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Exploring the Dynamic Interrelationship among Money Supply, Economic Output, and Price Levels: A Comprehensive Time Series Causality Analysis in the Context of Pakistan

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ABSTRACT

In Pakistan, the money supply, output, and price level have a tenuous relationship, as this study has shown. Data from time series is used to encompass the years 1980-2025. This study used the Granger causality analysis, the Augmented Dickey Fuller, the Johansen co integration test, and the unit root to check for stationary to analyze the causative link. Money supply and price were considered independent variables in the study, with the GDPG serving as the dependent variable. The findings demonstrated a positive correlation between the dependent and independent variables, indicating that rising inflation and broad money will boost GDP growth or that there is a Univariate causal relationship between price and GDP growth but no evidence of any causality between prices in Pakistan. The research suggests expansionary monetary policy with higher inflation necessary and sufficient conditions for the growth of Pakistan during the study period. More work is inevitable with including some other variables and with different techniques.

Keywords: *Casualty, Gross Domestic Product, Broad Money, Inflation, Expansionary Monetary Policy*

INTRODUCTION

The level of money and prices mostly determine the many macroeconomic"variableles"in any given country. Even there is disagreement on the role of money in various schools of thought as the Classical economists do not give importance to money while the monetarists consider money as a core variable.

Economists cannot agree on one direction regarding the causal relationship between money supply and price level. Anynation's EG can be greatly increased by monetary policy since money is an externally constant factor in the economy. It is an imperative issue for many policymakers to design appropriate monetary policy so the direction (track) of causality analysis b/w money along with output can reveal effective policy. Pakistan is one of the South Asian countries whose economy is growing fast. Inflation remained at 5% of GDP with a 10% growth rate till 1970. Since Pakistan's independence; Pakistan has documented even economic growth.

Since its inception, the economy of Pakistan has observed high inflation with high unemployment. Inflation reached 11% with moderate GDP growth from 1980 to 1990,but after 1990 inflation reached a double-digit between 9.8 to 13.0 and GDP revealed unstable with declining fluctuations at the lowest rate of 1.7. From 2004 to 2005,inflation remained at 5% with an increasing growth rate. Single-digit inflation was fruitful but double-digit harmful to Pakistan's economy (Shahzad Hussain and Shah Nawaz Malik 2011; Ali et al., 2021). After 1980 to some extent, stable political conditions occurred in Pakistan. The present Pakistani government conducted money supply stabilization and structural amendment programmed with support from the World Bank and the IMF. The goal of the strategy was to improve market inter-related proceeds,remove expenditure distortions, assist classified firms, and encourage exports to open up the economy to improve the functioning of the public sector in any country. Then a discreet monetary and fiscal policy environment was projected to emerge and confidence leads to a viable economy in service in an open market by this plan. Inflation was observed low during the amendment plan. The State Bank of Pakistan also did not show any significant improvements in a variety of indices, including EG, despite the government's growth in public spending and money supply. The key macroeconomic conundrum in the observable economy is the economy's persistently weak growth in gross domestic product. Researchers have worked very hard to understand the causal relationship between GDP and economic growth and the money supply and price. On the other hand, the accessible empirical literature has outlying commencing attainment definite contract on the specific association among price, GDPG, money supply,and economic growth. On the other hand, despite a strong positive correlation, there was debate over the direction of causality between prices and money supply. Thus, the primary goal of the study is to identify the basic relationship between GDPG, price,money supply, and economic growth in Pakistan (Denbel 2016). The question is whether money causes output and prices cause national output growth; these are significant for economists who work on macroeconomic variables. It is an imperative issue for many policymakers to design appropriate monetary policy so that the trend of causality analysis between money and output can reveal effective policy that fulfills the country's purposes.Analyses of macroeconomics kinds of literature present to find out the particular association between money and output, these linkages draw more attention to broad discussions (Lucas 1996, Blanchard 1990, Sargent, 1996). Money affects output through unlike channels, as well as unexpected monetary fluctuations, and actual and insignificant rigidities, models are constructed to illustrate these relations. The majority of economists admit that a country's ordering runs from ostensible financial aggregates to ostensible income. Conversely, the disparity in money manifested between nominal outputs under rigid prices.

