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MONETARY PRESSURE, INFLATION DYNAMICS AND STRUCTURAL SHOCKS IN PAKISTAN

The objective of the study was to analyze whether the changes in money supply can account for variations in inflation dynamics in the presence of structural breaks by using data for the period 1970-2019. Zivot Andrews (one break) and Lee and Strazicich (two breaks) unit root tests were used to detect the structural shocks. To determine the long run relationship in the presence of structural shocks, Gregory & Hansen (1996) Cointegration test was used. Results show a robust long-run relationship between inflation, money supply, interest rate, and output. The empirical evidence show that monetary pressure has a significant role in the inflation dynamics of Pakistan, especially in the presence of structural shocks. As a policy measure, a tight monetary policy with increasing interest rates should help reduce the growth of money supply and moderate the inflation dynamics in Pakistan.

Keywords: *Structural Shocks, monetary Pressure, inflation dynamics, Pakistan.*

1. INTRODUCTION

Inflationary effects create uncertainty in an economy (Svensson, 1997, and increasing uncertainty leads to firms' incorrect responses to observe price varia-

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tions and deteriorate the tradeoff between inflation and output (Lucas, 1973). Inflation uncertainties lead to the misallocation of resources and weaken economic growth (Friedman, 1977). It affects business activities, financial markets, and household consumption (Ruth, 2014). Inflation reduces consumers' purchasing power, discourages investment and saving, and accelerates capital movement to the unproductive sectors (Hossain and Islam, 2013). It also promotes income inequalities and poverty, which further leads to political and social unrest in an economy and becomes a hurdle in economic development (Ulvedal, 2013). Price fluctuations also cause adverse effects on real activities by the increasing interest rate on loans. Nominal returns on assets change because of inflation variations and bring portfolio adjustments; these adjustments are costly in welfare and economic growth (Ragan, 1994). Price stability can be managed by Appling appropriate monetary policy measures. Targets of monetary policy depend on the money mechanism through which it influences prices, growth, and employment. There are three variables, i.e., money supply, interest rate, and credit, used as monetary tools and monetary policy indicators (Smitha, 2010).

Inflation can be affected by monetary pressure via two different channels, i.e., direct expenditures and indirect interest rate mechanism (Grauwe & Polan, 2005). Monetary aggregate and loose credit policy increase inflation. The expansion in credit markets has resulted in economic growth in developed economies, however it negativly effect the real variables in developing economies (Booms and Are, 2004). The interest rate is the cost of holding money, through indirect mechanisms, monetary changes affect price level and spending through changes in interest rate (Piana, 2002). Changes in interest rates by the central bank directly affect the interest rate and indirectly affect lending and deposit rates. A high-interest rate encourages saving and reduces the attraction to take a loan for consumption and investment purpose, which further results in a fall in aggregate demand and prices (Brinkmeyer, 2015).

State bank of Pakistan (SBP) monitors the monetary situation of economy in coordination with other relative and fiscal policies. the Act (1956) gives the State Bank of Pakistan (SBP) a complete authority to structure the monetary policy; with the primary focus of economic growth and price stability (Hanif, 2014). Historically it is known that monetary policy objectives have remained the same over time. Still, the policy contents, i.e., intermediate targets, instrument choice, etc., had changed considerably over the years (Zaidi, 2006). Since the establishment, the officials of SBP have followed monetarism to achieve price stability through targeting monetary aggregate M2 (Hanif, 2014). Structural changes in the economy and the financial sector have destabilized the money-price relationship, and Pakistan moved from money targeting to an eclectic approach (formal recognition given to a medium to longer-term stance of monetary policy by enabling monitoring developments not only in money supply and credit market extension but also to number of financial aggregates) during the 1990s (Uddin, 2009); however it is also worth noting that monetary aggregates are still one of the most critical indicators of monetary transmission in Pakistan (Hanif, 2014).

