



**Macroeconomic Determinants of Economic Growth under the Perspective of Monetary Policy in Pakistan:  
An Empirical Analysis**

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**Abstract**

This article examines the determinants economic growth under the perspective of monetary policy in the case of Pakistan over the period of 1980 to 2018. Economic growth has been used as dependent variable, whereas exchange rate, consumer price index, unemployment rate and money supply have been used as independent variables. For empirical analysis data from 1980 to 2018 has been used. For checking the stationarity of the variables augmented Dickey-Fuller unit root test has been used. This study has used ARDL test for examining the cointegration among the variable of the model. The estimated results of the study show that the exchange rate has a positive and significant impact on economic growth in the case of Pakistan. Inflation has a positive, but insignificant impact on economic growth in the case of Pakistan over the selected time period. Unemployment rate negative and significant impact on economic growth in the case of Pakistan. The estimates show that monetary policy has a positive and significant impact on economic growth in the case of Pakistan. This study suggests that for raising the level of economic growth in the case of Pakistan, a soft monetary policy is needed to lower level of unemployment.

**Keywords:** economic growth, money supply

**JEL Code:** O4, E51

## **I. Introduction**

Monetary policy is the policy adopted by the monetary authority of a country that controls either the interest rate payable on very short-term borrowing or the money supply, often targeting inflation or the interest rate to ensure price stability and general trust in the currency. Unlike fiscal policy which relies on government to spend its way out of recessions, monetary policy aims to manipulate the money supply, i.e. 'printing' more money or decreasing the money supply by changing interest rates or removing excess reserves. Further goals of a monetary policy are usually to contribute to the stability of gross domestic product, to achieve and maintain low unemployment, and to maintain predictable exchange rates with other currencies. Monetary economics provide insight into how to craft an optimal monetary policy. In developed countries, monetary policy has been generally formed separately from fiscal policy, which refers to taxation, government spending, and associated borrowing. Monetary policy is referred to as being either expansionary or contractionary. Expansionary policy occurs when a monetary authority uses its tools to stimulate the economy. An expansionary policy maintains short-term interest rates at a lower than usual rate or increases the total supply of money in the economy more rapidly than usual. It is traditionally used to try to combat unemployment in a recession by lowering interest rates in the hope that less expensive credit will entice businesses into expanding. This increases aggregate demand (the overall demand for all goods and services in an economy), which boosts short-term growth as measured by gross domestic product (GDP) growth. Expansionary monetary policy usually diminishes the value of the currency relative to other currencies (the exchange rate). The opposite of expansionary monetary policy is a contractionary monetary policy, which maintains short-term interest rates higher than usual or which slows the rate of growth in the money supply or even shrinks it. This slows short-term economic growth and lessens inflation. Contractionary monetary policy can lead to increased unemployment and depressed borrowing and spending by consumers and businesses, which can eventually result in an economic recession if implemented too vigorously.

Monetary policy and economic growth theories have evolved rapidly over time, dominated by dissimilarities, obscurities, inconclusiveness and cross currents (Brunner and Meltzer, 1972). Economic growth theories and monetary policy predate as far back to the classical quantity theory of money (QTM) (Gali, 2008). However, modern theories only came to the fore in the 1930s, with the Keynesian Liquidity Preference Theory, followed by monetarism (a manifestation from the QTM), and subsequently by several theories, namely: New Classical real business cycles, the New Keynesian Model and New Consensus Model (NCM), which have been at the center of monetary policy analysis over the last two or so decades (Goodfriend and King, 1997; Arestis and Sawyer, 2008). Over the years, the short-run and long-run impact of monetary policy on real variables, in particular on output, has remained ambiguously at the center of research (Walsh, 2003). Most studies have focused largely on the monetary policy neutrality in the long run and on developed countries (Asongu, 2014). This study has examined the role of monetary policy in deciding the level of economic growth in the case of Pakistan.

## **II. Literature Review**

Hsing (2005) carried out yearly sample data from 1959 to 2001 to observe the conceivable affairs among real GDP in Venezuela and chosen macroeconomic variables. He examined the macroeconomics variables effect on real output by applying IS-LM and GARCH model. He concluded that real output has a positive relationship with the probable inflation rate, a real depreciation of Bolivar, world oil prices, real M2 and investing of government deficits. The GARCH model theory that past error variance and past squared error is a function of error variance. Continuously rising in the government debt may increase the interest rate and force out the other expenditures. The significant currency depreciation would encourage inflation. Bowen (2000) have the opinion that the initial aspect of monetary policy is to protect the purchasing value of Rand by minimizing inflation. The bank has that mandate to set inflation targets by the approaching medium to long term formulation of monetary policies. The economy can proceed proficiently when there is clear understanding of monetary policy objective. This will result in considerable economic growth and enhance employment opportunities. Price stability is an important factor for maximizing continuous economic growth and it is the main influence of monetary policy. Hanif and Arby (2003) mention that macroeconomic policies are intended to attain non-inflationary and steady growth. To accomplish the goal, macroeconomic policies have two main groups of policy measures; one is associated with monetary circumstances and the other with fiscal circumstances. Monetary measures are selected by central bank and fiscal measures are operated by the ministry of finance. Fiscal and monetary policies have strong influence on the proportion and amount of savings, investment, productivity and service along with capability of external account. Lack of effective policy planning results in financial instability which leads to high interest rates, exchange rate stresses, increase in inflation and adverse effect on economic growth. Barro (1995) used data on 100 countries from 1960 to 1990 to measure the effects of inflation on economic growth. The main outcome of his empirical analysis is that the

