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Monetary Policy and Inflation: A Regime-wise Assessment of Pakistan's Economy

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Abstract

Inflation poses a major global issue, particularly in developing nations like Pakistan. Money growth serves as a crucial indicator of inflation and economic expansion. The State Bank of Pakistan manages monetary policy to stimulate the economy and mitigate economic fluctuations, influencing people's financial choices. This study aims to assess how monetary policy impacts inflation across different regimes in Pakistan. Three distinct regimes are identified: pre-reforms, post-reforms to post-crisis, and post-structural changes. This helps in evaluating the stability of the money supply-inflation relationship over time. Money is categorised as inside money (time and demand deposits) and outside money (currency in circulation) to assess monetary policy's relative impact on inflation.

Using co-integration tests and FMOLS on quarterly data from 1982Q1 to 2019Q4, the study explores the relationships among variables, including money supply, exchange rate, adjusted real GDP, and budget deficit. Results show a significant long-term relationship, except for economic growth. FMOLS findings indicate a consistent money supply-inflation relationship across regimes. Private and central banks both influence inflation, with private banks slightly more impactful. The State Bank of Pakistan should prioritise managing private sector autonomy for effective inflation control, as central banks aim to control inflation more than commercial banks.

Keywords Monetary policy · Regimes · Pakistan · Inflation · Inside money · Outside money · Cointegration · FMOLS

JEL Classification E51 · E52 · E58

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Monetary Policy and Inflation: A Regime-wise Assessment of Pakistan's Economy

Inflation represents a significant global challenge, particularly within developing nations. It has detrimental effects on the overall GDP, the development of the financial sector, and the health of the vulnerable poor segment of the economy. Due to the adverse effects of inflation on the economy, the world's top central banks have agreed that price stability is the primary goal of monetary policy (King, 1999; Blejer et al., 2000). Price stability is normally recognised as an obligation upon central banks (monetary policy design), and they are held accountable for achieving it. A sufficiently strict monetary policy sustained over a sufficiently long period may control even the most deeply embedded inflation (Friedman, 1968). Money growth is considered an important indicator of inflationary levels prevailing in an economy.

Monetary policy objectively aims at the attainment of price stability, low unemployment rates, high economic growth, and stability of exchange rates, among others. Price stability is considered a primary goal of monetary policy because achievements of all other objectives are strictly tied to the achievement of price stability. Monetary policy transmission requires a careful selection of operational and intermediate targets for the achievement of its specified goals and objectives. Broad money (M2) has often been considered an intermediate target of monetary policy around the world. Pakistan has not been an exception to this generally adopted practice of monetary policy. However, successful transmission depends largely on the stability of the relationship between money supply and inflation over time. Fundamentally, the Quantity Theory of Money propagates this relationship as a long, sustained, and stable relationship, but its empirical relevance is often put to question by researchers. The study at hand extracts its motivation for regime-wise analysis from the same empirical query made by the researchers.

Although there is a lot of work on monetary policy assessment and its role in explaining inflation fluctuations, to the best of our knowledge, no study has been conducted on monetary policy evaluation and its relationship with inflation in a regime-wise manner in Pakistan. Qayyum (2008) investigated Pakistan's Monetary Policy Framework and its efficiency in controlling inflation; however, that study mainly focused on identifying the successes and failures of monetary policy in achieving inflationary targets via successful monetary targeting. Hanif (2014) examined Pakistan's monetary policy experience from 1951 to 2010 and its role for inflation across different eras but has not presented a formal empirical model for the regime-wise assessment. Therefore, our study is unique in the sense that it attempts to offer an empirical investigation of the relationship between monetary policy and inflation across specified regimes in the historical backdrop of Pakistan's economy. Three regimes have been classified with the sample period: one that pertains to pre-financial sector reforms (introduced in 1988) in Pakistan, another that envelops the sample range between the financial sector reforms (introduced in 1988) and the pre-financial crisis (2008), and the third that covers the sample period after the structural changes introduced in the monetary framework of Pakistan after the financial crisis (2008) observed around the globe. The regime-wise classification would allow us to evaluate the stability of the theoretically proposed relationship between money supply and inflation over time.

An important aspect that needs exploration is the relative role of private agents (for example, commercial banks) and the central bank in affecting inflation. This discussion demands to classify money into fractions which belong to or closely relate to each of these characters pertinent to the money market. Classification of money between "Inside" and "Outside" money helps in getting significant insights into the relative role played by commercial banks and central banks. "Inside Money," which often reveals the liabilities of private agents of the money market, must be differentiated from "Outside Money," which explains the liabilities of the central bank. This classification can help researchers in getting a clear picture of which form of money

has a strong relationship with inflation rather than the aggregate money supply. It also helps theorists settle the debate between the endogenous and exogenous nature of money. Our study is also unique in the sense that it intends to evaluate monetary policy's impact on inflation by classifying money into "inside" and "outside" components. This theme appears to give an innovative outlook to the empirical work conducted in Pakistan on related or similar themes.

