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INTERNATIONALIZATION OF RELATIONSHIP BETWEEN INFLATION AND MONEY SUPPLY POLICIES: AN EMPIRICAL STUDY OF PAKISTAN

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ABSTRACT
This study finds out the determinants of inflation by using cointegration and error corrections techniques, respectively. Money supply, real GDP, and foreign inflation significantly and positively impact inflation. This study recommends that state bank is responsible for maintaining a stable inflation level by controlling the money supply level. Similarly, state banks should provide domestic credit for capital formation goods to enhance economic growth.

Keywords: Inflation, Money Supply, Real GDP
JEL Codes: A11, A12

I. INTRODUCTION
The strength and prosperity of any country depend upon inflation and money supply, which are the economy's most important indicators. Maintaining price levels is the primary focus of economists. Monetarists argued that money supply and inflation rates are related to each other. However, an increase in the money supply may affect economic growth positively or negatively; that's why the supply of money and its factors are the subjects of hot debates in the financial circle. Inflation is an ever-existing process that is always present in the economy.

Contrary to the traditional view of economists that inflation can be eliminated. That's why the primary focus of policymakers is to control the inflation rate, which depends on monetary and fiscal policy. Pakistan is facing higher inflation, which contributes to uncertainty about the future of the business environment and the instability of financial markets (Hossain and Akhtar (1986). Higher inflation slows down economic activities such as investment and lack of employment opportunities. An increase in the level of domestic credit and a consistent increase in budget deficit remain the central issue in the monetary policy of Pakistan (Bilqees (1988). According to Chaudhry, Ismail. *et al.* (2015). The core problem of Pakistan's economy is the constant increase in the price level, which is still unsolved. Pakistan has undergone significant economic growth during the last few years, but the core problems of the economy are still unsolved. Inflation remains the biggest of all these problems. We aim to find the determinants of inflation and measures to control it.

The research investigates: how the money supply can affect inflation and output level based on econometric methods. The study is exclusive in that it initially explores the relation between inflation output level and money supply. However, the specific objectives include the following: To provide a thorough literature review on money supply and inflation and their correlation. Adopt econometric methods to analyze the impact of money supply on inflation. Provide empirically supported hypotheses about the effects of money supply on inflation. After a brief introduction, this research provides previous literature on inflations and their factors. The following section explains the data methodology and results and provides a policy recommendation and conclusion.

II. LITERATURE REVIEW
Moser (1995) showed that in Nigeria most prominent determinants of inflationary pressure are fiscal deficit and money devaluation. Ubide (1997) explored that in the long run, the factors that effects inflation are an increase in money

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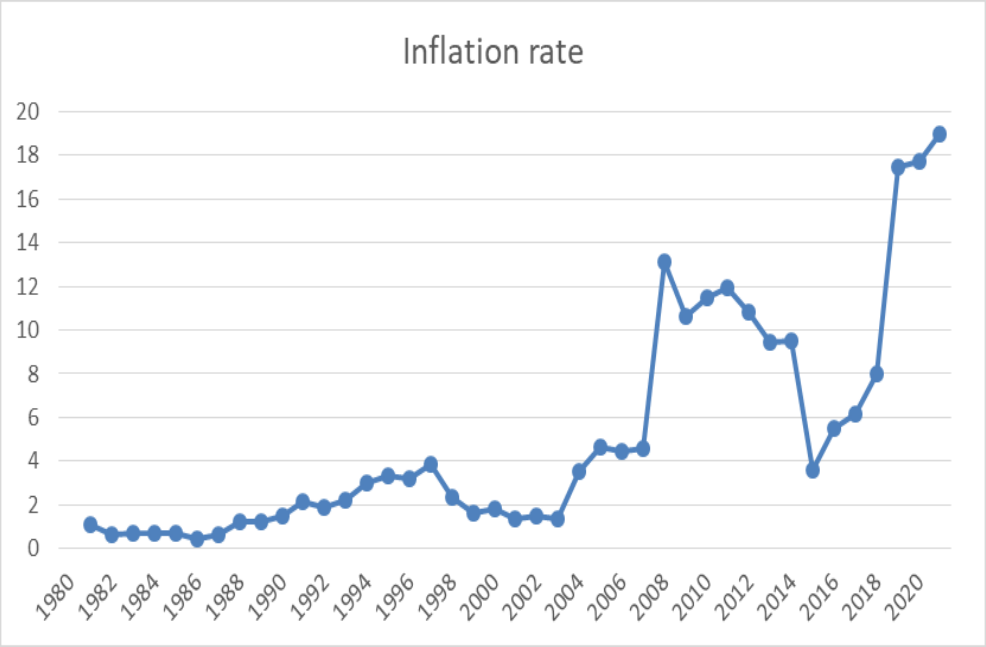
supply, depreciation of the exchange rate, and unexpected events in agricultural sectors. Lim and Papi (1997) analyzed the determinants of inflation in Turkey during 1970-1995, where the exchange rate and money drove Turkish inflation, and the public deficit was an essential factor. Lissovolik (2003) studied the sources of inflation in Ukraine from 1993-2000 and found that exchange rates and wages have a robust long-run link with inflation. In comparison, Blavy (2004) analyzes quarterly data for Guinea using cointegration and ECM and finds a significant long-run relationship between inflation and money. Patnaik (2010) found that demand and supply factors are the volumes of demand in India, which have the most significant effect on inflation.

