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THE IMPACT OF INTEREST RATE AND EXCHANGE RATE TRANSMISSION CHANNELS ON INFLATION IN PAKISTAN

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ABSTRACT

A small open economy, like Pakistan, usually face obstacles in achieving stability in the level of prices because of the nature of the economy's high degree of vulnerability to the external economy shocks and issues related to weak policy. Hence, the present paper is aimed at analyzing the effectiveness or otherwise of the monetary transmission channels of interest rate and the exchange rate in controlling inflation in Pakistan for the period January 1991 to December 2017. The VECM results show that the rate of interest plays a key role in transmitting monetary signals. Long run relationships were observed due to the presence of 3 cointegrating equations. Further the error correction term for interest rate indicates that it corrects 4.1924% of the deviations in disequilibrium per period of time, although VECM results were not significant for the exchange rate. However, both the Impulse Response Functions and Variance Decomposition indicate interest rates and rate of exchange as monetary transmission channels, for inflation. The impact of exchange rate is within a lag whereas the rate of interest takes longer lags to transmit the required policy results.

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INTRODUCTION

One of the major objectives of monetary policy is to control inflationary pressures in the economy. Central Banks' aim at achieving this objective, along with the support of fiscal measures taken by the government. However, for an economy like Pakistan that faces constant budget deficits, much is left at the discretion of monetary authorities alone. We can further elaborate this issue in the sense that our economy faces frequent money demand shocks as there is a constant pressure on SBP due to government borrowing as well as the foreign inflows are unpredictable. In such a situation the best option is to adopt interest rate as the operating target. Pakistan opted to do so in 2009. So much so, in the SBP's strategic plan for 2016-2020, Pakistan envisions to switch over to a flexible inflation targeting by 2020 (SBP, 2016).

Monetary transmission mechanism helps policy makers in adjusting policy tools to achieve the best possible results. However, in certain developing economies there are no standardized models to measure the effects of monetary policy due to sudden changes in the economic structure which in turn affects the monetary transmission mechanism (Kamin, Turner, & Dack, 1998). If Central banks are able to evaluate the transmission process appropriately, it can assist them in formulating and implementing monetary policies (Mishkin, 2006), to help them in controlling inflation. Hence, in every period of time, it is essential to analyze the various channels of monetary policy and to observe which channel is most effective to control inflation and get the desired results for output. This paper is an attempt in this regard. Our research hypotheses is focused on finding whether the rate of interest and the exchange rate are effective as monetary transmission channels in terms of their impact on inflation.

The reason why inflation is always considered a threat in most developing economies lies in the uncertainty which is associated with it. When the price level is stable, the economic agents are able to make decisions with certainty as they can assess the correct values of the demand and supply of products. In case of inflation, the market gets distorted signals, as firms and households are forced to spend resources on managing inflation risks. This in turn hampers all forms of productive economic activities (Akhtar, 2008).

As Ben Bernanke (2006) states: *"The stability in the price level is a major concern of monetary policy; it is actually useful for achieving other policy objectives".* This idea is favored by a number of policy makers and economists such as Keneth Rogoff (1985). He emphasized on inflation stabilization to be the primary goal of monetary authorities for welfare objectives. The State Bank of Pakistan is no exception. It follows a policy of controlling inflationary pressures which is a complementary strategy of promoting economic growth and stability in the economy.

Monetary History of Pakistan

As Pakistan became independent, Monetarism (Friedman, 1956) was extremely popular. Keeping up with the trend, the SBP focused on monetary aggregate targeting for achieving monetary stability.

Initially the prime objective of monetary policy was the achievement of growth, however it shifted to removing imbalances in the BOP and later to inflation targeting (Hanif, 2014). There has always been a debate over whether monetary authorizes should pursue a single objective (Hoskins, 1993) or multiple objectives (White, 2006). However, in the present paper it is not the major concern of the researcher.