During the last four decades, due to frequent events such as oil shocks, turning points of business cycles, changes in policy regimes, and natural disasters around the globe, the structural shocks have gained significant importance in determining the casual relationship between macroeconomic variables. (Balke, 1993). Inflationary dynamics are also no different, as numerous external and internal macroeconomic shocks affect inflation; thus, it deviates from its long run trend (Mankiw & Reis, 2003). These shocks can be monetary, political, economic, natural, and even because of new technology or innovations (Goktas & Disbudak, 2014). It is also possible that regime changes in monetary policy may bring multiple structural breaks in inflation (Zhang & Clovis, 2009). Monetary shocks have significant Importance in determining inflation dynamics; these shocks comprise sudden changes in money supply, interest rate, and output gap (Osorio & Unsal, 2013). these shocks can cause an increase in money supply, which results in a fall in interest rate, a temporary increase in real output, and a permanent increase in the price level (Hendry, 1995). While sudden changes in interest rate initially create a rise in prices before eventually declining and a temporary fall in money supply and output (Kasumovich, 1996).

Inflation in Pakistan is still one of primary issue to deal with; many studies were conducted to find out the reason for inflation in Pakistan (see for example; Agha and Khan, (2006) Khan & Schimmelpfennig, (2006) Mukhtar and Zakaria, (2010) Ahmad, et al., (2014)). However, the problem is not only persistent but is also Deeping. The estimation of inflation dynamics is very crucial for a central bank as it guides their policy initiative for maintaining and achieving price stability. Considering the possibility of structural shocks that have occurred in the past, and may also happen in the future. Policies can be planned to overcome the effects of such structural shocks on inflation. This study has used the P-Star model in which money plays an important role. At the same time, incorporate structural breaks to determine the dynamic interaction between inflation and monetary pressure in Pakistan.

This paper proceeds as follows: section 2 presents methodology and theoretical framework, section 3 discusses results and analysis, and section 5 explains the conclusion and some policy recommendations.

2. METHODOLOGY

2.1. P-Star Model

The P-Star model was developed by (Hallman, Porter, & Small, 1989 &1991). This model was developed based on the Quantity theory of money. After applying this model in the U. S economy, it was found that the P-star model could predict inflation dynamics. This model reveals that additional money leads to inflation in the long run. The P star model by (Hallman et al., 1989, 1991) is followed by Svesson (1999), Todter (2002), Gerlach & svesson (2003). According to them, inflation dynamics are affected by the price gap.

Hallman et al. (1989, 1991) explained the P-Star model with the help of the equation of exchange given by Irving Fisher in 1911, which can be written as:

$$MV = PY \tag{1}$$

Where M represents a total supply of money, V is the velocity of money, P is the general price level, and Y is output at constant prices. There is a strong relationship between money supply and price level. The price level in this equation is translated by the fluctuations in real output and velocity of money. The equilibrium level of real output and velocity of money is Y* and V*, respectively. In the long run, the equilibrium level of aggregate price level will be P*, which is obtained in the presence of Y* and V* and can be written as follows:

$$P^{*} = M \times V^{*}/Y^{*} \tag{2}$$

By transforming in logarithm, we can rearrange equation (2) as

$$\acute{P}^{*} = (m + v^{*} - y^{*}) \tag{3}$$

According to the theory, it is expected that the current price level (p) move towards the equilibrium price level (P*). The P-Star model states that the difference between the price level (current and equilibrium) can predict inflation. So inflation can be written mathematically as:

$$\prod^{*} = P - \acute{P}^{*} = (\text{ɣ} - \text{ɣ}^{*}) - (y - y^{*}) \tag{4}$$

This equation can be helpful to define inflation dynamics. The derived equation of the P-Star model by Rotemberg (1982) is as follows:

$$\Delta\prod_{t+1} = \Delta\prod e_{t+1} + \sigma_p(P^{*}{}_t - P_t) + \sigma_k K_{t+1} + \theta \tag{5}$$

Where Δ shows the difference between two-time lags. $\Delta\Pi_{t+1}$ is actual inflation, and $\Delta\Pi^{e}_{t+1}$ is expected inflation. While K represents exogenous variable and θ depicts cost push shocks. This equation can be interpreted as “the actual inflation rate” over a time period depends upon the expected inflation rate, price deviation, exogenous variables, and shocks. If the price difference in this equation has a positive value, it will accelerate the inflation rate of the next time period, so its coefficient σ_p will have a positive value. The price gap in the equation can measure the excess liquidity in the economy (Rotemberg 1982) and (Todter 2002).