projected effects of inflation on growth and investment are significantly negative when probable measures are applied in statistical procedures. He emphasized that severe effects of inflation occur under high inflation rate. He concluded that the magnitude of inflation effects on economic growth are not that large, e.g. An increase in the mean inflation rate by 0.1% each time is assumed near decrease growing amount of factual per capita GDP by 0.2-0.3% each time. This decrease popular growth rate is subjected to continuous increase in inflation rate and consistent lower level of output.

Bruno and Easterly (1995) suggested a nonparametric high inflation definition as the year periods in which inflation rate is more than 40% annually. They found that high inflation crisis promotes adverse fall in growth. The countries who have high inflation change there is no declaration of homogenous relationship between growth and inflation at any number. During high inflation crises the growth falls sharply and then surprisingly get back after inflation drop. During the crisis the declining of growth and after the crisis the improvement of growth aims to average out to close to zero, on that account the absence of robust cross section correlation. With the trend stationary of output the data could be rational in which inflation crises are purely cyclical phenomena or the model in which crisis have favorable long-run purgative effect. The conclusions do not support the view that reducing the high inflation conduct large-to-medium fall output costs. Dewan and Hussein (2001) selected sample of 41 middle-income developing countries, including Fiji to evolve an empirical model for growth. To explain the determinants for persistent economic development in rising nations, both off-road and period difference data remained castoff. They concluded that other than growth in labor force, investment in both physical and human capital along with low inflation and extensive trade policies are essential for economic growth. Moreover, the capability to take on technological changes in order to increase efficiency is also significant. Meanwhile, many developing countries have a large agricultural sector, severe supply blows in this sector was examined to have a negative effect on growth. Faria and Carneiro (2001) investigated the affiliation between production and inflation. They analyzed the event of Brazil by taking a sample period from 1980-1995 in which they found that inflation does not affect real output in the long run, but that in the short run there is a negative effect of inflation on output. Their results support a class of utility functions in which real money balances and consumption are perfect complements. Hence, regardless of the fact that our long-run results assist Sidrauski's super neutrality of money, our short-run results show doubt on the short-run consequences of Sidrauski's model for separable utility functions. Though, as Fischer (1978) has indicated, even in the Sidrauski model, inflation can impact real variables in the short run. Fischer has shown that inflation affects investment positively and consumption negatively, but only in the long run.

Fischer and Modigliani (1978) examined the values of nominal government institutions (tax systems, definition of taxable income, accounting procedures), nominally private institutions and accounting conventions (long term nominal contracts, measurement of income) when the inflation was anticipated. They also examined the effects of unanticipated inflation that is not incorporated in existing nominal long-term contracts, and of uncertain future inflation. Conventional analysis of the welfare costs of inflation highlights the area under the demand curve for money as the cost of anticipated inflation and redistributions as the cost of unanticipated inflation. They suggest that systemization of the list of real impacts can support in organizing attempts to measure the costs and benefits of inflation. Gelb (1989) studied the simple cross-country regressions for the period 1965-1984 to address the relationships between financial policies and growth. They concluded that severely suppressive financial measures normally result in slower growth and less efficiency. Growth impacts profitability and thus interest rates, but the reverse may also be true, interest rates and the degree of investment may impact efficiency and growth. The evidence assists the need for financial liberalization. This neither means that sudden liberalization is needed nor that definite intercessions that can recompense for observed deficits in financial markets may not be valuable unless measures to improve information, sensible supervision, regulation and macro-stability is significant.

Gregorio (1996) reviewed the theory and evidence of inflation and growth and the role of central banks. They emphasized on the difference between the effects of inflation on the rate of investment and on the efficiency of investment. They indicated that inflation has negative effects on growth in the long run and positive in the short run. Quantitatively, these effects could account up to 0.4-0.5% of faster growth for a reduction of 0.1% in inflation rate (for countries which have an inflation rate of 20 to 30% per year). Since theory and evidence suggest that inflation is harmful for growth, an effective central bank may play an important role not only in providing macroeconomic stability in the short run, but also by its inferences for long-run growth. Khan and Schimmelpfennig (2006) examined the relative importance of monetary factors and structuralized supply-side factors for inflation in Pakistan. They used a conventional inflation model that includes standard monetary variables (money supply, credit to the private sector), exchange rate along with wheat support price as a supply-side factor. The model is valued for the