So, in the fifties, monetary policy's objective shifted to correcting imbalances in the BOP. The SBP also tightened monetary policy in the earlier years of the fifties to overcome inflationary pressures. However, as in this period of time there was persistent deficit financing, it lead to increases in the supply of money (Zaidi, 2006).

Monetary expansion phenomenon persisted during the 1960s. (Though rate of growth of money supply decelerated in the later part of the fifties). This was done because of the increase in net private investment, and higher GDP growth of 6.8% in the sixties (Hanif, 2014).

The country went to war in 1965 with India and the economy suffered a crop failure in 1966. Both these events led to an increase in inflation. But, in the wake of the war there were heavy expenditures on the defense of the country and restrictions imposed on aid, again made the government aware about fiscal imbalances that were corrected through deficit financing. However, during this period inflation rates remained low, i.e., an annual average of 3.8%.This mainly was due to the steps taken by the SBP and the initial improved GDP growth rates

(Moinuddin, 2007).

The above mentioned events and external supply shocks due an increase in international oil prices occurred in the earlier part of the seventies. This was further exaggerated by the devaluation of the Pakistani rupee. This stemmed up in slow output growth although there was an anticipated increase in money supply, which led to a rising level of prices during this period. In the same time frame, private and public borrowings also showed an increase which resulted in increasing the supply of money in the economy. The Central Bank adopted a number of measures for tightening money supply but was unable to achieve any desirable success (Hanif, 2014).

In the beginning of the eighties budget deficit was mainly financed through banks and external sources. Because of this policy, there was higher inflationary pressures along with an increase in external debt. So much so that inflation hit an all-time high of 12.5% in 1981 and 1982. Thus, in the time period 1983—1990, the government financed a major portion of the deficit through non-bank borrowings to overcome both the issues. Because of this shift in policy, there was a fall in the inflation. It remained about 6.0% on an average during 1983--1990. (Moinuddin, 2007).

The 1990s saw the introduction of a number of financial reforms by the State Bank. These were achieved through various tools of monetary management such as an increase in reserve ratio or requirements, commercial banks privatization, new private commercial banks to acquire licenses, greater degree of independence to SBP, growth and development of secondary markets that would deal in government securities, higher commercial banks' lending rates, greater control of credit, reforms in the capital markets etc. (Hanif, 2014).

During 1990—1996, majority of the budget deficit was financed through bank borrowings which increased the inflation rate to about 10.6%, which is more when compared to the annual average of about 7.3% of the 1980s (SBP, 1996).

In 1998, in the aftermath of the nuclear test, the country came under a severe crisis when sanctions were imposed that almost crippled the economy of Pakistan. It pushed the economy into one crisis after another. In the year following 9/11, the State Bank followed an expansionary monetary policy by lowering the discount rate from 14% to 7.5% from July 2001. This was supplemented with smaller yields both on T-Bills and PIBs. This helped Pakistan's economy to perform

reasonably well. (SBP, 2001).

The State Bank of Pakistan continued with an accommodative policy until January of 2005. The idea was the pursuance of economic growth. So, there had to be some degree of a tradeoff. Which was naturally between inflation and growth (SBP, 2005).

From April 2005, the SBP pursued a tighter stance on monetary policy. It raised the discount rate to 9% from the previous 7.5%. Also OMOs were conducted to reduce liquidity. Due to these measures it was observed at the beginning of 2006, that inflation CPI as well as core started a downward trend. But, a rise in the international prices of oil and a strong domestic demand both dampened monetary policy impact (SBP, 2005).

However, a tight monetary policy in April, 2005 proved fruitful and the CPI inflation was contained to its targeted limit. The policy continued, throughout 2006. The rate of discount continued at 9%. The State Bank was able to reduce the gap between the repurchase rate and the discount rate (SBP, 2006).

The State Bank of Pakistan increased the policy rate to 9.5% in the 2nd half of 2006. It was a 50bp increase brought about by the growth in government expenditures that were more than growth in total revenues. This was obvious from the declining tendency in the total tax to Gross Domestic Product ratio. SBP initiated an increase in the yield on treasury bills to indicate a rise in the interest rate (SBP, 2006).