The price gap (P^{*}_{t}–P_t) is explained by two methods. The first method is to use output gap and velocity gap by Halman et al. (1991) as in equation (4), and the second method is the money demand relationship as used by Todter (2002).

By using the second method, we can write the money demand function as follows:

$$md_t = P_t + \beta y_t - \gamma i_t \tag{6}$$

Where md represents the demand for money, p is price level, y is real output, and i is the interest rate. β and γ are income elasticity and interest rate elasticity, respectively.

If money demand and money supply are equal at given output and interest rate level, there is equilibrium in the money market. According to Todter (2002), it is not possible that there is some difference between money demand and money supply at any point in time. This difference is called the monetary overhang.

$$ms_t = md_t + \tau_t \tag{7}$$

Where ms_t is the money supply (stock of money) and τ_t is the monetary overhang. In this equation sum of money demand and monetary overhang is equal to the stock of money. Equilibrium stock of money (m^*) is defined as the money demanded at a given price level when both goods and money markets are in equilibrium.

$$ms^*{}_t = P_t + \beta y^*{}_t - \gamma i^*{}_t \tag{8}$$

Where ms_t^* is equilibrium money stock, y_t^* is equilibrium output, and i_t^* is the equilibrium interest rate. Substitute equation (6) into equation (7) and then subtract equation (8); then we get:

$$ms_t - ms^*{}_t = \beta(y_t - y^*{}_t) - \gamma(i_t - i^*{}_t) + \tau_t \tag{9}$$

$ms_t - ms_t^*$ is the difference between the current stock of money and the equilibrium stock of money. It is known as the money gap and a useful tool of the monetary pressure. The money gap is identical to the price gap, and to show this identical expression, demand equations (6) and (8) are replaced in the price function. After readjusting, we get the price gap as:

$$P^*{}_t - P_t = \beta(y_t - y^*{}_t) - \gamma(i_t - i^*{}_t) + \tau_t \tag{10}$$

The money gap can also be expressed as a price gap so that we can write it as

$$P^*{}_t - P_t = \beta(y_t - y^*{}_t) - \gamma(i_t - i^*{}_t) + \tau_t = ms_t - ms^*{}_t \tag{11}$$

Where τ_t shows monetary pitfalls, β and γ show the elasticity of real income and interest rate, respectively (Todter, 2002). The price gap in this equation shows that price fluctuations arise when there is disequilibrium in the product or money market. Suppose there is an increase in the price gap. In that case, inflationary pressure occurs because of three reasons, i.e., actual output exceeds potential output ($y_t > y_t^*$), the actual interest rate is less than the equilibrium rate ($i_t < i_t^*$), or money supply exceeds in an economy ($\tau_t > 0$).

We can also express the price gap, the difference between equilibrium and actual price levels for econometric analysis as follows:

$$\Delta P_t = \alpha + \beta\left(y_t - y^*{}_t\right) - \gamma(i_t - i^*{}_t) + \tau_t + \varepsilon_t \qquad (12)$$

Pt is inflation at time t, Δpt = pt – pt-1, α is constant, and ε_t is an error term.

2.2. Data

For the empirical analysis data was collected from the State Bank of Pakistan, and World development indicator. All the data was transformed in the logarithm form. The consumer price index (CPI) was used to measure inflation. It is considered as the main source to measure inflation as it covers 374 items in 35 major cities of Pakistan and represents the cost of living (Gul and Iqbal, 2011). Several researchers have used CPI in their study, see [Habibullah and Smith (1998), Tang, (2008), Kiptui, (2013), Dumrul and Dumrul, (2015]. M2 (broad money supply) can be as an intermediate target to control inflation. It has a strong association with the inflation rate and consists of currency, time deposits, and demand deposits (Qayum, 2008). M2 was used by [Khan and Schimmelpfening (2006), Mukhtar and Zakaria (2010), Nguyen et al. (2012), Ayubu (2013), etc.] in their studies. Call money rate is referred to as interbank clean lending and borrowing rates in the money market (SBP, 2008). [Qayyum and Bilquees, (2005), Saleem (2008), and Hye et al., (2009)] have also used call money rate as a proxy of interest rate in their studies. Output as GDP per capita is used by [Garcia-Herrero and Pardhan, (1998), Salehi, (2006), etc. Table 1 represents all the variables and their sources.

