Prices, Money Supply and Output Nexus in Pakistan – A Macro Econometric Model

Asma Awan[1], Hafiz Khalil Ahmad[2], Altaf Hussain[3], Muhammad Yousuf Khan Marri[4]

[1]Assistant Professor, Department of Economics, University of the Punjab, Lahore, Pakistan. Email:asma.eco@pu.edu.pk
[2] Professor & Dean, Faculty of Administrative and Management Sciences, GC Women University, Sialkot, Pakistan. Email: hafiz.khalil@gcwus.edu.pk
[3] Assistant Professor, Department of Economics, The Islamia University of Bahawalpur, Bahawalpur, Pakistan. Email: altafhussain@iub.edu.pk
[4] PARC National Agricultural Research Centre, Park Road, Islamabad, Pakistan. Email: yousuf.marri@gmail.com

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ABSTRACT

This study is an endeavor to examine joint determination of prices, money supply and output in Pakistan during 1975-2019 by using macro-economic model and annual time series data. Three Stage Least Square (3SLS) method is utilized to estimate simultaneous model of prices, money supply and output nexus. Our results strongly support significant positive association between prices and money supply thus supports monetarist view that growth in money supply causes inflation and rising behavior of prices is detrimental to real output. The accelerated inflation has obstructed real output and reduced output levels has further caused jump in price levels during the investigated period. The empirical results also supports significant bi-directional relationship between prices and money supply. Prudent monetary policy is need of hour to stabilize prices in order to minimize its adverse impacts on real output.

Corresponding Author's Email: altafhussain@iub.edu.pk

1. Introduction

Monetary theoreticians, policy makers and social scientists have extensively tried to investigate the dynamics among prices, money supply and output. Monetarists claimed active role of money in determination of prices and output[1]. Lucas (1980), Rolnick and Weber (1994, Omoke and Ugwuanyi (2010) all have supported monetarist claim that money causes prices. Whereas, Keynesians believed passive role of money in determination of output. Advocates of Keynes asserted that prices are mainly determined by structural factors and income causes changes in money stock without any feedback (Hussain, 1982). The determination of the causal ordering among key macro-economic variables i.e. prices, money supply and output is crucial in making vigilant fiscal and monetary policies aiming at stable economic growth.

Researchers have extensively worked on subject matter in context of Pakistan started with pioneered work of Husain in 1970's, however, there is no consensus and empirical results remains inconclusive. Mostly studies have utilized single equation model which can lead to inappropriate results due to expected two-way causation among variables of interest. Therefore, we have made efforts to use simultaneous model that can potentially capture two way causations among the variables. The model employed in this research differs from past empirical research as simultaneous macro model is utilized consisting of three stochastic equations, 3SLS

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[1] Although changes in money supply transmits into prices and output with some lag not immediately.

methodology is utilized to estimate the model and stationary variables are used to avoid spurious regression results.

The graphical inspection of prices, money supply and output behavior during 1974-2019 is presented in figure 1. From the visual plot we can deduce some preliminary conclusion regarding behavior of growth rate of prices (GDP deflator), growth rate of broad money supply and growth rate of output during 1974-2019. The trended lines indicates that mostly periods of monetary expansion are associated with increased price levels and reduced output growths whereas periods of monetary contraction are associated with decreased inflation rates and increased output levels.
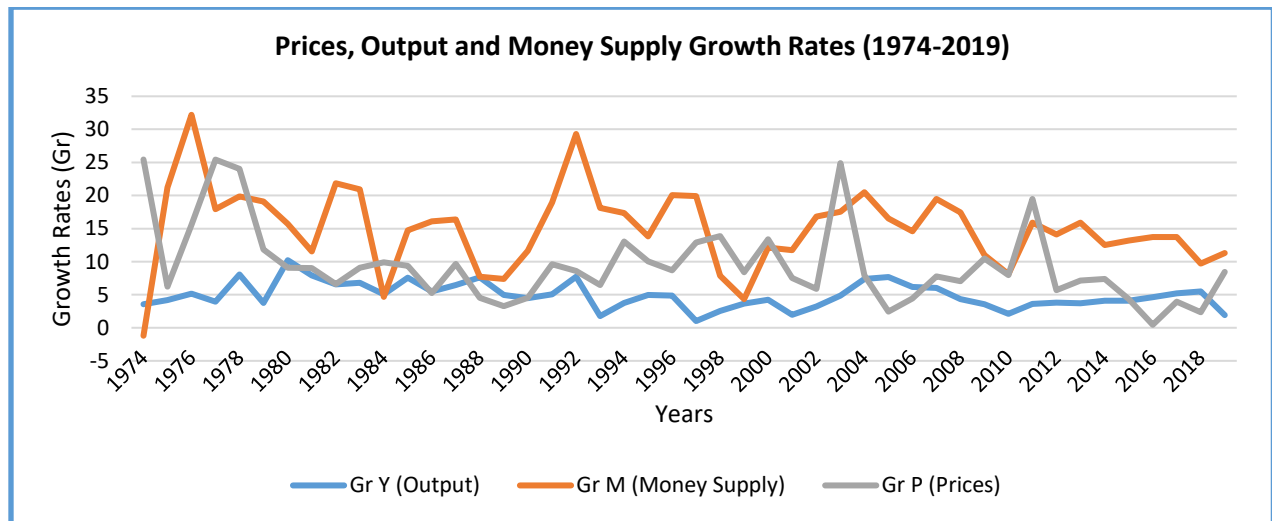