In contrast, the main drivers of inflation are money supply and external influences on domestic prices, with the last two determinants having a short-run impact. Using the multivariate cointegration technique and vector error correction method, Nachega (2005) studied the dominance hypothesis for the Democratic Republic of the Congo (DRC) during 1981-2003.in this study, he found a significant relationship between money supply and inflation. He recommended that appropriate monetary policy be required to stabilize the price level.

Figure 1: Trends in Inflation Rate



Source: Pakistan Economic Survey (various issues)

Figure 1 shows the inflation rate in Pakistan, showing an increasing trend from 1980 to 2021. From 1980 to 2020 time period the average inflation rate was 8.2%. In the period 2020, the inflation rate for Pakistan was 10.7 %. Pakistan's inflation rate fluctuated substantially in recent years but tended to increase through the 2001 - 2020 period, ending at 10.7 % in 2020.

III. MODEL SPECIFICATION

According to the quantity theory of money, if the government bank prints more money, it would increase the money supply in the economy. Due to increased circulation, households will spend more money on goods and services. Household purchase more goods with more money. However, the supply of goods and services remains the same, so firms will respond to demand increases by rising price levels. Therefore, an increase in the money supply will lead to a faster actual output level, which will cause inflation. Similarly, the international inflation rate affects domestic prices because an increase in gold prices and oil price shocks in the global market leads to increased inflation in the home market in developing countries (Chani et al., 2011; Satti et al., 2013; Abdullah et al., 2013; Ali and Ahmad, 2016; Arshad and Ali, 2016; Ahmad et al., 2018).

This study analyzes relationships among inflation factors for Pakistan using cointegration and error correction to find the short and long-run relationship. US inflation is used as an external shock variable. The model is thus stated as

$$IF = f(GDP, DC, M, USIF) \quad (1)$$

Whereas IF shows the inflation rate, GDP is real GDP.
Similarly, Dc is the domestic credit, whereas M2 is the money supply used as a proxy for M2.
USIF is the inflation rate of the US. Data has been collected from the World development indicator, IFS (International Financial Statistics), and the economic survey of Pakistan. We use time series data from 1980-2021, whereas the change in consumer prices (CPI) (GDP) is deflated by CPI and taken a simple form and all other variables are in log form.

IV. RESULTS AND DISCUSSION

Table 1: Results of unit root test

Variables	Level			Ist Difference			Order of Integration
	Intercept	Trend & Intercept	Lag	Intercept	Trend & Intercept	Lag	I (1)
Inflation	-2.6205 (-2.7227)	-2.6135 (-3.4514	Lag (1)	-5.8605* (-2.8558)	-6.0173* (-2.5562)	Lag (1)	I (1)
US Inflation	-2.56 (-2.862)	-3.12 (-3.4670)	Lag (1)	-3.6482* (-2.875)	-3.5756* (-3.4867)	Lag (0)	I (1)
Domestic Credit	-0.52 (-2.86)	-2.43 (-3.46)	Lag (1)	-3.4409* (-2.96)	-3.5432* (-3.47)	Lag (0)	I (1)
Money Supply	1.7408 (2.775)	0.5246 (3.486)	Lag (1)	4.5498* (2.9796)	3.9836* (3.4943)	Lag (1)	I (1)
RGDP	1.77 (2.7527)	0.425 (3.3514)	Lag (2)	3.25 (2.95) *	3.99 (3.1062)	Lag (1)	I (1)