This research examined the influences of money, output, and price in the short run and long run in the cost-cutting measure. To check the vital role of these macroeconomic variables in the economy consequently, under their policy impact the GDPG for the economy. Based on existing empirical and theoretical literature, to contribute to growing research, the objective of the study is to accumulate interest in causal linking for the target of monetary policy to achieve sustained economic growth and how much the price would concede to be suitable and stable for the Pakistani economy. One of the

foremost motivations for this research is the disagreement that monetary authorities are always operational towards encouraging EG to maintain inflation at a low level, there is a renowned phenomenon that higher inflation can influence the economy drastically, so the evidence is observed by Temple (2000) that suggested modest inflation has slowed down growth. This study aims to contribute to the prose by incorporating money supply,price level, and output into a dynamic model. This research also seeks to find theories that are in accord with the fast-growing economies for short-run movement in the price level to determine major suggestions. Conventional Growth theories suggest that inflation inversely affects the overall economic performance of any country. Several economic growth studies also reveal that high inflation has distinctly influenced the decisions of private agents concerning investment, saving, and production which leads to slow Economic Growth. A moderate level of inflation damages real economic growth.Leading economists believe that price permanence is the primal purpose of the financial course of action and the Federal banks devote the money supply to sustaining low inflation (Blejer et al, 2000). Estrella and Mishkin (1996) recognized that there are three major roles of monetary aggregates; rank the variables, indicators of strategy measures, and instruments of a policy rule. Final policy targets are mandatory for these roles, sequentially strong relationships with the monetary aggregates. Monetary base in particular cannot be taken in an easy way for monetary policy targets, taking facts from U.S. and German data. The role of monetary aggregates in policy-making has elicited enormous concern with the large empirical literature. Friedman and Schwartz (1963) indicated that anticipated changes in money stock precede changes to nominal income. Sheppard(1973), Davis and Lewis (1977), and Boehm (1983) Monetary aggregate are most important for real activity by all originate evidence in Australia. Hay (1998) threw light on EU countries including Canada,Japan, and the U.S.; many hypotheses were made to find out money-output Granger causality. broad-spectrum hypotheses based upon the Granger causality test were not vigorous, unlike monetary variables. periods and countries' conditions showed the results of the study. The rendered null and void causality for Canada and the U.S.indicated the existence of significant bivariate causality in Austria and Spain. By the considerable results which were more or less allied with detailed countries. Baek (1993)concluded that real output growth remained neutral to money growth. money supply shocks show short-run and long-run fluctuations in prices. Nell (1999) probed that money endogenously determined from the consumer price index. Hayo (1998), Davis, and Tanner (1997) Money should be constrained to the U.S. economy and cause economic activity when adjusted appropriately for the period. Hodrick stated that the OLS methodology performed worse than that of the VAR base. Rangarajan & Arif (1990)noted that inflation reacts to the money supply but changes in real output do not affect the money supply in India. Dutta and Gangadhar (2015) stated that structural factors and monetary factors are essential, to check the sustainability of inflation progression and volatilities. Short-run money demand has a positive relationship with GDP. Both the deposit rate and inflation rate have a negative coupled with the movement in money demand. QTM hypothesizes that the output level remains fixed at full employment level.The money supply is exogenously determined and changes in MS lead to higher changes in the general price level (Friedman & Schwartz (1963), Fischer & Stanley (1977),Laidier & David (1991) Hamilton (2001) inflation has generally explained the financially viable state of affairs where a decrease in money supply(money supply) decrease new-fangled fabrication of supplies moreover services in the identical cutback. Piana (2001) revealed that prices are increased within a tapered grouping of monetary commodities in addition to serving economists typically differentiate economic observable facts that will lead to an increase in prices. Ojo (2000) and Melberg (1992) explored that the inflation rate is deliberated with the percentage change in the price index. Abbas and Husain,(2006) probed connecting correlation b/w money supply as well as prices. Chimobi and Uche, (2010) considered the r/s among Output, Money, and inflation in Nigeria

by applying Granger Causality Test. Money supplies do Granger cause inflation. The result indicated the intention of price constancy in Nigeria.

The rest of the study consists of different sections. Section 2 explains reviews of asserted studies, section 3 theoretical framework, section 4 data, methodology, model specification, and results and discussions, section 5 expresses the conclusion, and section 6 the light on policy implications.

REVIEW OF LITERATURE

Vuslat (2004) examined the strategies of Monetary policies and the dynamics of inflation in Turkey's economy. The study used Time Series data from 1990-2002 and applied a vector error correction model to address the variables. The study used inflation as an independent but money supply was taken as a dependent variable. The finding was the persistent nature of inflation in Turkey. The study suggested that disinflation can be successful in such a way when the government cooperates with the central bank policies.

Ozbay's (2009) study showed causality between reserve returns and macroeconomic factors, facts taken from Turkey. The study used data from 1998 - 2008. Granger Causality model engaged to investigate correlation. The study used Money as a dependent whereas EX rate, interest rate, inflation, and foreign transactions were independent variables. The author explored that the casual rapport stock returns were more powerful than that of macro variables to stock returns. The study suggested that there is a need to reiterate and more work is inevitable in this field.

Sharma et al. (2010) elaborated on the causal relationship between the price,output,and money in the Indian economy. The author used Time Series data from the period 1986 to 1992 and applied the Granger causality test. Money supply is used as a dependent price and outputs an independent variable. The revision brings into being that money supply has casual r/s to price and output in the short run but output and price have granger causality to money supply or not. This study rejected bivariate feedback coming from the output,prices,and M3.