Figure 1: Graphical Representation of Prices, Output and Money Supply Growth Rates

From the visual, we can also deduce that historically Pakistan remained candidate of single- and double-digit inflation. During 1970's, 1990's and second half of 2000's high inflation episodes were observed due to various internal and external factors. Internal factors of price volatility include low saving rates, low deposit growth rates, high lending rates, low output growth rates, severe energy crises and food shortages whereas external factors include oil prices hike, global financial slump and massive depreciation of local currency against US dollar. In recent times, GDP deflator-based inflation continuously declined from 7.12% (2013) to 0.45% (2016) except in 2011 (19.5%). Afterwards, increase in inflation is observed till 2019. The growth rate of broad money supply, on average, was 13.98% (1970's), 13.28% (1980's), 16.17% (1990's) and 15.37% (2000's). During second half of 2000's Government heavily asked for SBP (State Bank of Pakistan) borrowings to meet its expenditures and to finance budget deficit. All in turn causes inflationary pressures for the economy. During 2011-2019, on average, 12.85% growth in broad money supply was observed. In addition, Pakistan remained victim of volatile economic growth as she lost its growth momentum of first phase of 2000's during 2007–2010. On average in the first half of 2000's 5.3% growth was observed which drastically declined to lowest level of 2.4% in fiscal year 2010. The plausible reasons behind this lower growth rate were rising cost of war on terror, increasing inflation, security issues, terms of trade shocks (2008) and floods (July 2010). From 2011-2019, on average, 4.12% real GDP growth rate was observed. (Pakistan Economic Survey (PES), various issues)

The declining rate of economic growth, rising inflation, ineffectiveness of stabilization policies is a potential threat to Pakistan's economic sovereignty which needs to be addressed on priority basis. The monetary policy if effectively pursued can ensure sustainable economic growth but before formulating and pursuing any monetary policy, it is important to analyze that whether monetary policy variable (money supply) affect real variable (output) or just cause rise in prices? Therefore, core objective of this study is to contribute in research through joint determination of

prices, money supply and output dynamics within the framework of simultaneous model in Pakistan.

The study is organized as following the introduction, section 2 presents literature review, section 3 contains research design, section 4 reports empirical results and discussions, and section 5 concludes with policy suggestions.

2. Literature Review

To ferret out the causal ordering among prices, money supply and output considerable amount of empirical literature is available in context of developed and developing countries including Pakistan. The findings of Sims (1972) empirical work in context of US economy that money causes income (supporting monetarist preposition) attracted the social scientists and researchers to work on the subject matter. Since then, economic literature is replete with number of empirical studies.

During 1970's and 1980's traditional granger causality test was adopted mainly to gauge interrelationships among variables of interest whereas during 1990's and 2000's more sophisticated econometric techniques like Johansen co-integration, ARDL approach, ECM (error correction models), VAR models were adopted. Most of the past empirical research is based on single equation models rather than macro-economic models consisting number of equations. In recent times more scientific approach i.e., Graph theoretic approach is also utilized in Pakistan to detect causal nature of money, prices and output.

Following Sims work, Barth and Bannett (1974) found two-way causation between money supply and output in Canadian economy. William et al. (1976) created doubts on Sims empirical work by finding that money does not granger causes income in UK, however, income does granger causes money and money in turn causes prices only. Lee and Li (1983) worked for Singaporean economy and reported bi-directional relationship between money and output whereas in money-prices nexus money causes prices without any feedback. In context of India Joshi and Joshi (1985) also supported that money granger causes output with feedback. Daniel and Batten (1985) also supported bi-directional causality between money and output.