Review of the Literature

Empirical Background

The process of developing monetary policy in Pakistan has evolved with the changing dynamics across the world. The State Bank of Pakistan Act 1956, Section 9 A.1, elaborates on the targets of monetary policy. It states that the targets of monetary policy are linked with the targets set by the federal government, i.e., the rate of growth and inflation.[1] As a result, meeting the government's growth and inflation targets have been regarded as the primary goal of monetary policy in Pakistan. Money supply management has been used as the most important tool by the SBP for controlling inflation in Pakistan. The State Bank of Pakistan has been using M2 as its intermediate target and reserve money as its operational target. The selection of M2 as an intermediate target is based on the assumption of a stable relationship between money and inflation (Qayyum, 2006). The other variable used by SBP as an intermediate target is credit. The SBP implicitly assumed that it could effectively control M2 and credit aggregates through the effective use of monetary policy instruments. The SBP implements monetary policy mostly through indirect instruments. These instruments are: SBP Policy Rate, Standing Facilities (SBP Reserve Repo Facility & SBP Repo Facility), Open Market Operations, Reserve Requirements, Cash Reserve Requirements, Statutory Liquidity Requirements, and Foreign Exchange (Forex) Swaps.[2]

Earlier studies on the subject matter have shown diverse findings. Khan and Qasim (1996), Nasim (1995), Hossain (1990), Agha and Khan (2006), Kemal (2006), Qayyum (2006), and Mohamed et al. (2016) concluded that inflation is a monetary phenomenon in the long run. Omer and Saqib (2008), Gatawa et al. (2013), and Amassoma et al. (2018) claim that the money supply has no effect on inflation. Researchers at large are convinced about the relationship between monetary policy and inflation. Adodo et al. (2018) examined the role of monetary policy in controlling inflation in Nigeria from 1985 to 2016 and concluded that monetary policy is effective in reducing inflation. Denbel (2016) examines the link between money supply, economic growth, and inflation in Ethiopia. According to this study, inflation is a monetary phenomenon, and the Central Bank of Ethiopia should properly monitor/control money supply to manage inflation. Chaudhry et al. (2015) examined monetary policy and its inflationary pressures in Pakistan and argued that the fundamental source of inflation is the excess money supply. They also proposed that raising the interest rate may help reduce inflationary pressure in Pakistan. A number of studies have focused on the nexus between money supply and inflation in the Asian region. Uddin et al. (2019) explored the causal link between money and inflation in Bangladesh and found healthy evidence of a strong relationship between the two variables. Hossain (1990) performed a cross-country analysis including Bangladesh, India, Nepal, and Sri Lanka for data spanning between 1960 and 1988 and confirmed the theoretically proposed relationship.

[1] Inflation is measured differently in various nations. Data on different pricing indices, such as the Consumer Price Index (CPI), Wholesale Price Index (WPI), GDP deflator, and Sensitive Price Index (SPI), are accessible in Pakistan. The State Bank of Pakistan monitors inflation using a 12-month moving average of the Consumer Price Index (CPI). International Financial Statistics compiles CPI data and publishes them monthly, quarterly, and annually."

[2] See the State Bank of Pakistan Official Website

Empirics have also examined the short- and long-run associations between inflation and money supply. Monetary policy is often believed to carry large and variable outside lags, showing that the impact of monetary policy is more pronounced in the long run rather than in the short run (Friedman, 1961). According to Agha et al. (2005), monetary tightening causes a drop in domestic demand, which is financed by bank lending, and then a gradual reduction in pricing pressures and, eventually, an overall price level decrease with a significant lag in Pakistan. Khan and Schimmelpfennig (2006) concluded that monetary factors play a dominant role in determining inflation rather than supply factors in Pakistan. He further argues that monetary policy affects inflation within a time lag of around 12 months. Khan (2008) reported that the impact of a shock to monetary policy takes 12–18 months to have up to 90% of its impact on inflation.

Mirbagherijam (2014) reports neutral short run behaviour of money supply towards inflation but non-neutral behaviour in the long run. A recent report of the Federal Reserve Bank (2023) citing the findings of Dupor (2023) argues that the lags in the transmission mechanism of monetary policy can be extended up to 29 months. Munir and Qayyum (2014) used Factor Augmented Vector Auto Regressive (FAVAR) methodology to examine the effect of monetary policy in Pakistan using 115 monthly variables for the period 1992–2010 and found that the money supply has an output effect in the short run, but the entire influence is communicated to nominal variables in the long run.

The aforementioned studies have estimated the relationship between monetary policy and inflation over the whole sample range without focusing on periodic classifications. A period-wise analysis is often found evident in the modern literature as it helps the researcher critically evaluate the propositions of the quantity theory of money. Researchers of the modern era believe that the relationship between money supply and inflation is changeable in different sub-periods of a larger sample, and hence, the presumption of a stable relationship between money and inflation can be questioned (Tursoy and Mari, 2020; Su et al., 2016). Similar evidence of the time-varying relationship between money and inflation has been found in a study by Rua (2012) for the Euro area. A recent work by Ringwarn and Zorner (2021) evaluated the impact of money supply across volatile and stable regimes of inflation in three developed economies (the US, UK, and Canada) and reported money supply as the most important determinant of inflation among all included determinants. Khan and Schimmelpfennig (2006) provided IMF-based evidence that monetary aggregates play a dominant role in explaining inflation in Pakistan relative to supply-side factors, with monetary policy shocks affecting inflation with a lag of several quarters. Bildirici and Ersin (2013), using emerging-market data, find that inflation responses to monetary expansion are nonlinear and regime-dependent, reinforcing the relevance of sub-sample and regime-wise analysis in developing economies. Benati (2015) further shows that the relationship between money growth and inflation weakens during periods of policy transition and structural reforms but becomes stronger under stable and credible monetary regimes, reinforcing the relevance of regime-wise empirical analysis.