Gaurisankar (2011) extended the relationship between MI and price in Suriname in the SR and long run analysis, using time series data from 1980 - 2010.The study explored the direction of causality between these macro-variables were investigated. GC eminent technique was applied to check the Stability. The study used Money as a dependent whereas inflation and prices are independent variables. The results suggested Unidirectional causality from prices to money in the long run, whereas a two-way linkage in the SR. The system should consequently retain solid policies to regulate to avert huge changes in Money and price. For small open economies caution in expenditure policies is necessary, particularly when distant exchange inflation lows turn down. Coric (2011)estimated the impact of money supply on the output and price; and took considerations from forty-eight countries with different income levels like lower, middle, and upper. The study used data from 1940-2010 and adopted the SVAR model- impulse response analysis and S VAR to address the blow of price in this study. The result of the study observed that output and economic growth were affected by the monetary policy shocks.

Abiola & Egbuwala (2012) stated the comparison of two economic theories of QTM and Milton Friedman's QTM and rewrote the study in precise form. This research used data from the period of 1970-2008 and adopted an error correlation approach, cointegration econometric technique, OLS, and ADF in this study. Money was taken as dependent and price as an independent variables in this article.

The result showed positive R/S to human wealth to non-human wealth. This study's results conform with Friedman's study. The reason for the declining B/C per-capita income of the countries for consecutive years.The lower the value of CPI over time when it is included in the factorization. Under its impact were negative changes in money demand.

Valadova and Yanchev (2015) noted the price and dynamics of money supply and showed empirical evidence of both relations in the Bulgarian economy. The study covered the period 1998 to 2012. The author used cross-correlation, granger causality,and Johanson co-integration techniques to check the stability in the short run and long run. The writer took Money as an independent variable, price, and output transactions,CPI, and GDP deflator as the dependent variables. The results of the study led to the path that causality ran from currency in circulation to inflation but when inflation was analyzed the circulation of money was in a weak condition.

Kamal (2016) pointed out the r/s between MMoney,output, and price level in Bangladesh.The study used data from the period 1972-2013 indicating that a one-way connection was presented between real GDP and price. There was used m as an explanatory variable and price as a regressand. Money supply and price level were correlated one to one, but the price had little effect on the money supply. Granger Causality is eventually broken down by the three variables that are correlated: money supply, pricing, and output (Ali,Sharif & Hameed,2017).

Gocmen (2016) studied the basic relationship between M and inflation in Turkey during the high inflation period. The research employed Co-integration and Error Correction models,utilizing Time Series data spanning from 1970 to 1996. The linearity of the data was assessed using the Box-Cox (1964) test. To check for stationary in the bivariate model, the DF and ADF tests, as well as a Box Cox test chi-square statistic, were used.Nominal interest rates, EX rates, and M served as the study's independent and dependent variables. The study discovered that the MV model showed a one-way causal relationship between the money supply, price level, and criticism association. The findings also demonstrated the significant influence that interest rates and currency rates had during the extended period of high and sustained inflation in the country.

Alemu (2017) focused on the impact of inflation by the Monetary policy on the Ethiopian economy. The study useddata from 1974 to 2015 by applying the error correlation model (ECM) to explain the R/S between inflation and money supply. The wwriter took the money supply as the dependent but inflation as an independent variable. The study found when capacity was reserved then neutrality of money claimed in an economy and long run R/S existence between variables (Ali & Sajjad, 2017).

Salunkhe and Patnaik (2017) probed how the price level and output of the Indian economy correlated with the price. Time series used data from 2002-2015 by applying the Unit Root test, Hodrick- Prescott test, Zivot Andrew test, granger causality in the frequency domain, price test, and ADF test to observe the levels of stationarity and found the output gap. The study found that inflation and policy rate had bi-directional causal R/S and also between policy rate as well as output. These results gave the main focal point to the monetary authorities to take equal weighting and attention to inflation and GDP when making the policy.

Owen and Ishioro (2023) understood how important macroeconomic variables affect the stability and recital of the Nigerian cutback, the study looks closely at the relationships that exist between these indicators and basic policy elements such as prices, money supply,production levels, exchange rates, and interest rates. The research uses the ARDL method and other estimate approaches to assess the

long-run correlations among these variables using annual time series data from 1981 to 2021. The results show a strong long-term correlation between the chosen macroeconomic variables. Furthermore, a greater causal relationship between the macroeconomic fundamentals and the money supply and price level highlights the critical role that these variables play in determining policy results. The analysis concludes that, both in the short and long run money supply,the money supply and price level have a more significant causal influence on other macroeconomic factors. To avoid unfavorable growth trends,recommendations stress the significance of macroeconomic policies taking relevant data into account over both short-and long-term periods. policies can be formulated by authorities to protect economic stability and promote sustainable growth paths by coordinating with these insights (Ali,Yasmin & Muntaha, 2020).