In context of Pakistan, Abbas (1991) worked on selected Asian countries including Pakistan, Malaysia and Thailand. He used granger causality test and found significant two-way causal relationship between money and income in Pakistan. Bangali et al. (1999) finding was consistent with Abbas (1991) empirical study. In addition, Bangali et al. (1990) asserted that increase in price level is caused by monetary expansion in Pakistan. Hussain and Mahmood (1998) found one way causation running from money to prices. A precise summary of the empirical literature on subject matter is reported in table 1.

Table 1
Summary of Empirical Literature on Prices, Money supply and Output

Study	Sample	Variables	Methodology	Findings
Olivo and Miller (2000) Venezuela	1950-1996 (Annual data)	Money Nominal GDP Prices	Johansen Co-integration Test	Stable long run relationship when M1 was used. Absence of relationship when M2 was used.
Hussain and Abbas (2002) Pakistan	1950-1999 (Annual data)	GNP[2] CPI[3] M2	Granger Causality and ECM[4]	Y→M, M↔P

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[2] Gross National Product
[3] Consumer Price Index
[4] Error Correction Model

Ahmad (2003) SAARC countries (Bangladesh, Pakistan, India)	----	Money (M) Prices (P) Interest Rate Income (Y)	Granger Causality Test	Bangladesh M↔P, M→Y, R→Y, R→P Pakistan M↔P, Y→R, P→R India Y→R, P→R, Y→M
Abbas and Fazal (2006) Pakistan	1959-2003 (Annual data)	Money Income Prices	Co-integration ECM Granger Causality	There is long run relationship. M↔P, Y→M
Qayyum and Abdul (2006) Pakistan	1960-2005 (Annual data)	QTM equation: Inflation Rate Monetary growth Velocity growth Output growth	Johansen Co-integration	Inflation is purely monetary phenomenon
Hussain and Rashid (2008) Pakistan	1960-2004 (Annual data)	Money Prices Income	Johansen Co-integration and Causality Test	Y→M , M→P without any feed back
Omoke and Ugwuanyi (2010) Nigeria	1970-2005 (Annual data)	M2 Output Inflation	Johansen Co-integration, Granger Causality Test	No significant co-integration, M→P, M→Y.
Asghar and Jahandad (2010) Pakistan	1971 to 2003 (Quarterly data)	Money supply Prices Income	Graph Theoretic Approach	Money supply and prices causes' income.
Singh et al. (2015) India	Q1 1991 to Q1 2015 (Quarterly data) data)	Money Supply[5] Prices Output	Granger Causality Johansen Co integration	Relationship is quite sensitive with respect to choice of variables. Narrow money found better policy measure.
Dingela and Khobai (2017) South Africa	1980-2016 (Annual data)	Broad money supply GDP per capita Interest rate Inflation	ARDL (Autoregressive Distributed Lag Model)	Money supply and economic growth are positively related in short run and long run

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[5] Multiple measures were used in this research pertaining to each variable. For example, reserve money, narrow money and broad money are used as proxy of money supply.

Mansoor et al.(2018) Pakistan	1980-2016 (Annual data)	Money Supply Prices Economic Growth	ARDL	GDP → M2 M2 → CPI CPI & GDP do not cause each other.
Mahara (2020) Nepal	1975-2019 (Annual data)	Money Supply Economic Growth	ARDL	M2 → Real economic growth

Note: → denotes one way causation, ⟷ denotes two-way causation.

After reviewing literature on relationship among prices, money supply and output we found that literature remains inconclusive and there are various possible reasons for this inconsistency. The varying results attributes to adoption of different estimation strategies, time frame, frequency of the data and differences in cross sectional units. The ambiguity of relationship among variables of interest in turn demands more research on subject matter but by using simultaneous model that truly captures endogeneity between variables. This research is an endeavor in this context and will be a contribution in empirical literature. It also provides avenues for further research using macro-economic models.

3.   Research Design
3.1.   Data Set and Description of the Variables

Using the annual data this study examines dynamic relationship among prices, money supply and output for the period 1975-2019. It is relevant to mention that lagged output variable is also used in the analysis, therefore, estimation period starts from 1975 instead of 1974. Data is of secondary nature and selection of the variables is based on data availability and relevance to theory. Brief description of the variables along data source is provided in table 2.