However, most of the issues remained such as food inflation, increase in aggregate demand because of public borrowing, and a deficit on the current account. As a consequence, the SBP raised the discount rate to 10% in the beginning of August 2007, which was again an increase of 50bp, CPI inflation was 7.8% (SBP, 2007).

In 2008, the period July to December saw a further rise in food inflation. Further, government borrowing increased from the Central bank. The SBP further raised the discount rate to 10.5%, defending its policy move as a contractionary measure to combat food inflation. Although a better option would have been to take notice of supply side issues (SBP, 2008).

For Pakistan's economy, the SBP's choice of targets (intermediate), instruments used to control, and the contents of monetary policy have been varying to a certain extent over the course of years. Zaidi (2006), considered it

as discretionary in the beginning of the new millennium. But, structural changes in the financial sector as well as the economy, a higher availability of financial products, advancements in technology have somewhat weakened the inter relation between money and inflation (Moinuddin, 2007; Hanif et al., 2010).

At the onset of 2009, the economy saw a fall in CPI inflation. However, GDP fell to a growth rate of 2% due to extreme power shortages, security issues etc. from the previous year's 4.1%. There was a total decline of 7.9% in inflation from 19.1% in March to 11.2% in July 2009. Effective from August 2009, there was a fall in policy rate by 100 basis points to 13% (SBP, 2009).

Inflation soared to 12.5% in 2010. The policy rate was increased by 50 basis points to 14% on 30th November, 2010 (SBP, 2010). 2011 witnessed a continuity in floods that devastated a major portion of the crops. In such a scenario, inflation stayed 15% to 16%. The policy rate had remained 12.5% in 2009, monetary policy was tightened, and in 2010, it was increased to 14% to control the increase in prices. 2011 also witnessed a persistent increase in energy prices and the policy rate was maintained at 14% (SBP, 2011). There was a decline in the rate of interest in 2012. Average inflation remained between 11—12%, which was lower than the previous year's (SBP, 2012).

In the year 2013, although LSM grew by 4.3%, private investors stayed away from investing, (SBP, 2013). All these issues were extremely serious, especially in terms of bringing about a reduction in macro stability. There was a constant decrease in bank loans to the private sector, especially the long term loans. The policy rate was revised to 9.5%.

The year 2014 saw an improvement in the economic environment. There was a decrease in government borrowing from the banking system. Inflation was contained to 8.6%. The policy rate was revised to 10%. This year also saw a deceleration in M2, it decelerated by 12.5% which was the lowest in terms of expansion during the past five years (SBP, 2014). The year 2015 saw an improvement in most macro indicators. In this respect the policy rate was reduced by 300 basis points to 6.5%. Inflation also came in check after the CPI inflation fell to 4.5% in June 2015 from the previous year's 8.6%. In this regard the SBP tried to ensure that the average overnight money market rate remains more or less in the proximity of the policy rate of 6.5%, (SBP, 2015).

The year 2016 saw a major improvement in key macro-economic indicators,

in the first half. Inflation was curtailed at 2.1%. The policy rate was further reduced to 6%, (SBP, 2016), which continued on till 2017.

From the above overview of the various years' monetary policy, it can be observed that the State Bank of Pakistan has slowly and gradually changed its stance from targeting monetary aggregates to a wide-ranging set of targets in the past twenty years. Exchange rate regime has shifted to a flexible system which is market driven. The State Bank is following a policy of ensuring price stability keeping in mind the issues with respect to economic growth (Hanif, 2014).The State Bank of Pakistan have been shuffling the objectives of monetary policy since its inception. Before the year 2000, it mainly focused on exchange rate stabilization. In 2002, growth was the focus of attention. However, since 2005 to date the primary objectives have become balanced growth with a contained inflation.

The above was a brief introduction. The next segment consists of literature review followed by methodology and results, discussion, conclusion and references.