Rubbo (2023) reevaluated "The New Keynesian paradigm" in this study, both theoretically and practically, in an economy with many sectors and input-output relationships. It extracts welfare and Phillips curve analytical expressions, showing that all sectoral and aggregate Phillips curves have declining slopes with intermediate input shares. A swapping between yield and rise results from variations in productivity, except for the novel divine coincidence index. The superiority of the divine coincidence index over consumer prices in Phillips curve regressions is confirmed empirically. The limits of monetary policy prevent it from producing optimal results; under the constrained-optimal policy, welfare loss amounts to 2.9% of GDP every period, and when consumer inflation is targeted, it rises to 3.8%. To stabilize the output gap, the constrained-optimal policy must accept relative price distortions across companies and sectors. This can be done by using a Taylor rule that aimed money supply to target the divine coincidence index.

DATA AND METHODOLOGY

This part consists of these variables that are selected on a theoretical and empirical basis to find the connection between money, output, and inflation. This study has used the annual data for the variables, money supply as a proxy of money supply, GDP deflator-based inflation rate, and Gross Domestic Product growth % of GDP proxy by Output.

Period

To determine the relationship between regressand and regressors, time series data from Pakistan covering the years 1980-2025 are used, with a maximum of 35 observations available.

Data Source

Data for all three variables are collected from WDI managed by WB.

Model Specification

The model specification consists of three various models. Model 1 is described as inflation dependent on two independent variables broad money and GDP respectively.Model 2 explains that broad money broad money depends on the two independent variables inflation and GDPG. In model 3, GDPG is dependent upon two variables namely broad money and inflation.

Model 1

$$INF = f(M_2, GDPG)$$

$$INF = \alpha_0 + \sum_{i=1}^{n} \beta_0 NF_{i-1} + \sum_{j=1}^{m} Q_1 M_{i-1} + \sum_{k=1}^{p} \chi_i GDPG_{T-1} + U_t$$

Model 2

$$M_2 = f(INF, GDPG)$$

$$M2_t = \eta_0 + \sum_{i=1}^{n} \beta_0 NF_{i-1} + \sum_{j=1}^{m} Q_1 M_{i-1} + \sum_{k=1}^{p} \chi_i GDPG_{T-1} + U_t$$

Model 3

$$GDPG = f(M_2, INF)$$

$$GDPG_i = \varphi_o + \sum_{i=1}^{n} \beta_0, NF_{i-1} + \sum_{j=1}^{m} Q_i M_{i-1} + \sum_{k=1}^{p} \chi_i GDPG_{T-1} + U_t$$

Where:

inflation=inflation rate, GDP Deflator

$$M_2 = broadmoney(\%ofGDP)$$

GDG=GDPgrowth (annual %)

RESULTS AND DISCUSSION

This part of the study gives results about under-study variables.

Descriptive Statistics and Correlation Analysis

The study presents the descriptive statistics and correlation among money, output, and price level in Table 1.

Table 1: Descriptive Statistics.

	Average	Center values	Max	Min	St Dev	Skewness	Kurtosis	JB	Price value
GDG	4.93	4.90	10.22	1.01	2.11	0.16	2.65	0.36	0.83
Inflation	87.95	49.12	318.10	10.47	89.96	1.24	3.31	9.94	0.01
Broad money	42.18	41.43	49.19	36.14	3.65	0.22	1.91	2.20	0.33

Outcomes are conducted by using eviews9

Good empirical workstarts from evocative information investigation. In Table 1,vivid data show the results of gross GDPG, inflation, and money supply. Mean is the central tendency measure of the unarranged value in a set of data but the median is the arranged value. The mean value of the gross GDPG is 4.93 with a median value of 4.90 in Pakistan covering the period of 1980 to 2025. Both vaues are approximately the same. The GDPG max value is 10.22 with a min value is 1.01. Standard deviation measures the scattering and how much the individual value disperses from the central value. SD of the GDPG is 2.11 which shows the low fluctuations around the best measure of average. Skewness measures the symmetry distribution or departure from symmetry. GDG is 0.16 which shows the positively skewed distribution because the GDPG mean value is 2.93 greater than the median of 2.90 in positively skewed distributions. Kurtosis measures the degree of peakedness of the uni-model frequency curve. Kurtosis of GDP is 2.65 platy kurtic with flat top. JB is a test for ordinariness (normality) by comparing the p-value. The p-value of GDPG is 0.83 greater than 0.10 with normal distribution.