Table 2
Description and Data Sources of the Variables

Variables	Description	Source
P	Prices – GDP deflator (%) used as proxy for price level.	Pakistan Economic Survey (PES), various issues.
M	M_2 - Broad money Supply ($ million)	International Financial Statistics (IFS) database
Y	Output - Real Gross Domestic Product ($ million)	PES, various issues.
V	Velocity of money supply - (GDP/money supply)	State Bank of Pakistan
R	Discount Rate (%)	IFS database
G	Total Government expenditures ($ million)	PES, various issues
Open	(Exports + Imports) /GDP	Federal Bureau of Statistics (FBS), various Issues.
ED	Total external debt ($ million)	PES, various Issues.

3.2.   Derivation and Specification of the Model

To analyze dynamic interrelationships among stated variables, macroeconomic model consisting of three stochastic equations is developed. The derivation of the model is explained below.

3.2.1. Formulation of Price Equation

In order to gauge general price level in a country we are going to use Cambridge equation of QTM (Quantity theory of Money) which reflects monetarist preposition that prices are mainly caused by increase in money supply. The respective equation can be stated as:

$$M_t V_t = P_t Y_t \ldots\ldots(a)$$

$"M_t"$	= quantity of money stock. It can be M_1, M_2 or M_3
$"V_t"$	= velocity of money or average turnover of money per unit
$"P_t"$	= general price level. It can be CPI[6], PPI[7] or GDP deflator[8]
$"Y_t"$	= total transactions of goods and services or output
$"t"$	= time subscript

The above stated equation can be written for price level as:

$$P_t = \frac{M_t V_t}{Y_t} \ldots\ldots\ldots(b)$$

The equation (b) states that general price level of a country in a given year is determined by money stock, its velocity and country's output level. By taking natural log on both sides, we arrive at a final equation of price level i.e.

$$LnP_t = LnM_t + LnV_t - LnY_t \ldots\ldots\ldots(c)$$

The long run price level equation states that prices are direct and positive function of money stock[9] and its velocity whereas an indirect and negative function of aggregate output. Although in quantity theory of money it is assumed that velocity and output do not change in long run, however, keeping in view Pakistan's economy characteristics where mostly output fluctuates and deviates from its potential level we cannot assume it constant. Furthermore, we are also dropping the unrealistic assumption of constant velocity because velocity of money normally increases with the rapid increase in economic activities, monetization of economy and shifts in financial structures. Qayyum and Bilquees (2005) also rejected unrealistic assumption of constant velocity and output while investigating causal orderings of prices, money supply and output.

3.2.2. Formulation of Money Supply Equation

In order to formulate equation for money supply we can use equilibrium condition of money market which states that D_M (demand for money) is equal to S_M (supply of money). The demand for money takes the following functional form in terms of transactive and speculative demand for money.

$D_M = \kappa(Y_t, R_t) \ldots\ldots\ldots(a)$ Where $\kappa_y > 0, \kappa_R < 0$

$"Y_t"$	= income level
$"R_t"$	= interest rate
$"\kappa_Y"$	= sensitivity parameter of money demand with respect to income or output

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[6] Consumer price index

[7] Producer price index

[8] Gross domestic product deflator

[9] Monetarists claimed that most significant contributing factor in raising general prices is how quickly growth in money supply takes place in an economy.

"κ_R"   = sensitivity parameter of money demand with respect to interest rate

"t"   = time subscript

We also know that supply of money is:

$$S_M = \frac{M_t}{P_t} \ldots\ldots\ldots(b)$$

"M_t"   = money supply

"P_t"   = general price level

"t"   = time subscript.

       In the long run money market equilibrium requires D_M = S_M therefore by equating equation (a) and equation (b) we get

$$\frac{M_t}{P_t} = \kappa(Y_t, R_t) \ldots\ldots\ldots(c)$$

       The above relationship between money balances and real money supply can be transformed into nominal money stock as

$$M_t = P_t * \kappa(Y_t, R_t) \ldots\ldots\ldots(d)$$

Finally the money supply equation can take the following multiplicative form

$$M_t = P_t^{\lambda_0} * Y_t^{\lambda_1} * R_t^{\lambda_2} \ldots\ldots\ldots(e)$$

By using logarithmic transformation, we can rewrite equation (e) as

$$LnM_t = \lambda_0 LnP_t + \lambda_1 LnY_t + \lambda_2 LnR_t \ldots\ldots\ldots(f)$$

       The above equation states that money stock is a function of price level, output and interest rate in the long run. Although in context of Pakistan interest rate is policy determined variable rather than market determined variable, however, if we use discount rate as a measure of interest rate we can safely posit that State Bank can potentially lower money supply (paper money plus deposits) by increasing discount rate. In support of inclusion of interest rate in money supply equation we can refer Okpara and Nwaoha (2010) research on subject matter. In their empirical study, they have used interest rate as an explanatory variable in money supply equation and found significant negative association between money supply and interest rate.