Table 1:

VARIABLES AND SOURCES

Factor input Name	**Variables**	**Abbreviations**	**Data source**
Inflation dynamics	Consumer price index	CPI	WDI
Monetary pressure	Monetary aggregate	M2	SBP
Output	Gross domestic product per capita	GDP	WDI
Interest rate	Call money rate	IR	IFS

2.3. Estimation Procedure

The common defect of ADF and PP tests is they may not reject the null hypothesis of a unit root in the presence of structural shocks. Perron (1989) had also shown that the existence of break leads to spurious rejection. In this study Zivot-Andrews (1992) and Lee and Strazicich (2004) unit root tests were used to determine the unit root in the model while incorporating one and two endogenous structural breaks respectively for all series.

2.3.1. Zivot and Andrews (1992) test

To test the null hypothesis of unit root against the alternative of trend stationery, three models of structural breaks are used. Model A shows a change in intercept, Model B shows a change in trend, and Model C shows a change in intercept and trend.

$$\Delta y_t = \alpha_o + \alpha_1 DU_t + \beta DT_t + \beta t + \delta y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta y_{t-i} + \varepsilon_t \quad (18)$$

Model A

$$\Delta p_t = \alpha_o + \alpha_1 DU_t + \beta t + \delta p_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta p_{t-i} + \varepsilon_t \quad (18a)$$

Model B

$$\Delta p_t = \alpha_o + \beta DT_t + \beta t + \delta p_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta p_{t-i} + \varepsilon_t \quad (18b)$$

Model C

$$\Delta p_t = \alpha_o + \alpha_1 DU_t + \beta DT_t + \beta t + \delta p_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta p_{t-i} + \varepsilon_t \quad (18c)$$

Where p_t is inflation, DU_t is intercept dummy, which shows a change in level, $DT_{t\ is}$ a slope dummy, which shows a change in the slope of trend. DU= 1 if t >$T_{B,}$ 0 otherwise and DT = t – T_B if t > $T_{B,}$ 0 otherwise.

2.3.2. Lee and Strazicich (2003) Lagrange Multiplier test

Z. A test could define only one break in the model. But if there is more than one break in reality, then Z. A test fails because one endogenous break is not enough, as it could lead to the loss of information. One more flaw in Z. A test is the size distortions, which reject the null hypothesis of unit root, and the incorrect estimation of breakpoint occurs (Altinay, 2005).

To overcome these problems, Lee & Strazicich (2003) developed a unit root test of the Lagrange Multiplier test (LM) for a minimum of two structural breaks. LM test is unaffected by the problem of size distortion. The LM unit root test is presented in the following regression form:

$$\Delta y_t = \delta' \Delta Z_t + \varphi \check{S}_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta \check{S}_{t-i} + \epsilon_t \tag{19}$$

Where $\check{S}_{t-1} = y_t - \dot{\Psi}_x - Z_t \hat{\delta'}$, t=2…… T, δ' are coefficients in regression of Δy_t on ΔZ_t. Augmented term of lags $\Delta \check{S}_{t-1}$ is included in the model to correct the serial autocorrelation problem. $\dot{\Psi}_x$ is restricted MLE of Ψ_x and given by $y_1 - Z_1 \hat{\delta'}$. y_1 and Z_1 are the first observations of y_t and Z_t respectively. Z_t represents a vector of exogenous variables. In the case of Model C with one structural breaks unit root test $Z_t = [1, t, D_{1t}, DT_{1t}]'$ while for the Case of Model CC with two structural breaks unit root test $Z_t = [1, t, D_{1t}, D_{2t}, DT_{1t}, DT_{2t}]$ where, $D_{jt=1}$, $DT_{jt} = t - T_{Bj}$ for $t \geq T_{Bj} + 1$, $j = 1,2$ and zero otherwise. T_{Bj} is the period of the structural breaks and $\delta' = \delta_1, \delta_2, \delta_3$. The LM unit root test is calculated by $\tau = t - statistics$ for testing the null hypothesis of a unit root $\phi = 0$ the location of structural breaks T_{Bj} is determined by selecting breakpoints for the minimum statistics as

$$lnf\, \tilde{\tau}(\tilde{\lambda}_i) = lnf_{\lambda} \tilde{\tau}(\lambda), \; Where, \; \lambda = \frac{T_B}{T}$$