Researchers have also focused on the structure/composition of markets and the relative role of banking and central banking in channelisation of funds in the market. Hristov and Wollmershäuser (2012) found that bank credit shocks have larger and more persistent effects on prices than central bank liquidity shocks, while Schularick and Taylor (2012) documented that credit-driven expansions are closely linked to inflationary and financial cycles, particularly in bank-dominated economies. Borio (2014) and Goodhart and Hofmann (2008) further emphasise that inflation outcomes are closely tied to financial cycles driven by credit booms and busts rather than narrow measures of money supply alone. Lowe and Borio (2002) similarly argue that monetary aggregates regain predictive power for inflation once financial cycles are explicitly incorporated into the analysis, cautioning against abandoning money-based indicators altogether. For developing economies, including Pakistan, financial structure and institutional constraints shaped the effectiveness of monetary

policy. Uddin et al. (2019) reinforced this view for South Asia by showing a strong long-run co-integrating relationship between money supply and inflation in Bangladesh, despite weak short-run dynamics.

The regime-wise assessment in the case of Pakistan differentiates our work from earlier research, notably Qayyum (2008), Khan (2013), and Hanif et al. (2014). Qayyum (2008) examines the Monetary Policy Framework and its effectiveness in controlling inflation in Pakistan.

Hanif et al. (2014) examined the monetary policy experience in Pakistan from 1951–2010 and concluded that the financial reforms in the late 1980's and restructuring have lowered the volatility of broad money growth and inflation in the country. However, we shall measure the overall relationship between money supply and inflation as well as the stability of the long-run relationship between money supply and inflation from 1982Q1 to 2019Q4 in three different regimes, i.e., pre-reforms, post-reforms, and the regime after the introduction of the interest rate corridor (IRC) by employing the fully modified least squares (FMOLS) technique.

Another common feature in the aforementioned studies is the focus on the aggregate role of money in output and inflation. One important aspect to be explored is the relative role of the central bank and private agents like commercial banks in affecting inflation. According to Tobin, J. (1978), it is far from inconsequential that monetary supplies are mostly "inside" rather than "outside" money. The economic impact of banks and other intermediaries monetising private loans and indirectly the real capital asset holdings that such debts support differs significantly from that of monetising federal debt. Thus, inside money is more powerful than outside money. King & Plosser (1982) investigated money, credit, and prices in the real business cycle and concluded that output has a strong relationship with respect to inside money and is weak in terms of outside money. They infer from this relationship that monetary policy actions are not important rather than private agents like commercial banks in the market. Tobin (1978) and King & Plosser (1982) explored that inside money is more powerful than outside money in affecting output. McLeay, Radia, and Thomas (2014) demonstrated that in modern economies, most money is created endogenously through bank lending rather than exogenously by central banks, highlighting the dominant role of commercial banks in the money creation process. Jakab and Kumhof (2015) further show that bank-based money creation amplifies macroeconomic fluctuations and inflationary pressures, suggesting that private credit dynamics may matter more for inflation than central-bank-controlled monetary aggregates.

Related to this theme, our empirical analysis estimates whether inside money or outside money matters more for inflation. Our work is distinguished from previous empirical research because none of these studies has been conducted to estimate whether commercial banks or central banks are effective in controlling the inflation rate in Pakistan.

Historical Background of Monetary Policy Experience in Pakistan

In this section, we briefly discuss the monetary policy experience and its effect on inflation rates in the era of pre-reform, post-reform, and after the introduction of the interest rate corridor in Pakistan. The pre-reform regime (before 1990) captures the period in which monetary management relied more heavily on administrative controls and financial repression. The reform/transition regime started with the early-1990s financial sector reforms that moved Pakistan towards a more market-based framework—e.g., increased reliance on auction-based government securities and indirect monetary control through market operations—together with subsequent institutional changes that strengthened the operational role of the State Bank of Pakistan. The interest rate corridor regime is motivated by the State Bank of Pakistan's formal introduction of an overnight interest rate corridor in August 2009 to reduce short-term interest rate volatility and enhance

policy transparency. For empirical implementation, the corridor regime dates from 2010 to align with the first full year after the corridor became operational and to avoid partial quarter effects around the policy change.

Pre-Reform Era (Before 1990)

In the late 1980s, the IMF and the World Bank encouraged Pakistan to restructure its financial institutions. This approach featured two primary actions: the creation of new efficient capital markets and the strengthening of financial institutions. Positive development and robust competition among financial institutions have been observed as a result of these reforms. However, this financial institutional reform process has had little impact on the macroeconomic situation because of the situation that prevailed before the 1990's. Pakistan's economy before 1990 was largely characterised by macroeconomic uncertainty (high inflation and a large budget deficit). In the international sector, the exchange rate has made the economy more susceptible to monetary policy since exports and imports are used to calculate production levels.[3] The government's budgetary policies heavily influenced the execution of monetary policy. The economy was experiencing a budget imbalance, and the government was attempting to address the problem by printing additional money or borrowing from both domestic and international sources. Pakistan's economic development slowed during the term owing to inflationary pressures; however, external capital inflows cushioned the stability of the economy.

Era Between Structural Reforms and the Introduction of the Interest Rate Corridor

Pakistan's dismal performance in 1990 resulted in the lowest GDP growth rate among regional nations, as well as worsening economic indicators such as GDP ratio, double-digit inflation, infrastructure, social sector indicators, and government sector indicators. As a result, several experts referred to the 1990s as Pakistan's "lost decade" in terms of growth.[4] The government launched new reforms and supply-side policies, such as liberalisation, deregulation, and privatisation, in the early 1990s. The government of Pakistan in 1990 took the initiative to reform the financial sector by privatising some national banks. Pakistan's financial sector and monetary policy outlook were characterised by directed and subsidised credit, credit ceilings, control over deposit and lending rates, and so on since 1972-1973 and 1989-1990. Later, after August 1992, the credit ceiling was abolished as an instrument of credit control and replaced by a credit deposit ratio in which banks were free to extend credit within limits, which was removed on September 30, 1995, in the pursuit of financial liberalisation. Since 1990, the SBP has used direct monetary policy measures to implement targeted monetary and credit expansion, including cash reserve requirements (CRR), Statutory Liquidity Ratio (SLR), Selective Credit Controls and Quota Systems, Directed and Subsidised Credit, and Interest Rate Ceilings. But these changes were unsuccessful because they were solely related to the supply side of the economy, not the demand side, in order to stabilise major macroeconomic disruptions.[5]

