An Empirical Investigation between Money Supply, Government Expenditure, output & Prices: the Pakistan Evidence

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Abstract

The main purpose of this paper is to find out long run relationship among M2, inflation, government expenditure and economic growth in case of Pakistan. For this purpose we have used Johnson co integration test to find out long run association and Granger causality test to find out bilateral and unilateral causality. We have selected annual data from 1977 to 2007. Our finding shows that public expenditure and inflation are negatively related to economic growth in long run while M2 is positively impacts on economic growth in long run. The reason behind the negative association among public expenditure, inflation and economic growth is the most of public expenditure is non development and inflation is due to adverse supply shock (cost push inflation) in case of Pakistan.

1. Introduction

Instruments of fiscal and monetary policies have been used almost in every country to obtained macroeconomics goals such as development, growth, redistribution, stabilization, job opportunities, stability of current account etc.

Macroeconomic theory suggested that budget deficit is caused expansionary money supply and budget surplus is contractionary. The basic question is that more government expenditure can cause to motivate economic growth, while the appropriate policy measures also can motivate the economic growth. In this scenario policy makers are usually interested in demand management policy and supply side polices. As far as management policies relating to the demand normally focused on management of money supply (monetary policy) and public expenditure (fiscal policy). Change in money supply
will affect the liquidity position in financial institutes and private spending of the economy while the public expenditures affect public spending of the economy.

For policy purpose monetarism has two elements the quantity theory of money and the natural rate of unemployment. Monetarism derives from the quantity theory of money and states that constant inflation is caused by increases in the money supply. Assuming that the velocity of money is constant and the output is not influenced by money supply, increases in the money supply feed through into inflation. The long run evidence behind monetarism is compelling but the short run support is poor.

According to the monetarism money supply is changed by monetary authority. As money supply increases which cause to increase in price proportionally (with other thing remain constant). This cause inflation as monetary authority increases money supply. The hypothesis of natural rate of unemployment holds that economy in long run back to natural rate of unemployment which is determined by the institution of the economy. Any increase in money supply cause output level is above natural level but in the long run it cause cost of proportionally increase in the inflation. It is followed that instead of following up full employment objective macro economic policy should be limited absolutely chase of the constant rate of monetary growth.

It was ruled out by monetarists’ school of thought that the possibility the demand management can impact either on real economic growth or employment in the long run. It was argued that given policies did not generate employment on the contrary it creates only inflation in the economy. This methodology of demand management critically spoiled the free market mechanism while stability in prices is a necessary base.

A second salient feature of the monetarist approach to the monetary policy was the focus on supply side economy. They ruled out any discussion for demand management policies but they agreed upon that government can take a severe initiative to enhance economic efficiency by macroeconomics instruments and policies to influence households and industries from the supply side. One angle of this approach which has given immediate attention that the policy of reducing marginal tax rates for those who have high incomes. This was initiated to increase incentives, and increased managerial and entrepreneurial contributions to economic efficiency. For those who have low incomes, the subsequent incentives were to be obtained by lessening of unemployment benefits (particularly the earnings-related payments) relative to wages.

In section 1: the money supply effects on economics growth, government expenditure and growth rate of the economy have discussed. In section 2 consists of literature review. Section 3 we focus on methodology which was use to analysis affects of money supply and government expenditure on economics growth. Section 4 consists of result and conclusion

In this spirit, an attempt has been made in this paper to estimate the behavior of money supply, government expenditure, output and prices and their simultaneous impacts on inflationary expectations in fuelling the fire of inflation in Pakistan and also to evaluate some factual background regarding the working of monetary mechanism so that the extent of price instability can be judged in the shades of realities.

Objectives

- How Monetary & fiscal policy cause real GDP.
- To find out the association between current governments spending and consumer price index.
- To find out the impact of public spending on monetary base in case of budget deficit (deficit financing).
2. Review Literature
So far a lot of work has been done in this regard some selected review literature as:

- Christos Karpetis (2006) investigated closed economy model and concepts of the multiplier and accelerator were used and applied post Keynesian view to determine the path of income and expected inflation towards the long run equilibrium. He defined that long run value of inflation (expected and actual) is affected by size of government expenditure and nominal money supply.

- David Demary (2004) used the data set from 1964 to 1981 period in case of West Germany he found that unanticipated money growth affects output and employment in case of West Germany. He found that unanticipated money growth (random walk) affects real variables such as output and employment.