The mean value of inflation is 87.95 with a median is 49.12. The max value of inflation is 318.10 with 10.47 min. The standard deviation of inflation is 89.96 which indicates low fluctuations from the mean. inflation is 1.24 which expresses the positively skewed with 3.31 kurtosis that is on the extreme top leptokurtic value of inflation is 0.01 less than 0.10with non-normal distributions. The mean value of board money is 42.18 with a 41.43median which indicates the positively skewed by 0.22.broad money max is 49.19 with 36.14 min. The standard deviation of broad money is 3.65 which expresses the high fluctuations around the mean. The Kurtosis of broad money is 1.91 platy kurtic with a flat top, the value of broad money is 0.33 greater than 0.10 which shows normal distributions.The research depicts the correlation among concerned variables GDPG, inflation, and broad money in Table 2.

Correlation	GDG	Inflation	Broad money
GDG	1.00		
Inflation	0.21	1.00	

Broad money	0.04	0.48	1.00

Table 2: Correlation Matrix

Author's calculations

Table 2 reports the correlation results of major variables of the study like gross domestic product,price, and broad money. Correlation measures the degree of linear relationship between any two variables in a multivariable problem under the condition that any common relationship or influence with all other variables has been removed. Gross domestic product growth is positively correlated with inflation which indicates the weak correlation between GDP and inflation.

Gross domestic product growth and broad money are positively correlated with each other. The correlation between GDP and broad money is 0.04 which shows a weak correlation between GDP and broad money. The correlation between inflation and broad money is 0.48 which expresses the moderate correlation between inflation with money supply. The results report +IVEand a weak correlation between GDP with inflation, and GDPG with broad money but inflation moderately correlated with money supply.

Unit Root Analysis

Unit root test is conducted to establish the order of integration of the data series for every one of the variables. Table 3 depicts the ADF statistics and parallel critical values written (in parenthesis) of the concern variables GDPG, inflation, and broad money and all concern variables like gross domestic product, price, and broad money are stationary in their 1ST difference form and the results of such test reports, it is clear that the null hypothesis of unit roots for all the time series are rejected at their first difference while accepting the alternative hypothesis. Thus, all the variables are at a halt and integrated I (1);apply the Johansen co-integration approach to check the long-run relationship.

Table 3: Unit Root Results

ADF (URT)							
Variable S	Intercept	Lags	Intercept and Trend	Lags	None	Lags	Conclusion
GDG	-0.83 (0.96)	0	-1.70 (0.23)	0	-1.66 (0.09)	0	I(1)
inflation	4.96 (1.00)	8	3.90 (1.00)	8	4.63 (1.00)	8	I(1)
broad	-2.03	0	-2.13	0	-0.48	0	I(1)

money	(0.27)		(0.51)		(0.49)		

Results created by the author

To determine if a variable is unit root or non-stationary, unit root tests are utilized. The ADF test was employed to assess non-stationary. By comparing the price value with the level of significance (conceder 10%), the research determines the ADF unit root. The GDPG intercept's p-value of 0.96 supports the null hypothesis, which states that the data is non-stationary at level (I0) and stationary (or significant) at the first difference (I). The null hypothesis accepts GDPG non-stationary at (I0) and becomes stationary at I (I), as indicated by the price value of the GDPG intercept and trend of 0.23. cost GDPG none's value of 0.09 shows that the level is stationary and rejects the null hypothesis.Consequently, the GDP is not level-stationary. Thus; gross domestic product is non-stationary at level (I0) and stationary or significant at the first difference I (I).The price-value of inflation intercept and trend and none is 1.00 which indicates the stationary (Ho reject) at level (Io) as well as at the first difference and significance. Thus; inflation has no unit root, stationary, or significant at both.

The broad money intercept's price value, which is 0.27, shows that the system is non-stationary at level (I0)and becomes stationary at I (I). The broad money intercept and trend have a p-value of 0.51, indicating that they are stationary at the first difference and non-stationary at level I (0). Broad money none has a p-value of 0.49, meaning that it is non-stationary at level I (0) and stationary or significant at (I). Thus; broad money is non-stationary at a level and stationary at (I). These results allow us to progress to the next section to apply the JCT because all variables under consideration are stationary at IST difference.Johansen test for Cointegration results are given in following Table 4.

Johansen Cointegration Test (JCT)

JCIT shows the results in trace and max tests of Cointegration in Table 4. Table 4displays the two forms of unrestricted Co integration rank tests (maximum Eigen value and trace) that are used to express JCIT reports. If co integration is present at none*, as hypothesized, trace statistics are more than the critical value, or if the price value (0.05) is smaller than the critical value (42.91), then the null hypothesis reject (HO) is significant.At most 1* hypothesized, more than one co-integration exists, null hypothesis reject (Ho)alternate accept, trace statistic is (60.00) greater than a critical value, price value 0.020less than the critical value (42.91) which indicates significance. At most 2 hypotheses,no co-integration exists, the null hypothesis accepts (Ho), and trace statistics is (60.0061)less than the critical value but the price value (0.0201) is still less than the critical value 42.9153 which indicates insignificant. Thus, the Trace T) test (T) indicates 2Cointegration Eq(s) at a 5% price.