period January 1998 to June 2005 on a monthly basis. The observed results showed that monetary factors determine inflation in Pakistan and a long-run relationship exists between the CPI and private sector credit. Also, wheat support price impacts inflation in the short run, but not in the long run. Hameed and Amen (2011) studied the impact of monetary policy on GDP of Pakistan by identifying the severity of effects of money supply, interest rate and inflation on growth of GDP. They indicated that the monetary policy of Pakistan has twin impartial of encouraging economic growing and fee permanence. It attains the area through directing financial collections i.e. Wide change stocks tumor equally a middle mark and deputy cash by way of a working mark in harmony per real GDP growth and inflation goals fixed via the Direction. They observed relationship between the financial plan and GDP by applying a regression technique on sample data from 1980-2009 of Pakistan. They concluded that the interest rate has a minor relationship with GDP, but the growth in money supply significantly impacts the GDP of an economy. Maghyereh et al, (2001) examined the impact of Jordan's external indebtedness on its economic performance. Their results indicated that there exist a positive relationship between economic growth and external debt below a certain threshold level (optimal external debt). This level is found to be equal to about 53 percent of GDP. In other words, once the external debt exceeds this level, its impact on the performance of the Jordanian economy (growth) becomes negative and statistically significant. It is projected, for example, that an increase in the external debt from 50% to 100% of GDP reduces the growth rate in GDP by about 7.4 percentage points.

Lucas (1973) reported the results of an empirical study of real output-inflation tradeoffs, based on annual time-series from eighteen countries over the years 1951-67. He examined the hypothesis from the point of view that average real output levels are invariant under changes in the time pattern of the inflation rate, or that there exists a "natural rate" of real output. They concluded that the positive association of price changes and output arises because suppliers misinterpret general price movements for relative price changes and also indicated that changes in average Inflation rates will not increase average output, and secondly, that the higher the variance in average prices, the less "favorable" will be the observed tradeoff. Saaed and A (2007) analyzed the relationship between inflation and economic growth in the context of Kuwait. They used annual data set on real GDP and CPI for the period of 1985 to 2005 in which they assessed the empirical evidence that has been acquired through the co-integration and error correction models. The empirical evidence demonstrates that there exists a statistically significant long run negative relationship between inflation and economic growth in the country as indicated by a statistically significant long-run negative relationship between CPI and real GDP. These results have important policy implications for both domestic policy makers and the development partners working in the country. Malik and Chowdhury (2001) pursued to study the relationship between inflation and GDP growth in four South Asian countries (Bangladesh, India, Pakistan and Sri Lanka). The period of study were, Pakistan 1957-1997, Bangladesh 1974-1997, India 1961-1997 and Sri Lanka 1966-1997, selected by data availability. They used annual data collected from the IMF international financial statistics for comparison of empirical evidence and applied the co-integration and error correction models. They examined that there is a long-run positive relationship between GDP growth rate and inflation for all four countries. They also observed that inflation and economic growth are positively related and the sensitivity of inflation to changes in growth rates is larger than that of growth to changes in inflation rates. Hence, moderate inflation is helpful to grow, but faster economic growth feeds back into inflation.

Li (2004) analyzed the impacts of the inflation rate on economic performance by using the growth expenditure equation and the growth accounting equation. They used the sample data from 1960-2002 for 90 countries, 63 developing countries and 27 developed countries. The results strongly and consistently supported the existence of a nonlinear relationship between inflation and growth. In addition, developing countries and developed countries show significantly different forms of nonlinearity in the inflation-growth relationship. Their results showed that increase in inflation by 10 percentage points per year will reduce economic growth by about 0.2-0.4 percentage points. They also tried to find the mechanism through which inflation impacts long-run economic growth in a nonlinear fashion. They founded that at low to moderate inflation, specifically, below 65% for developing countries and below 42% for developed countries, inflation even has a significantly positive effect on the level of investment. Qayyum (2002) applied Monetary Conditions Index (MCI) of inflation variable in Pakistan by using monthly data from June 1990 to June 2001. They used unit root analysis and Johansen (1988) maximum likelihood method base on vector autoregressive technology for estimating weights of interest rate and exchange rate to be used in the construction of MCI. The estimated monetary conditions ratio for Pakistan is around 2.79:1. This is close to the estimated ratio of small developing countries as Turkey, Thailand etc. For detailed analysis, we decomposed the series into seasonal, trend, cycle and irregular factors. The trend factor is obtained by the application of Hodrick and Prescott (1997) filter. The analysis indicates an overall tight monetary policy during the decade. However, there is some easing spell during 1997 to 1999. This shows the determinedness of monetary authorities with the objective of keeping inflation

low. Qayyum (2006) tested the monetarists proposition that money supply has been the main determinant of inflation in Pakistan. For this purpose, they estimated the relationship between the inflation rate, money growth, growth in real income in Pakistan in the 1960–2005 period. The results from the correlation analysis indicate that there is a strong relationship between the money growth and inflation. The correlation coefficient between the money growth and current real GDP growth is 0.226 and it is 0.069 with the previous year's money growth and current year's real GDP growth. Though, it is statistically insignificant. The results indicate that money growth at first round impact real GDP growth and at second round the money growth impacts inflation in Pakistan. The significant conclusion that aroused from the analysis is that the money supply growth has been an important contributor to the rise in inflation in Pakistan during the study period. This is to conclude that inflation in Pakistan is a monetary phenomenon.