- Wood Gyu Choi and Micheal B. Devereux (2005) tested empirically that how has fiscal policy (rising public spending) asymmetrically impact on economic activity and at various stages of nominal interest rate. His paper provides new proof that expansionary public expenditure in more favorable in short run growth when real interest rate is low. They also find that asymmetric effects of other macroeconomic variables such as inflation and interest rate.

- Han and Mulligan (2006) effort to facilitate that the economic theory of huge government and inflation. Huge government may become the cause of high inflation rate. But they realized that positive relationship between inflation and huge size of the government in the period of war and peace, time series correlation coefficient between inflation and the size of government which has a negative correlation coefficient of inflation with other than defense expenditures.

- Komain Jiranyakul (2007) used Thai-data for the year from 1993 to 2004 to find out causal association between economic development and size of government. His finding shows that no cointegration among public spending, economic growth and money supply. But unidirectional causality is found among economic growth, public spending and Quasi-money supply (M2).

- Fedrick Patterson and Peter Sjoberj (2003) used data from 1961 to 2003 in case of Sweden to find out the relationship between government expenditure and economic growth. They divided public spending in three broad categories which are private consumption, Gross fixed capital formation and interest payment; they are all significantly effect on economic growth.

- Junko Koeda and Vitali Kamarenko (2008) evaluate of fiscal scenario based on the assumption of rapid scaling up or increase rapidly government expenditure cause to decline economic growth due to increase oil price. They used neo classical growth model to define this situation.

- Abdullah H. Albatel (2007) used data from 1973 to 2004 in case of Saudi Arabia, employing granger causality test to find association among M2, government expenditure and economic growth and his finding shows bilateral causality between the variables.

Methodology
The data has been selected annually from 1975 to 2007 by international financial statistics and federal bureau of statistics. Different variables and latest analytical softwares are used frequently in this research paper. For the purpose of regression analysis E-view (software) is used to check whether the data is stationary or not, further the long run and short run relationship existing or not among the chosen variables. The model is being used in this research paper given as:
\[ RGDP = \beta_1 + \beta_2 M2 + \beta_3 CPI + \beta_4 GE + \mu \]

Where

\[ RGDP: \text{Real Gross Domestic Product} \]
\[ M2: \text{Money Plus Quasai Money} \]
\[ CPI: \text{Consumer Price Index} \]
\[ GE: \text{Government Expenditure} \]
\[ \mu: \text{Error Term} \]

For stationary purpose unit root analysis has been applied, for long run association among variables Johnson multivariate cointegration approach and for short run association Error Correction Mechanism has been employed.

**Unit Root Analysis**

This is the modern technique that is widely used for converting data from nonstationary to stationary. It is assumed that the error term of the two consecutive times period of models are uncorrelated then Dicky-Fuller Test can be applied as:

\[ \Delta Y_t = \beta_2 \Delta Y_{t-1} + \mu \ldots \ldots \text{With no Drift & Trend} \]
\[ \Delta Y_t = \beta_1 + \beta_2 \Delta Y_{t-1} + \mu \ldots \ldots \text{with intercept} \]
\[ \Delta Y_t = \beta_1 + \beta_2 t + \beta_3 \Delta Y_{t-1} + \mu \ldots \ldots \text{With Drift & Trend} \]

In mentioned above three models variables will be verified for stationary. Simply tau-statistics (Like t-statistics) tells about whether particular variables are stationary or not. On the other when the assumption is relaxed that the error term are uncorrelated then Augmented Dicky-Fuller test is frequently used to extract stationarity. The following models are extensively used by Dicky & Fuller as

\[ \Delta Y_t = \beta_2 \Delta Y_{t-1} + \delta \Delta Y_{t-1} + \mu \ldots \ldots \text{with no trend & drift} \]
\[ \Delta Y_t = \beta_1 + \beta_2 \Delta Y_{t-1} + \delta \Delta Y_{t-1} + \mu \ldots \ldots \text{with drift} \]
\[ \Delta Y_t = \beta_1 + \beta_2 t + \beta_3 \Delta Y_{t-1} + \delta \Delta Y_{t-1} + \mu \ldots \ldots \text{with trend & drift} \]

**Johnson Multivariate Co integration**

Basically this technique is used for long run association among variables. In this technique two statistics are used first is to trace statistics and another is to max Eigen statistics. When the sample size is smaller (n<40) then max Eigen value gives the more sophisticated result, but on the other hand when the Eigen values comes close to other trace statistics give the more sophisticated results.