3.2.3. Formulation of Output Equation

       The output function used in this research takes the form of following multiplicative power function augmented with prices, government expenditure, openness and external debt. The lagged output variable is also used as an explanatory variable.

$$Y_t = \delta_0 P_t^{\delta_1} (Y_{(t-1)})^{\delta_2} G_t^{\delta_3} (Open_t)^{\delta_4} ED_t^{\delta_5} \ldots\ldots\ldots(a)$$

"Y_t"   = output level

"P_t"   = general price level

"Y_{t-1}"   = lagged output level

"G_t"   = government expenditures

"$Open_t$"   = openness

"ED_t"   = DOD[10] external debt

Taking Log on both sides, we get

$$LnY_t = Ln\delta_0 + \delta_1 LnP_t + \delta_2 Ln(Y_{(t-1)}) + \delta_3 LnG_t + \delta_4 LnOpen_t + \delta_5 LnED_t \ldots\ldots(b)$$

The above output function states that output depends on price level, lagged output (used as proxy for economic development), government expenditures, openness and external debt. It is expected that there is a negative or indirect relationship between external debt, prices and output whereas there is a positive or direct impact of government expenditures, openness, lagged output on current output of a country. Inclusion of lagged variable is of great significance in order to judge variations over the time period. We have used four exogenous variables in the output equation.

Finally, we can report complete macroeconomic model consisting of three stochastic equations related to price level, money supply and output to analyze linkages or causal orders among variables during 1975-2019, time period consisting of 44 years.

Macroeconomic Model of Prices, Money Supply and Output

$Pr iceEquation:$

$$LnP_{1t} = \alpha_{10} + \alpha_{12} LnM_{2t} + \alpha_{13} LnY_{3t} + \beta_{11} LnV_{1t} + \varepsilon_{1t}$$

$MoneySupplyEquation:$

$$LnM_{2t} = \alpha_{20} + \alpha_{21} LnP_{1t} + \alpha_{22} LnY_{3t} + \beta_{22} LnR_{2t} + \varepsilon_{2t}$$

$OutputEquation:$

$$LnY_{3t} = \alpha_{30} + \alpha_{31} LnP_{1t} + \beta_{33} Ln(Y_{t-1})_{3t} + \beta_{34} LnG_{4t} + \beta_{35} LnOpen_{5t} + \beta_{36} LnED_{6t} + \varepsilon_{3t}$$

List of Endogenous Variables
LnP   = Log of prices
LnM   = Log of money supply
LnY   = Log of output

List of Exogenous Variables
LnV   = Log of money velocity
LnR   = Log of interest rate
Ln (Y) $_{t-1}$ = Log of lagged output
LnG   = Log of government expenditures
LnOpen = Log of openness
LnED   = Log of external debt

The first equation of the simultaneous system is price equation, money supply is a second equation, and third equation is an output equation. The system is complete as it contains equal number of dependent variables and equations. There exist three equations related to three dependent variables. The alphas ($\alpha's$) are used as coefficients of dependent variables whereas betas ($\beta's$) are used as coefficients of exogenous or independent variables.

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[10] Disbursed and Outstanding

3.3. Estimation Strategy

To check order of integration we have employed recent and most powerful Ng-Perron (2001) unit root test[11] which is preferable over ADF, PP and KPSS unit root tests. Furthermore, simultaneous model on subject matter is estimated by 3SLS (full information) method proposed by A. Zellner and Theil in 1962. This approach is superior to 2SLS approach as 2SLS method is a limited information method. The assumptions of 3SLS approach includes presence of simultaneity in the model, over-identification of the model, residuals of each equation must be serially uncorrelated and model must be correctly specified. Hausman's simultaneity test is used to confirm simultaneity in the model. Over identification of the model is confirmed through application of order and rank condition. Breusch Pegan Godfrey serial correlation LM test (1969) is utilized to confirm serially uncorrelated residual terms, whereas, Ramsey's RESET test (1969) is used to check the correct specification of each equation of the model.

