after the second period and this effect dies out till the eight period.

IPILSM shows no response after the initial period but receives a negative shock after the first period. This negative shock begins to die out after the second period. The shock approaches zero after the fourth period and its effect eventually dies out till after the tenth period.

IPILSM receives a positive shock after the initial period whose effect declines till the third period. The effect on IPILSM begins to approach zero after the fourth period and eventually dies out after the tenth period.

ER receives a negative shock right after the initial period and abruptly declines till the second period. The effect begins to die down by the sixth period and approaches zero till the eight period and then dies out.

ER receives a series of positive shocks right after the initial period which oscillates till the third period and begins to decline right after. The effect of the shock begins to approach zero after the sixth period and dies out till the tenth period.

ER receives a positive shock after the second period and his effect begins to die out by the fourth period. This effect begins to approach zero and dies out after the tenth period.

ER receives a positive shock right after the initial period and the effect begins to decline after the first period. The effect begins to approach zero towards the tenth period and dies out after the tenth period.

The variance decomposition graphs indicate that the relative impact of other factors is significantly less than their own. This shows that the inter-relationships are significantly weak. This means that most of the variation in these variables is explained by themselves, rather than each other (Figure 16).

Conclusions

In this paper we attempted to look at the effectiveness of the exchange rate channel of the monetary transmission of Pakistan. We looked at the effects of Interest Rate on Exchange Rate and simultaneously on GDP and Inflation (where IPILSM is taken as a proxy measure of GDP).

Our research and literature shows us that the monetary transmission mechanism acts as a black box where the effectiveness and existence of transmission channels depends on the unique economic structure of the country.

From our analysis, we can conclude that the Exchange Rate channel is significant in the overall workings of the monetary transmission mechanism albeit it is a weak transmission channel as its effect on the overall monetary policy is negligible, for it mainly operates in the short-run. This is because the results indicate that the impact of the impulse shocks usually die down within the first quarter (three periods). Our conclusion is in accordance with prevailing empirical literature regarding the effectiveness or relative strength of the Exchange Rate channel in the context of the Pakistani economy.

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Appendix

Table 1: Descriptive Statistics				
	IPILSM	**TBR**	**CPI**	**EXRT**
Count	360	360	360	360
Mean	91.105083	9.81233	56.746861	72.408668
Standard Deviation	37.253532	3.449791	36.688534	35.668403
Min	34.84	1.21	13.24	22.5604
25%	57.097500	7.212500	28.272500	46.116
50%	99.805	9.98	39.735	60.553
75%	122.315	12.4625	90.925	98.6096
Max	175.17	17.25	142.61	167.7064

Table 2: Granger Causality Test				
	IPILSM_x	**TBR_x**	**CPI_x**	**EXRT_x**
IPILSM_y	1.00	0.00	0.00	0.00
TBR_x	0.7714	1.00	0.00	0.0008
CPI_x	0.00	0.0332	1.00	0.0001
EXRT_x	0.0013	0.1167	0.00	1.00

Table 3: Unit Root Tests for the Stationarity Properties of the Variables				
	ADF Statistics	**P-Valuation**	**ADF Statistics**	**P-Valuation**
	Level		**First Difference**	
IPILSM	-0.223969396	0.663200638	-3.969019715	0.00158170959
TBR	-2.45368960	0.127150091	-8.579241423	7.8096580e-14
CPI	-0.3187367957	0.9228084013	-3.329935024	0.0135922665
EXRT	-0.849979098	0.803998	-12.67178345	1.240003131e-23

Table 4: Results of AIC for Determination of VAR of order *p*										
Lags	1	2	3	4	5	6	7	8	9	10
AIC	-24.055	-24.060	-24.056	-24.252	-24.210	-24.247	-24.259	-24.423	-24.467	-24.654