**Trace Statistics**

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternative Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_0: r = 0 )</td>
<td>( H_1: r \geq 1 )</td>
</tr>
<tr>
<td>( H_0: r \leq 1 )</td>
<td>( H_1: r \geq 2 )</td>
</tr>
<tr>
<td>( H_0: r \leq 2 )</td>
<td>( H_1: r \geq 3 )</td>
</tr>
</tbody>
</table>

\( H_0: r \leq n \)

Trace statistics see the null hypothesis among remaining all hypotheses.
Max Eigen Statistics

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternative Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_0 : r = 0 )</td>
<td>( H_1 : r = 1 )</td>
</tr>
<tr>
<td>( H_0 : r \leq 1 )</td>
<td>( H_1 : r = 2 )</td>
</tr>
<tr>
<td>( H_0 : r \leq 2 )</td>
<td>( H_1 : r = 1 )</td>
</tr>
</tbody>
</table>

Max Eigen statistics only check co integration one by one.

Error Correction Mechanism

This technique is widely used to determine the short run relationship and it works as in the following manner

\[
RGDP = \beta_1 + \beta_2 CPI + \beta_3 M 2 + \beta_4 GE + \mu
\]

First Step is run this equation & Note down its residual Series i.e.
Residual \( w \)

After noting the series again concentrate on previous model & run as

\[
\Delta RGDP = \beta_1 + \beta_2 \Delta CPI + \beta_3 \Delta M 2 + \beta_4 \Delta GE + \lambda w_{t-1} + \mu
\]

where

\( \lambda : \) Speed of adjustment’

The expected sign of lambda is negative, if it is existing and statistically significant then it can be predicted somehow, otherwise its short run relationship is unpredictable.

The Granger Causality Test

The dependency of one variable is dealt with regression analysis, on the other variable, it is not essential to involve causation. Nevertheless the presence of the association between variables does not prove causality or the track of the influence. But the regression involving time series data, the situation may be somewhat different because if A event happens before B then it is not possible that B is causing A. In other words event in the past can cause event to happen today.

Granger Test

To explain the Granger test we consider the following relationship, if GDP causes the money supply M or money supply causes GDP. Granger causality test supposed that the relevant information to forecast of the respective variables GDP and M is contained solely in the time series data on these variables.

\[
Y = \sum_{i=1}^t \alpha_i X_{t-i} + \sum_{i=1}^t \beta_i Y_{t-i} + \mu
\]

\[
X = \sum_{i=1}^t \lambda_i X_{t-i} + \sum_{i=1}^t \delta_i Y_{t-i} + \nu
\]

It is an assumption that \( u \) and \( v \) are uncorrelated. There are two variables and dealt with bilateral causality. Equation 1 represent \( Y \) is related to its lag values and \( X \) is related to its lag values.

Steps involving in Granger Causality Test
Step-I: Regress current Y on all lagged Y terms and other variables if any, but do not include the lagged X variable in this regression. From this regression obtain the RSSr.

Step-II: Now run the regression consisting X terms and obtain RSSur.

Step-III: Null hypothesis is $H_0 : \sum_{i=1}^{I} \alpha_i = 0$ that mean that X term does not belong in this regression.

Step-IV: Test the hypothesis we apply F-statistics as

$$F = \frac{RSS_r - RSS_{ur}}{RSS_{ur}} \frac{m}{n-k}, \text{ where } (\alpha, n, n - k) \text{ is the DOF}$$

M: number of lagged M terms.

K: number of parameters in unrestricted regression.

Step-V: If F-value is greater then the tabulated value, reject $H_0$, which mean that lagged M terms belong to the regression. Now step I to step V repeated for second equation whether Y is caused by X or not.

**Some Important Cautions**

I- It is assumed that Y and X are Stationary.

II- It is presented in the causality test the number of lag terms test is a vital research question. We can use Akaike or Shiwarze information criteria to make use of choice of lag. But it should be added that the direction of causality may depend upon the number of lagged term included.