Table 4: Trace and Max tests of Cointegration

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No.of CE(s)	Eigen value	Statistic	Critical Value	prob.**
None*	0.57	60.00	42.91	0.05

At most 1*	0.42	28.93	25.87	0.02
At most 2	0.22	9.11	12.51	0.17
* denotes rejection of the hypothesis at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigen value)				

Hypothesized		Max-Eigen	0.05	
No.of CE(s)	Eigen value	Statistic	Critical Value	prob.**
None*	0.57	31.07	25.82	0.00
At most 1*	0.42	19.81	19.38	0.04
At most 2	0.22	9.11	12.51	0.17
* denotes rejection of the hypothesis at the 0.05 level				

Source: Author's calculations

Cointegration is present at none* hypothesized (no of cointegration). The price value (0.00) is considered significant because it is less than the crucial value of 25.82, and the MEV (31.07) is more than the critical value, indicating a HO reject. There are at most 1*hypothesized co-integrations (no of co-integration). price value (0.04) below the critical value (19.38), the hypothesis that signals significance is rejected, and the MEV remains higher than the critical value (HO reject). No co-integration exists, with a maximum of two hypotheses. Accept the null hypothesis, which suggests insignificance, as the MEV is less than a crucial number. Table 4's conclusion indicates that board money, GDP, and price level are moving in tandem. To maintain a long-term relationship between the variables in the case of both trace and Eigen statistics expresses two integrating equations at the 0.05 level, it is to articulate that the effects of a shock to one variable spread to the others, if two variables are co-integrated, possibly with time lags. The tests' outcomes are displayed in Table 4. The Trace test yields two co-integrating equations at a 5%significance level. This conclusion has also been supported by the MEVT.Consequently,the two variables in the study-broad money and inflation-have a long-term equilibrium connection. There might be a short-term divergence from the equilibrium to determine whether or not such disequilibrium satisfies the long-run equilibrium.The vector error correction model is responsible for producing these short-run dynamics.A corrective mechanism is provided that permits the partial restoration of the disequilibrium in the following time frame. The VEM, therefore, provides a means of balancing short-and long-term behavior. Finding the ideal lag time, which is covered in the 5 Table, is the next step toward an ongoing collaboration.

Lag Selection Criteria

The research shows lag selection criteria to find out the optimal lag length model by various criteria in Table 5

Table 5: VAR-based results of Lag order

Endogenous variables: GDPG, inflation, broad money (1980-2023 Pakistan)						
Lag	Log L	long run	FPE	AIC	SC	HQ
0	-367.58	NA	315769.7	21.17	21.30	21.22
1	-241.32	223.65	389.6347	14.47	15.00*	14.65*
2	-235.77	8.88	480.76	14.67	15.60	14.99
3	-222.15	19.44684*	381.63*	14.40*	15.74	14.86
* indicates lag order selected by the criterion						

Source: Author's calculations

The study analyzes VAR result-based lag order long run analysis in Table 5 and to test the optimal lag length by different criteria at 5%,a sample is taken. GDPG, inflation,and broad money are used as endogenous variables. At lag t-0(no lag) sequential modified long run test statistic is NA, log L -367.58, Final prediction error 315769.7, Akaike information criterion 21.17, AIC 21.17, and HQ 21.22 while no optimal lag length (minimum value) of the model by criterion. At t+1 log L is -241.32, long run 223.659,FPE 389.63, AIC 14.47, SC 15.00*,HQ 14.65* * indicates the lag order criterion but not optimal (only two minimum values by criterion). At t+2 log L is -235.77,long run 8.88,FPE 480.76,AIC 14.67,SC 15.60,and 14.99 while no optimal lag selection with*at this level. At t +3 log L is -222.15, long run 19.44*, FPE 381.63*,AIC 14.40*,SC 15.74 and HQ 14.86. Only lag three has maximum minimum values except for other criteria. Thus,according to the different lag crieria, this research's optimal lag span of representation is 3 in chart 5.

Long Run Analysis

The study reports Johansen-Juselius estimates of money, output, and price model to find out the long-run analysis in Table 6

Table 6: Johansen-Juselius Estimates of Output, price, and Money Model (1980-2025)

Dependent Variable: GDPG

Variables	Coefficient	Std.Error	t-Statistic
C	0.27	-	-
inflation	2.35	0.17	13.17
broad money	0.56	0.14	3.82

Source: Author's calculations

The research applies the Johansen-Juselius Estimates of output, price, and money model for indicating the long-run analysis and uses the dependent variable GDPG with two independent variables namely inflation and broad money in 6 Table. price has a positive relation with GDPG. One percent increase in inflation caused a 2.35 percent change in GDP,while results favor the Phillips curve and Keynesian theory of QTM under the assumption of rigid wages downward. As price shows the trade-off between B/W inflation and unemployment and positive R/S B/W inflation and employment as inflation goes up in the economy, unemployment falls, and employment increases lead toward an increase in GDPG. These results are matched by Salunkhe & Patnaik (2017), Leduc &Sill (2004) and Vuslat (2004).