Figure 1

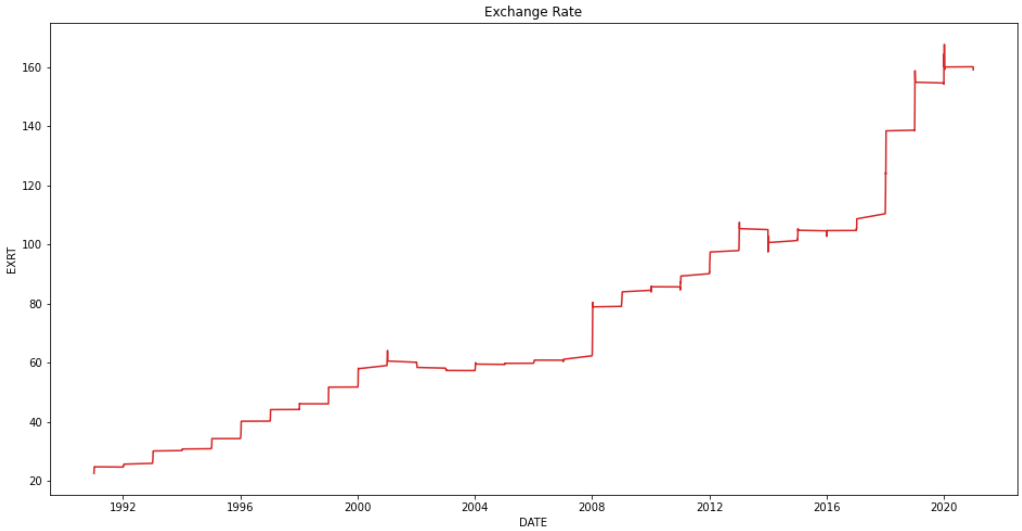


Figure 2

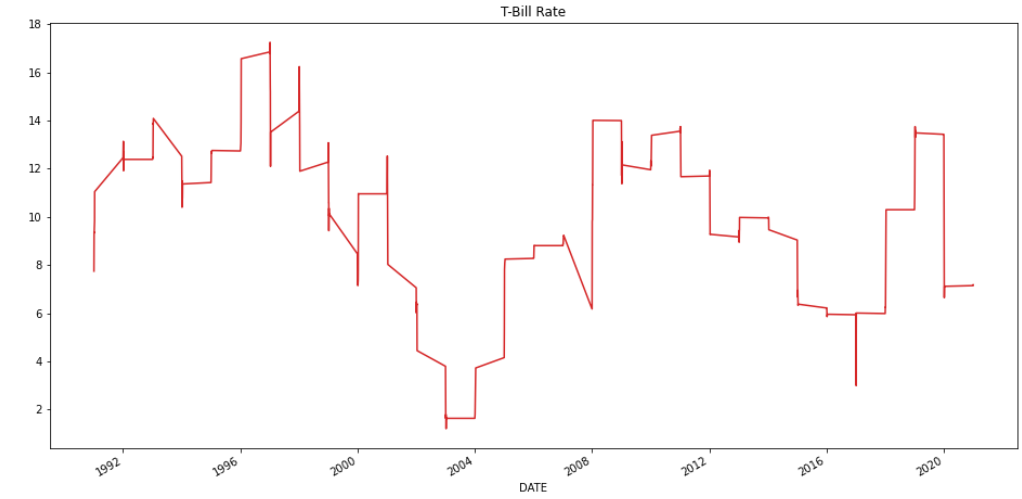


Figure 3

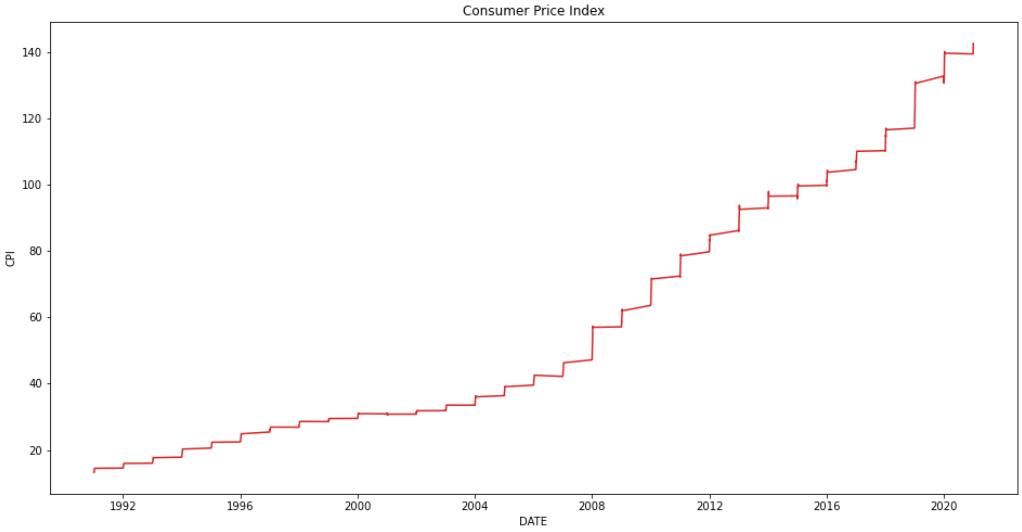


Figure 4

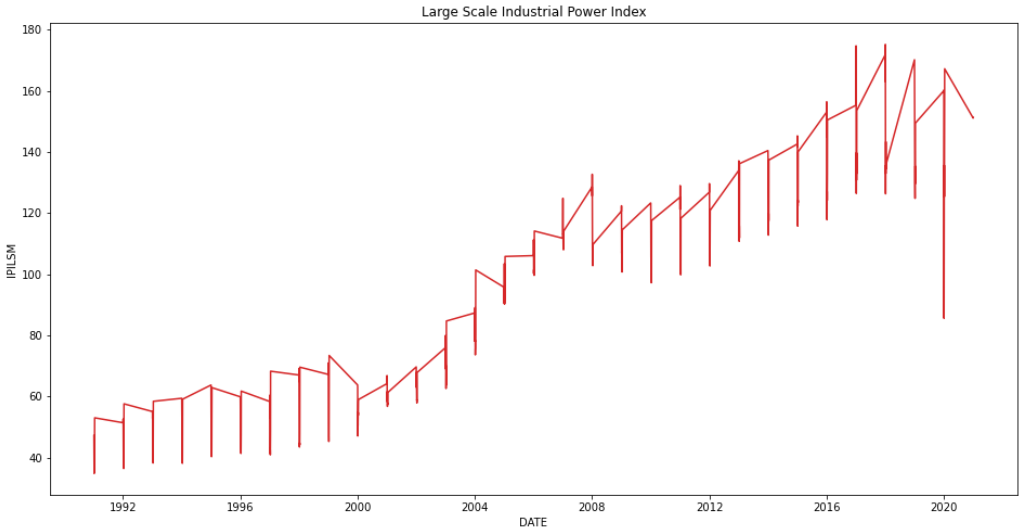