4. Empirical Results and Discussions

After confirming stationarity, all assumptions of the 3SLS approach are confirmed. In order to conserve space we are not going to report results related to unit root checks and pre-requisites of 3SLS approach. However, results of macro model on subject matter are reported in table 4.

Table 4
3SLS Estimates (Prices, Money Supply and Output Macro Model)

Variables	Prices equation (Ln P)	Money Supply equation (Ln M)	Output equation (Ln Y)
Dependent Variables			
LnP_{1t}	-----	1.38* t-stat [5.02] prob. (0.00)	-0.54* t-stat [-3.25] prob. (0.001)
LnM_{2t}	0.38* t-stat [4.06] prob. (0.00)	-----	-----
LnY_{3t}	-0.78* t-stat [-6.27] prob. (0.00)	-0.37 t-stat [-1.01] prob. (0.31)	-----
Independent variables			
LnV_{1t}	0.073 t-stat [0.13] prob. (0.89)	-----	-----
LnR_{2t}	-----	-0.66* t-stat [-2.45] prob. (0.01)	-----
$(Ln(Y)_{-1})_{3t}$	-----	-----	0.074 t-stat [0.52] prob. (0.59)
LnG_{4t}	-----	-----	0.016 t-stat [0.28] prob. (0.77)
$LnOpen_{5t}$	-----	-----	-0.212* t-stat [-1.65] prob. (0.10)
$LnED_{6t}$	-----	-----	0.251 t-stat [0.98] prob. (0.32)

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[11] It addresses issues of ADF and PP test related to poor size and power distortions.

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	-5.38	3.28	5.35
Intercept	t-stat [-4.96]	t-stat [1.32]	t-stat[3.11]
	prob. (0.000)	prob. (0.18)	prob. (0.002)
Summary Measures			
R^2	0.992	0.986	0.979
Adjusted R^2	0.991	0.985	0.975
S.E of Regression	0.082	0.112	0.108

Note: Asterisk * is used to indicate the significant variable. The p-values are reported to show the exact level of significance.

Table 4 report results of 3SLS estimation. It reports the estimated coefficients, t-values, and respective probabilities. Most of the variables are statistically significant as well as having expected signs. The summary measures are reported in lower section of the table. All summary statistics are found satisfactory.

4.1. Discussion Related to Price Equation

In price equation, two explanatory variables out of three are statistically significant and have their expected signs. Money supply and velocity of money both are positively associated to prices with a reported coefficient 0.38 and 0.073 respectively. However, money supply is highly statistically significant and velocity of money is not statistically significant. The estimated coefficient of money supply can be interpreted as 1 percent increase in money supply directly, on average, increases price level by 0.38 percent in the long run, keeping other factors constant. This empirical finding suggests that monetary variable i.e. money supply is causing inflation in Pakistan which is consistent with the findings of Rangarajan and Arif (1990), Khan and Qasim (1996) Hussain (2006), Abbas and Fazal (2006), Mansoor et al. (2018) who supported monetarist stance for causing inflation beside other structural factors. The plausible reason behind this finding is that whenever there is an increase in money supply circulation, it definitely lowers the purchasing power of each unit of a currency (or increases prices) as there is more money chasing same amount of goods and services.

Since velocity of money supply is statistically insignificant hence no valid inferences can be obtained from this empirical finding. Furthermore, results strongly supported the inverse relationship between output and prices. From last couple of years Pakistan remained candidate of low growth rates which transmits in rising cost of production and inflation. This empirical finding is highly consistent with the Pakistan experience. The reported coefficient of output indicates that 1 % decline in output increases prices directly, on average, by 0.78 % in the long run.

4.2. Discussion Related to Money Supply Equation

In money supply equation two variables are significant out of three however their significance level vary from variable to variable. From reported results we found that prices are positively associated with money supply and it is statistically significant. From the significance of prices in money supply equation and significance of money supply in price equation we are able to conclude that relationship between prices and money supply is a two-way relationship. The rise in money supply positively affects prices and rise in prices further cause expansion of money supply. The coefficient of money supply equation indicates that 1 percent rise in prices directly, on average, increases money supply by 1.38 percent in the long run.