Note:*Denotes the rejection of hypothesis at 5%level of significance

Augmented Dickey-Fuller (ADF) test has been used to determine the order of integration of all variables. The above results indicate that all variables are stationary at the first difference and reject the null hypothesis.

IV.I. COINTEGRATION TEST

Table 2: Unrestricted Co integration Test (Trace)

Number of CE(s)	Eigenvalue	Trace stat	Critical value	Probability
none*	0.7321	175.16	102.8473	0.001
At Most, 1*	0.7123	133.92	75.97277	0.00
At Most, 2*	0.564	67.043	52.07904	0.00
At Most 3	0.3418	21.489	19.26184	0.30
At Most 4	0.156	14.870	8.164546	0.20

The max-eigenvalue test shows three cointegrating equations: * Rejected the null hypothesis at a 0.05 level

Table 3: Unrestricted Co integration Test (Maximum Eigenvalue)

Number of CE(s)	Eigenvalue	Max-Eigen stat	Critical value	Probability
None*	0.8876	61.21	40.956	0.000
At Most, 1*	0.8127	46.91	34.805	0.00
At Most, 2*	0.662	30.38	28.558	0.02
At Most 3	0.447	14.60	15.892	0.13
At Most 4	0.189	5.880	9.164	0.20

The max-eigenvalue test indicates three cointegrating equations: * Rejected the null hypothesis at a 0.05 level

After determining that all the variables are stationary at the first difference, we analyzed the long-run relationship between money supply and inflation using the Johansson cointegration test. Akaike information criterion (AIC) is used to determine the optimal lag length using vector autoregressive. The optimal lag length of AIC is 2.

We test the null hypothesis of several cointegration tests using maximum Eigen statistics. The results of (Tables 2 and 3) indicate that three cointegrating equations exist among the variables, so we move forward to find out the long-run relationship among the variables.

Table: 4 Normalized Cointegration Test: Dependent Variable (Inflation)

Variables	**Coefficient**	**St. Error**	**t-stat**
US inflation	0.4819	0.208	2.9*
Domestic Credit	0.0026	0.0497	0.05
Money Supply	0.130	0.04	3.25*
Real GDP	-0.308	0.0494	7.5*
C	-1.69	0.2681	10.662*

*Shows significance at 5% and 1% levels of significance. ** Shows significance at 10% level of significance

Results (table 4) indicate that a one percent increase in money supply leads to increased inflation by 0.13 % as households will spend more money on goods and services due to increased money circulation. However, the supply of goods and services remains the same, so firms will respond to demand increases by rising price levels. Therefore, an increase in the money supply will lead to a faster actual output level, which will cause inflation. Similarly, the international inflation rate does affect domestic prices because an open market increase in the prices of gold and oil leads to increase inflation in the home market in developing countries.

The results of US inflation are according to economic theory and also significant. It shows that US inflation and domestic inflation have a positive relation. It means a 1% increase in US inflation leads to a rise in domestic inflation by 0.581%. US inflation affects domestic prices because an increase in the gold price and oil price shocks in the international market lead to an increased general price level in the domestic market. The inverse relationship between real GDP and inflation shows that expanding the economy's output production level decreases inflation. Similarly, by increasing the domestic credit, the inflation rate will increase as banks issue more money to borrowers under the expansionary monetary policy, increasing the price level.