Figure 5

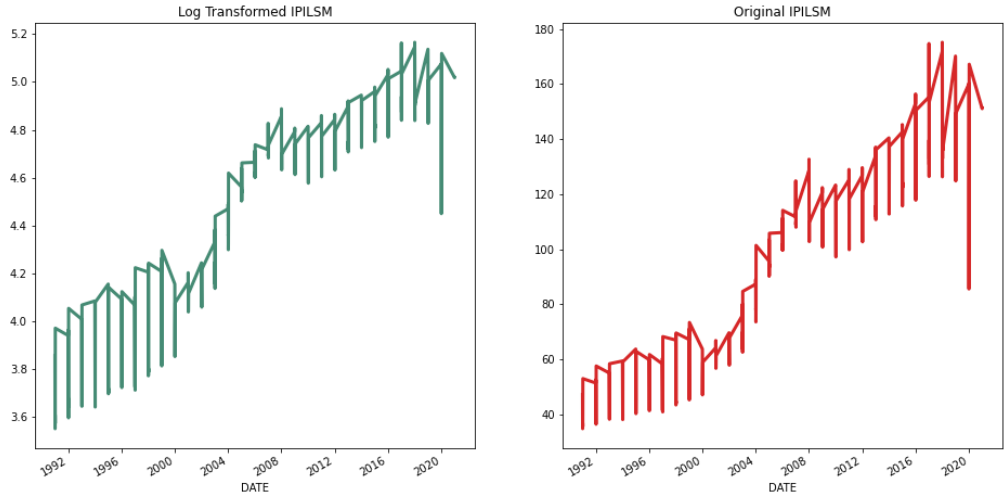


Figure 6

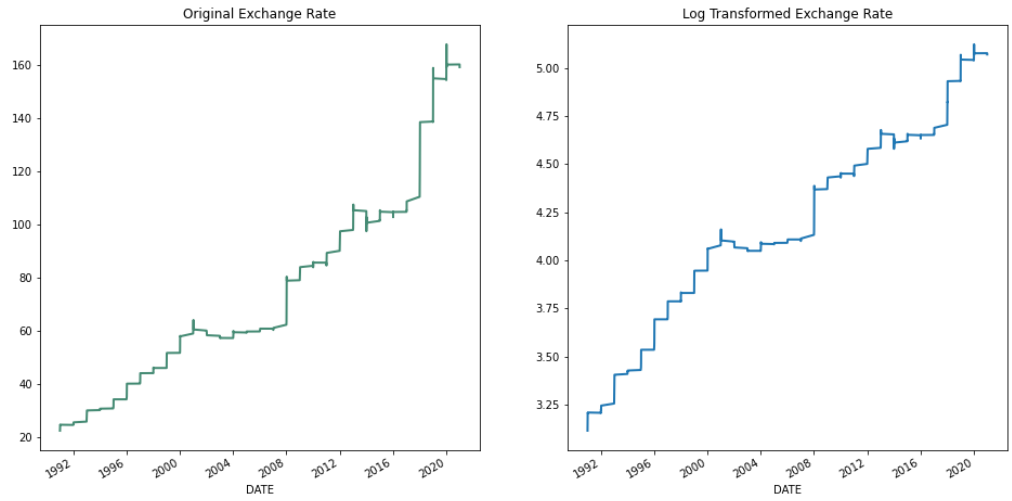


Figure 7

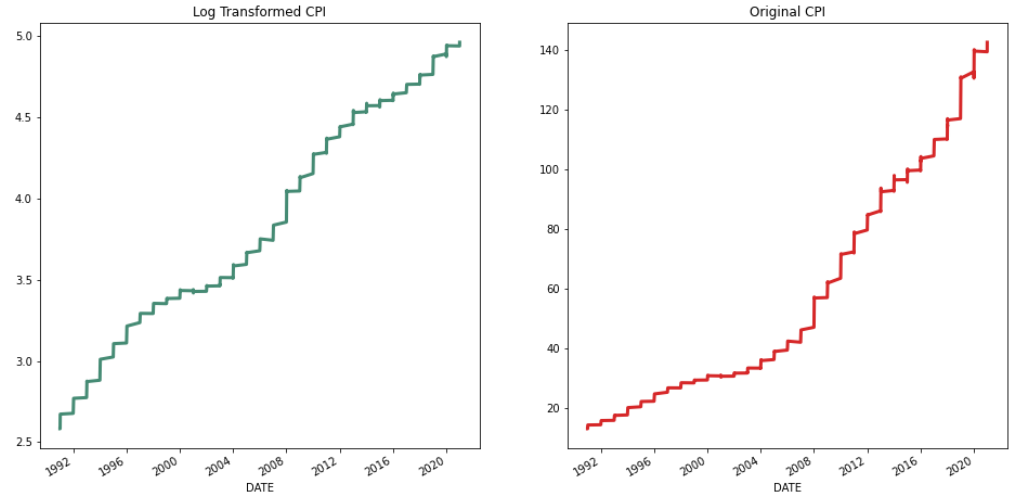


Figure 8