Shamshad (2007) indicated that monetary policy alone cannot contain the rise in inflationary pressures. The Government had to continue to alleviate supply-side constraints because of problems of market structure and distribution system. Success in containing inflation further depends on continued effective monetary management, which requires minimizing Government's recourse to central bank borrowing, mitigating the monetary pressures arising from the surge in capital flows ensuring that these are sterilized and keeping refinancing within manageable limits, while complementing these measures with a check and vigilance on food prices. There will be need for introducing supportive legal and regulatory framework which allows for targeting inflation and allow greater operational independence to the central bank, while ensuring that SBP has the desired transparency and communication strategy critical for a transition to an eventual adoption of inflation targeting. Shamshad (2006) suggested that while pursuing monetary aggregate, SBP will need to maintain its monetary tightening stance and enhance its communication to influence inflation expectations and counter concerns about the adverse effects of higher interest rates on competing or growth. Inflationary pressures arising from supply side factors respond more to legal and administrative measures, and are less sensitive to monetary tightening. SBP should explore what is an appropriate index to target, whether some components of the CPI should be systematically excluded from or added to the CPI index, what new statistics and refinements in data (including information on stock market indicators and real estate prices) might be needed for developing models and analytical framework for inflation forecasting. Taylor (1995) highlighted that changes in exchange rates are now a key part of the monetary transmission mechanism, and we now have an explicit empirical analysis of the fixed versus flexible exchange rate question. He indicated that the degree to which short-run changes in nominal GDP are split between changes in real GDP and inflation (the "missing equation" in Friedman's terms) has been addressed by some form of empirically estimated staggered price setting equations. Such equations incorporate both long run monetary neutrality and short-run non-neutrality due to rigidities in goods and labor markets. He also pointed out that the expectations model of the term structure appears to be a useful framework to study the impact of future changes in monetary policy on long-term interest rates.

Zhang and Thorbecke (2008) examined the response of gold and silver prices to changes in the funds rate target in the 1970s and from 1989 to 2006. They found that funds rate hike over both sample periods primarily affected short term interest rates and near term forward rates. In addition, positive funds rate innovations raised gold and silver prices during the 1970s and lowered commodity prices after 1989. These findings reported here underscore the importance of credibility for monetary policy. Federal funds rate changes can affect economic activity if they move longer-term real interest rates and the value of the dollar in the same direction. However, if funds rate increases raise expected inflation, then the link between funds rate changes, real interest rates, and the dollar will be reduced. Tobin (1965) observes the role of monetary factors in deciding the degree of capital intensity of an economy. Aggregate and primitive models are used by him. To take the merited rate of growth of capital down to the natural rate monetary debt of the government can be an alternative store of the value and indicate how much saving can be focused. Portfolio behavior and monetary factors as well as saving behavior and technology, thus determined through equilibrium capital intensity and interest rates. By deficit spending and by deflation the real monetary debt grows at a natural rate in the equilibrium. The equilibrium's stability is also deliberate. In classical theory, the interest rate and capital intensity of the economy are determined through productivity and thrift that is with the interaction of technology and saving partialities. Hussain et al, (2016) observes the impact of macroeconomic variables such as inflation, real exchange rate and interest rate on GDP of Pakistan by taking 32 years time series data from 1980 to 2011. Descriptive statistics and multiple regression analysis were used to analyze the data. They found that there is a significant influence of inflation rate, interest rate and exchange rate of GDP. The inflation rate and exchange rate had a negative impact on GDP, while exchange rate had positive relation to GDP. The government adopted a monetary policy due to inflation because inflation provides significant effect, but negative relation to GDP. In developing countries like Pakistan value of the exchange rate must be maintained.

Hussain (2009) conducted the study to reveal the various channels of monetary policy transmission mechanism not only in the short run, but also in the long run for the economy of Pakistan. They discovered that, the estimates for both inflationary measures (including CPI gap using Prescott filter), aggregate demand management policy tools (based on Johansen full information maximum likelihood technique) and the output gap are co-integrated and move together in the long run. For the short dynamics, we estimated the error correction models with different specifications. They specified that the State Bank can also attempt to control inflation by also highlighting on exchange rate as the monetary policy tool in case of Pakistan. They also found that in Pakistan's economy, inflation is not only a monetary phenomenon, but it is also an exchange rate and government spending phenomenon. Malla (1997) conducts an empirical analysis using a small sample of Asian countries and countries belonging to the Organization for Economic Cooperation and Development (OECD) separately. After controlling for labor and capital inputs, the estimated results suggest that for the OECD countries, there exists a statistically significant negative relationship between economic growth and inflation, including its first difference. However, the relationship is not statistically significant for the developing countries of Asia. The crucial finding of this empirical analysis suggests that the cross-country relationship between inflation and long-term economic growth experiences some fundamental problems like adjustment in country sample and the time period. Therefore, the inconclusive relationship between inflation and economic growth can be drawn from comparing cross country time-series regressions with different regions and time periods.