IV.I. VECTOR ERROR CORRECTION

$$\Delta \ln IF_t = \alpha + \beta_1 \sum_{i=1}^{n} \Delta \ln IF_{t-i} + \beta_2 \sum_{i=0}^{n} \Delta \ln GDP_{t-i} + \beta_3 \sum_{i=0}^{n} \Delta \ln DC_{t-i} + \beta_4 \sum_{i=0}^{n} \Delta \ln MS_{t-i} + \beta_5 \sum_{i=0}^{n} \Delta \ln USIF_{t-i} + \lambda Ecm_{t-1} + \varepsilon_t$$

The results related to the short-run period are given in table 5. All variables have effects according to theory except money supply, which does not affect inflation in the short run. Error correction term shows that a short-run relationship exists among the variables.

Table 5: Vector Error Correction: Dependent Variable: Inflation

Variable	Coefficient	St. Error	t-Stat
ECM(-1)	-0.801	0.610	1.33**
d(IF(-1))	0.913	(0.73)	1.29**
d (IF (-2))	-0.74	(0.67)	-1.24**
d (USIF (-1))	1.21	(0.84)	1.44**
d (USIF (-2))	-0.98	(1.03)	-0.96
d (lnDC (-1))	0.061	(0.21)	0.3
d(ln DC (-2))	0.12	(0.12)	1.00
d(lnMS(-1))	-0.05	(0.16)	0.34
d(lnMS(-2))	-0.05	(0.22)	-0.23
d(lnGDP(-1))	-0.32945	(0.17)	-1.96*
d(lnGDP(-2))	-0.008560	(0.22)	-0.040
R-Squared	0.72		
F-stat	1.70		

*Shows significance at a 5% level of significance. ** Shows significance at a 10% level of significance

IV.III. VECTOR ERROR CORRECTION GRANGER CAUSALITY TEST

Table 6 shows that foreign inflation can cause domestic inflation. It is impossible to attain an inflation target in a country due to global inflation. Thus, we reject the null hypothesis that global inflation does not affect domestic inflation. So unidirectional causality effects exist between global inflation and domestic inflation. Similarly,

unidirectional causality effects exist from domestic inflation to domestic credit as borrowing from state banks increases the money supply level, which leads to an increase in the inflation level. Reverse causal effects run from inflation to real GDP, which means output increases during peak periods due to high employment levels, leading to high economic growth.

Table 6: Vector Error Correction Granger Causality test

Null Hypothesis	Chi. Square Stat	Chi. Square Prob.	Causality Direction
USIF does not cause IF	5.43	0.03	USIF→IF
IF does not cause USIF	0.04	0.89	Causality does not exist
DC does not cause IF	1.4	0.4	Causality does not exist
IF does not cause DC	7.4	0.03	IF →DC
MS does not Cause IF	0.311	0.2	Causality does not exist
IF does not cause MS	1.3	0.6	Causality does not exist
GDP does not cause IF	3.9	0.2	Causality does not exist
IF does not cause GDP	7.0	0.04	IF→GDP

IF= inflation, USIF = international inflation DC= domestic credit MS= money supply GDP= real GDP

Table 7: Diagnostic Tests

Diagnostic Tests	
SC (LM Test)	F.statistics.0.052 (prob)
N (Residuals normality test	0.0516(prob. Jarque Bera)
Heteroskedasticity (White test)	0.391(probability. F.stat.)
Functional form misspecification test	0.177(probability. F.stat.)

V. CONCLUSION AND POLICY IMPLICATION

In this study, the authors find out the determinants of inflation for Pakistan using cointegration and error correction tests from 1980 to 2021. All variables, such as real GDP, domestic credit, money supply, and US inflation, are stationary at the first difference; we used the cointegration test to determine the long-run relationship. Household credit, money supply, and US inflation have a significant and positive impact on inflation, whereas real GDP negatively affects inflation. Similarly, a negative relationship exists between inflation and money supply, which shows that money supply does not affect inflation in the short run. VEC granger causality results show that reverse causality exists between foreign and domestic inflation and between real GDP and domestic credit to inflation. From the above discussion, it can be recommended that the state bank of Pakistan stabilize the price level by controlling the money supply, which can help achieve economic stability. A moderate inflation level minimizes the financial sector's risk factor and fluctuation, which helps enhance capital formation activities by providing domestic credit. Sustainable economic growth requires a stable inflation rate, which can also be achieved by controlling the international inflation level. The government should take steps to diversify the productive base of the economy to non-oil exports.

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