Literature Review, Empirical And Theoretical Framework

There have been a multitude of empirical findings that have come up with various transmission channels of monetary policy that affects output and inflation. Two of the more popular views are the "money view" and the "credit view" (Taylor, 1995).

As per the "money" view, as money supply increases it lowers the real rate of interest. This transmits to an increase in capital investment and an increase in consumer spending, as the capital costs decline, pointing out the interest rate to be a strong medium for transmitting monetary signals (Taylor, 1995).

On the other hand Bernanke and Gertler (1995), strongly criticize this view. They are of the opinion that, it is not just the rate of interest but rather there can be many other channels through which the monetary transmissions may be taking place. So much so, that they referred to the working of monetary policy as something happening inside a "Black Box" (Bernanke & Gertler, 1995).

When these channels are analyzed, their effectiveness or otherwise help in the evaluation of various economic theories in terms of whether monetary policy is consistent with evidence collected empirically (Mazhar, 2013).

Monetary policy for any country plays a significant role for stabilization of the economy as its major goals are price and exchange rate stability, growth and development objectives and controlling inflation. Pakistan is no different, here it has been applied along with fiscal policy for fostering macro stability and economic growth targets. Although there are numerous channels of monetary transmission, the present paper aims at two basic channels i.e., the interest rate and the exchange rate channels.

The Interest rate channel

This is the traditional Keynesian view (Keynes, 1936). A fall in interest rates trigger investments which via the multiplier effect bring about an increase in the demand for goods and services. Hence, the increase in output (Mishkin, 2006). However, for small open economies it has been observed that a relatively lower rate of interest results in motivating both consumption as well as investment through the expansion of credit as well as issuance of securities (Hanif, 2014). The State Bank of Pakistan has to adjust its policy rate to affect the KIBOR and LIBOR rates which ultimately affect the deposit and lending rates. The SBP decides the rates at which lending is done to large scale state owned enterprises also. Naturally a fall in the lending rates motivates such firms to borrow more for investment.

The Exchange Rate Channel

With globalization and shifts towards a more flexible exchange rate system, it has been observed that changes in money supply can affect exchange rates which affect net exports and total output. With a devaluation in currency, the exchange rate depreciates which brings about a boom in the export trade (Shehzad et al., 2017). The same idea was floated by Iqbal et al. (2015) making use of the Marshall Lerner condition. It was found that the condition holds for Pakistan for six out of a total of its ten trading partners.

In the above scenario, it is quite clear that all or some of the channels can play a significant role for achieving monetary policy objectives. Hence, which policy/ policies should be adopted to reduce fluctuations caused in the level of prices and output for the coming period of time?

For Pakistan, researchers have been divided on their assessment. Agha et al. (2005) empirically proved that banks are an important channel of policy

transmission; but Khan and Khan (2012), gave exactly the opposite verdict. They considered bank loans and deposits not to have any significant role to play.

Hussain (2009), found the exchange rate channel to be the only significant one in case of Pakistan, whereas Safia (2012) focused on the net worth channel to be the most noteworthy one.

In comparison to the above studies Baig (2011) concluded that all four channels, i.e., interest rate, credit, asset prices as well as exchange rate were ineffective in transmitting monetary changes. Similarly, Hussain (2014) compared the credit channel to the interest rate channel and found both of them insignificant in transmitting monetary signals. Similarly, Nizamani et al. (2016) made use of quarterly data from January 1996 to December 2012 and came up with the findings that exchange rate is the least important channel for monetary policy transmission.

As can be seen, there have been mixed outcomes for Pakistan; as have been a mixed regime of exchange rates, changes in the banking and financial structure that kept on changing with each regime change. To find solutions to these issues it is necessary for policy makers to know about the impact of their policy on inflation. For this purpose it is necessary that they should know the mechanisms involved in the transmission of monetary policy.