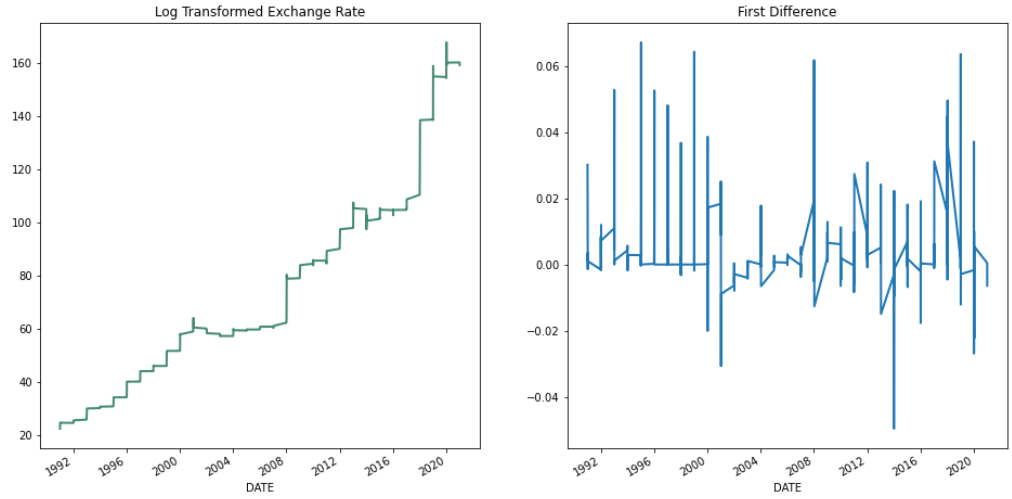


Figure 9

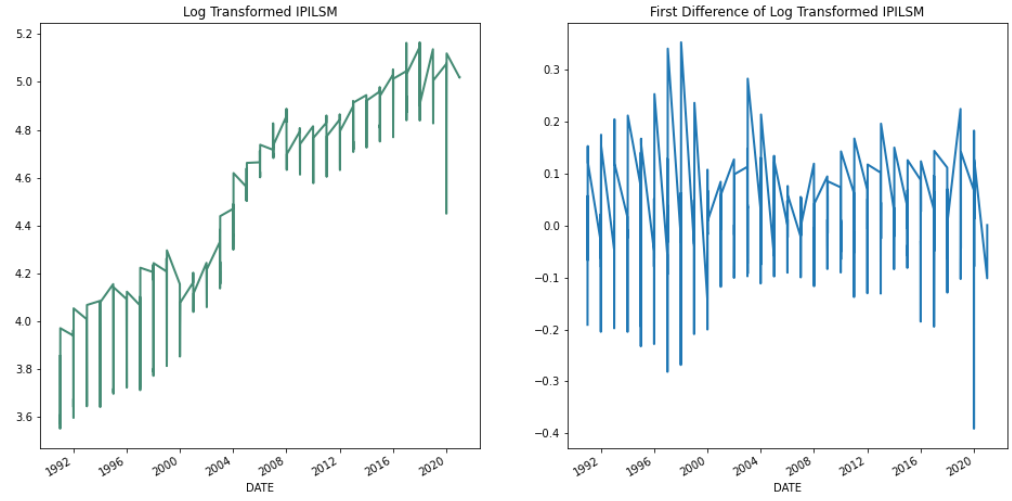


Figure 10

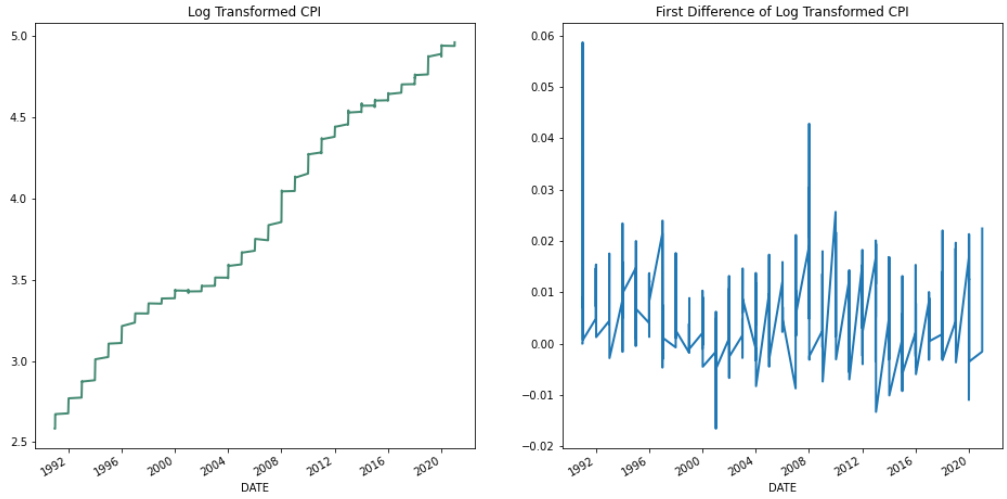


Figure 11

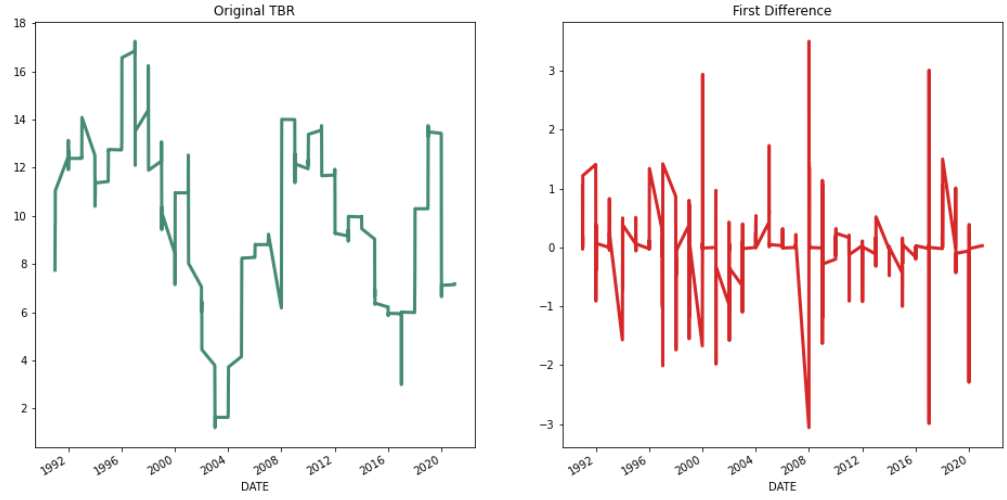