2.3.3. Gregory & Hansen (1996) Co-integration Test

The long run relationship among price, money supply, interest rate, and output can be affected by variations in the economy's structure or by structural shocks, therefore to investigate the long run relationship among price, money supply, interest rate, and output in the presence of structural shocks is determined by Gregory & Hansen cointegration test (1996).

Gregory & Hansen (1996) introduced residual based cointegration methodology, which incorporates structural shocks or regime shift. In the G-H test, the null hypothesis of no cointegration of variables in the presence of structural shocks is tested. The alternative hypothesis in the G-H test includes cases where the intercept and/or slope coefficients have a single break of unknown timing (Omisakin et al., 2012). There are three models for the analysis of structural shocks in co-integrating relationship. These models are (1) level shift model (C), (2) a model with a level shift plus trend (C/T), (3) a "regime shift" model (C/S) where both the constant and slope parameters change.

$$y_t = \mu_1 + \mu_2 D_t + \beta' x_t + u_t, \qquad t = 1, ..., T, \qquad (C)$$

$$y_t = \mu_1 + \mu_2 D_t + \alpha t + \beta' x_t + u_t, \qquad (C/T)$$

$$y_t = \mu_1 + \mu_2 D_t + \beta_1' x_t + \beta_2' x_t D_t + u_t, \qquad (C/S)$$

The vector X_t of I (1) variables is of dimension k, ut should be a stationary disturbance, and Dt is a dummy variable of the type

$$D_t = \begin{cases} 0, & \text{if } t > [T\tau] \\ 1, & \text{if } t \leq [T\tau]. \end{cases}$$

Here T Є J denotes the unknown relative timing of the breakpoint. The trimming region denoted by J may be any compact set of (0, 1), but following earlier literature, Gregory & Hansen (1996) propose J = (0.15, 0.85).

The specified models of inflation in this study are as follows:

$$\Delta P_t = \mu_1 + \mu_2 D_t + \beta_1 y_t + \beta_2 m_t - \beta_3 i_t + \varepsilon_t \qquad (21a)$$

$$\Delta P_t = \mu_1 + \mu_2 D_t + \alpha t + \beta_1 y_t + \beta_2 m_t - \beta_3 i_t + \varepsilon_t \qquad (21b)$$

$$\Delta P_t = \mu_1 + \mu_2 D_t + \beta_1 y_t + \beta'_1 y_t D_t + \beta_2 m_t + \beta'_2 m_t D_t - \beta_3 i_t - \beta'_3 i_t D_t + \varepsilon_t \quad (21c)$$

Where P_t *is inflation*, y_t is output, i_t is the interest rate, m_t is money supply and ε_t is the error term. In this test, the break date is estimated where test statistics are at a minimum.

2.3.4. Dynamic OLS

Dynamic OLS has more advantages over OLS and maximum likelihood procedures, and it is used in small samples (Stock & Watson, 1993). The problem with the Johansen test is that the estimation of parameters in one equation can be exaggerated by misspecification in other equations. The DOLS method is a single equation that corrects regressors' endogeneity by including lead and lags with first differences and serially correlated errors by GLS (Azzam & Hawdon,1999). The DOLS Method is used to determine the long run coefficients of the model after incorporating structural changes.

$$lCPI = \mu_1 + \mu_2 DB_t + \propto_1 IR + \propto_2 lM2 + \propto_3 Igdp + \beta_1 IRDB_t + \beta_2 lM2DB_t + \beta_3 lgdpDB_t + \mu_t \tag{22}$$

Where DB is the dummy variable correspond to the dates detected by Gregory and Hansen model 3.

3. RESULTS AND DISCUSSION

Table 2 represents that the null hypothesis of nonstationary with a break is accepted for LCPI, LGDP, LM2, and IR at the level. All four series are stationary with the first difference, which implies one endogenous structural break.