Because of these financial sector changes, the SBP switched to market-based monetary and credit management and stopped intervening directly in the market. The currency rate was also permitted to be regulated by market forces at the time. This statute improved the convertibility of financial and capital accounts even further. In 1995, the SBP adopted annual monetary aggregate objectives and phased out the use of the credit-deposit ratio as a credit management tool. The SBP has employed open market operations as a significant tool for monetary policy since January 1995. The link between money supply and inflation, however, was not stable because of these structural changes in the financial sector and the general economy. SBP discontinued using M2 as an indicative target and intermediate objective in 2001. As a result, the SBP has

[3]See Janjua, M. Ashraf (2004), "History of the State Bank of Pakistan (1988-2003)," State Bank of Pakistan, Karachi.
[4]See Sartaj Aziz, 'Was the 1990s a 'lost decade'?' Dawn, Feb. 11, 2001.
[5]Dr Ishrat Hussain, 'Economic Challenges Facing Pakistan' Lecture delivered at the Centre for Development & Democracy, Karachi on January 19, 2001.

begun to use short-term money market interest rates indirectly to affect aggregate demand and moderate inflationary pressures in the economy. However, since January 2009, the SBP has used the overnight market repo rate (with the SBP reverse repo rate as the ceiling and the SBP repo rate as the floor) to effectuate its monetary policy. The major goal of the Interest Rate Corridor (IRC) was to lower the overnight repo rate's excessive volatility.

The monetary policy decision-making process has evolved as the SBP Act has been amended. These changes have increased the SBP's power and enhanced the operational instruments used in monetary management. On the other hand, the SBP cannot define its own growth and inflation objectives. The global financial crisis of 2007–2008 had a significant impact on Pakistan's economy. The economic crisis has affected Pakistan in various ways. Pakistan's macroeconomic imbalances were severe, with GDP growth falling from 6.8% in 2007 to 4.1 in 2008 and the budget deficit reaching a new high of 7.4% of GDP. For the first time, our economy witnessed "five straight years of double-digit inflation" because of the oil price shock. Pakistan faced significant challenges in attaining macroeconomic stability, which led the government to implement a tight monetary policy as well as an expansionary fiscal policy to counteract cyclical fiscal policy. In July 2007, the SBP increased the discount rate from 9.5% to 15%.[6] The deployment of a stabilisation programme aided the recovery of the Pakistani economy, with headline inflation falling to 13.1% by June 2009.[7]

After the Introduction of the Interest Rate Corridor (2010-2019)

The SBP establishes the interest rate corridor as a mechanism to alleviate the trade-off between financial and price stability presented by global market volatility. Since the global financial crisis, emerging economies have become too vulnerable to changes in global monetary policy. Sudden changes in capital flows and global risk appetite make developing economies less predictable, which may be a source of macroeconomic instability in and of itself. This climate has underlined the need for new instruments to be developed that will allow for quick responses to changes in global liquidity and risk perceptions. In response to these concerns, the SBP has created and implemented a plan by the end of 2010 (August 2009) that includes a wide interest rate corridor and active liquidity management. In a corridor system, the central bank's policy rate is lower than the lending rate but higher than the deposit rate. The central bank can use this policy instrument to affect loan and deposit transactions without having to change the policy interest rate.

As a result, it aims to have a simultaneous influence on speculative capital inflows and credit markets. The SBP determines policy rate by comparing the floor and ceiling of the interest rate corridor with the SBP standing facilities. To keep the money market weighted average overnight repo rate near the SBP target rate, the SBP uses liquidity management tools, including OMOs and outright sales or purchases of government securities. When there is upward pressure on the repo rate owing to a liquidity deficit in the system, the SBP injects rupee liquidity into the system by acquiring government securities from banks and agreeing to sell them on a transaction maturity date—this is known as an OMO injection by the SBP. On the other hand, if banks have surplus liquidity, placing downward pressure on the overnight repo rate, the SBP absorbs this liquidity by selling government assets to banks, usually with a promise to buy them back at the transaction maturity date. By SBP, this transaction is called an "OMO mop-up."

Standing facilities are intended to provide and absorb overnight liquidity, indicate the broad attitude of monetary policy, and maintain overnight market interest rates within acceptable limits. On their own initiative, qualifying counterparties can use two standing facilities. The SBP Reverse Repo (Ceiling) facility and the SBP Repo (Floor) facility are two of them. The width of the explicit interest rate corridor was set

[6] Monetary Bulletins of the State Bank of 2007
[7] Monetary Bulletins of the State Bank 2009

at 300 basis points when it was introduced in August 2009. It remained at this level until February 2013, when it was reduced to 250 basis points. In FY10, SBP increased the liquidity injections as market conditions gradually tightened. However, an increase in the deposits of the banking system helped the market liquidity conditions. Through Open Market Operation (OMO), SBP made heavy injections into the banking system to manage market liquidity conditions and align the market repo rate with an easy monetary policy stance. Despite strained market liquidity conditions, market interest rates and their volatility declined. In May 2015, the SBP's IRC was modified to improve monetary policy transmission and associate the SBP's monetary policy operational structure with worldwide best practices. The SBP strives to keep the overnight money market weighted average repo rate close to the target rate.[8] As of May 2015, the breadth had decreased even further to 200 basis points.