Duskobilov (2017) studied the interconnection between monetary policy and economic stability using econometric analysis methods. He analyzed the power of monetary policy in regulating the domestic economy in the exemplary of Uzbekistan. Analysis showed that in the selected period monetary policy tools, e.g. refinancing rate, mandatory rate, and sterilization operations positively influenced on economic growth, which means monetary policy tools were effective in economic regulation. Additionally, monetary policy and economy, possessed long-term relationship in the given period of time. They indicated that monetary policy tools played a vital role in regulating the economy towards growth. Though, in 2005-2016 period, inflation rate and exchange rate were the main barriers to economic growth, which were in "jurisdiction" of monetary policy. They enlarged the external negative effect of monetary policy tools and often resulted in less efficiency. Jawaid et al, (2011) conducted a study to empirically examine the impact of monetary, fiscal and trade policy on economic growth in Pakistan using annual time series data from 1981 to 2009. They used money supply, government expenditure and trade openness as proxies of monetary, fiscal and trade policy respectively. Co-integration and error correction model specified the existence of positive significant long run and short run relationship of monetary and fiscal policy with economic growth. Their study results identified that monetary policy is more effective than fiscal policy in Pakistan. In contrast, trade policy has minor impact on economic growth both in the short run and in the long run. In light of the results, it is suggested that the policy makers should focus more on monetary policy in order to certify economic growth in the country. Ayub and Shah (2015) explored the impact of monetary policy on gross domestic product (GDP) of the state. They studied different to prove the hypothesis. They used sample data for past 10 years from 2005 to 2014 for evaluating the results. They used regression and correlation technique to determine the relationship between monetary policy and GDP. Their study concluded that money supply, interest rate and inflation greatly affect the GDP. For the few years monetary policy of Pakistan is assisting and encouraging the objective of price stability and economic growth and it is achieving its objective by aiming monetary aggregates in accordance with GDP growth and inflation target set by the Government.

Ahmad et al, (2016) attempted to discover, importance of monetary measures in promoting economic growth of Pakistan. They used sample data from 1973 to 2014 in the form of annual time series and applied Augmented Dickey-Fuller (ADF) unit root test to measure stationary variables. They found GDP, money supply, Inflation and Interest rate as stationary at level while exchange rate measured stationary at first difference. They used Autoregressive Distribution Lag (ARDL) co-integration approach to differentiate the robust between the variables with specification of short run and long run. Their study results highlighted long-run association between variables, money supply and exchange rate which positively influence economic growth. Inflation positively while insignificant while interest rate negatively impacts economic growth. Their study suggested a stable exchange rate policy be confirmed to enhance, economic growth of the country. Hussain and Haque (2017) studied the relationship between fiscal deficit and its impact on economic growth in Bangladesh, using two different data sets from two different sources. They used Bangladesh bureau of statistics' (BBS) dataset as a local source while the world bank development indicators (WBDI) data set from the World Bank as a foreign source. They used VECM for BBS data and found that there is a positive and a significant relationship between FD and GDPGR, supporting the Keynesian

theory while from the VECM for World Bank data indicated that the effect of fiscal deficit (FD) on GDPGR is minor but negative and significant at the 5% level. The results contradicted the Keynesian theory, but supports the neoclassical theory which emphasizes that fiscal deficits lead to a drop in the GDP. Shaheen (2013) examined the relative roles of monetary and fiscal policies to achieve the basic macroeconomic objectives of stable prices with sustainable growth in Pakistan. She used sample data from December 1981 to June 2008 and indicated that the changes in the monetary policy affected the domestic price level and output growth. She also tested the fiscal theory of price determination using quarterly data for the sample period 1977q1-2009q4, by investigating the relationship between the fiscal deficit, debt accumulation and inflation dynamics. Her study showed that there exists a fiscal dominant regime for most of the sample period since the fiscal authority is insensitive to monetary policy in the sense that neither taxes nor expenditure react (now or in the future) to the changes in the stock of outstanding government debt. It is also found that changes in the primary deficit exert an effect on aggregate demand which is also evidence of an active fiscal policy regime.