Figure 12

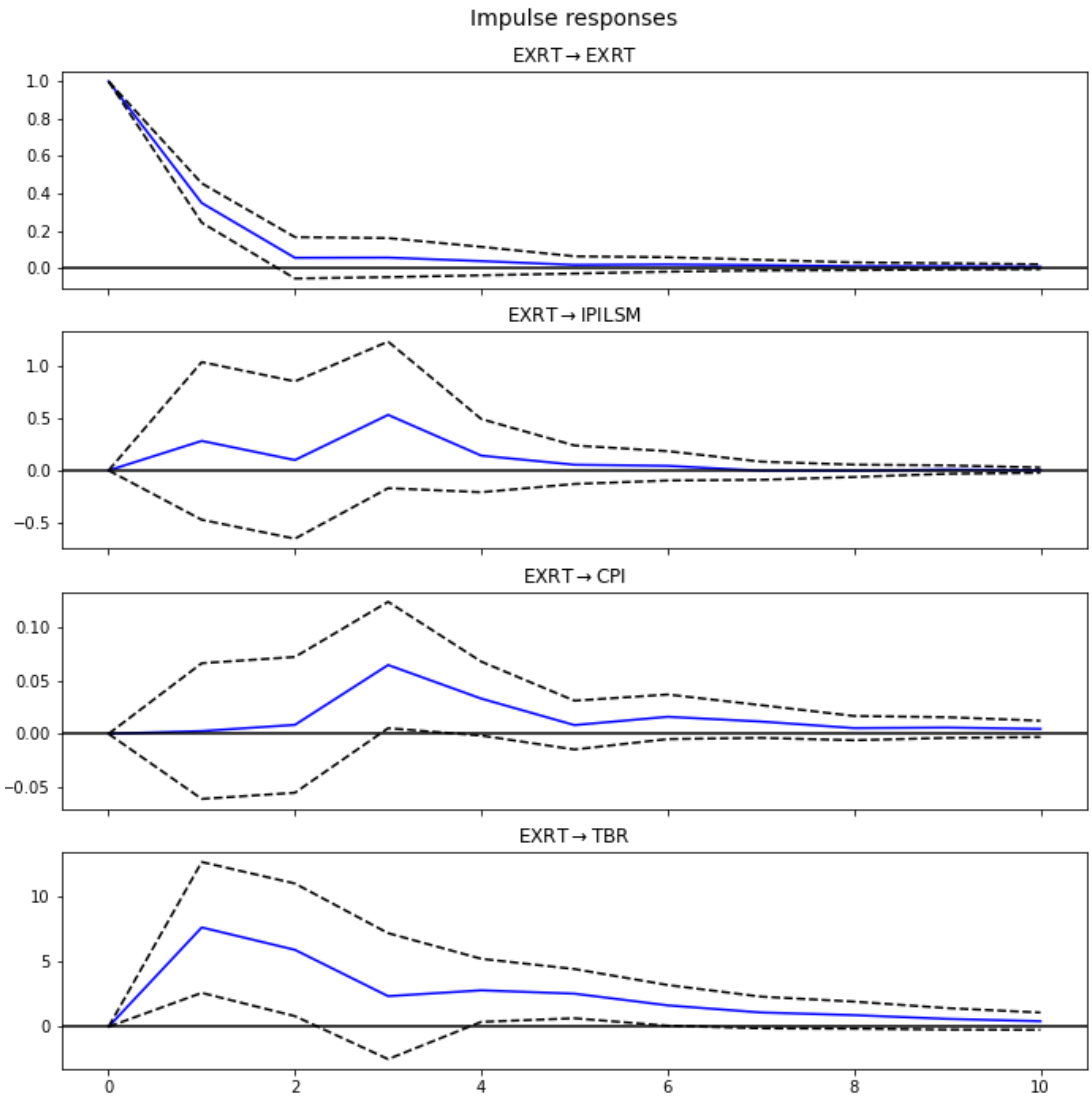

Impulse responses
EXRT → EXRT
1.0
0.8
0.6
0.4
0.2
0.0
EXRT → IPILSM
1.0
0.5
0.0
−0.5
EXRT → CPI
0.10
0.05
0.00
−0.05
EXRT → TBR
10
5
0
0
2
4
6
8
10