III- We assume that the error term included in causality are uncorrelated but if not appropriate transformation is needed.

$$Y = \sum_{i=1}^{I} \alpha_i X_{t-i} + \sum_{i=1}^{I} \beta_i Y_{t-i} + \mu$$  \hspace{1cm} (A)

$$X = \sum_{i=1}^{I} \lambda_i X_{t-i} + \sum_{i=1}^{I} \delta_i Y_{t-i} + \nu$$ \hspace{1cm} (B)

Apply F Test

$$F = \frac{RSS_r - RSS_{ur}}{RSS_{ur}} \frac{m}{n-k}, \text{ where } (\alpha, n, n - k) \text{ is the DOF}$$

$H_0 : \alpha = 0$

$H_1 : \alpha \neq 0$

**IV. Data Analysis**

Different econometric techniques for estimation are used in this analysis. Data is taken annually from 1975 to 2007 from different sources i.e. Federal Bureau of Statistics & International Financial Statistics (IFS). The following model is used in this study
\[
RGDP = \beta_1 + \beta_2 M2 + \beta_3 CPI + \beta_4 GE + \mu
\]

*Where*

\[
RGDP: \text{Real Gross Domestic Product}
\]

\[
M2: \text{Money Plus Quasai Money}
\]

\[
CPI: \text{Consumer Price Index}
\]

\[
GE: \text{Government Expenditure}
\]

\[
\mu: \text{Error Term}
\]

**Behavior of M, GE, CPI & Output 1975-2007: Regression Results.**

**Table 1**  Unit Root Test Result

<table>
<thead>
<tr>
<th>Variables</th>
<th>Augmented Dicky Fuller (ADF)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LEVEL</td>
</tr>
<tr>
<td>Real GDP</td>
<td>1.78</td>
</tr>
<tr>
<td>M2</td>
<td>2.38</td>
</tr>
<tr>
<td>CPI</td>
<td>1.21</td>
</tr>
<tr>
<td>GE</td>
<td>3.92</td>
</tr>
</tbody>
</table>

*, ** & *** shows the level of significance at 1%, 5% & 10% respectively.

Schwarz Information Criteria and Akaiken Information Criteria are employed for the selection of maximum lag length. All outcomes show that all series are in unit root and are at level stationary at first difference.

To find out cointegration between variables the Johnson Multivariate trace and maximum Eigen values are employed in this model as:

**Johnson Test for Co integration**

**Trace Test**

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternate Hypothesis</th>
<th>Trace Statistics</th>
<th>Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( r = 0 )</td>
<td>( r \geq 1 )</td>
<td>95.83*</td>
<td>47.85</td>
</tr>
<tr>
<td>( r \leq 1 )</td>
<td>( r \geq 2 )</td>
<td>34.83*</td>
<td>29.79</td>
</tr>
<tr>
<td>( r \leq 2 )</td>
<td>( r \geq 3 )</td>
<td>18.62*</td>
<td>15.49</td>
</tr>
<tr>
<td>( r \leq 3 )</td>
<td>( r = 4 )</td>
<td>4.78*</td>
<td>3.84</td>
</tr>
</tbody>
</table>

**Maximum Eigen Values**

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Alternate Hypothesis</th>
<th>Trace Statistics</th>
<th>Critical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( r = 0 )</td>
<td>( r = 1 )</td>
<td>60.99*</td>
<td>27.58</td>
</tr>
<tr>
<td>( r \leq 1 )</td>
<td>( r = 2 )</td>
<td>16.20*</td>
<td>21.13</td>
</tr>
<tr>
<td>( r \leq 2 )</td>
<td>( r = 3 )</td>
<td>13.83*</td>
<td>14.60</td>
</tr>
<tr>
<td>( r \leq 3 )</td>
<td>( r = 4 )</td>
<td>4.78*</td>
<td>3.84</td>
</tr>
</tbody>
</table>

* shows the 5% Level of significance

Variables included in the vectors are: RGDP, GE, CPI & M2
Error Correction Model Estimates Dependent Variable $\Delta \text{RGDP}$

