Impact of monetary policy changes on sectoral trade balance

A case study of Pakistan

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CERTIFICATE

This is to certify that this thesis entitled **"Impact of Monetary Policy Changes on Sectoral Trade Balance: A Case Study of Pakistan".** submitted by **Mr. Haider Ali Khan** is accepted in its present form by the Department of Business Studies, Pakistan Institute of Development Economics (PIDE) Islamabad as satisfying the requirements for partial fulfillment of the Degree of Master of Philosophy in Economics and Finance.

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ABSTRACT

This study examines the impact of monetary policy using Discount rate, Money Supply and incorporating exchange rate on trade balance and sector groups identified by Pakistan Bureau of Statistic. This study also identified the surplus and deficit sector groups. SVECM (Structural Vector Error Correction Model) is used with long and short-run restrictions to examine the macroeconomic variables shock to trade balance, using annually data of variables from 1980 to 2018. The results for the trade balance in long run shows that the Real exchange rate, Real output, price level has a positive and significant relation. While the money supply has a negative and significant long-run relation to trade balance. The study reveals that discount rate has no long-run relation to trade balance. In short run the trade balance is most influence by the real exchange rate than the money supply and discount rate. While the price level and real output have a weak response to trade balance. The study also finds the four sectoral groups are trade surplus and six are in trade deficit. The study suggest that the monetary policy tools have a significant and positive relation in long-run as well as in short-run with Trade balance. but the real exchange rate is more dominant variable to the trade balance than the other macroeconomic variables which response highly in long-run and in short-run. The study suggest that the policy maker should keep in mind the real exchange rate before further development and planning for the trade balance and preferred the exchange rate stabilization policy for the effectiveness of the monetary policy.

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CHAPTER 1

INTRODUCTION

1.1 Background of the study

The important and main goal of the monetary policy makers is to accomplish the welfare of the society by targeting the price stabilization through implication of the various policies they acquire for inflation, interest rate and money supply. For that the interest rate and money supply is used as a main key tool of monetary policy for achieving its targeted inflation and economic stabilization in the country. There is large number of empirical as well as theoretical studies available on monetary policy changes to intervene in controlling the inflation and price stability in the economy. Monetary policy can be both expansionary as well as contractionary which is enacted by the central bank independent to the government with the mandate to control the inflation as well as the other economic variables. Expansionary monetary policy could use to boost the economic growth and reduce the unemployment by targeting the increase in aggregate demand in the economy. While the primary reason the central bank uses the contractionary policy by reducing the aggregate demand for their targeting inflation. Accordingly (Friedman, 1968) inflation is the main fundamentally monetary phenomenon. It is most universally belief that monetary policy can contribute to the economic growth with the stable price level and agree upon that the high level of inflation is generally caused by the excess growth in the money supply. In Pakistan the monetary policy is authorized by the state bank of Pakistan and mostly use the interest rate and money supply tools for overcome the macroeconomic instability in country. Accordingly (Qayyum, 2006) excess money supply in Pakistan is the main reason for the increase in inflation and also effect the real GDP. Excessive increase in money

supply possibly increases the real income and trigger the demands for the imports which worsen the trade balance. On the other hand, the monetary policy is concerned with the control of money supply and interest rate fluctuation in the economy, as in the quantity theory of money[1] the purchasing power of the money depend on the quantity of money supply.

Indirectly the low interest rate is less attractive for the individual to save and preferred to spend on the consumption which leads to increase in aggregate demand and same for the higher interest rate is paid by the consumer on their credits is more difficult for their essential financial purchases and resultant the lower demand for the good and services. Ahmed *et al.,* (2016) accordingly there is inverse relation between the interest rate and economic growth in Pakistan. Uzma *et al., (2017*) however, the consensus point of view is that the interest rate is not the main cause of economic growth for Pakistan but alternately the economic growth is causing the fluctuation in the interest rate in Pakistan. Monetary policy variables (money supply, interest rate) also have direct effect on macroeconomic variables such as exchange rate, foreign direct investment, international trade, income, unemployment, balance of payment, inflation and investment. Inflation is almost related to the interest rate[2] and fluctuating interest rate fluctuate the exchange rate and resultant directly influence the trade of balance either in the short run or in the long run (Fernando Alvarez, 2001).

[1] Quantity theory of money arises in the 16th century when the gold and silver coins are minted from America into Europe which cause the inflation. Further in 1802 Henry Thornton explains that the more money supply increases inflation.

[2] Increasing interest rate shows that a country currency is more beneficial for foreign investor which will increase the demand for that country currency in foreign exchange market increases will which strengthen the exchange rate.

The Pakistan economy goes through balance of trade deficit approximately all his fiscal year from 1980. The lowest trade deficit recorded in the last 15 fiscal years is $7.8bn in 2019. Continual Depreciation in the exchange rate worsen the balance of trade in the Pakistan (Shahbaz et al., 2011). While a study using the Marshall-Lerner condition[3] which is found satisfactory in the long run and J-Curve[4] in short run for Pakistan (Aftab, 2002). The high level of interest rate is more attractive for the foreign direct investment and the economic growth is increased with increasing in foreign direct investment in Pakistan (Dar et al., 2016). The volatility between the interest rate and exchange rate is continuously correlated with the foreign direct investment. Accordingly (Determinants et al., 2018) the growth in the foreign direct investment enhance the trade balance of Pakistan. However, it is found a significant spillover effect from foreign direct investment to domestic output (Mohsin hasnain ahmad, shaista alam, 2003). The Increase in domestic and foreign direct investment is essential for the stabilization of trade balance and for the economic growth in Pakistan. One possible channel could be that the change in the money supply could change the real income which lead to change the consumption pattern hence intervene in the demand of imports and exports. Second possible channel could be that the fluctuation in the interest rate could fluctuate the

[3] The condition states that, for a currency devaluation to have a positive impact on the trade balance, the sum of the price elasticities of exports and imports (in absolute value) must be greater than 1. The net effect on the trade balance will depend on price elasticities. If goods exported are elastic with respect to price, their quantity demanded will increase proportionately more than the decrease in price, and total export revenue will increase.

[4]An economic theory that stat under precise assumption that depreciation of currency initially worsens the trade deficit because the high price of import is greater that the decrease in the quantity demanded of imports.

saving of individuals and foreign direct investment hence lead to the shifts in consumption demand for domestic and foreign goods and be a main reason of variation of balance of trade.

1.2 Research Question

The key subject discuss in this study is to evaluate the combine interaction of monetary policy, macroeconomic variables, and sectoral trade balance relationship in Pakistan, which may be essential for policy makers and regulatory bodies in determining the exact policy measurements that might affect the specific economic sector as well as national economic situation. In the light of previous discussion, the study is aimed to answer the,

A. How the monetary policy effects the different sectors of trade categorized by PBS ?

B. How the mentioned macroeconomic variables effect these trade sectors ?

1.3 Objective of the study

Bring into focus on Pakistan the study goal is to examine the impact of monetary policy incorporating money supply, interest rate and exchange rate as a main tool on the trade balance and among sector groups. The study scrutinizes to answer the long and short run influences of monetary policy and macroeconomic variables on the trade balance and sectoral groups trade of Pakistan. The study goal is to answer and examine the effects of the trade balance and sector groups due to the monetary policy changes in Pakistan.

1.4 Significance of the study

In the best of our understanding there is no study found which investigate the relation between the monetary policy and trade balance of sectors in Pakistan incorporating both money supply and interest rate as a main tool of monetary policy using the annual data from 1980 to 2018. The study assists in the primary query for the policy maker that whether the shift in the monetary policy is influential to encourage or discourage the trade balance of which sector in Pakistan. However, it is serious required to explore the relationship among money supply, interest rate and other macro variables on trade balance at sectoral level.

1.5 Study plan

The research proposal is organized as introduction in the first chapter including the background, objective, significance, and the linkages of the study. The second chapter is based on literature review which include the theoretical, empirical, and national literature subjected to the related study. The third chapter consist of the methodology and the date used in the study. The fourth chapter conclude the empirical results and the observations found in the study. The fifth chapter is based on impulse shocks results and the last chapter is based on conclusion and policy recommendation.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter takes into account for the review of theoretical, empirical and national literature concerning the impact monetary policies on the sectoral trade balance and concerned macroeconomic variables. The theoretical literature is based on the economic theories and different school of thoughts explains the monetary policy and other key variables impact. The Empirical literature is based on the different economic models used for the monetary policy and key macroeconomic variable. The national literature is based on the related literature available for the Pakistan examines the monetary policy and other macroeconomic variables.

2.1 Theoretical review

Monetary policy is used since a wide and very complex expansion when the economic phenomenon came in existence, which drawn the observation of researchers with their different perception and theories in different time period. Classical economist[5] view on monetary policy says that the increase in the money supply only increase the price level and the interest rate, income level and the economic level is unchanged. Classical economists believe that the only role of money is a medium of exchange and also believe that there is always full employment level in the economy, when the price level

[5] Classical economics or classical political economy is a school of thought in economics that flourished, primarily in Britain, in the late 18th and early-to-mid 19th century. Its main thinkers are held to be Adam Smith, Jean-Baptiste Say, David Ricardo, Thomas Robert Malthus, and John Stuart Mill.

increase it reduces the real wages which gives the motive to employers to extend the employment lever and output which is effective in full employment level in economy. In argument of the classical views the Keynesian economist[6] did not agree on that the money supply only increase the price level and the employment level is always at equilibrium. Keynesians believe that the increase in the money supply not only change the price level but also the interest rate, income, output level and the unemployment. In adverse of employment the Keynesian belief on high money supply, which tend to lower the interest rate that is determine by the demand and supply of money in economy and gives the more capability to the capital to improve investment which lead to the increase in the demand of output and employment.

2.1.1 Linkages to variables

Basically the monetary policy by the central bank of Pakistan will work through the various channels affecting the verity of the variables before hit the real economy and works through the monetary policy transmission mechanism. If the central bank cut the interest rate that is the expansionary policy and that could lead to the lower the credit interest rates that is basically the lower borrowing cost for consumers which incentivize more borrowing and incentivize less savings which leads to increase in marginal propensity to consume and aggregate demand increase in economy. In contradict to the cut in interest rate, reduces the savings factor as it is also the rate of return consider for savings and the savings account deposits will fall in economy and consumption

[6] Keynesian economics served as the standard economic model in the developed nations during the latter part of the Great Depression, (1936–1973)

increases. Also the cut in interest rates across the economy can well in the exchange rate and that is because the saver has less of incentive to save and they move their money out country which known as a hot money[7]outflows which leads to an increase in the supply of a domestic currency and depreciating the currency. As discussed above the lower interest rate stimulates the aggregate demand which could widen the trade deficit by spending more there savings on imports.