In context of money and output nexus, we surprisingly found negative association but this association is not statistically significant. Given insignificance, no valid inferences can be drawn. Furthermore, with regard to discount rate (interest rate) and money supply nexus we found significant negative association with the reported coefficient 0.66 percent which indicates

that 1 % increase (decrease) in discount rate, directly on average, decrease (increase) money supply by 0.66 percent. The significance level of this association is 1%. State Bank of Pakistan can potentially lower growth of money supply by raising discount rate. As rise in discount rate makes borrowings of commercial banks expensive which further decrease money supply creation process. The SBP has drastically increased lending rates from June 2007 to March 2009 as it was 10.32% in 2007 which increased to 14.28% in March 2009. All this tightening of monetary stance has lowered growth of money supply especially if we compared with 1980s and 1990s era of monetary growth but sharp rising trend of lending rates has also spurred inflation in Pakistan because rising interest rates has caused investment projects more expensive. It is also pertinent to mention that in recent times SBP has reduced interest rate given increasing incidence of inflation.

4.3. Discussion Related to Output Equation

In output equation only two variables out of five are statistically significant. With respect to prices and output we found highly significant negative relationship. More inflation means lesser real output or conversely we can say that lesser inflation means higher real output. Pakistan has experienced sky rocketing inflation which has potentially deteriorated real output during the investigated period. The rising trend of inflation especially double digit inflation has caused uncertainties, erosion of investment activities, increased vulnerabilities which transmitted in lowering output and growth momentum of real GDP. The reported coefficient indicates that 1 percent increase in prices directly on average deteriorated real output by 0.54 percent in the long run. This finding is consistent with Suleman et al. (2009) and Cechetti (2000) as well as with the Pakistan experience. However, results contradicts with findings of Mansoor et al. (2018) that CPI based inflation and output do not cause each other. This contradiction may be attributed to change in specification of model, analysis period and estimation method. From the results we also observed that there exist two-way causation between output and prices in Pakistan as prices in output equation is statistically significant and output in price equation is statistically significant.

With respect to output and government expenditures we found positive relationship but this relationship is statistically insignificant. Its insignificance in Pakistan claims that increase in government expenditures does not cause rise in output levels. Since government expenditures are mainly non-development expenditures rather than of development expenditures. The worst thing to mention is that share of development expenditures in total expenditures is decreasing. Furthermore, openness is partially statistically significant at 10% and negatively related to output. Its negative association with real output is quite surprising. Possible rationale behind this refers to lower competitiveness of Pakistan in International market due to its concentration of primary commodities, absence of value added products, deteriorated terms of trade and low market share.

The coefficient of external debt is also positively associated with real output but it is insignificant hence we cannot infer from this relationship. Realistic formulation of many economic relations requires inclusion of lagged variables therefore we have included lagged variable of output in order to investigate impact of lagged output growth on current real GDP growth and found signs of positive relationship but it is insignificant.

5. Conclusion

This study empirically examines joint relationship among prices, money supply and real output in Pakistan using annual data from 1975-2019. It improves deficiency in methodology by utilizing macro-economic model instead of a single equation model. After confirming stochastic properties of the data with Ng-Perron test, 3SLS method is utilized to estimate the model. The 3SLS results report that most of the variables are significant, aligned with theory and consistent with current situation of the country. The core finding is high surge in Pakistan's inflation rate caused by excessive monetary expansion during 1975-2019, on average, have retarded real GDP. It strongly supports Monetarist believe by confirming direct and positive relationship between money supply and prices during the investigated period. Prices are caused by expansion in money supply with feedback effect. Furthermore, prices and output are negatively associated

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with each other. In a nutshell, we can safely conclude bi-directional relationship between prices and money supply and between prices and real output in Pakistan. To overcome these ill effects of rising prices on real output and to mitigate inflation two key policy measures are suggested. Firstly, coordinated monetary and fiscal policies are need of hour to keep macro-economic balances and to mitigate adverse impacts of inflation on real output. Secondly, in order to reap benefits from economic globalization, there is a need to ensure trade competitiveness.

In this research, we put best efforts to examine long run causal ordering of money, prices and output within the framework of macro model in Pakistan using longer data. We tried to make it inclusive in its all possible aspects, however, in research there is always room for improvement. We have used QTM for formulation of price equation, whereas, future potential researchers can formulate price equation with any other relevant theory of money. Moreover, graph theoretic approach based evidence on subject matter can also be examined as it is limited in case of Pakistan.

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