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Stand Error</th>
<th>T-Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta \text{M2}$</td>
<td>2.092024</td>
<td>0.502050</td>
<td>3.89*</td>
</tr>
<tr>
<td>$\Delta \text{CPI}$</td>
<td>4965444</td>
<td>1264803</td>
<td>4.16*</td>
</tr>
<tr>
<td>$\Delta \text{GE}$</td>
<td>0.951341</td>
<td>0.735815</td>
<td>-3.92*</td>
</tr>
<tr>
<td>$\mu_t (-1)$</td>
<td>-0.442597</td>
<td>0.118395</td>
<td>1.29</td>
</tr>
<tr>
<td>Constant</td>
<td>122827.3</td>
<td>31514.36</td>
<td>-3.73*</td>
</tr>
</tbody>
</table>

* shows the 5% Level of significance

Granger Test

<table>
<thead>
<tr>
<th>No</th>
<th>Null Hypothesis</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GE does not Granger Cause RGDP</td>
<td>0.17625</td>
</tr>
<tr>
<td>2</td>
<td>RGDP does not Granger Cause GE</td>
<td>0.00041*</td>
</tr>
<tr>
<td>3</td>
<td>M2 does not Granger Cause RGDP</td>
<td>0.00036*</td>
</tr>
<tr>
<td>4</td>
<td>RGDP does not Granger Cause M2</td>
<td>3.2E-05*</td>
</tr>
<tr>
<td>5</td>
<td>CPI does not Granger Cause RGDP</td>
<td>0.12215</td>
</tr>
<tr>
<td>6</td>
<td>RGDP does not Granger Cause CPI</td>
<td>3.7E-06*</td>
</tr>
<tr>
<td>7</td>
<td>M2 does not Granger Cause GE</td>
<td>0.18769</td>
</tr>
<tr>
<td>8</td>
<td>GE does not Granger Cause M2</td>
<td>0.02110*</td>
</tr>
<tr>
<td>9</td>
<td>CPI does not Granger Cause GE</td>
<td>0.12449</td>
</tr>
<tr>
<td>10</td>
<td>GE does not Granger Cause CPI</td>
<td>0.00147*</td>
</tr>
<tr>
<td>11</td>
<td>CPI does not Granger Cause M2</td>
<td>1.4E-08*</td>
</tr>
<tr>
<td>12</td>
<td>M2 does not Granger Cause CPI</td>
<td>0.0250*</td>
</tr>
</tbody>
</table>

* shows the 5% Level of significance

Explanation

Table 1 shows that all the variables which have been used in this study are stationary at first difference. After validations of variables which have been used in this study are stationary therefore, Johnson co-integration technique is employed to test long run relationship between variables.

The statistical hypothesis of no cointegration is rejected for $r = 0$ for both trace and Eigen tests at 5% level of significance. In this case it implies that there are four cointegration vectors appearing in the data. It is concluded that the individual data series are found non stationary while their linear combinations are found stationary. Then Error Correction Model is applied to estimates short-run equilibrium which shows adjustment coefficient is negative and significant (-0.44); suggest that 44% of the disequilibrium will be corrected immediately, i.e. in next period.

As well as we found causality between the various variables which cause to each other by using Granger causality test. It is found that government expenditure, CPI, M2 & CPI do not cause to real gdp, rgdp, GE & GE respectively, on the other hand RGDP, M2, RGDP, RGDP, GE, GE, CPI & M2 granger cause to GE, RGDP, M2, CPI, M2, CPI, M2 & CPI respectively.

V. Summary & Policy Implication

The main objective of this study is to find out and examine the relationship among government expenditure, CPI (consumer price index), M2 (quasi money) and economic growth. Several researchers used Granger Causality Test to find whether the said variables cause each other or not, this study suggests that these variables have important, dominant and positive effects on prices and variation in real output. It is concluded that impact of fiscal and monetary policies is limited. Increase in public spending by deficit financing has no real effects in case of Pakistan.

Deficit financing by the government of Pakistan cause more liquidity effects and cause inflationary pressure in the economy. To avoid continuing rise in inflation and restore the health of the
economy. It is therefore suggested that state bank of Pakistan (SBP) to imply the ceiling on the growth rate of money supply. Government should control on deficit financing through state bank of Pakistan. Money supply should be allowed to grow according to the real output of the economy (monitorized economy). Excess growth of money causes inflationary pressure in case of Pakistan. Government should control its current expenditure which stimulates aggregate demand and more focus on development expenditure which stimulate aggregate supply and increase real output level. Finally this aggregate supply is monitorized by monetary growth according to real output increased in the economy.

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