Shaheen (2013) identified the indirect channels of the fiscal regime by including a monetary, real sector, exchange rate and the consolidated budget deficit variables in three different specifications of vector error correction models and finds the monetary and fiscal variables as the main determinants of inflation in Pakistan. She suggested a positive and significant relationship between the budget deficit and seignior age revenues, confirming the monetization of the fiscal deficit and indirect evidence of the fiscal dominance in the economy. In addition, this thesis employs a SVAR specification of exogenous fiscal policy shocks to observe the relative effectiveness of fiscal multipliers and finds their significant role to affect inflation and output in the economy. Waliullah and Rabbi (2011) empirically analyzed the long-run relationship amongst money, price level and GDP in the context of the Pakistani economy. They examined the insights on the long run relationship amongst money, price level and the GDP and indicated that these are of significant importance for monetary policy formulation in a developing country like Pakistan. They applied time-series econometric techniques such as unit roots, ARDL and ECM to quarterly data for the year 1972:1 to 2005: IV. Their results suggested that there is a steady long run relationship between money supply (M1), GDP and the CPI in Pakistan and also indicated that fundamental changes in monetary policy in the past have significantly impacted the movement of the macro economy in the country. Akram et al, (2011) conducted a study to analyze the role of monetary and fiscal policies in the determination of the level of prices in Pakistan. They applied VAR to examine interactions between the monetary and fiscal policies in impacting the prices. They concluded that the results of the variance decomposition reveal that both, monetary and fiscal policies impact prices in Pakistan. Moreover, fiscal deficit also has a relationship with money supply. They indicated that an increase in the money supply due to the monetization of fiscal deficit, leads towards higher price level. The results of impulse response functions show that increase in money supply, exchange rate, fiscal deficit and debt results in raising the price level.

Luqman et al, (2013) analyzed the effective use of foreign aid in Pakistan. They applied time series data of Pakistan over the period 1972-2011. They used principal component analysis to create the index of financial sector development. They concluded that foreign aid has a positive and statistically significant impact on economic growth while nonlinearity between the variables turn indicates fading return to foreign aid in case of the Pakistan. Their control variables, i.e. Physical capital and human capital accept their expected positive signs and are also statistically significant. This identifies that physical capital and human capital also play an important role in the log-run economic growth process of Pakistan. Ayubu (2013) observed that in clarifying inflation dynamics the monetarist spaces a strong weight on the growth rate of money supply. The goal of this study is to examine to which point inflation is a result of monetary phenomena in the case of the Tanzanian economy. The purpose is attained by comparing money supply and other determinants of inflation, which contains output, the exchange rate and international oil price. They conclude the econometric results by using SVAR and VECM models. They choose the date set ranging from 1993 to 2011. The empirical results propose that inflation in Tanzania is more of an output factor than a monetary phenomenon. The study strains the significance of close cooperation of supply and monetary policies.

### **III. The model**

Traditional economic analysis takes the behavior of monetary policy makers, as exogenous. According to this system, money is neutral in its effects on the economy. Therefore, transmission mechanism in the classical theory works directly and indirectly. The direct mechanism is based on the long-run equilibrium of the demand for and supply of money and the indirect system operates through the money, the rate of interest and links with the banking system. In Keynesian theory, changes in the money supply affect aggregate expenditure and output via the changes

in the interest rate and thus mechanism works indirectly. Monetarism concludes that monetary expansions influence the real variables such as output and employment in the short-run, while the nominal variables such as nominal national income, interest rates and prices are influenced in the long-run. In Pakistan, monetary policy is pro-growth and State Bank of Pakistan attempts that policy formation whose implementation should be more transparent and proficient. Its main concern is on the responsiveness of institutions, market-based management, and communication of monetary goals of economic agents. Following the methodologies of Ali, (2011), Ali (2015), Ali (2018), Ali and Bibi (2017), Ali and Ahmad (2014), Ali and Audi (2016), Ali and Audi (2018), Ali and Rehman (2015), Ali and Zulfqar (2018), Haider and Ali (2015) and Ali et al., (2016), the functional form of the model becomes as:

$$GDP = \beta_0 + \beta_1 EXR + \beta_2 CPI + \beta_3 UN + \beta_4 M2 + e \quad (1)$$

GDP = Gross domestic product

M2 = Money supply

EXR = Exchange rate

CPI = Consumer price index

UN = Unemployment Rate

e = error term

The annually date has been obtained from 1980 to 2018 for estimation. The data has been collected from WDI.

#### IV. Econometric Methodology

The application of econometric tools on macroeconomic models is one of the most important aspects within the quantitative economic analysis. In most of macroeconomic data, the involvement of time trend makes the time series data non-stationary and the regression results of this data become spurious. Dickey and Fuller (1981) proposed the Augmented Dickey-Fuller (ADF). The general forms of the ADF can be written as:

$$\Delta X_t = \delta X_{t-1} + \sum_{j=1}^q \phi_j \Delta X_{t-j} + e_{1t} \quad (2)$$

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{j=1}^q \phi_j \Delta X_{t-j} + e_{2t} \quad (3)$$

$$\Delta X_t = \alpha + \beta t + \delta X_{t-1} + \sum_{j=1}^q \phi_j \Delta X_{t-j} + e_{3t} \quad (4)$$

$X_t$  is a time series for testing unit roots,  $t$  is the time trend and  $e_t$  is error term having white noise properties. If  $j = 0$ , it represents the simple DF test. The lagged dependent variables in the ADF regression equation are included until the error term becomes white noise. For checking the serial correlation of error terms, LM test is used. The null and alternative hypotheses of ADF unit roots are;

$H_0 : \delta = 0$  non-stationary time series; so, it has unit root problem.