The instrument which is used by the monetary policy to achieve its short- and long-term objectives are classified as Market control approach and Portfolio control approach. Open market operations and discount rate is used as a market control approach in which the central bank buy or sell the government approved bonds and securities to control the money supply and the discount rate which is the rate of interest which is charge by central bank to the commercial banks for the funds they lend. The increase in the discount rate is costlier for the commercial banks and for the general public, resultant the lower demand of borrowing and therefore money supply decreases and vice versa for the decrease in the discount rate. Portfolio control approach include the constraint on reserve requirement, selective credit controls and the special deposits with the central bank through which they intervene the money supply in the economy.

2.2 Empirical review

(AGHELI, 2016) studied the effect of money supply on the balance of trade for Iran, using a time period of 1977 to 2014 by applying the Keynesian model with absorption

[7] Hot money is the savings that chases the best interest rates.

approach[8] and employing the unit root test for the structural break in the time series and co-integration test. The finding stat the long run relationship between the monetary policy and the balance of trade and the decrease in the money supply and inflation can increase the net exports. Similarly (Lee & Chinn, 1988) study verify the money supply have a large impact on the trade balance and exchange rate in the short run. (Koray & McMillin, 1999) found that the contractionary monetary policy negatively impact the U.S output and price level and insist the J-curve effect on the trade balance due to the monetary policy shocks. (Onyebuchi & Emeka, 2017) investigates the monetary policy variables including the money supply and the interest rate on the net export of Nigeria, employing the Auto Regressive Distributed Lag (ARDL) Model, co-integration test and granger causality test for the time period of 1981 to 2016. The finding say that the money supply has positive insignificant and interest rate has negative insignificant effect on the net export of Nigeria. The study find that the money supply has unidirectional relation with the net exports.

(Manual & San, 2019) the latest study which investigate the relation between the trade balance and macroeconomic variables which include the inflation, money supply, domestic income and exchange rate using the annual date from 2000 to 2015, employing the ARDL model and granger causality. The results indicate that the money supply has insignificant effect on trade balance while inflation, domestic income and exchange rate has significant effect on trade balance. (Ivrendi & Guloglu, 2010)

[8] The Absorption approach states that when the economy is operating at less than full employment, currency depreciation makes domestic goods and assets more attractive than foreign goods and assets, and that both income and expenditure will increase, however, the increase in national income will be greater than total expenditure, therefore, improving balance of trade.

suggest that the contractionary monetary policy have a beneficial effect on the trade balance in short-run time period. (Imoisi et al., 2013) investigate the effectiveness of monetary policy in achieving Nigeria's balance of payments stability based on time series data from 1980 to 2010. The results indicate positive relation between variables of monetary policy such as money supply, interest rate and exchange rate by using Ordinary Least Square (OLS) technique. Balance of payments had significant relationship with interest rate and money supply, while balance of payment had not statistically significant relationship with exchange rate. (Ehikioya et al., 2015) explores monetary policy approach in Nigeria to balance of payment from 1986 to 2013. By using Error Correction Model (ECM), study reported that its exits long run relation between the balance of payment, interest rate and money supply. More incorporating that monetary policy variable and balance of trade are stationary at first order level of difference. Furthermore, the results revealed that balance of payment is monetary phenomenon. (Osisanwo et al., 2019) explore the relation between the monetary policy and balance of payment during the time period of 1980 to 2015 using the bound test approach. The finding suggests that the money supply and the trade balance has positive relationship on balance of payment of Nigeria. Importantly the study emphasizes on the existence of strong long-run relation of money supply with the balance of payment than the other monetary policy variables. (Duasa, 2007) used the ARDL bound test and examines the monetary and absorption approach to study the relation between the trade balance, exchange rate, money supply and income for the country of Malaysia using the data of 1974 to 2003. The study finds the existences of the strong long-run relationship of money supply, income and trade balance as

compared to exchange rate. (Phong & Van, 2017) studied the macroeconomic variables impact on balance of trade for the Vietnam using the date from 1986 to 2014. By incorporating the ARDL and ECM-ARDL model, the test result show that the trade balance has positive impact on the money supply in the short run and has negative impact in the long run. While the exchange rate and GDP has a positive impact in both long run and short run on the trade balance. (Huong et al., 2014) Examine the monetary policy impact on trade balance in Vietnam using the monthly data from 2003 to 2012 employing the Structural Vector Auto Regression Model (SVAR). The result shows the negative relation of interest rate, money supply on trade balance. The result stat that the shocks in money supply cause in increasing the export is less that the increase in imports which worsen the trade balance. (Akoto & Sakyi, 2019) recently study the j-curve effect and Marshall-Lerner condition and other macroeconomic variable on the trade balance of Ghana, using the date from 1984 to 2015. The study uses the co-integration bound test, ARDL framework for the study estimation and the error correction model. The finding of the study stat that the money supply and the foreign income has significant and positive impact on trade balance, while the household consumption expenditure, domestic prices and the government consumption expenditure has significant and negative impact on trade balance in short and long run. (Yeshineh, 2017) investigates the long and short run relationship of macroeconomic variables and the trade balance of Ethiopia, comprising with money supply, income, foreign income, real exchange rate and balance budget, using the annually date from 1970 to 2011. The study employs the bound test approach, error correction model and ARDL model to exam the relation between the variables. The tests of the study

investigate that it exists a co-integration relation among the variables and trade balance and the money supply and budget balance has a significant impact on trade balance of Ethiopia than the exchange rate. (C Rincón, 1998) analyses the long-run and run-run behavior of Colombia to their trade balance. The results reported that there is co-integration exist among the trade balance, income, money supply and the exchange rate. The study also examine that the exchange rate has positive effect on the trade balance and money supply and the income are the important variables for the trade balance.

2.3 National literature

Only few literature is available in the multiple direction and multiple variable influencing the trade balance. Shah *et al.*(2014) recently find the long run and short run impact of real exchange rate, money supply and income on the trade balance of Pakistan using the date from 1980 to 2011. The study used the ARDL framework and co-integration model to analyze the results. The study reveals that money supply do not has any impact in the long run on the trade balance, while the income and the real exchange rate has negative impact on the trade balance both in the long run and in the short run. (Kakar et al., 2010) Also examine the long and short time period relation of money supply, real exchange rate and money supply on the trade balance of Pakistan using the data from 1970 to 2005. The study employs the ARDL and co-integration model to study the relation. The results of the study stat that the deprecation in real exchange rate is positively relate to the trade balance of Pakistan. Hence more the behavior of the trade balance is strongly determined by the money supply and income.

(Nizamani et al., 2016) study the relationships of the monetary policy shocks, exchange rate on the trade balance of Pakistan using the date from 2003 to 2013. The study uses the vector error correction model for the estimation of the variables. The study also examines the effect of the trade surplus and trade deficit sectors and the results say that the trade surplus sectors have negative effect due to the monetary shocks while it enhances the total trade balance in the short run. Furthermore, the impact is positive and significant on the trade deficit sectors.

(Oskooee & Cheema, 2009) study the long and short run effect of depreciation of Pakistani rupee on trade balance of Pakistan with her 13 most trading countries. The study uses the bound test approach and Johansen's co-integration approach to study the relationship and using data from 1980 to 2003. The results find that the bilateral trade balance with china and U.E.A is effected by the depreciation of the Pakistani rupee. While the trade with other countries have positive and significant impact due to exchange rate. (Mujahid et al., n.d.) explore the relation among the trade and economic growth of Pakistan. The study uses the time series data from 1970 to 2013 using the main macroeconomic variables including imports, exports, GDP and FDI and employ the ARDL and Error correction model for the estimation. The results stat the existence of the long run relation among the variables. The export and imports has positive impact on GDP. (Ahmad, Dilshad , Mohammad, Afzal , Usman, 2016) check the monetary policy impact on economic growth of Pakistan. The study uses the time series data from 1973 to 2014. The study used the ARDL co-integration approach and ADF unit root test for the stationary. The estimation stat that the existence of the long run relation between the variables. The exchange rate and money supply has positive relation with

the GDP and the interest has negative relation with the GDP. (Hameed & Amen, 2011) studied the impact of monetary policy on GDP using annually data from 1980 to 2009. The results of the study prove that the money supply has a great impact on GDP than the impact of the interest rate. (Shahbaz et al., 2012) uses ARDL approach to analyze the long run relation among the exchange rate and trade balance for Pakistan and finding suggest that the currency depreciation loads to decline in the trade balance. (Aftab & Khan, 2008) examine the j-curve existence of Pakistan with the trading partners countries and found that the devaluation in Pak rupee improves the trade balance with the Hong Kong, Germany, Italy, Netherland and Spain. While the devaluation in Pak rupee does not have any significant effect on Pakistan trade balance with U.S, France and UK. (Aftab & Aurangzeb, 2002) Analyze the trade balance using the time series data and satisfactory resulted the Marshall-Lerner condition for Pakistan. The results found that the exchange rate depreciation improve the trade balance of Pakistan for short time and worsen the trade balance in long run. (Shahbaz, 2012) Explore the relation between the exchange rate and trade balance of Pakistan using ARDL model for data of 1980 to 2006. The study found the long run relation among the trade balance and exchange rate resulted that depreciation in exchange rate deteriorates the trade balance in Pakistan and J-Curve does not hold for Pakistan.

CHAPTER 3

METHODOLGY AND DATA

Introduction

This chapter include the two sections, econometric model and estimation technique in which the study methodology is briefly discussed. Econometric model represent the SVECM model used in the study. Further the estimation technique includes two section which briefly explained the diagnostic testing and identification of long and short run restriction in the model and in last is the data collection and variables representation used in the study.

3.1 Econometric Model

To study the impact of trade balance and sectoral groups due to monetary policy incorporating exchange rate changes we use Structural Vector Error Correction Model (SVECM). For the study of the set of variables which has one and more cointegration relation than the VECM is suitable estimation technique. It was originally developed by (King, 1991) and further modified by (Breitung, Jorg , Luetkepohl, 2004). The SVAR and SVEC models are like similar because both models are used to impose the structural shocks by applying restrictions. The only difference is that the SVEC accounts for cointegration among variables. The error correction model can be developed from the autoregressive distributed lag model as long as there is a cointegration relationship between the variables. Engle and Granger combined cointegration and error correction models, to establish the trace error correction model. As long as there is a cointegration relationship between variables, the error correction model can be derived from the autoregressive distributed lag model. And each equation

in the VAR model is an autoregressive distributed lag model. Hence, it can be measured that the VEC model is a VAR model with cointegration restrictions. Because there is a cointegration relationship in the VEC model, when there is a large range of short-term dynamic fluctuation, VEC expressions can restrict long-term behavior of the endogenous variables and be convergent to their cointegration relation Further the coefficient of the error term in the VEC model estimates the speed of recovery of economic variable towards the equilibrium.