Figure 13

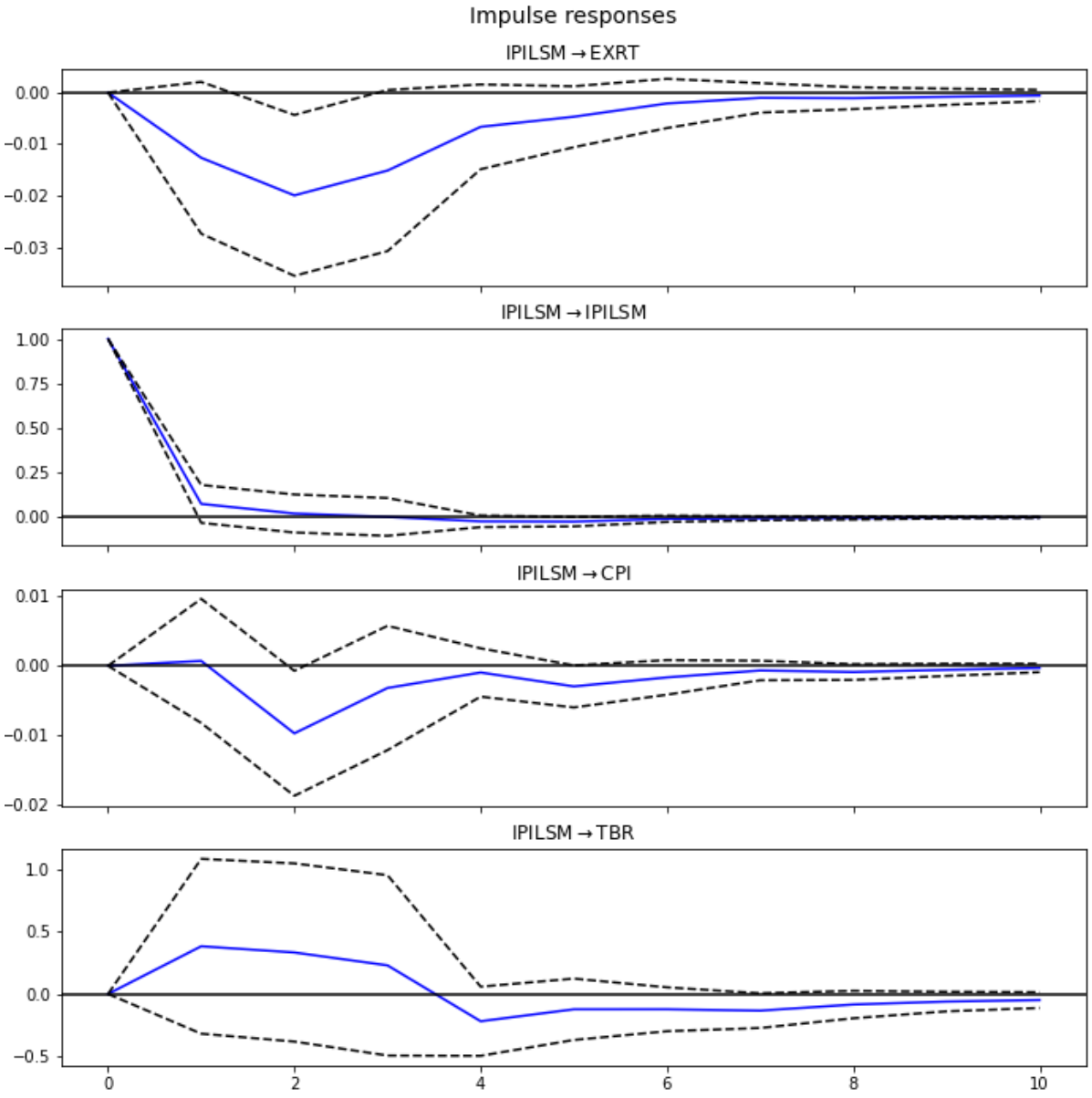

Impulse responses
IPILSM → EXRT
0.00
−0.01
−0.02
−0.03
IPILSM → IPILSM
1.00
0.75
0.50
0.25
0.00
IPILSM → CPI
0.01
0.00
−0.01
−0.02
IPILSM → TBR
1.0
0.5
0.0
−0.5
0
2
4
6
8
10