METHODOLOGY AND RESULTS

This paper has made use of a Vector Error Correction model. It is a form of VAR which is restricted. Cointegration in a system of I (1) series can be tested through VECM. Then the VAR model (Sims, 1980) is applied to check for the structure of VAR through: Impulse Response Functions, Variance Decomposition and Granger Causality.

Before applying any of the models variables are checked for stationarity as it is required to run the VAR and VECM models.

Specification of the Model

The group of endogenous variables Y includes the inflation rate (INFL), the rate of exchange (EX) and 6 monthly T-bill rate (R).

$$Y= \{INF, EX, R\}$$

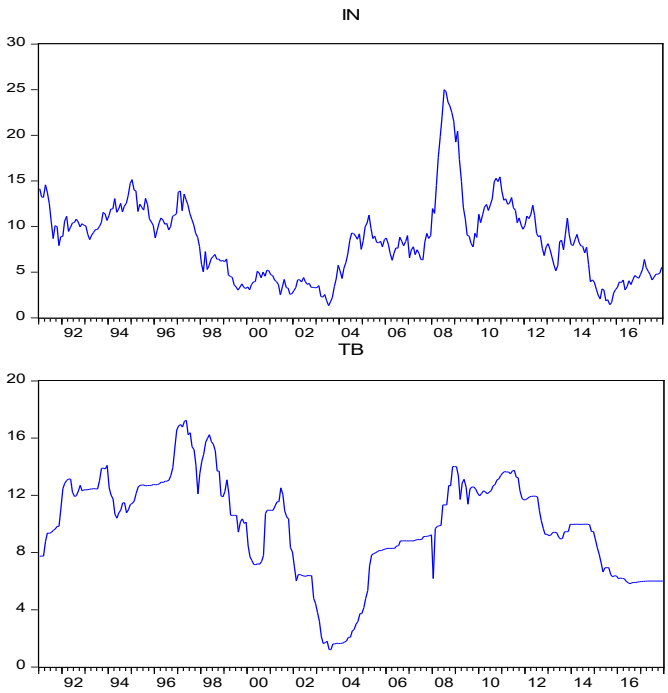
As it is a Time series Analysis, therefore E-Views 8 has been selected as it

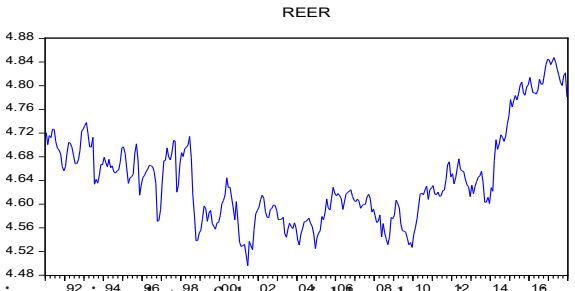
gives the best results in running VAR models, whether restricted or unrestricted, it is also the best option available at the disposal of the researcher along with having a very user friendly interface.

Variables

Variables selected based on literature review, were: INF is inflation, which is taken to show inflationary pressures in the economy. Log of inflation was taken. As we were interested to see the impact of exchange rate on inflation, therefore we selected the Real Effective Exchange Rate (REER).The log of REER was taken. For the export sector it is considered to be a better variable as compared to the nominal effective rate as it accounts for price differentials (Caballero & Carbo, 1989). For the policy variable, TB6 was selected. Generally speaking a number of papers such as Bernanke and Blinder (1992) for the US economy, Disyatat and Vongsinsirikul (2003) for the economy of Thailand and Agha et al. (2005) for Pakistan have all made use of short term interest rates. The data for the above variables has been retrieved from the website of the State Bank of Pakistan http://www.sbp.org.pk on a monthly basis from January 1991 to December 2017.

Fig. 1: Time Series Plots of the Variables





The above time series plots of the variables show increasing and decreasing trends over the time frame from January 1991 till December 2017.

Unit Root Test Results

As time series data tends to suffer from non-stationarity, therefore the Augmented Dicky Fuller tests were conducted for the 3 series LINF, LREER and TB6 (Dicky & Fuller, 1979).