$H_a : \delta < 0$  stationary time series

Apply OLS and compute  $\tau$  statistic of the estimated co-efficient of  $X_{t-1}$  and compare with the Dickey Fuller (1979) critical  $\tau$  values. If the calculated value of  $\tau$  statistic is greater than the critical value then we reject the  $H_0$ . In this case the time series data is stationary. On the other hand, if we do not reject the  $H_0$ . In this case the time series is non-stationary. In this way of applying this procedure on all variables, we can easily find their respective orders of integration.

#### IV.I. Autoregressive Distributive Lag (ARDL) Approach to Co-Integration

In applied econometrics, a large number of co-integration tests are available. Most famous and traditional co-integration tests are the residual based Engle-Granger (1987) test, Maximum Likelihood based on Johansen

(1991/1992) and Johansen-Juselius (1990) tests. One thing is common in these tests, they require same order of integration for their analysis. These co-integration tests become invalid and inefficient when the variables of the model have different level of integration. Pesaran and Pesaran (1997), Pesaran and Shin (1999), Pesaran et al., (2001) has introduced, the most advance and recent method of co-integration known as the Autoregressive Distributive Lag (ARDL) bound testing approach. The ARDL bound testing approach has numerous advantages over traditional methods of co-integration. First, ARDL can be applied regardless by following the order of integration. It can be applied I(0), purely I(1) or mix order of integration (Pesaran and Shin, 1999). Second, the ARDL bound testing approach to co-integration can be used for smaller sample sizes (Mah, 2000) rather than traditional methods. Third, this approach allows to use sufficient number of lags for capturing the data generating process in a general to the specific modelling framework (Laurenceson et al., 2003). This technique is based on Unrestricted Vector Error Correction Model (UVECM) which have better properties for short and long run equilibrium as compared to traditional techniques (Pattichis, 1999). For applying the bounds testing procedure, it is necessary to represent equation in a conditional autoregressive distributed lag model as follows:

$$\Delta \ln Y_t = \beta_1 + \beta_2 t + \beta_3 \ln Y_{t-1} + \beta_4 \ln X_{t-1} + \beta_5 \ln Z_{t-1} + \dots + \sum_{h=1}^p \beta_h \Delta \ln Y_{t-h} + \sum_{j=0}^p \gamma_j \Delta \ln X_{t-j} + \sum_{k=0}^p \phi_k \Delta \ln Z_{t-k} + \dots + u_{it} \quad (5)$$

Here  $\ln Y_t$  is used for different dependent  $t$  is for time of  $\ln Y_{t-1}$  representing the lag of the dependent variable and  $\ln X_t$  is first independent variable and  $\ln Z_t$  is second independent variable and so on.  $\Delta$  represents the rate of change in variables. The calculated F-Statistic is compared with the critical value tabulated by Pesaran and Pesaran (1997) or Pesaran et al., (2001) that is extended by Narayan (2005). If the F-test statistic exceeds the upper critical value, the null hypothesis of no co-integration is rejected regardless the order of integration I(0) or I(1). If the calculated F-test statistic is less than the lower critical value the null hypothesis is accepted and there is no co-integration among the variables of the model. On the base of the above equation our null and alternative hypothesis for co-integration test is as given below:

$$H_0 : \beta_3 = \beta_4 = \beta_5 = 0 \text{ (no co-integration among the variables)}$$

$$H_A : \beta_3 \neq \beta_4 \neq \beta_5 \neq 0 \text{ (co-integration among variables)}$$

## V. Empirical Results and Discussion

This part of the paper presents the estimated results of the study. The estimated unit root results have been given in the table 1. The estimated results show that GDP and money supply is stationary at level. Exchange rate, inflation rate and unemployment rate are stationary at first difference. This show that there is mixed order of integration among the selected variables of the model. This situation is best fit for ARDL test for further analysis.

**Table 1. ADF Unit Root Outcomes**

Variables	Stationary	t-statistic	prob.*
GDP	I(0)	-4.176912	0.0024
M2	I(0)	-4.841703	0.0021
EXR	I(1)	-7.914395	0.0000
CPI	I(1)	-4.196861	0.0130
UN	I(1)	-7.111773	0.0000

The estimated VAR results have been given in the table 2. On the basis of estimated results, we have to selected maximum 2 lag length for our empirical analysis.

**Table 2. VAR Lag Order Selection Criteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-605.0720	NA	2.65e+09	35.88659	36.11105	35.96314
1	-413.0369	316.2931	145841.6	26.06099	27.40778*	26.52029
2	-378.1500	47.19990*	90271.18*	25.47941	27.94852	26.32145*

The estimated results of bound testing have been given in the table 3. The results show that estimated F-statistic is greater than the critical F-statistic. This reveal that there is cointegration among the selected variables of the model. Now we can find the long run results of the selected variables of the model.