3.1.1 SVEC Model

We start with assuming that the economy is represented by VAR(p) Process.

$$B(L)\, y_t = c + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (1)$$

Where B(L) In the lag operator L, a matrix polynomial of order p is a k dimensional vector of measurable variables, μ_t is an n x 1 zero mean white with noise phase and matrix of non-singular covariance $\sum\mu$, $\mu_t \sim (o, \sum\mu)$. Moreover, y_{t-p+1}, ….. y_0, initial conditions are assumed to be fixed.

The same rationale for SVAR models can be extended to SVEC models, especially when the equivalent level-VAR representation of the VECM is used by the SVEC models (Pfaff, 2008). The VAR (p) has the following vector error correction representation, as all variables are I(1)* at most.

$$\Delta y_t = \alpha\beta' \, y_{t-1} + \Gamma_1 \Delta y_{t-1} + \ldots\ldots \Gamma_{p-1} \Delta y_{t-p+1} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (2)$$

n x r and r<n are the dimensions of both the α and β matrices. More specifically, the loading coefficients and cointegration vectors, respectively, are found in β and α. Aβ'

has decreased rank and the word $\alpha\beta' y_{t-1}$ stands for the term of error correction. The $\Gamma_i (i=1,2,\ldots,p-1)$ shows n×n which is short-run coefficient matrices reduced form.

The equation (2) has the structural form.

$$A\delta y_t = \prod y_{t-1} + \Phi_1 \Delta y_{t-1} + \ldots + \Phi_{p-1} \Delta y_{t-p+1} + \varepsilon_t \quad \ldots\ldots\ldots\ldots (3)$$

In equation (3) *A* stand for the coefficient's matrix of contemporaneous effect, the Φí represent the short run coefficient matrices structural form, and the term ε_t represent for structural innovations.

The reduced form disturbances (μ_t) are connected linearly to structural innovations (ε_t) in the SVEC model in such a way that the reduced form disturbances (μ_t) are

$$\mu_t = A^{-1}\varepsilon_t \quad \ldots\ldots\ldots\ldots (4)$$

As assume that there is zero mean for structural developments ε_t and define the covariance matrix. Because of this assumption $\sum\mu = A^{-1}(A^{-1})'$ can be obtained. The restrictions on the A^{-1} of n^2 elements can be obtained through $n(n+1) / 2$ relation. We need at least $n(n-1) / 2$ more restriction for the A^{-1} elements for finding of structural shocks identify in the system, So contemporaneous relations between the macroeconomic variables is determined in the system.

Two forms of structural disruption may affect *Yt*, first is the interference from the permanent effect and the second from the transitory effects. It follows that the procedure has the following representation of the Vector Moving Average from the Johansen(1995) version of the Granger's representation theorem (VMA).

$$Y_t = p(1)\sum_{i=1}^{t} \mu_t + p(L)\mu_t + y_o \quad \ldots\ldots\ldots\ldots\ldots (5)$$

y_t shows the transitory and permanent shocks, and also the initial conditions. The y_o is show as the initial conditions. The absolute sum power of the term $p(L) = \sum_{i=1}^{\alpha_i} p_i L^j$

indicates that when j reaches to ∞ than the matrices converge to zero. This in resultant state that in long-run the transitory shocks have no effects. The $p(1)$ term which represents the permanent shocks in the long run is identified by the following equation.

$$p(1) = \beta\perp \left[\alpha\perp'(I_n - \sum^{r}_{i=1}\Gamma_i)\beta\perp\right]^{-1} \alpha\perp' \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

The rank of $n - r$ matrix implying that the system has $n - r$ independent common trends. The common stochastic trends in equation four can be rephrased by Replacing μ_i by $A^{-1}\varepsilon_i$

$$p(1)\sum^{t}_{i=1}\mu_i = p(1)\,A^{-1}\sum^{t}_{i=1}\varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The matrix A^{-1} must be non-singular since the structural developments have a nonsingular covariance matrix.. This means that n-r is the rank of $p(1)A^{-1}$ and there is r zero columns can be at most in the matrix $p(1)A^{-1}$. In other words we say that in a cointegration relationships with r in the systems, systemic shocks may have transitory effects at most r and must have lasting effects at least n-r of them. Since the r columns can be reduced to zero in the matrix $p(1)A^{-1}$ and the n-r columns are left unregulated.. Notice that since the reduced range of $p(1)A^{-1}$ is n-r, and each zero column shows the representation of one transitory shock and n-r stands for the independent restrictions. The r transitory shocks therefore involve r(n-r) independent constraints on the system's co-integrating relation for system. We need r(r-1) / 2 additional constraints to simply define the transitory shocks in the system. We required (n-r)((n-r)-1) / 2 more restrictions to precisely define permanent shocks in system. Now the total of r(n-r)+r(r-1)/2+(n-r)((n-r)-1)/2= n(n-1)/2 constraints are needed for the identification of permanent shocks and transitory shocks in the system. The transitory shocks can be defined by replacing the A^{-1} matrix with zero restrictions. These zero constraints

suggest that certain shocks have no instantaneous effect on some of the system's variables. Therefore, the limits of the A^{-1} matrix should not be arbitrary and must be compatible with economic theories. They also need to be defined so that it is possible to distinguish the transitory and permanent shocks. As a rule, the form of defining constraints is given as.

$$S_ı\, vec(p(1)A^{-ı}) = s_ı \quad , \quad S^a vec(A^{-ı}) = s_s \ldots\ldots\ldots\ldots..(8)$$

As S^a *and* $S_ı$ is matrices of choice to specify the contemporaneous restrictions and the long-run restrictions. The s_s and $s_ı$ vectors are zero vectors of suitable dimensions. Further the restriction on variables are rearranged using the properties of VES as

$$S_ı(I_n \Theta p(1))vec(A^{-ı}) = S' vec(A^{-ı}) = s_ı \ldots\ldots\ldots\ldots\ldots\ldots (9)$$

In which $S' = S_ı(I_n \Theta p(1))$ shows an $A^{-ı}$ matrix with long-run restrictions and the Θ donates for Kronecker product.

3.1.2 Restriction Identification

For identification of the long run and short run macroeconomic variables shocks we need to impose identifying restriction in SVECM. The presence of the relationship between macroeconomic variables was described by the cointegration test and it is already mentioned that monetary policy does not have lasting effects on variables in the long term. The long run impact matrix will be written as:

$$p(1)A^{-1} = \begin{bmatrix} 0 & * & * & * & * & * \\ 0 & * & * & * & * & * \\ 0 & * & * & * & * & * \\ 0 & * & * & * & * & * \\ 0 & * & * & * & * & * \\ 0 & * & * & * & * & * \end{bmatrix} \quad \ldots\ldots\ldots\ldots\ldots\ldots (10)$$

As the * represent the free parameters. As r = 1. Without the additional limitations on (r(r-1)/2 = 0), the transitory shock is defined. Further contemporaneous restrictions on the matrix A^{-1} can be obtained by (n-r)(n-r)-1/2 = 15. We use total of 15 short run restriction which are imposed in the following manner.

$$\mu^t = A^{-1}\varepsilon^t = \begin{bmatrix} 1 & 0 & 0 & 0 & * & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ * & * & 1 & 0 & 0 & 0 \\ * & * & * & 1 & * & * \\ * & * & * & * & 1 & * \\ 0 & 0 & * & 0 & * & 1 \end{bmatrix} \begin{bmatrix} r \\ GDP \\ CPI \\ TB \\ REr \\ MS \end{bmatrix} \quad \ldots\ldots\ldots\ldots(11)$$

The contemporaneous restriction in (11) shows that the monetary policy in the first row have only response to the exchange than the other variables. Accordingly (Khan, 2010) assumed that the exchange rate can be affected by monetary policy with interference in the foreign exchange market. The second row represent the real output which do not react to any variables. The second row shows the no interaction of output on the other variables. Accordingly (Soyoung Kim, Nouriel Roubini, 2000) output may not be effected other variables but output may effected from other variable. The third row represent the price level and only respond to the real output and interest rate. Accordingly (Loi, 2016) and (Karim, 2014) The price level have significant effect on stabilizing the real output at potential level and interest rate have a positive response in controlling inflation. The fourth row represent the trade balance equation which shows the response and interaction to all variables. We interact the trade balance to all macroeconomic variables as our main focus of the study is to examine the response of all macroeconomic variables in the model Which are our model's main determinants. The fifth row represent the real exchange rate response to the macroeconomic variables,

and we do not impose any restriction on it as the exchange rate is a fast-moving variable and cannot be normally managed by the domestic forces. The last row represents the money supply response to the variables and only response to the price level and real exchange rate. According (Gul & Hassan Iqbal, 2011) Money supply and inflation have a strong negative relation and inflation is greatly effect by the money supply. We also introduce the world oil prices (WTO) in our equation as an exogenous variable for the response of the adverse shocks for the outside of the model.

3.2Estimation Testing

3.2.1 Unit root

It is most important to test the stationary of the variables for the time series properties to examine the variance decomposition and impulse response function. We use the ADF (Augmented Dicky Fuller) test for the stationary of the data. As the data is stationary if its mean and variance is constant, and its covariance is depend on its lag but do not relate to time and for graphical representation if there is no trend found in graph than the series is say to be stationary. For the hypothesis testing the null hypothesis refer the presence of unit root (data is non-stationary) and alternative hypothesis refers for the stationary of the series.

3.2.2 Lag Selection

Before moving to the cointegration test the lag selection criterion must be determined so that the model do not have the effect of autocorrelation issue. We follow the schwarz information criterion with suggestion of 1 lag length for all macroeconomic variables and sector groups variables.

3.2.3 Cointegration Test

The cointegration is first introduced in 1987 by Clive Granger and Robert Engle. Cointegration test helps in identifying the two or more stationary time series are combined in such a manner that they cannot deviate from equilibrium over time. Further cointegration helps in identifying the spurious results of the model due to the non-stationary series. It is also a technique to help in finding the correlation between the series in the long run. Cointegration can be find through the Engle-granger test, Johansen test, Trace test and from maximum eigen value test.