Table 1: Test Results

Series (x_i)	t-stat	p-value	Outcome
LINF	-1.449058	0.5582	Presence of a unit root.
D(LINF)	-9.985932	0.0000	Stationary on the 1st difference or I (1).
LREER	-2.194829	0.2087	Presence of a unit root.
D(LREER)	-15.08666	0.0000	Stationary on the 1st difference or I (1).
TB6	-1.387256	0.5888	Presence of a unit root.
D(TB6)	-15.76267	0.0000	Stationary on the 1st difference or I (1).

Notes: (i) The results of Augmented Dicky Fuller (ADF) Test (Dicky and Fuller, 1979 With a null hypothesis that the series is non-stationary. (ii) D() represents the difference of the series.

The natural logs of inflation and exchange rate are taken. From the above results we can see that all the series are integrated of order one that is they are I(1), as VECM does not take first differences for variables that are integrated of order 1, i.e., I(1) if variables are cointegrated therefore the model is able to highlight multiple cointegrating relationships without misspecification (Enders, 2015).

Unresticted Cointegration (Johansen, 1988) and VECM Results

Before estimating the results for cointegration by the Johansen (1988) procedure for the series DLINF DLREER DTB, it is necessary to select the appropriate lag length. We are following the Akaike criterion and based on it the selected lag length is 4. At lag length 4, the series does not suffer from auto correlation as shown by the LM test. The given table shows the statistics for Cointegration for the series DLINF DLREER DTB:

Table 2: Cointegration Results

Hypothesized No. of CE(s)	Trace Stat.	0.05 Critical Value	Prob.	Max. Eigenvalue	0.05 Critical value	Prob.
None *	185.7992	29.79707	0.0001	87.85773	21.13162	0.0000
At most 1 *	97.94148	15.49471	0.0001	62.88052	14.26460	0.0000
At most 2 *	35.06096	3.841466	0.0000	35.06096	3.841466	0.0000

For the series DLINF DLREER DTB, we can see 3 cointegrating equations at the 5% level (MacKinnon-Haug-Michelis (1999) p-values).

As we saw the existence of 3 cointegrating relationships therefore we concluded that long run relationship exists between the selected variables. Hence, in the next step we ran the VECM. The results of the cointegrating equation and error correction are:

Table 3: VECM Results

Vector Error Correction Estimates

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LINF(-1)	1.000000
TB(-1)	0.669925
	(0.18331)
	[3.65464]
LREER(-1)	-68.55423
	(38.3118)
	[-1.78937]
C	94.15627

Error Correction:	D(LINF)	D(TB)	D(LREER)
CointEq1	0.000182	-0.041924	0.000129
	(0.00018)	(0.01406)	(9.1E-05)
	[1.02506]	[-2.98206]	[1.41095]

From the above we can estimate the cointegrating equation 1 as:

LINF +0.669925TB - 68.55423LREER + 94.15627 = 0

This can be re-written as:

LINF= -0.669925TB + 68.55423LREER - 94.15627 = 0

As in the above equation coefficient of cointegration is representing the long run relationship and other than the interest rate we have taken the other variables in natural log form, therefore their coefficients can be interpreted in terms of long run elasticities. From the results it can be seen that interest rate has a negative impact on inflation whereas exchange rate has a positive effect. There is a fall of 0.669925% in inflation due to a one unit increase in interest rates whereas inflation rises by 68.55423% due to a one unit rise in exchange rate.

In terms of economic interpretation when interest rate rises the Central bank is pursuing a contractionary monetary policy, as credit becomes expensive money supply declines hence a fall in inflationary pressures. The second part of the table show error correction results. Error correction term's value should ideally be between (0, -1). The presence of a negative sign shows the convergence and represents the adjustment speed leading to equilibrium. From the given results we can see that the value of the error correction term for interest rate is negative whereas for the other 2 variables it is positive. Hence, interest rate corrects 4.1924% of the deviations in disequilibrium each month, whereas the other 2 variables have insignificant t-values.