**Table 3. Bound Test**

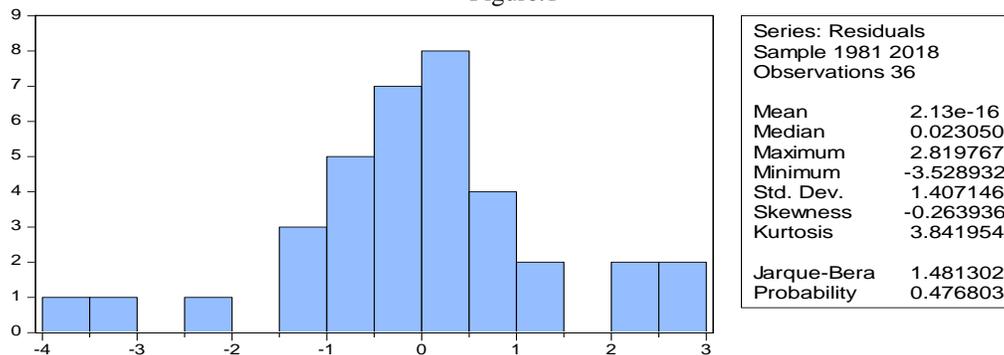
F-Bounds Test Null Hypothesis: No levels relationship				
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.138317			
	10%	2.2	3.09	
K	5%	2.56	3.49	
	2.5%	2.88	3.87	
	1%	3.29	4.37	

The estimated long run results of the model have been presented in the table 3. The results show that exchange rate has positive and significant impact on gross domestic product in the case of Pakistan. The result show that 1 percent increase in exchange rate, 0.022034 percent increase has been occurred in gross domestic product in the case of Pakistan. The results show that inflation has positive and significant impact on gross domestic product in Pakistan. The estimates show that exchange rate coefficient is positive, if there is one percent increase in exchange rate then there will be 0.022034 increase GDP. CPI coefficient is positive, if there is one percent increase in CPI then the GDP will also increase by 0.009926. unemployment rate coefficient is negative, if there is one percent increase in unemployment rate then the GDP decrease by -0.229530. M2 coefficient is positive. If there is one percent increase in M2 then there is 0.099358 increase in GDP. From long-run method exchange rate consumer price index and money supply positively affects GDP. This reveal that monetary policy is playing an important role in deciding economic growth in the case of Pakistan.

**Table 3. Long Run Outcomes**

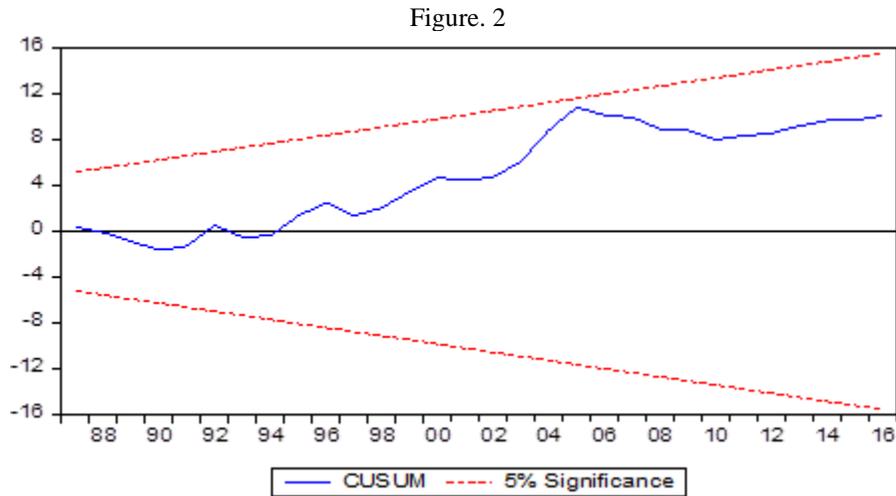
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR	0.022034	0.007851	2.806418	0.0094
CPI	0.009926	0.005979	1.660019	0.1089
UN	-0.229530	0.074223	-3.092456	0.0047
MSUPPLY	0.099358	0.028932	3.434125	0.0020
C	-0.706182	1.429925	-0.493859	0.6256

Figure.1



Histogram-Normality test result specifies that the residuals are normal since probability of Jarque-Bera is more than 0.05. This reveal that the data of selected variable is normally distributed.

The estimated CUSUM test has been given in the table 2. The results show that estimated model is correctly specified.



## VI. Conclusion

This study has examined the impact of monetary policy on economic growth. In this study economic growth has been used as dependent variable, exchange rate, consumer price index, unemployment rate and money supply have been used as independent variables. For empirical analysis data from 1980 to 2018 has been used. For checking the stationarity of the variables augmented Dickey-Fuller unit root test has been used. This study has used ARDL test for examining the cointegration among the variable of the model. The estimated results of the study show that exchange rate has positive and significant impact on economic growth in the case of Pakistan. Inflation has positive but insignificant impact on economic growth in the case of Pakistan over the selected time period. Unemployment rate negative and significant impact on economic growth in the case of Pakistan. The estimates show that monetary policy has positive and significant impact on economic growth in the case of Pakistan. This study suggests that for raising the level of economic growth in the case of Pakistan, a soft monetary policy is needed with lower level of unemployment. The country should encourage the flexible exchange rate for higher economic growth.

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