Broad money is positively correlated with gross domestic product (GDPG).1% boost in broad money is a 0.56 % rise in GDPG. The direction of causation can be expressed by two very different monetarist theories. Firstly, the monetary-business-cycle theory is explained by modifying in amplifying of money supply source change in GDP,(money causes output). New Keynesian models or sticky-wage models have explained this relation. Wage contracts are fundamental aspects of the economy that are fixed which are assigned by the laborers, their nominal wage remains fixed over the length of the period of agreement. If inflation is higher than expected and the money supply has grown more rapidly than was predicted, individuals' real wages will decrease. This will influence the behavior of a firm, and increase in turn demand for more workers, which would lead to an increase in the production of the financial systemn. Accordingly, the sticky-wage theory with unexpected changes in M is related to a +ive r/s b/w money supply as well as GDPG (Fisher, 1977; Taylor, 1980). “Imperfect information models”(Lucas, 1975; Barro, 1976) illustrated by monetarist “theorists for non-neutrality of money", financial changes have actual sound effects b/c people have restricted in sequence & as a result may misperceive aggregate and comparatively vary. On the other hand, in these models, if the money supply goes up, the price will have a propensity to get higher right through E but people's characteristic; price amplifies to swing in demand toward their artifact and away from commodities formed by other sectors. This implies that a boost in comparative demand as an upshot of misperceptions leads to ascending in fabrication. These results are according to the economic theory which shows expansionary monetary policy decreases the rate of interest and boosts the investment level in the economy, money demand increases, demand for labor increases, and employment increases along with GDPG increases by the multiplier effect.

The outcome specifies a one-way causality successively b/w pecuniary aggregates;broad money and productivity which is constant via notional inference by Keynes and post-classical thoughts univariate from (MA) in the long run, (broad money & GDPG)Moreover, the result suggests that all fiscal aggregates have a brawny unidirectional causality running from M to price but no facts for the reverse causality. These fallouts are matched by Smith (2004), Nouri Samimi (2011), Coric (2011), Sulunkhe

& Pattnaik (2017), Kamal (2016), Patnaik Witkowski (2013), Muhammad et al (2009), Balquees &Mukhtar (2008), Zulkhibri & Majid (2007) and Ben Bouziane & Benamar (2004).

Stability(S) Analysis

The research reports the stability analysis to check the stability of the model in Table 7:

Table 7: Stability Condition of Output,price, and Money

Stability Condition					
Variables	C.I vector	(E.C) coefficient	(C.I) coefficient *E.C coefficient	Significances(E.C)	Result
GDPPC	1	-0.60	-0.60	Significant	
inflation	2.35	-1.25	-2.94	Significant	Ok
broad money	0.56	-0.73	-0.41	Significant	Ok
			-3.96		

Source: Author's calculations

In Table 7, the study checks the stability of the model by stability analysis under two conditions as necessary and sufficient conditions. Co-integration vector of GDPG is 1,the EC coefficient is -0.60 and the product of the co-integration coefficient and EC coefficient is -0.60 while the EC of GDPG is significant as well as The stable cause to sum of the product of CIC and EC coefficient is -3.96 which fulfill the condition of negativity if any disturbance occurs, equilibrium will recover approximately after four months.

CI vector of the inflation is 2.35, EC coefficient -1.25 and - integration co-efficient* EC coefficient -2.94, while EC of inflation is significant as well as stable cause the summation of the item for consumption of correction integration coefficient and EC coefficient,is -3.96 which fulfill the condition of negativity and result Ok. CI vector of the broad money is 0.56, EC coefficient -0.73,and CI co-efficient*EC coefficient-0.41while Error correction of broad money is significant as well as stable cause the totting up of the item for consumption of correction integration co-efficient and EC coefficient is -3.96 which fulfill the condition of negativity and result is Ok. The stability analysis satisfies the necessary and sufficient conditions so the study moves toward the GC analysis to find out the cause of the r/s in Table 8.

Granger Causality (GC)Analysis

The Granger causality test is conducted with three optimal lag length periods and the results report a pairwise causality test in the following Table 8.