Table 4: Granger Causality Tests (Granger, 1969)

Null Hypothesis:	Chi-sq.	Prob.	Decision
INF does not Granger Cause REER	27.65330	0.0000*	Reject
INF does not Granger Cause TB	8.339407	0.0799	Does not reject.
REER does not Granger Cause INF	4.307582	0.3660	Does not reject.
REER does not Granger Cause TB	9.488461	0.0500*	Reject

TB does not Granger Cause INF	12.00549	0.0173*	Reject
TB does not Granger Cause REER	12.48387	0.0141*	Reject

* At 5% significance level

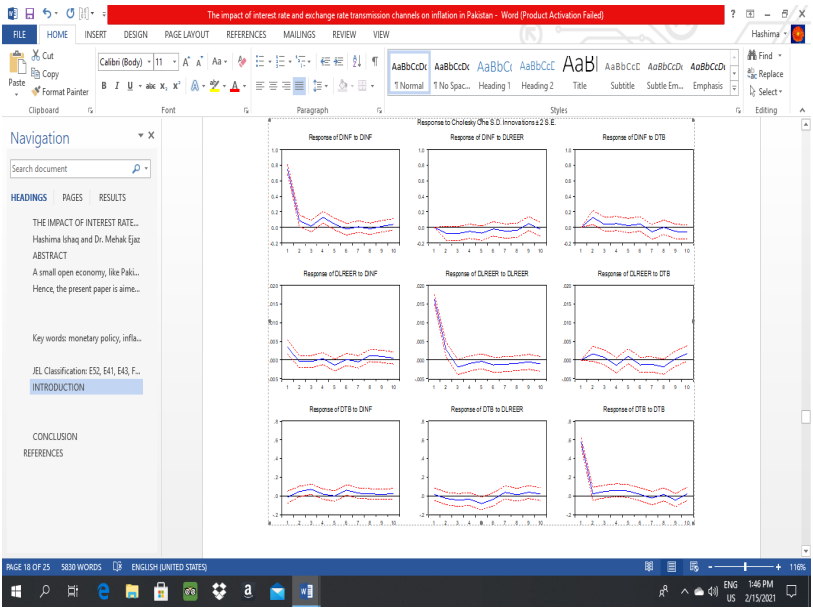
The above results indicates a one way causality from inflation to the rate of exchange and from the rate of interest to inflation. A two way causality between the rate of interest and the rate of exchange.

Table 5: Variance Decomposition

Variance Decomposition of DLINF:				
Period	S.E.	DLINF	DTB	DLREER
1	0.007181	100.0000	0.000000	0.000000
2	0.007509	94.14892	0.105424	5.745653
3	0.007604	91.86964	1.249442	6.880916
4	0.007767	91.42577	1.443563	7.130670
5	0.007791	90.86891	2.019210	7.111877
6	0.007829	90.01496	2.705732	7.279304
7	0.007845	89.96165	2.710071	7.328280
8	0.007846	89.93330	2.738094	7.328602
9	0.007851	89.85027	2.769355	7.380377
10	0.007854	89.83860	2.767803	7.393601

Variance decomposition of inflation shows that about 89.83860% of variations in inflation is explained by its own adaptive expectations whereas, the rate of interest contributes 2.767803% and the rate of exchange 7.393601% to overall inflation in the 10th period of time.

Fig. 2: Impulse Response Functions



The impulse response function of inflation to itself shows that mostly any external shock results in ultimately driving adaptive expectations, it ultimately ends with a slightly higher inflation rate in the 10th month. However, a shock to both the interest and exchange rates bring a significant change initially in inflation. The impact of a positive shock to interest rate results in driving inflationary pressures positively till the 6th period, after which inflation responds negatively and ends on a negative note. For a positive shock to REER, inflation responds negatively from the 1st till the 8th period. However, after the 8th period inflation responds positively slightly oscillating ending on a negative note in the 10th month.