In nutshell, the monetary policy experience in Pakistan has provided a road map to classify different regimes to conduct a comprehensive regime-wise analysis. A regime before formal structural reforms (1980's–1990), post financial structural reform period till introduction of interest rate corridors (1990–2010), and post interest rate corridor time frame (2010-2019). We have also validated these historical classifications based on the formal structural chow-break point test in our Results section. The statistical results support these structural break points for our analysis.

Methodology

Theoretical Framework

Deterministic Framework of Inflation

Modelling inflation needs a deterministic framework supported by theory. When we evaluate the deterministic framework of inflation, the theoretical consensus in one way or the other rests on the quantity theory of money initially proposed by Fisher (1911) and later having many re-interpretations. Irving Fisher, an American classical economist, investigated the link between money, output, and inflation. According to the quantity theory of money (QTM), increasing the money supply causes a corresponding increase in the price level. Following the Great Depression of the 1930s, J.M. Keynes (1936) recognised the significant impact of the money supply on a country's economic health and inflation, but unlike traditional economists, he did not believe in the direct link between money supply and inflation. Milton Friedman, the pioneer of the monetarist school of thought, backed Fisher QTM saying, "*Inflation is always and everywhere a monetary phenomenon*" (Friedman et al., 1968). According to Friedman, "Money Matters" in order to promote the economy. Monetarists believe that excessive money growth is the sole cause of inflation.

Theory offers healthy evidence on the link between the exchange rate and the domestic price level or inflation. Exchange rates and prices are commonly characterised in the economics literature through two channels: direct and indirect (Hendry, 1980). The concept of the law of one price and purchasing power parity is related to the direct channel. As a result, fluctuations in the exchange rate for imported goods are directly reflected in domestic prices. However, the indirect channel is expressed as a total demand channel whereby, as the foreign exchange rate rises, domestic goods become more affordable to overseas consumers, increasing exports, overall demand, and prices. The rate of inflation increases as the foreign exchange rate increases.[9] Svensson (2000) explained the importance of the exchange rate in the monetary transmission mechanism through three different channels, which show how a change in the currency rate can impact inflation: The exchange rate affects the domestic currency prices of imported intermediate inputs. Eventually, it will also affect nominal wages via the effect of the CPI on wage-setting. In both cases, it

[8] State Bank of Pakistan

[9] Our description uses the exchange rate definition as domestic currency unit per foreign currency unit (RS/$).

will affect the cost of domestically produced goods and hence domestic inflation. Second, as an asset price, the exchange rate is inherently a forward-looking and expectation-determined variable. This contributes to making forward-looking behaviour and the role of expectations essential in monetary policy. Third, some foreign disturbances will be transmitted through the exchange rate, for instance, changes in foreign inflation, foreign interest rates, and foreign investors' foreign exchange risk premium. Disturbances in foreign demand for domestic goods will directly affect aggregate demand for domestic goods.

Economic growth or output growth is a viable candidate for determining inflation in theory. The Keynesian full employment hypothesis reveals the underlying gist of this relationship. According to Keynesian theory, when output increases via effective aggregate demand pressures and exceeds its full employment level, inflationary gaps are created. The central idea is that if actual growth is higher than the long-run trend rate, we get inflationary pressures. Dornbusch et al. (1996) further claim that aggregate demand (AD) and aggregate supply (AS) result in a route of adjustment. It indicates a positive association between inflation and economic growth at first, but it eventually turns negative as the adjustment route progresses. The time inconsistency problem explains the early positive association between inflation and economic growth. Producers believe that only their product prices have increased, whereas the prices of other producers have remained unchanged. In actuality, though, general prices have risen.

Soaring budget deficits are also considered key determinants of inflation within an economy. Sargent and Wallace (1981) gave a theoretical review of the fiscal deficit and its impact on inflation. Who argued that governments with chronic budget deficits must finance them through money creation, which results in inflation? Keynes (1923) argued that when the government's budget deficit is financed by the printing press, it raises aggregate demand but does not increase the supply of products, resulting in a price spiral. According to the Neoclassical view, a rise in the government's budget deficit will induce government borrowing; as a result, demand for loanable funds will increase, which will raise the real rate of interest, resulting in the crowding out of private investment.

Role of Inside and Outside Money

Money supply is considered to be exogenous in the monetarist or neo-Keynesian view since the central bank plays a key role in supply expansion. However, since Kaldor's key study in 1982, the endogeneity of money supply has gained attention. The endogenous perspective holds that the money supply is governed by the interplay between loan demand and bank lending practices. Due to the illiquid nature of banking activity, commercial banks produce money by issuing loans, and the central bank accommodates bank money demand. Inside money is a credit instrument that the issuer promises to repay in the future in return for something that is costly to give up, which provides an incentive to overissue it (Mills, 2007). The incentive to overissue is one of the reasons why Friedman (1959) advocated 100% reserve requirements, thereby abolishing inside money. The debate is about who determines the stock of money in the market and which economic agent has an entire control upon its determination and via that on inflation. The core of the endogenous money theory is that the stock of money in a country is controlled by the demand for bank credit, and the latter is causally dependent upon the economic variables that impact the level of output.

Some economists think that money is by nature endogenous others emphasise the interaction between commercial banks and their clients, or the crucial role of both in the payment system, rather than just the relationship between commercial and central banks, or the relationship between banks' loans and reserves. The interplay between the central bank, commercial banks, and the public determines the money stock (Brunner and Meltzer, 1981; Chick and Dow, 2002). Commercial banks produce most the money supply in the contemporary monetary system in the form of bank deposits (McLeay et al., 2014). Even if one accepts that the central bank, a nonmarket organisation, determines the monetary base exogenously, this does not

imply that the entire money supply is exogenous. Exogenous and policy-determined variables should not be confused. After all, monetary policy is made in reaction or anticipation of the actions of market agents and economic changes (Goodhart, 2001). This discussion reveals that a careful analysis of monetary policy must distinguish and classify the role of inside and outside money.