Table 8: Granger Causality Outcome

Pairwise GC				
Optimal Lag Length:Lags:3(1980-2023)				
Null Hypothesis:	Obs.	F-Statistics	prob.	Conclusion
inflation does not GCGDPG	35	2.50	0.07	Univariate Causality
GDPG does not GC inflation		0.44	0.72	
broad money does not GCGDPG	35	4.27	0.01	Univariate Causality
GDPG does not GC broad money		0.08	0.96	
broad money does not GC inflation	35	2.27023	0.11	None
inflation does not GC broad money		3.47791	0.22	

Source: Author's calculations

With 35 observations, take a pair wise Granger causality test and take an optimal lag length is three to show Granger causality results. Inflation does Granger cause GDP because the price value is 0.07 less than 0.10; the null hypothesis is rejected while indicating univariate causality. GDPG does not guarantee cause inflation because the price value is 0.72 greater than 0.10, The null hypothesis is accepted which indicates bivariate causality does not exist. broad money has a greater cause with gross domestic product because the price value is 0.01 less than 0.10, null hypothesis reject (Ho) while indicating univariate causality. GDPG does not cause broad money because the price value is 0.96 equal to about 0.1The 0, null hypothesis accepts (Ho) which indicates bivariate causality does not exist. broad money has no granger cause with inflation because the price value is 0.11 greater than 0.10, null hypothesis accepts (Ho) while indicating (neither univariate nor bivariate causality) no causality exists by the result.inflation does not guarantee broad money because the price value is 0.22 greater than 0.10, the null hypothesis accepts (Ho) while indicating the result as none. As a result,Granger causality analysis results also favor the long-run analysis results,thus positively affecting independent variables (inflation and broad money) with gross domestic product and no causality between inflation and money supply.

CONCLUSION

This study aims at a dynamic exploration of the strength of money,output, and price level in Pakistan which states that an increase in price level and broad money causes an increase in gross domestic product growth in the case of Pakistan. Yearly TS data on all the strategy variables are taken for the period from 1980 to 2025. traditional QTM,monetarist, and Keynesian theories are consistent with data. Various works have been done across the world with different variables but this research was established only for Pakistan which has almost synonym results like developing countries. As it is understood money works as blood and growth grows, so the positive relation has acquired under study period that continual increase in both which can list the economy in a developed country. Stationary analysis is done with the URT. As all data included in the study (inflation, money, and GDPG) are found to be stationary at thefirst difference,ADF and Johansen Cointegration methodology is applied which reveals that the growth in GDPG,being statistically significant, ispositively dependent upon price level as a proxy on inflation although not proportionately. The optimal lag length of this model is three.Results of the URT of all three variables that is GDPG, price, and broad money are stationary at IST difference which precedes the long run analysis by applying the JJ estimate. Both price and broad money positively depend upon the gross domestic product growth which is derived from the Johansen Juselius estimate. The stability condition of the money, output, and price model is checked by the stability analyses which declare all variables are significant and in turn OK. Moreover, the EG pair wise causality test is applied to perceive the direction of this causal relationship between gross domestic product growth and the price, broad money with all GDPG, and price with broad money.Empirical results reveal that there exists a long-run positive relationship, between these two variables, operating from growth in the GDPG to the increase in the rate of inflation and broad money. Thus consequently, univariate causality exists between gross domestic product and inflation, GDPG and broad money, and no causality exists between broad money and inflation. The study reveals that the broad money and price have been an important contributor to the rise in gross domestic product in Pakistan during the study period, the soft monetary policy can achieve the priority growth objectives and rising inflation rate in Pakistan.

POLICY IMPLICATIONS

Policy implication is the vital essence of this research and its imposition will be derived from consistent and high-priority growth in Pakistan. Economic policy is a critical component in fostering the economic growth of any given country, aside from the fact that money is decided exogenously in the economy. A significant amount of research on its impacts on prices and output (inflation) in both rich and poor countries has been framed by Keynesian, Monetarist, and Classical arguments. Due to its enormous macroeconomic importance, scholars and decision-makers alike continue to be very interested in this topic.

There are two policy implications suggested as follows,

- State banks may adopt the expansionary monetary policy which will raise the gross domestic product (GDP) which has been proved by the under-concerned study period in Pakistan.
- As more inflation requires more growth, inflation should increase for development and growth which will support in turn soft monetary policy for a multiplier impact on GDP in Pakistan.

Despite many studies on testing the money-output r/s in the case of Pakistan, the topic remains relatively under-explored for developed and low-income economies. The literature review conducted for this

study reveals that there has been no consensus reached in Pakistani literature regarding the effects of many variables, just positive direction or effect. It is evident from the data thus far that monetary policy does not significantly bolster the process of production growth,even though money does react to economic activity. It is difficult to diagnose how differences in statistical methods affect these results. There is activity in more persuasive new studies as well as sufficient room for advancement in the present study.Several modified estimation methodologies should be used to look into the dynamic relationship between money and income level in Pakistan.

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