3.3 Data and Variables

This study use annually data from 1980 to 2018. Most of the Trade data, sector groups data (G1,G2……G10) and Money supply data is collected from the Pakistan Bureau of Statistics and Pakistan Statistical Yearbook. Other Variables data (Discount rate, GDP, CPI and Real exchange rate) have been collected from the International Financial Statistics. The money supply and discount rate are used for monetary policy representation. The GDP is used as a real output of Pakistan. The CPI is used for measurement as price level. In this study we use real exchange rate because the theory related to trade balance explains more strong relation with the real exchange rate than the nominal exchange rate. Frist we interact the trade balance (TB) with all macroeconomic variables in equation and further we replace the trade balance (TB) one by one with sector groups (G1,G2,……G10) to interact with macroeconomic variables. In the study all macroeconomic variables are converted into natural logs form while the discount rate which is remained in percentage form. As most of the time period the Pakistan trade balance faces the deficit, and we use trade balance in term of ratio

between the exports over import[9] which allowed us to transform the series into natural log. Similarly used for the sector groups (G1,G2…….G10) trade. We use the world price of oil to monitor the adverse shocks in the country in order to control the global shocks.

3.4 Variables Representation

Discount Rate	r	World Oil Price	WOP	Chemicals	G6
Gross Domestic Product	GDP	Food and live animals	G1	Manufactured goods material	G7
Consumer Price Index	CPI	Beverages and Tobacco	G2	Machinery and transport equipment	G8
Trade Balance	TB	Crude materials inedible(except fuels)	G3	Miscellaneous manufactured	G9
Real Exchange Rate	Rer	Minerals fuels lubricants	G4	commodities (non-classified)	G10
Money Supply	MS	Animals and vegetables oils and fats	G5		

Further the sector groups import, and export are explained in Appendix.

[9] The same approach is used by (Koray & McMillin, 1999) and (Ivrendi, Mehmet & Guloglu, 2010) to define the trade balance as the export-import ratio.

CHAPTER 4

EMPIRICAL RESULTS AND OBSERVATION

4.1 ADF results

We use the ADF (Augmented Dicky Fuller) test for the stationary of the data and the results shows that all the variables are stationary at the first difference level with integrated of order I(1) with 5% significant level. ADF Unit Root Test Results are given below.

Table I: ADF at Level and first difference

At Level			**At First Difference**		
Variable	**t-statistic**	**Prob**	**Variable**	**t-statistics**	**Prob**
r	-3.440225	0.0161	r	-4.806353	0.0004
GDP	-2.66127	0.0899	GDP	-4.052689	0.0033
CPI	-0.582788	0.8622	CPI	-2.519031	0.0021
TB	-0.824297	0.8003	TB	-5.689638	0.0000
Rer	-3.830129	0.0058	Rer	-6.064746	0.0000
MS	-1.048393	0.7251	MS	-4.521726	0.0009
WOP	-1.165184	0.6790	WOP	-5.857445	0.0000
G1	-2.808043	0.0669	G1	-6.331969	0.0000
G2	-2.294117	0.1794	G2	-9.181507	0.0000
G3	-0.960853	0.7566	G3	-9.385381	0.0000
G4	-3.886568	0.0050	G4	-6.458401	0.0000
G5	-1.339494	0.6008	G5	-6.898713	0.0000
G6	-1.687015	0.4293	G6	-5.795526	0.0000
G7	-0.921384	0.77002	G7	-5.903226	0.0000
G8	-1.657600	0.4439	G8	-6.013202	0.0000
G9	-1.951813	0.3060	G9	-5.501529	0.0001
G10	-2.017572	0.2783	G10	-10.96070	0.0000

All the data is stationary at 1st difference with 5% significant level as the prob value is less than 5%.

The table include the economic variables and sectoral trade groups in the study. Under the observation of the null hypothesis is not accepted comparing the probability value which is less than 5% at first difference level and non-stationary at level.

4.2 Lag Suggestion

Table II: Optimal lag selection

Endogenous Variables : r GDP CPI TB Rer MS
Exogenous Variables : WOP

Lag	LogL	LR	FPE	AIC	SC	HQ
0	37.68750	NA	9.29e-09	-1.467857	-0.934595	-1.283775
1	317.7705	432.1281	8.55e-15	-15.41546	-13.28241*	-14.67913
2	364.1377	55.64061*	5.97e-15	-16.00787	-12.27503	-14.71929
3	415.3914	43.93178	4.81e-15*	-16.87951*	-11.54689	-15.03869*

*Indicates the lag order selection by the criterion at the 5% level.

The results of the lag selection criterion indicate the SC with optimal 1 lag selection in our study. The AIC, HQ, FPE, refers the 3 lags and LR refers the 2 lags. In selection of the SC indicates the less parameters obtained in model with more precise estimation due to minimum or least lag selection.

4.3 Cointegration results

Table III: Cointegration results

Hypothesis	Eigen value	Trace Test			Maximum Eigen Value		
		T-Stat	CV	Prob 5%	E-Stat	CV	Prob 5%
NONE *	0.805524	140.1271	95.75366	0.0000	58.94809	40.07757	0.0001
Atmost 1*	0.668153	81.17899	69.81889	0.0047	39.71088	33.87687	0.0090
Atmost 2	0.382909	41.46810	47.85613	0.1742	17.37857	27.58434	0.5476
Atmost 3	0.289153	24.08953	29.79707	0.1967	12.28671	21.13162	0.5196
Atmost 4	0.209330	11.80282	15.49471	0.1666	8.455492	14.26460	0.3343

We employ the Johansen's cointegration test for cointegration among the variables with trace test value, probability value and maximum eigen value. 1 lag are selected according to the SI criterion and with the help of hypothesis the results suggest the two cointegration equations among all variables except the G2 with 1 cointegration equation and G3 with 3 cointegration relation. As the T-stat value is greater that the critical value, as well as the probability value is less that 5% in trace test . Similarly the same results are verified by the max eigen value where the E-stat value is greater that the critical value and probability value is less than 5%. In our model we study the only one cointegration equation relation because the monetary policy causes only the transitory effect and do not affect other variables specially in the long run.

4.4Restriction Identification

Table IV : Structural VAR is Identified

A =						
	1	0	0	0	C(11)	0
	0	1	0	0	0	0
	C(1)	C(4)	1	0	0	0
	C(2)	C(5)	C(7)	1	C(12)	C(14)
	C(3)	C(6)	C(8)	C(10)	1	C(15)
	0	0	C(9)	0	C(13)	1
B =						
	C(16)	0	0	0	0	0
	0	C(17)	0	0	0	0
	0	0	C(18)	0	0	0
	0	0	0	C(19)	0	0
	0	0	0	0	C(20)	0
	0	0	0	0	0	C(21)

Contemporaneous Coefficient in the Structural Model

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-0.000584	0.005607	-0.104246	0.9170
C(2)	-1.210807	312.4225	-0.003876	0.9969
C(3)	-0.046064	0.503382	-0.091508	0.9271
C(4)	0.195013	0.350979	0.555626	0.5785
C(5)	-60.35859	15674.52	-0.003851	0.9969
C(6)	-0.841672	89.46732	-0.009408	0.9925
C(7)	49.40005	12734.19	0.003879	0.9969
C(8)	2.060041	12.86954	0.160071	0.8728
C(9)	-0.593780	0.282288	-2.103457	0.0354
C(10)	3.780583	165.2526	0.022878	0.9817
C(11)	59.64804	77.27853	0.771858	0.4402
C(12)	21.09445	5429.355	0.003885	0.9969
C(13)	0.175464	0.095521	1.836923	0.0662
C(14)	14.77058	3874.095	0.003813	0.9970
C(15)	-0.349729	46.50115	-0.007521	0.9940
C(16)	4.590937	4.742290	0.968085	0.3330
C(17)	0.013272	0.001543	8.602327	0.0000
C(18)	0.019515	0.004855	4.019710	0.0001
C(19)	-1.646234	429.0927	-0.003837	0.9969
C(20)	-0.287172	12.71194	-0.022591	0.9820
C(21)	0.031093	0.003650	8.519724	0.0000

CHAPTER 5

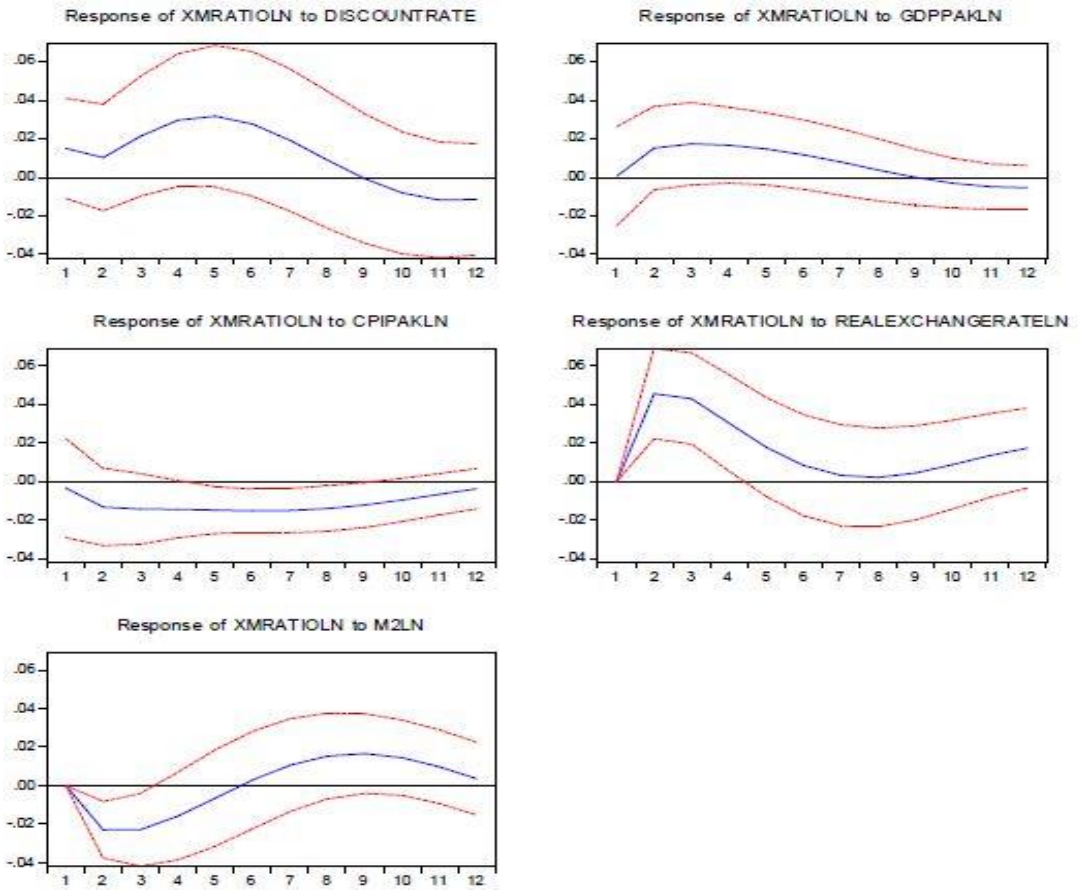
IMPULSE RESPONSE SHOCKS

Introduction

This chapter is based on the impulse response shocks of the variables on trade balance as well as the sectoral trade groups. According to our study we only examine the impulse response shocks of macroeconomic variable with trade balance and real exchange rate rather than the impulse response shocks with each variable. Every figure of impulse response includes the upper and lower band with dotted line shows the 95% confidence level and the solid line between the bands show the real response to the macroeconomic shocks.