In the presence of two structural breaks Z.A test might give inaccurate results, therefore, Lee and Strazicich's test with two structural breaks was incorporated. The alternative hypothesis of a stationary series with two endogenous breaks was accepted at the first difference. It implies the presence of two structural breaks in the model. Table 3 shows that all the variables are nonstationary at the level. After taking the first difference, become stationary with breaks.

Table 2:

ZIVOT ANDREWS UNIT ROOT TEST

Variables	Intercept	Trend	Intercept+ Trend	Decision
LCPI	-3.89 (2004)	-3.76 (1984)	-4.88 (1998)	Non stationary
ΔLCPI	-5.72 (2004)	-5.53 (2010)	-6.04 (2004)	Stationary
LGDP	-1.63 (1980)	-2.72 (1988)	-2.93 (1993)	Non stationary
ΔLGDP	-6.80 (2000)	-6.71 (1999)	-6.89 (2002)	Stationary
LM2	-2.90 (2003)	-2.93 (2011)	-4.11 (2001)	Non stationary
Δ LM2	-7.36 (2003)	-7.39 (2007)	-7.32 (2003)	Stationary
IR	-4.75 (1985)	-4.06 (2010)	-5.07 (2002)	Non stationary
Δ IR	-6.21 (2005)	-5.775 (1980)	-6.15 (2004)	Stationary

Source: Author calculation. Note: Break dates are given in (). Critical values when including structural break in intercept: 1%: -5.34, 5%: -4.93, 10%: -4. 58. Critical values when including structural break in trend: 1%: -4.80; 5%: -4.42; 10%: -4.11. Critical values when including structural break in intercept and trend: 1%: -5.57; 5%: -5.08; 10%: -4.82 (Zivot and Andrews, 1992).

Table 3:

LEE AND STRAZICICH UNIT ROOT TEST

Panel A: Variables at Levels	Intercept			Intercept+ Trend		
Variables	T- statistics	Break 1	Break 2	T- statistics	Break 1	Break 2
LCPI	-3.8981	2000	2011	-4.921	1996	2008
LGDP	-1.45	1977	2009	-4.94	1997	2015
LM2	-3.27	1994	2015	-3.33	1999	2010
IR	-4.29	1993	1997	-5.19	2002	2013
Panel B: Variables at 1st Difference	Intercept			Intercept+ Trend		
Variables	T- statistics	Break 1	Break 2	T- statistics	Break 1	Break 2
LCPI	-5.81	1989	2010	-7.67	1996	2013
LGDP	-4.2	1988	2011	-6.71	1999	2009
LM2	-5.08	1998	2006	-6.82	1980	2014
IR	-5.19	1979	1999	-6.96	1993	2005

Source: Author. Notes: D and DT represent break in intercept and break in trend respectively, Critical values of model A: 1%: -4.545; 5%: -3.842; 10%: -3.504. Critical values of model C: 1%: - 5.823; 5%: -5.286; 10%: -4.988. (Lee and Strazicich, 2003).

When a structural break exists in time series data, the power of conventional cointegration falls and likely to give bias results in favor of no long run relationship (Gregory& Hansen, 1996). To avoid this problem, the Gregory & Hansen (G-H) Co-integration test was used in this study. Considering possible structural breaks, the results of G-H cointegration are presented in Table 4. The null hypothesis of no cointegration was rejected for all models. According to these results, LCPI, Lm2, IR, and LGDP are in the long run relationship. The break date was 1979 in Model C, 1992 in Model C/T, and 1988 in Model C/S.

Table 4:

G-H CO-INTEGRATION TEST

Models	Break Date	Test statistics	0.01% critical values	0.05% critical values	0.10 % critical values	Reject H_0 of no co-integration
Level Shift Model (C)	1979	-5.85	-5.77	-5.28	-5.02	Yes
Level Shift with Trend Model (C/T)	1992	-5.79	-6.05	-5.570	-5.33	Yes
Regime Shift Model (C/S)	1988	-7.39	-6.51	-6.00	-5.70	Yes

Source: Author. Notes: Critical values are obtained from Gregory Hansen (1996).