Figure 14

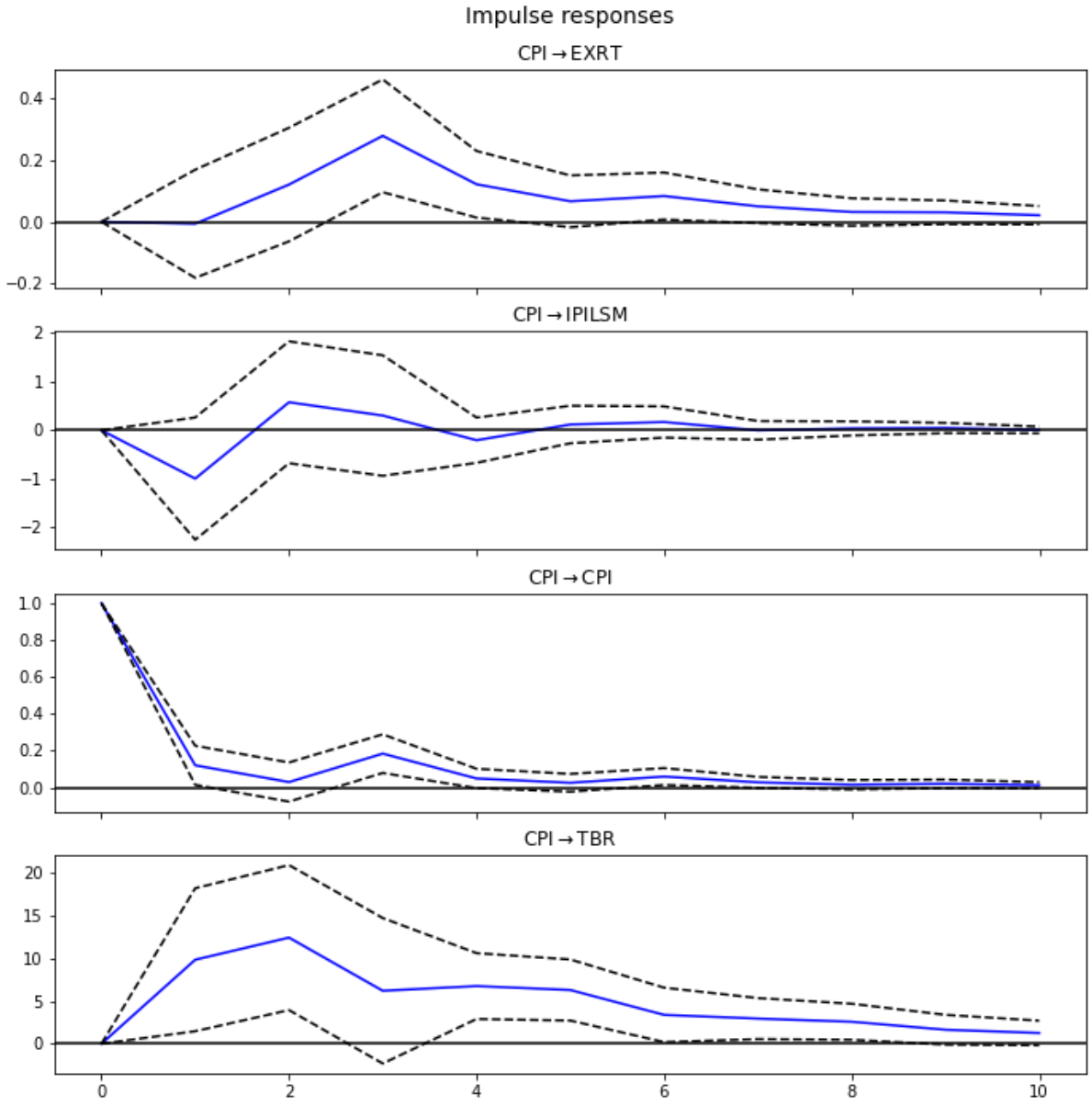

Impulse responses
CPI → EXRT
0.4
0.2
0.0
−0.2
CPI → IPILSM
2
1
0
−1
−2
CPI → CPI
1.0
0.8
0.6
0.4
0.2
0.0
CPI → TBR
20
15
10
5
0
0
2
4
6
8
10