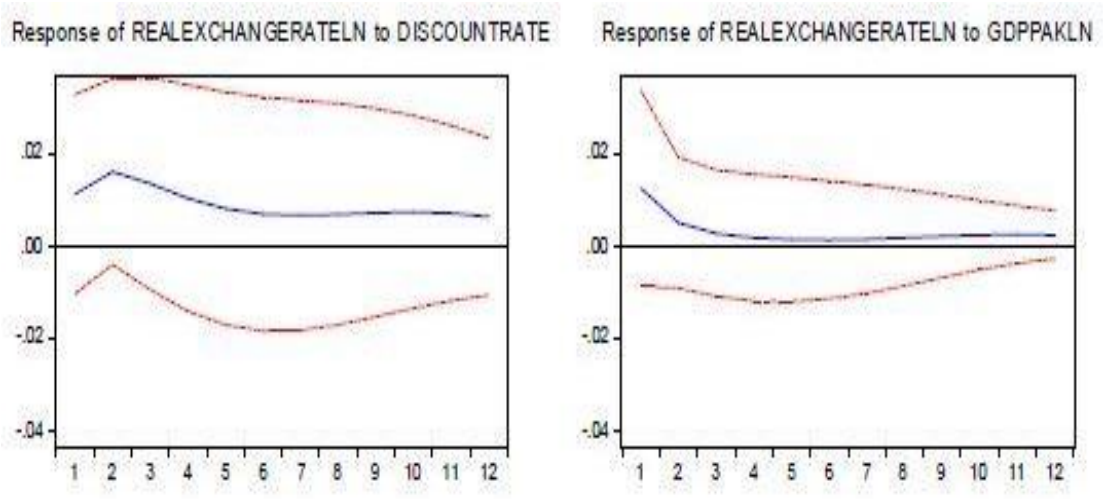
5.1 IRS to trade balance and exchange rate

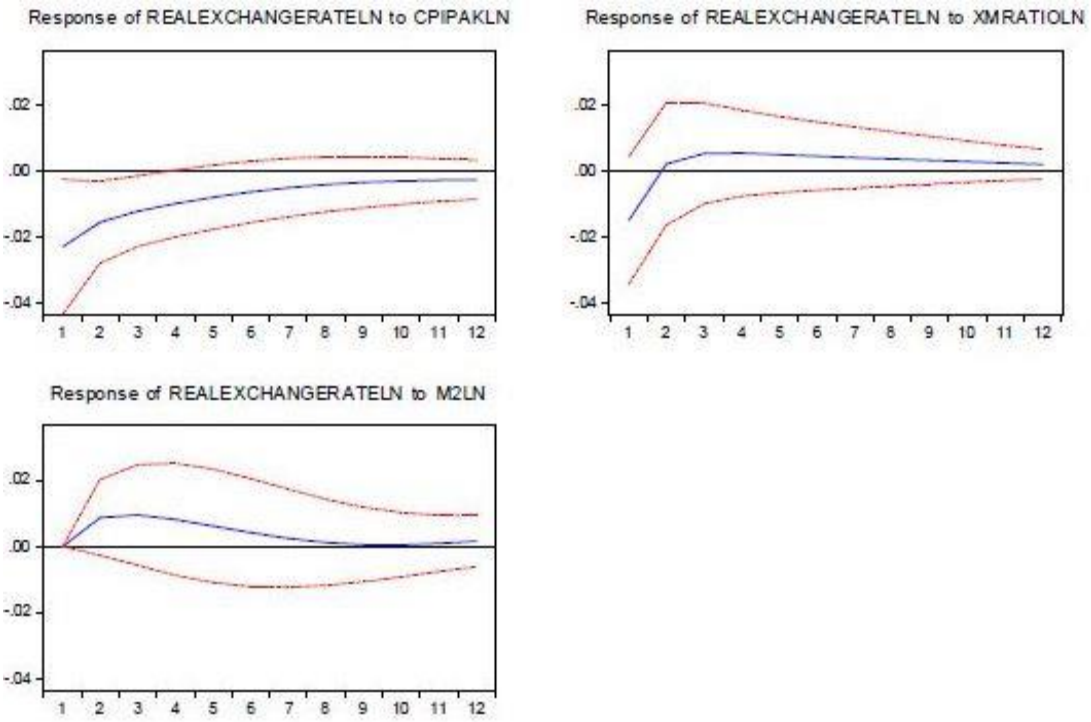
Fig I: Macroeconomic variables response to Trade Balance



In the **Fig1** the macroeconomic variables response to the trade balance. In first graph the TB shows the response to the *r*. For the first 2 period the TB decline and then show the sharp increase till period 6 and that start moving to equilibrium in the long period. The second line shows the TB response to GDP which only increase to the 2nd period and then move to the equilibrium in the long run. The third graph shows TB response to the CPI which initially decline for the 2nd time period and move negatively for the equilibrium in long run. The fourth graph shows TB response to the REr which sharply increase to the 3rd time period and move to equilibrium. The last graph shows the TB response to MS which initially decline to the 2nd time period and soon recovered in the 5th time period.

Fig II: Macroeconomic variables response to Real exchange rate



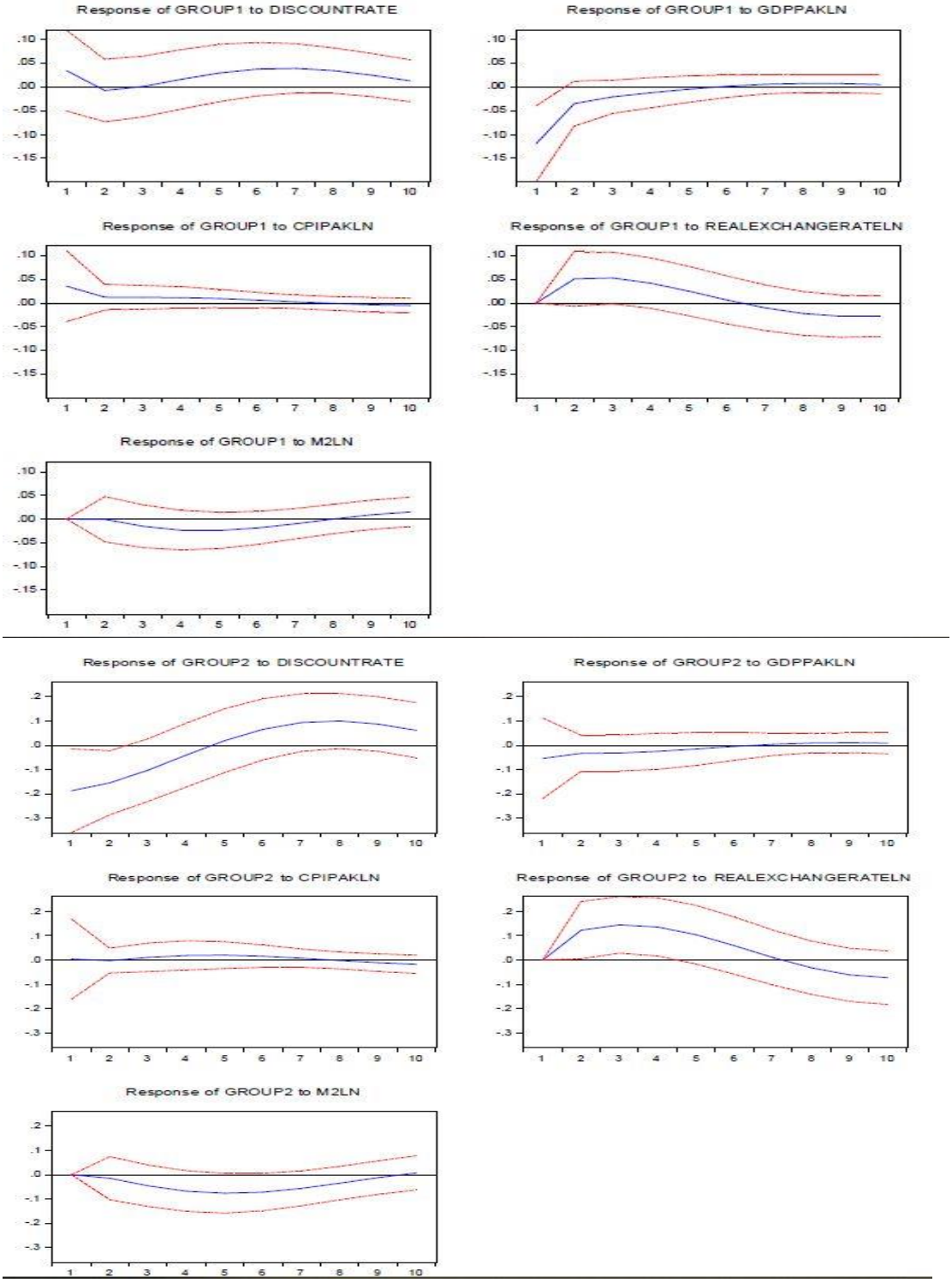


In **Fig 2** the first and last graph show the initial increase to 2nd time period and moving along to the equilibrium in long run. The third and fourth graph shows positive response in initial time period and in equilibrium for long time period. The second graph shows the sharp negative response till 4th time period and then move toward equilibrium in long period. the sector groups (G1,G2……G10) shocks to macroeconomic variables are shown the below **Fig III.**

5.2 IRS to Sectoral groups

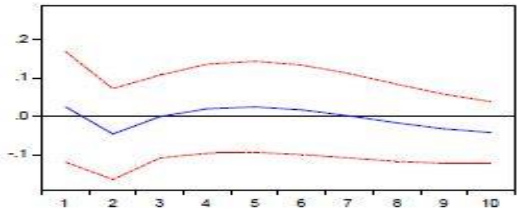
Fig III: Macroeconomic variables response to Sector groups (G1,G2….G10)