Empirical Models

This section provides a brief overview of the model, methods, data, and variables used in this empirical study. Following a theoretical framework, the current section specifies our empirical models based on determinants of inflation identified earlier. Building on the standard open-economy inflation framework, we specify inflation (CPI) as a function of monetary aggregates, the official exchange rate, real activity, and fiscal stance. This multivariate specification is consistent with prior evidence that broad money growth is closely linked to inflation dynamics and is commonly used to represent the monetary channel in Pakistan and comparable economies (e.g., Qayyum, 2006; Mohamed et al., 2016; Chaudhry et al., 2015). In addition, the inclusion of the exchange rate captures imported inflation and cost–push effects documented in the Pakistan context around the exchange rate channel in related work such as Choudhri and Khan, 2002), while output and fiscal imbalance are included because inflation in emerging economies Pakistan's economy can reflect demand conditions and deficit-financing pressures (Shabbir and Ahmed, 1994; Agha and Khan, 2006; Khan and Gill, 2010; Muhammad et al., 2016).

To assess whether the money–inflation relationship remains stable over time, we also estimate regime-wise specifications by interacting monetary variables with regime dummies, an approach motivated by the growing evidence that the strength (and sometimes the sign) of the money–inflation relationship can vary across sub-periods and macroeconomic regimes (Su et al., 2016; Rua, 2012).

Finally, to distinguish the relative roles of private intermediaries and the monetary authority, we replace aggregate money with its inside (deposit/credit-based) and outside (currency-based) components. This decomposition is motivated by the classic inside–outside money discussion (Tobin, 1978; King and Plosser, 1982) and aligns with the broader endogenous-money perspective that emphasises the role of banking-sector balance sheets in monetary expansion (Rochon and Rossi, 2013).

For estimation purposes, we have specified six models with the help of theoretical and empirical literature. Following a review of the literature, the current study developed a model that includes both demand and supply-side factors. The following equations represent our empirical models.

$$\ln CPI_t = \beta_0 + \beta_1 \ln M2_t + \beta_2 \ln OER_t + \beta_3 \ln RGDPSA_t + \beta_4 \ln BD_t + \mu_t ... \tag{1}$$

$$\ln CPI_t = \beta_0 + \beta_1 \ln OER_t + \beta_2 \ln RGDPSA_t + \beta_3 \ln BD_t + \beta_4 \ln M2_t{}^*D_1 + \beta_5 lnM2_t{}^*D_2 + \quad \beta_6 lnM2_t{}^*D_3 + \mu_t ... \tag{2}$$

$$\ln CPI_t = \beta_0 + \beta_1 \ln INSIDE_t + \beta_2 \ln OER_t + \beta_3 \ln RGDPSA_t + \beta_4 \ln BD_t + \mu_t ... \tag{3}$$

$$\ln CPI_t = \beta_0 + \beta_1 \ln OUTSIDE_t + \beta_2 \ln OER_t + \beta_3 \ln RGDPSA_t + \beta_4 \ln BD_t + \mu_t ... \tag{4}$$

$$\ln CPI_t = \beta_0 + \beta_1 \ln OER_t + \beta_2 \ln RGDPSA_t + \beta_3 \ln BD_t + \beta_4 INSIDE_t{}^*D_1 + \beta_5 lnINSIDE_t{}^*D_2 + \beta_6 INSIDE_t{}^*D_3 + \mu_t ... \tag{5}$$

$$lnCPI_t = \beta_0 + \beta_1 \ln OER_t + \beta_2 \ln RGDPSA_t + \beta_3 \ln BD_t + \beta_4 OUTSIDE_t{}^*D_1 + \beta_5 OUTSIDE_t{}^*D_2 + \beta_6 OUTSIDE_t{}^*D_3 + \mu_t ... \tag{6}$$

The first model (1) captures the main (overall) effect of monetary policy upon inflation, whereas the second model (2) estimates the impact of monetary policy on inflation in a regime-wise manner in Pakistan. The interactive terms on the right-hand side represent the impact of monetary policy in three distinct

regimes: D1 represents the first regime (1982q1-1989q4), D2 represents the second regime (1990q1-2009q4) and D2 represents the third regime (2010q1-2019q4). Models (3) to (6) can be distinguished from models (1) and (2) based on the classification of money into inside and outside components. Models (3) and (4) capture the main effect of inside and outside money upon inflation, while models (5) and (6) reflect the impact of both forms of money in a regime-wise manner.[10]

Where $ln\,CPI$ is the log of consumer price index, $lnM2$ represents the log of money supply, $ln\,OER$ is the log of the official exchange rate, $ln\,GDPSA$ is the log of real gross domestic product seasonally adjusted, $ln\,BD$ is the log of budget deficit, $lnInside$ is the log of inside money (demand deposits + time deposits), and , $lnoutside$ is the log of outside money (currency in circulation). While $lnM2{*}D_1$, $lnM2{*}D_2$, $lnM2{*}D_3$ are interactive dummies for money supply, and $Inside{*}D_1$, $Inside{*}D_2$, $Inside{*}D_3$, $outside{*}D_1$, $outside{*}D_2$, $outside{*}D_3$ are interactive dummies for inside and outside money, respectively. Where D_1, D_2 and D_3 are used to capture three regimes, respectively. All these variables are measured in millions of rupees.