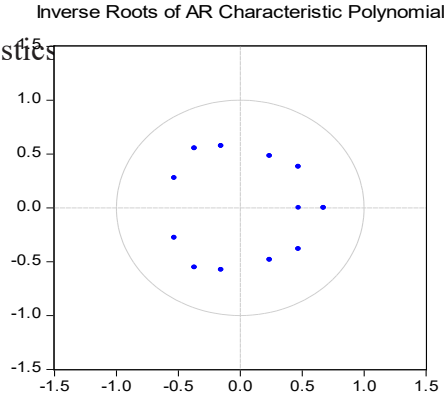
DISCUSSION

Although the VECM results do not indicate a strong influence of the exchange rate on inflation, yet both the Impulse Response Functions and the Variance Decomposition indicate a strong impact of REER on Inflation. As the real effective exchange rate appreciates there is a decline in inflationary pressures. This is because our economy is heavily dependent on imports. An appreciation of currency indicates a fall in the price of most import commodities. Naturally as for example crude oil or imported machinery becomes cheaper for Pakistan's economy, costs decline pushing down inflation. Similarly, a depreciation of the Pakistani rupee would result in building inflationary pressures as imports become expensive. This impact is almost immediate, i.e., within the first lag.

The behavior of interest rate influence for a desired contractionary monetary policy takes longer lags to become effective as the impact of an increase in interest rate to control inflation occurs after the 6th lag or month. Initially, with a rise in the rate of interest, inflation also rises. This phenomenon is referred to as the "Price Puzzle" (Javid & Munir, 2010), in economic literature. This is because when interest rate rises, borrowing becomes expensive leading to higher costs and supply shocks.

The Granger Causality results indicate a two way causality between the interest and exchange rates. Meaning a change in either one would impact the other.

Fig. 3: Diagnostics



The AR roots graph plotted here shows that all the inverse roots lie within the unit circle. This verifies the stability of our VAR model. We also tested for serial auto correlation with the help of the LM test and fail to reject the null of no Serial auto correlation.

CONCLUSION

The scope of the study falls in the macro economy of Pakistan. It looks at the potential of how a change in a policy tool can bring about a change in inflation through the transmission channels of interest rate and the exchange rate. From the above results we can conclude that the transmission channel of interest rate has a negative impact on inflation as shown in the VECM results. The selected variables are cointegrated in the long run. The error correction term indicates a correction of 4.1924% in the rate of interest to correct disequilibrium per period of time. The Granger causality result also support the above conclusion as the rate of interest is seen to granger cause inflation but not vice versa. Impulse Responses

indicate policy effectiveness after the 6th lag. Hence, we reject the null hypothesis of the rate of interest not affecting inflation.

Although the rate of exchange doesn't have a significant explanatory power in the VECM model, however, variance decomposition of inflation shows that about 7.393601% changes in inflation are explained by the changes in the exchange rate in the 10th lag. Impulse Response Functions also indicate a strong negative influence of an appreciation in REER on Inflation. The impact is almost immediate within the first lag. Here, we can also reject the null hypothesis of the rate of exchange not affecting inflation.

Inflation is observed as Granger causing the rate of exchange which can be easily interpreted as when inflation rises the value of the domestic currency in terms of the foreign currency will fall due to instability in domestic prices. The impulse response functions and the variance decomposition shows that both the rate of interest as well as the exchange rate do explain the fluctuations in inflation. There is a two way causality observed between the rate of interest and the rate of exchange which is also as per economic theory.

The above results are in line with the monetary policy adopted by the State Bank of Pakistan in the past years. The State Bank has shifted its focus from monetary aggregates to the rate of interest to help control inflation in the country.

This paper is aimed at an in depth analysis of the interest rate and the exchange rate as transmission tools of monetary policy especially in their impact on inflation, and would hopefully turn out to be a valuable addition to the existing literature. *The findings of the paper are interesting in terms of supporting the decision of the State Bank of Pakistan towards adopting flexible inflation targeting by the year 2020, rather than relying on monetary aggregates.*

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