Response to G1 and G2

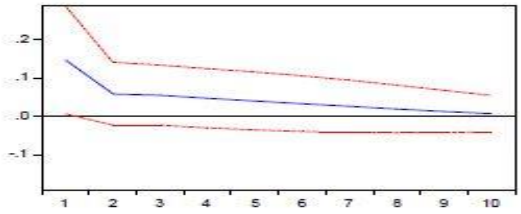


Response to G3 and G4

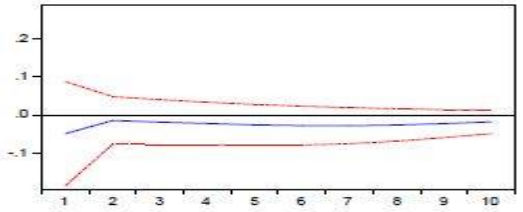
Response of GROUP3 to DISCOUNTRATE



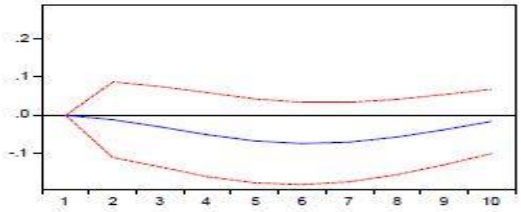
Response of GROUP3 to GDPPAKLN



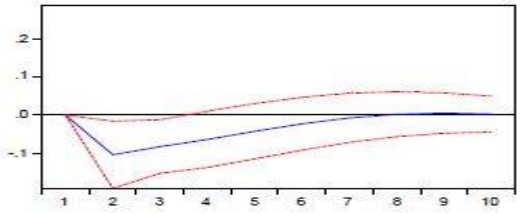
Response of GROUP3 to CPIPAKLN



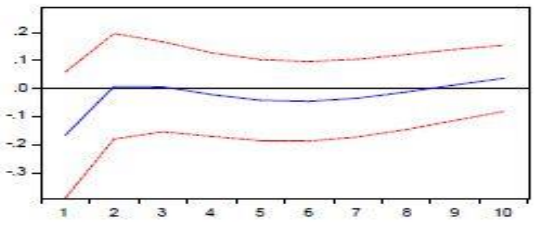
Response of GROUP3 to REALEXCHANGERATELN



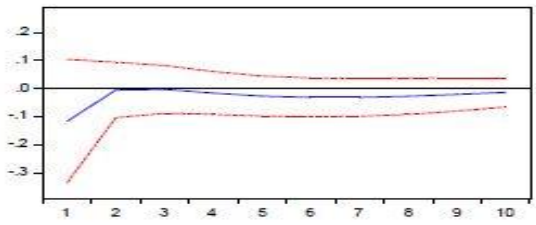
Response of GROUP3 to M2LN



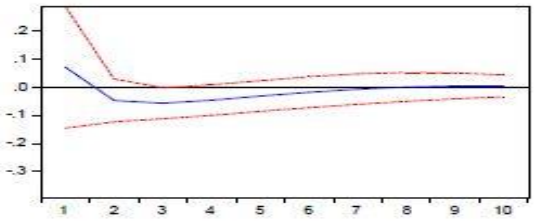
Response of GROUP4 to DISCOUNTRATE



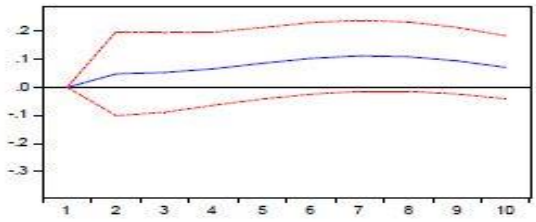
Response of GROUP4 to GDPPAKLN



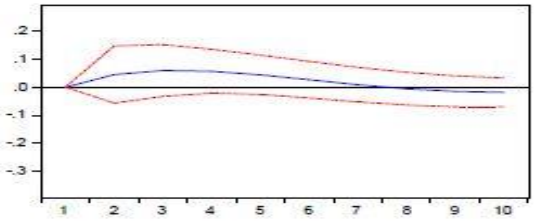
Response of GROUP4 to CPIPAKLN



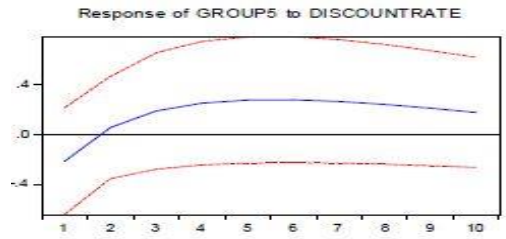
Response of GROUP4 to REALEXCHANGERATELN