Figure 15

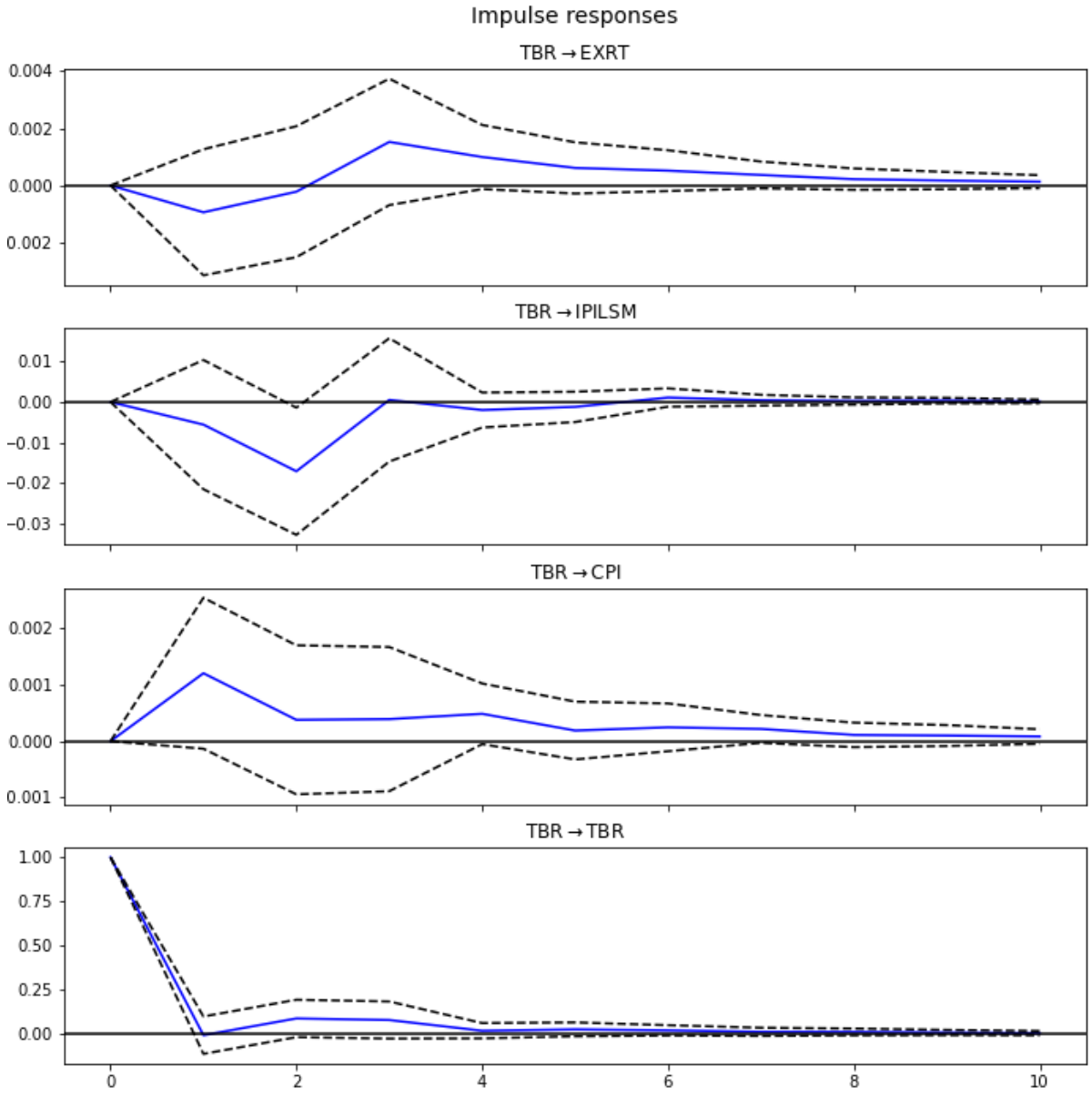
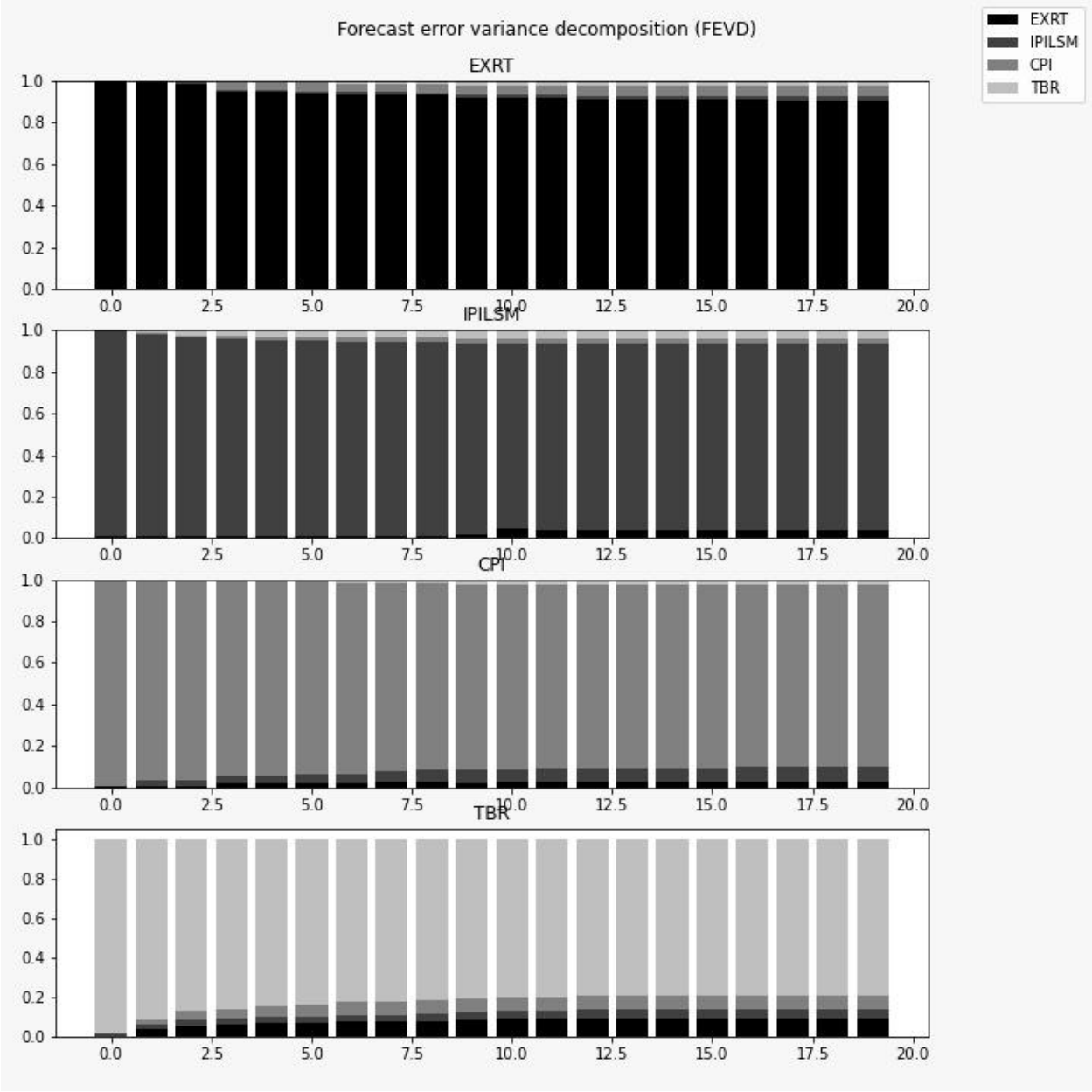

Impulse responses
TBR → EXRT
0.004
0.002
0.000
0.002
TBR → IPILSM
0.01
0.00
−0.01
−0.02
−0.03
TBR → CPI
0.002
0.001
0.000
0.001
TBR → TBR
1.00
0.75
0.50
0.25
0.00
0
2
4
6
8
10

Figure 16


Forecast error variance decomposition (FEVD)
EXRT
IPILSM
CPI
TBR
EXRT
IPILSM
CPI
TBR
0.0
0.2
0.4
0.6
0.8
1.0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0