To find out long run coefficients after considering a structural break. DOLS was used because it performs better in small samples (Stock & Watson, 1993). The Break date estimated by the G-H regime shift model was used to construct long run coefficients of level and slope dummy variables. Results are presented in Table 8. All the coefficients had theoretically correct signs.

Table 5:

DYNAMIC (OLS) TEST

Dependent Variable LCPI		
Variables	Coefficients	t-values
LM2	3.18*	3.44
IR	-6.42*	-3.51
LGDP	5.53*	5.07
LM2*DUMMY	1.12	0.34
IR*DUMMY	10.07	3.37
LGDP*DUMMY	-3.35	-0.70

*Source: Author. Note: * denote significant level at 5 percent.*

DISCUSSION

When structural breaks are present in time series data, the short run and long run coefficients are not valid, and the model suffers from non-normality (Feridun, 2014). Therefore, in this study, structural breaks are incorporated. (Zivot and Andrews, 1992) unit root test with one structural break and (Lee and Strazicich, 2003) two structural break unit root tests. The break date estimated by Z. A test was 1998. During that time, there was a decline in the inflation rate (Gul & Iqbal, 2011). Inflation dynamics were because of tight monetary policy, economic sanctions after nuclear tests, and financial crises. After the nuclear test many countries imposed economic sanctions and stopped importing commodities from Pakistan that caused excessive domestic supply and reduced domestic demand, ultimately creating deflation in the economy (Zaidi, 2005). Growth in Agricultural production and depression in the international market also caused deflation (Economic survey, 1999).

LS two structural break test identifies two breaks, i.e., 1996 and 2008. Inflationary pressure in 2008 was because of financial crises, food, and commodity prices. Along with that, nonfood components such as house rent index, transport group, fuel, and lightening group also surged inflation (Economic survey, 2008). There was also an increase in M2 (money supply) in 2006-2007 because of the sharp rise in net foreign assets and net domestic assets in the banking system; it has might cause inflation dynamics in that time (Chaudhry et al. 2015).

Gregory and Hansen Co-integration test results confirm the long run relation among the variables in the presence of structural break. The break date identified by the G-H regime shift model is 1988. During the latter half of the 1980s, inflation dynamics in Pakistan were because of monetary pressure. The country observed a rise in inflation by 13.7%. Drought and heavy rains also adversely affected cultivation; therefore, inflation was increased (Economic survey, 1988).

4. CONCLUSION

This study investigated the long run relationship between inflation, interest rate, money supply, and output in the presence of structural breaks. As previous studies have shown, the weak long run relationship among variables might be because of structural shocks. Therefore, Gregory & Hansen cointegration test (1996) was used to establish a long run relationship in the presence of structural breaks. First, G-H Co-integration test confirms a robust long run relationship among variables. Second, the DLOS test was used to obtain the long run coefficients. All the coefficients show theoretically correct signs, which show money supply, output and inflation have a positive relationship. Interest rate and inflation have a negative relationship. Therefore, inflation in Pakistan is a monetary phenomenon. Tight monetary policy can be adopted to control inflation.

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MONETARNI PRITISAK, DINAMIKA INFLACIJE I STRUKTURNI ŠOKOVI U PAKISTANU

Sažetak

Cilj studije bio je analizirati mogu li promjene u ponudi novca objasniti varijacije u dinamici inflacije uz prisutnost strukturnih lomova korištenjem podataka za razdoblje 1970.-2019. Zivot Andrews (jedan prekid) i Lee i Strazicich (dva prekida) testovi jediničnog korijena korišteni su za otkrivanje strukturnih šokova. Kako bi se odredio dugoročni odnos u prisutnosti strukturnih šokova, korišten je kointegracijski test Gregoryja i Hansena (1996). Rezultati pokazuju snažan dugoročni odnos između inflacije, ponude novca, kamatne stope i proizvodnje. Empirijski dokazi pokazuju da monetarni pritisak ima značajnu ulogu u dinamici inflacije u Pakistanu, posebno u prisutnosti strukturnih šokova.

Ključne riječi: Strukturni šokovi, monetarni pritisak, dinamika inflacije, Pakistan.