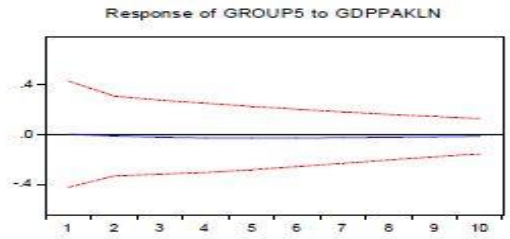


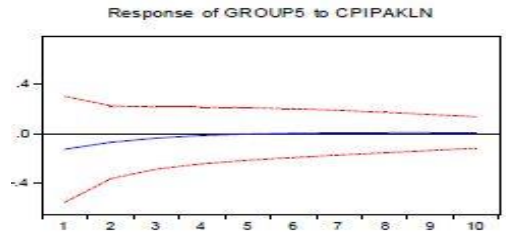
Response of GROUP4 to M2LN

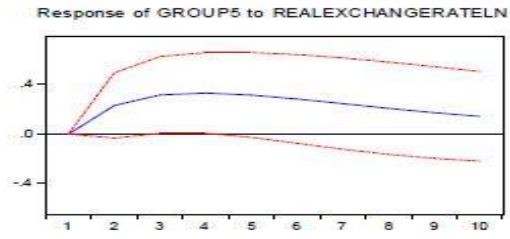


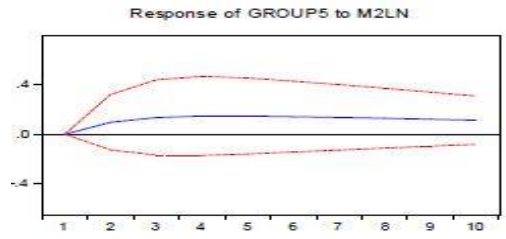
Response to G5 and G6

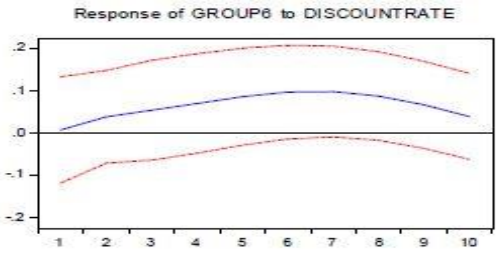


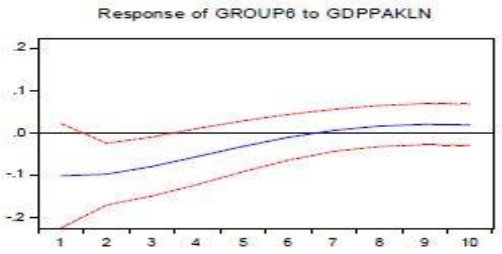


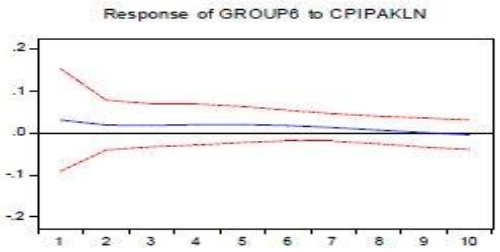


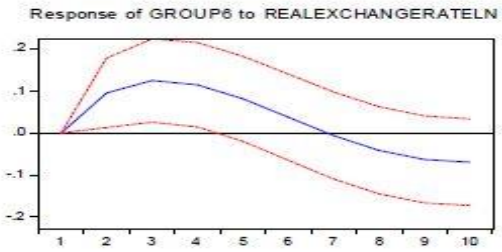


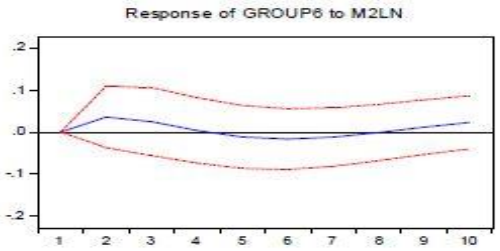




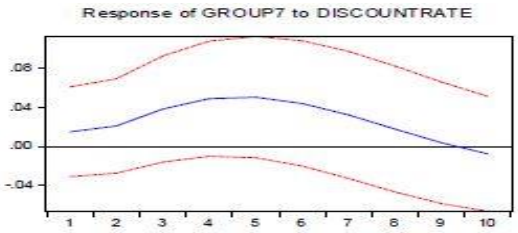


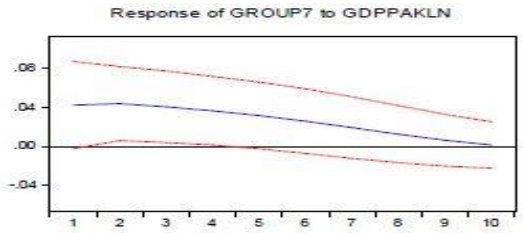


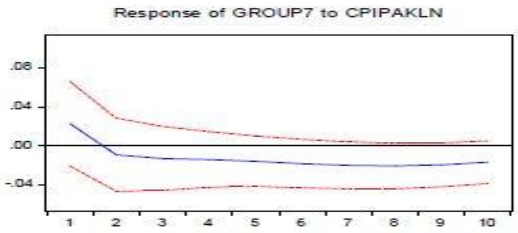


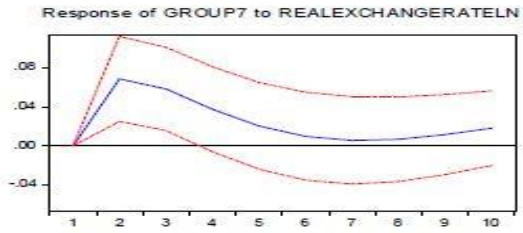


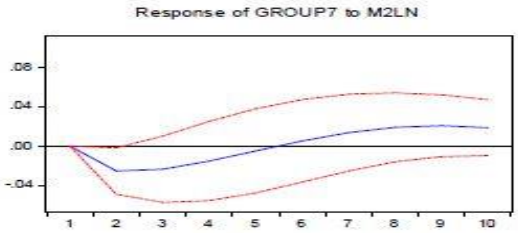
Response to G7 and G8

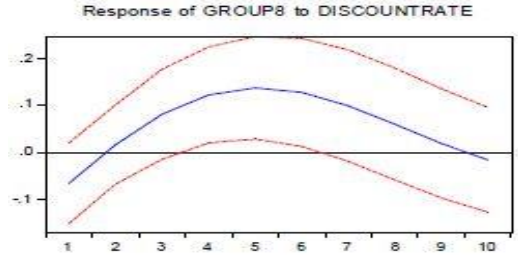


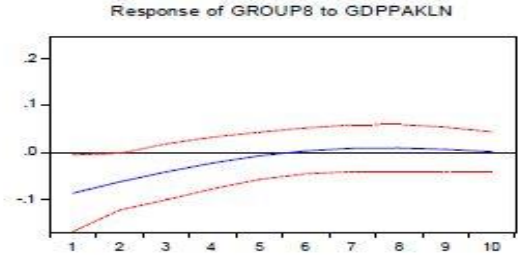


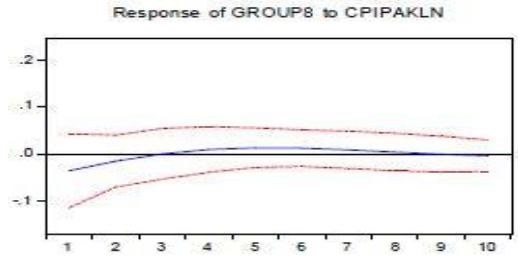


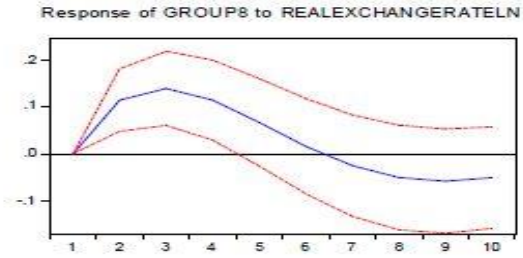


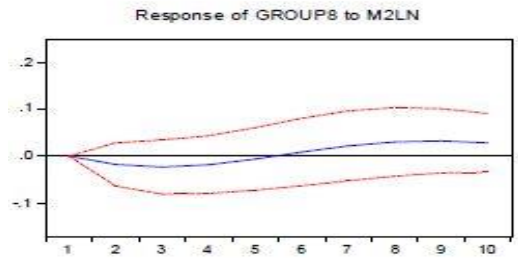






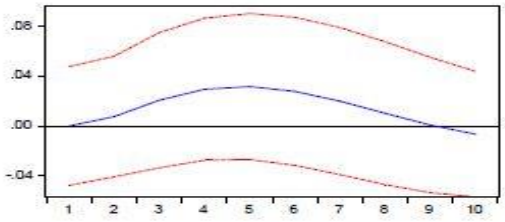




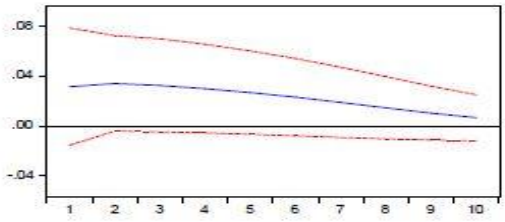


Response to G9 and G10

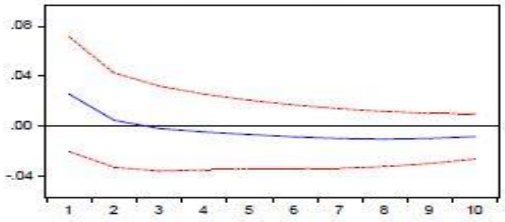
Response of GROUP9 to DISCOUNTRATE



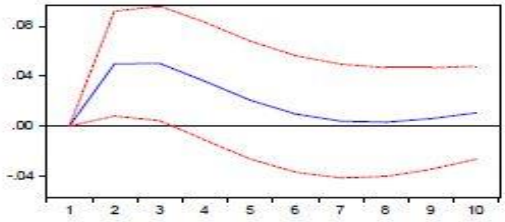
Response of GROUP9 to GDPPAKLN



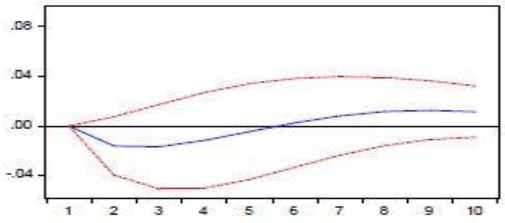
Response of GROUP9 to CPIPAKLN



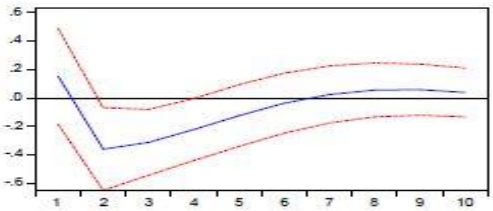
Response of GROUP9 to REALEXCHANGERATELN



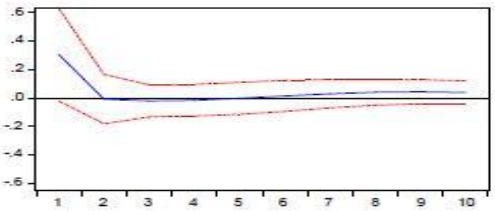
Response of GROUP9 to M2LN



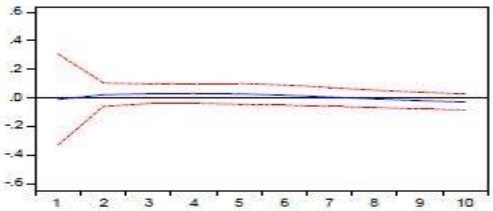
Response of GROUP_10 to DISCOUNTRATE



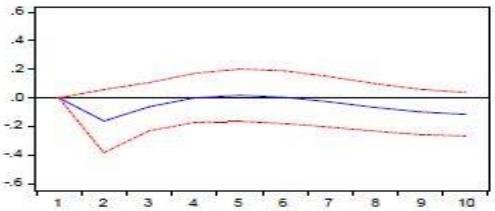
Response of GROUP_10 to GDPPAKLN



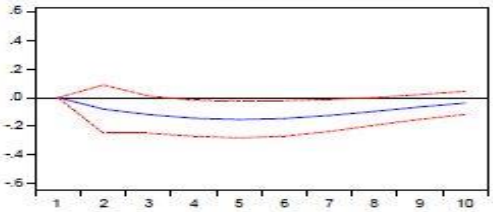
Response of GROUP_10 to CPIPAKLN



Response of GROUP_10 to REALEXCHANGERATELN



Response of GROUP_10 to M2LN



5.3 Forecast Error Variance Decomposition to trade balance

Table V: Forecast error variance decomposition to Trade balance.

Period	TB	r	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	47.57041	6.687355	4.881254	3.229400	29.66830	7.963283
8	39.28578	14.69277	5.906889	6.652011	25.28643	8.176124
12	36.05527	14.97120	5.690050	7.413846	25.75368	10.11596
16	33.76724	14.74984	5.434956	6.925779	28.44841	10.67378
20	32.56400	17.07045	5.366044	6.714660	27.55421	10.73064
24	32.05819	17.17092	5.338274	6.796892	27.39399	11.24173

Variance decomposition of the forecast error help sin determining the percentage of unexpected variation in each variable that is reflect by the shocks of the other variables. In table 5 the short term 100% FEVD in trade balance is explained by itself and other macroeconomic variables do not have influence in one month time period. The real exchange rate has a higher and strong influence on trade balance with 29% in four months period which gradually stable between 25% to 27% in two-year time period. The money supply has a second higher influence on the Trade balance with 8% in four months period and increased to the 11% in two-year period. The *r* has a third higher influence on trade balance in fourth months which gradually increase to 17% which is more than the money supply in the two-years which also stats that in long run period of two years the *r* is more influence the TB than the MS. Further the GDP and CPI has a week influence on the TB with 3% to 6% than the other macroeconomic variables. Further the FEVD of the sector groups (G1,G2,….G10) are explained in Table:7.

5.4 Forecast Error Variance Decomposition to trade Sectoral groups

TABLE VI : Forecast error variance decomposition to (G1,G2….G10)

G1

Period	G1	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	89.22038	0.482417	0.206386	0.229059	8.905773	0.955982
8	81.64586	6.243001	0.214232	0.343086	9.533374	2.020442
12	78.11451	7.039007	0.216956	0.363013	11.38121	2.885299
16	76.81687	7.938655	0.230743	0.366446	11.56739	3.079896
20	76.24690	8.003558	0.235247	0.378764	11.86341	3.272115
24	75.94198	8.188357	0.238178	0.378770	11.96262	3.290095

G2

Period	G2	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	76.24493	7.293101	0.634413	0.125009	13.95387	1.748684
8	67.40630	11.05411	0.632277	0.271161	15.69395	4.942196
12	63.23197	12.60662	0.634830	0.524808	18.11546	4.886304
16	62.13562	13.27129	0.773938	0.626793	18.22888	4.963486
20	61.10477	13.28110	0.856186	0.621662	18.73116	5.405127
24	60.46333	13.80769	0.848266	0.640299	18.73441	5.506014

G3

Period	G3	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	89.48284	1.162664	0.124929	0.039553	1.339211	7.850803
8	83.70330	1.291159	0.163036	0.491695	6.866259	7.484552
12	81.35481	3.281706	0.172968	0.677431	7.240739	7.272341
16	79.95780	3.565781	0.231617	0.669935	7.725201	7.849664
20	79.10753	4.009622	0.272976	0.709380	7.816852	8.083645
24	78.83126	4.040317	0.317207	0.785321	7.961991	8.063908

G4

Period	G4	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	94.22161	0.345871	0.073045	1.905011	1.798158	1.656303
8	86.23079	0.665597	0.365953	2.035370	8.760847	1.941439
12	82.72058	1.858657	0.427237	1.954965	11.02613	2.012434
16	81.72004	2.782151	0.421038	1.953250	11.10775	2.015768
20	81.54587	2.839220	0.436200	1.973408	11.15512	2.050183
24	81.37366	2.861231	0.451854	1.969793	11.26869	2.074762

G5

Period	G5	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	83.96852	6.423583	0.043551	0.031954	8.020660	1.511733
8	69.62212	13.73784	0.097760	0.085702	13.35958	3.096994
12	65.84484	15.61452	0.106559	0.100116	14.31552	4.018445
16	65.21938	15.66372	0.106995	0.118510	14.49545	4.395946
20	65.07355	15.62769	0.119617	0.143463	14.52121	4.514479
24	64.98429	15.62653	0.140839	0.160687	14.50494	4.582717

G6

Period	G6	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	73.82887	3.796514	5.159757	0.343102	16.06126	0.810496
8	61.91925	15.01164	5.013407	0.769359	16.43534	0.851006
12	57.24351	15.83376	4.843145	0.759615	19.73095	1.589010
16	55.57846	17.24453	4.725549	0.771509	19.75891	1.921042
20	54.72812	17.23686	4.692791	0.809081	20.47487	2.058274
24	54.28849	17.51118	4.690668	0.813601	20.61671	2.079347