Data and Variable Descriptions:

A time series data set with a quarterly frequency from 1982q1 to 2019q4 was used in our study. This data sample is large enough to be used to draw empirical conclusions from theoretical relationships. The data are obtained from the World Development Indicator, the State Bank of Pakistan, Pakistan's Handbook of Statistics, and International Financial Statistics. All variables are scaled using the logged form. The Consumer Price Index (CPI) is a dependent variable, whereas all other variables are independent. Annual real GDP (constant prices) is taken from the *State Bank of Pakistan's Handbook of Statistics on Pakistan Economy* and harmonised across base-year revisions by splicing overlapping vintages into a single annual benchmark series. To obtain a consistent quarterly real GDP series for 1982Q1–2019Q4, the annual benchmark is temporally disaggregated to quarterly frequency using the **Denton proportional benchmarking method**, which distributes the annual totals across quarters while preserving the published annual sum and producing a smooth quarterly path (Denton, 1971; Cholette and Dagum, 2006). The resulting quarterly GDP series is seasonally adjusted in EViews using X-13ARIMA-SEATS **seasonal adjustment** and used in logarithms (LNGDPSA) in the estimations. The budget deficit is constructed from official fiscal tables using the standard identity **(government expenditure minus government revenue)** and then aligned to the quarterly frequency for consistency with the quarterly dataset; its logarithm (LNBD) is used in the models. The summarised outlook of variables and sources are presented in Table 1.

Table 1

Variable description and data sources

Variable (Labels)	Description of Variables	Unit of measurement	Data Source	Expected Signs
CPI	Consumer Price Index	Index	IFS	NA
M2	Money Supply	Millions of Rupees	SBP	Positive
Inside	Demand Deposits + Time Deposits	Millions of Rupees	SBP	Positive
Outside	Currency in Circulation	Millions of Rupees	SBP	Positive
OER	Official Exchange Rate	Index	WDI	Positive

[10] Inside and outside money appears to be highly correlated, as the correlation coefficient is 0.774. That's why we have specified the two models separately: one is for inside money and the other is for outside money. Simultaneous inclusion of both variables in one regression is not appropriate due to high collinearity. Especially, regressions, which involve interactive terms, lead to the singularity of matrix. Therefore, the exercise is not possible in the context of interaction terms resulting in singularity.

Variable (Labels)	Description of Variables	Unit of measurement	Data Source	Expected Signs
RGDPSA	Real Gross Domestic Product Seasonal Adjusted	Millions of Rupees	Generated	Positive/Negative
BD	Budget Deficit	Millions of Rupees	WDI	Positive

Econometric Analysis

ARDL Bounds Testing Approach

To test for a long-run (levels) relationship among inflation and its determinants, we employ the ARDL bounds-testing approach of Pesaran, Shin, and Smith (2000, 2001). For a dependent variable y_t (here, lnCPI$_t$) and a vector of regressors x_t (money/exchange rate/output/deficit), the conditional error correction (UECM) representation of an ARDL model can be written as follows:

$$\Delta y_t = \alpha_0 + \sum_{i-1}^{p-1} \varnothing_i \Delta y_t + \sum_{j=1}^{k} \sum_{m=0}^{q_{j-1}} \delta_{jm} \Delta x_{j,t-m} + \lambda y_{t-1} + \sum_{j-1}^{k} \Upsilon_j x_{j,t-1} + \epsilon_t \tag{7}$$

The bounds test evaluates the joint null of the no-level relationship**:**

$$H_0 : \lambda = \gamma_1 = ... = \gamma_k = 0, \tag{8}$$

Using an F-statistic compared to the Pesaran et al. (2001) critical bounds. If the F-statistic exceeds the upper bound I(1), we reject H_0 and conclude co-integration; if it falls below the lower bound I(0), we fail to reject H_0 while values between bounds imply an inconclusive result.

3.4.2 Long- and Short-Run Dynamics

Once a levels relationship is supported, the implied long-run coefficients are obtained from the estimated level terms (intuitively, the long-run effect of regressor x_j is $\frac{\gamma_j}{\lambda}$). Short-run adjustments are summarised by an error-correction model:

$$\Delta y_t = \eta_0 + \sum_{i-1}^{p-1} \eta_i \Delta y_{t-i} + \sum_{j=1}^{k} \sum_{m=0}^{q_{j-1}} \psi_{jm} \Delta x_{j,t-m} + \rho ECT_{t-1} + \mu_t \tag{9}$$

Where ECT is:

$$ECT_{t-1} = y_{t-1} - \beta_o - \sum_{j-1}^{k} \beta_j x_{i,t-1} \tag{10}$$

A statistically significant and negative ρ indicates convergence back to the long-run equilibrium after short-run shocks (speed of adjustment).

FMOLS long-run estimation

To obtain long-run parameter estimates that are robust to endogeneity and serial correlation in co-integrated systems, we estimate the long-run relationship using the Fully Modified OLS (FMOLS) introduced by Phillips and Hansen (1990). The co-integrating regression is:

$$y_t = \alpha + \textstyle\sum_{i-1}^{k} \beta_i x_{it} + \varepsilon_t$$

where y_t is the dependent variable, x_{it} is a vector of integrated regressors, and ε_t is the equilibrium error term. The regressors x_{it} is are assumed to be integrated of order one, while ε_t is stationary.