G7

Period	G7	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	65.42347	6.299267	3.327451	2.685239	19.30717	2.957394
8	58.83556	12.50458	3.946727	5.541809	15.91192	3.259404
12	55.11212	12.42854	3.756292	6.892496	17.33584	4.474715
16	52.84077	12.28945	3.652386	6.602509	19.76719	4.847687
20	51.43794	14.02413	3.628750	6.415311	19.30466	5.189212
24	50.90196	14.25354	3.617699	6.606905	19.28563	5.334271

G8

Period	G8	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	54.14226	14.42642	1.620813	0.020420	29.03513	0.754955
8	47.54381	26.01143	1.575784	0.030812	23.64664	1.191520
12	45.46721	25.80599	1.478239	0.049312	25.13562	2.063630
16	44.90242	25.94727	1.456901	0.051709	25.30124	2.340454
20	44.58486	26.29261	1.441989	0.053696	25.15774	2.469105
24	44.35953	26.22432	1.432844	0.062134	25.40747	2.513701

G9

Period	G9	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	79.49252	2.861005	1.787623	1.128455	13.30559	1.424801
8	75.24632	6.212757	2.620857	2.628068	11.74657	1.545430
12	73.48231	6.345890	2.513388	3.292262	12.29388	2.072266
16	71.82357	6.362079	2.437853	3.209983	14.03345	2.133062
20	71.20947	6.957898	2.450241	3.181341	13.99394	2.207111
24	70.99822	7.034642	2.453912	3.237131	14.01125	2.264848

G10

Period	G10	*r*	GDP	CPI	REr	MS
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
4	76.74053	18.02288	0.001936	0.155716	2.141507	2.937426
8	71.88459	18.02423	0.136124	0.225341	2.376519	7.353200
12	69.11957	17.57746	0.307376	0.423648	5.146847	7.425099
16	68.04013	18.25657	0.357164	0.525004	5.435411	7.385720
20	67.34396	18.20490	0.432618	0.527097	5.631068	7.860356
24	66.89455	18.36104	0.434914	0.578186	5.687397	8.043913

In G1,G2,G5,G7,G8,G9 shows that the REr and *r* has a strong influence on the TB and MS has a week response to the TB. In G3 and G4 shows that the MS and REr has a strong response to TB. In G10 shows that the *r* and MS have a strong response to the TB than the response of REr. Only in G6 show the influence of the GDP and REr. In all the sector groups the results state the very weak response of GDP and CPI to TB.

CONCLUSION

This study examines the impact of monetary policy (Interest rate, Money Supply) incorporating the exchange rate on trade balance and sector groups identified by Pakistan Bureau of Statistic. This study also identified the surplus and deficit sector groups. SVECM Structural Vector Error Correction Model is used with short run and long run restriction to examine the macroeconomic variables shocks to trade balance, using annually data of variables from 1980 to 2018.

The findings of this study suggest that the monetary policy leads significant effects on the trade balance of Pakistan in the short run along with other key macroeconomic variables. The results for the TB in long run shows that the REr, GDP, CPI has a positive and significant relation. While the MS has a negative and significant long-run relation to TB. Further the *r* has no long-run relation to TB. In short run the TB is most influence by the REr than the MS and *r*. While the CPI and GDP have a weak response to TB. The study also finds that the sector groups (G1,G2,G7,G9) are the trade surplus groups and the (G3,G4,G5,G6,G8,G10) are the trade deficit groups. Further the (G1,G4,G8) have a positive and significant relation with REr and MS in long-run. The (G2,G3,G10) have a negative and significant relation with REr and Ms. While the (G5,G6) have a negative and significant relation with REr and positive relation with MS and the (G7,G9) have positive and significant relation with REr and negative with relation with MS. The Discount rate (*r*) have shown no effect on sector groups (G1,G2….G10) in long run.

The study suggest that the monetary policy (*r,* MS) have a significant and positive relation with the Trade balance in short-run as well as in long run but the REr is more dominant variable to the TB than the other macroeconomic variables which response

highly in short run and in long run. The study suggest that the policy maker should keep in mind the REr before further development and planning for the trade balance and preferred the exchange rate stabilization policy for the effectiveness of the monetary policy. The study clearly identified the sectors which is most influence by the monetary policy and exchange rate and possibly include the specific trade sectors in their policy decisions than a single policy for all the trade sectors.

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APPENDIX

Food and live animals = G1

Live animals	Meat, fresh, chilled or frozen Meet, dried salted or smoked	Meat in airtight containers n.s. and meat preparations
Milk and cream	Butter	Cheese and curd
Eggs	Fish, fresh and simply preserved	Fish in airtight containers
Wheat (including spelt) & Maslin, unmilled	Rice	Barley unmilled
Maize (corn) unmilled	Cereals, unmilled, other than wheat, rice barley and maize	Meal and flour of wheat or of Maslin
Meal and flour of cereals, except meal & flour of wheat of Maslin	Cereal preparations and preparations of flour and starch of fruits and vegetables	Fruit, fresh & nuts not including oil nuts fresh or dried
Dried fruits including, artificially dehydrated	Fruit preserved and fruit preparations	Vegetables fresh frozen or simply Preserved including dried leguminous vegetables roots.
Tubers & other edible vegetable product	Vegetable roots and tubers preserved or prepared	Sugar and honey
Sugar confectionery & other sugar Preparations except chocolate Confectionery	Coffee	Cocoa
Chocolate and other food preparations containing cocoa or chocolate	Tea and mate	Spices
Feeding stuff for animals not including unmilled cereals	Misc. Edible products & preparation	

Beverages and Tobacco = G2

Tobacco, un-manufactured	Tobacco manufactures	
Non-alcoholic beverages		
Alcoholic		

Crude materials inedible(except fuels) = G3

Hides & skins except fur skins undressed	Fur skins, undressed	Oil seeds, oil nuts & oil kernels
Crude rubber including synthetic and reclaimed	Fuel wood and charcoal	Wood in the rough or roughly Squared
Wood, shaped or simply worked	Cork, raw and waste	Pulp and wastepaper
Silk	Wool and other animal hair	Cotton
Jute	Vegetable fibers except cotton & Jute	Synthetic and regenerated artificial fabrics
Waste materials from textile fabrics, (including rage)	Fertilizer, crude	Stone, sand and gravel
Sulphur and un-roasted iron pyrites	Natural abrasives including industrial, diamonds	Other crude mineral
Iron ore and concentrates	Iron and steel scrap	coniferous base metal
Non-ferrous metal scrap	Silver and platinum ores	Ores and concentrate of uranium and thorium
Crude animal materials	Crude vegetable materials	Crude animal materials

Minerals fuels lubricants = G4

Coal coke and briquettes	Petroleum crude and partly	refined, for further refining
excluding natural gasoline	Petroleum products	Gas, natural and manufactured
Mineral tar and crude	chemicals from coal petroleum	

Animals and vegetables oils and fats = G5

Animal oils and fats	Fixed vegetable oils soft	Other fixed vegetable oil
Animal and vegetable oils	waxes of animal or vegetable origin	

Chemicals = G6

Organic chemical	Inorganic chemicals, elements oxides and halogen salts	Other inorganic chemicals Radioactive and associated materials
Synthetic organic dyes tuffs, natural indigo and color lakes	Dyeing and training extracts and synthetic tanning materials	Pig-mints, paints varnished and related materials
Medical and pharmaceutical products	Essential oils, perfume and flavor materials	Perfumery and cosmetics dentifrices & other toilet
preparations except soaps	Soaps, cleansing & polishing preparations	Fertilizer, manufactured
Explosives and pyrotechnic products	Plastic materials regenerated Cellulose and artificial resins	Chemical materials & products

Manufactured goods material = G7

Leather	Manufactures of leather or of artificial or leather	Fur skins, tanned or dressed
Materials of rubber	Articles of rubber	Veneers, ply-wood boards, improved or reconstituted wood
Wood manufactures	Cork manufactures	Paper and paper board
Articles made of paper, pulp of paper or paper board	Textile yarn and thread	Cotton fabrics woven
Textile fabrics woven	Tulle, lace embroidery, ribbons trimmings and other small wares	Special textile fabrics and related products
Made-up articles wholly or chiefly of textile materials	Floor covering tapestries	Lime, cement and fabricated building material
construction materials and refractory materials	Mineral manufactures	Glass
Glass ware	Pottery	Pearls & precious semiprecious stones, unworked or worked
Pig iron spiegeleisen, sponge iron, iron and steel powders and shots	Universal plates and sheets of iron and steel	Ingots other primary forms
Hoop and strips of iron or steel	Rails & railway track construction material of iron or steel	Iron & steel wire (excl.wire rod).
Tubes, pipes and fittings of iron and steel	Iron or steel casting and forgings, unworked,	Silver, platinum and other metals of the platinum groups
Copper	Nickel	Aluminum

Lead	Zinc	Tin
Uranium and thorium	Miscellaneous non-ferrous base metals, employed in metallurgy	Finished structural parts and structures
Metal containers for storage and transport	Wire products (excluding electric and fencing grills)	Nails, screws, nuts, bolts, rivets and similar, articles of iron,
Tools for use in the hand or in machines	Cutlery	Household equipment of base metal

Machinery and transport equipment = G8

Power generating machinery other than electric	Agricultural machinery and implements	Office machines
Metal working machinery	Textile and leather machinery	Machines for special industries
Machinery & appliances (other than electrical)& machine parts	Electric power machinery and switch gear	Equipment for distributing electricity
Telecommunications apparatus	Domestic electric equipment	Electric apparatus for medical, purposes & radiological apparatus
Other electric machinery and apparatus	Railway vehicles	Road motor vehicles
Road vehicles other than motor vehicles	Aircrafts	Ship and boats
Others		

Miscellaneous manufactured = G9

Sanitary, plumbing heating and lighting fixture	Furniture	Travel goods, handbags and similar articles
Clothing (except Fur clothing)	Fur Clothing & other articles made of fur-skins, artificial fur & articles thereof	Footwear
Scientific, medical, optical, measuring & controlling	Photographic and cinematographic supplies	Developed cinematographic film
Watches and clocks	Musical instruments, sound recorders and reproducers	Printed matter
Articles of artificial plastic materials	Perambulators, toys games and sporting goods	Office & stationery supplies,
Works of art, collectors pieces and antiques	Jewelry and goldsmiths, and silver smiths ware	Manufactured articles
Firearms of war and ammunition		

Commodities (non-classified) = G10

transactions not classified according to kind	Postal packages not classified according to kind	Animals n.e.s. (including zoo animals' dogs and cats
Coin (other than gold) not legal tender	Gold non-monetary	