The FMOLS estimator modifies the conventional OLS estimator by applying nonparametric corrections based on the long-run covariance matrix of (ε_t, Δx_t). These corrections account for (i) contemporaneous cor-

relation between the regressors and the error term and (ii) serial correlation in the co-integrating residual. As a result, FMOLS yields asymptotically unbiased estimates of the long-run coefficients β_i . In the empirical analysis, FMOLS is applied after establishing co-integration using the ARDL bounds-testing approach, and the estimated coefficients are interpreted as long-run elasticities in the log–log specifications.

Consistent with Pesaran et al. (2001) and Phillips and Hansen (1990), the ARDL framework in our study is employed solely to establish the existence of a long-run co-integrating relationship, whereas FMOLS is used for final long-run inference due to its robustness to endogeneity and serial correlation. We have made certain diagnostic tests to justify our choice of FMOLS, including stationarity test in the following section and exogeneity test presented in Table A3 of the Appendix. The evidence of non-stationarity at levels and endogeneity in the model justifies our choice of using FMOLS after bounds testing and estimating robust β's representing the long-run coefficients. It is imperative to mention that the dynamic short-run analysis and the focus on the adjustments from short-run to long-run are not the subject matter of our study, and other protocols of ARDL are secondary to our analysis. Therefore, the diagnostics, long-run level equation results, error correction specification results, and related output of ARDL are reported in Table A4 Appendix and have not been discussed in our main result section.

Results and Discussion

Unit Root Test

Table 2 reports the results of the Augmented Dickey–Fuller (ADF), Phillips–Perron (PP), and KPSS unit root tests. The ADF and PP tests (with trend) fail to reject the null hypothesis of a unit root for all variables at levels, whereas both tests strongly reject the unit root null after first differencing. Consistent with these results, the KPSS test rejects the null of trend stationarity at levels for all series. Taken together, the evidence indicates that all variables are integrated of order one, I (1), satisfying the requirements for applying the ARDL bounds-testing approach.

Table 2

Unit Root Test (ADF, PP, and KPSS)

Variable	ADF (Level) p-value	PP (Level) p-value	KPSS (Level) τ(stat)	ADF (1st diff) p-value	PP (1st diff) p-value	KPSS (1st diff) μ(stat)	Integration order
LNCPI	0.5307	0.5891	0.235	0.0008	0.0000	0.1027	I(1)
LNM2	0.1129	0.4552	0.3715	0.0038	0.0001	0.1309	I(1)
LNOER	0.5929	0.6348	0.518	0.0018	0.0014	0.1162	I(1)
LNGDPSA	0.1850	0.4630	0.311	0.0002	0.0000	0.3458	I(1)
LNBD	0.9761	0.9809	0.163	0.0025	0.0012	0.2679	I(1)
LNINSIDE	0.5363	0.1443	0.477	0.0000	0.0000	0.0642	I(1)
LNOUTSIDE	0.3662	0.2797	0.329	0.0031	0.0000	0.0300	I(1)

Note: ADF and PP tests (with trend) indicate that the series are non-stationary at levels but become stationary after first differencing, whereas KPSS rejects trend-stationarity for the variables at levels; therefore, all variables are concluded to be I (1). For the KPSS test, a variable is classified as I(1) if it is non-stationary at level (KPSS statistic > critical value 0.146 at 5% in τ test) but stationary at first difference (KPSS statistic < critical value **0**.463 at 5% in μ test). KPSS critical values are taken from **Kwiatkowski et al. (1992).**

Structural break tests (Zivot-Andrews, Bai-Perron)

The results of the Zivot–Andrews structural break unit root test are presented in Table 3. This test allows for one endogenous structural break; our results indicate that most variables remain non-stationary at

levels even after accounting for a potential break (the unit-root null cannot be rejected at conventional levels). However, the inside-money series (LNINSIDE) becomes stationary once a structural break is permitted, suggesting that part of its persistence in standard unit-root tests may reflect a regime shift rather than a pure unit-root process. The identified break dates are economically plausible and cluster around major macro-financial episodes (e.g., 2008Q1 for inflation and the fiscal deficit), reinforcing the importance of incorporating stability and break-robust diagnostics when evaluating the long-run relationship between monetary aggregates and inflation.

Table 3

Zivot–Andrews (1992) Structural Break Unit Root Test

Variable	Break quarter	ZA test statistic	1% CV	5% CV	10% CV	Decision (5%)	Inference
LNCPI	2008Q1	−2.7609	−5.57	−5.08	−4.82	Fail to reject	Non-stationary at levels with break
LNM2	1990Q1	−4.3700	−5.57	−5.08	−4.82	Fail to reject	Non-stationary at levels with break
LNOER	1995Q1	−3.8138	−5.57	−5.08	−4.82	Fail to reject	Non-stationary at levels with break
LNGDPSA	2003Q4	−3.8274	−5.57	−5.08	−4.82	Fail to reject	Non-stationary in levels with break
LNBD	2008Q1	−2.6678	−5.57	−5.08	−4.82	Fail to reject	Non-stationary in levels with break
LNINSIDE	2007Q4	−7.6421	−5.57	−5.08	−4.82	Reject	Stationary with one break
LNOUTSIDE	1991Q1	−4.3333	−5.57	−5.08	−4.82	Fail to reject	Non-stationary in level with break

Note: Null hypothesis (H0): unit root (non-stationary), allowing **one endogenous break** in the intercept/trend.
Decision rule: Reject H0 if the ZA test statistic is **less** than the critical value (e.g., < −5.08 at 5%).

To validate the regime-wise classification, we formally test for parameter instability at the policy-relevant break dates that define the sub-periods. We have already discussed these potential break points based on historical evidence in our earlier sections (section 2.2). Using Chow tests applied to the baseline inflation equation LNCPI. As a function of money, exchange rate, real activity, and fiscal stance, we find statistically significant evidence of structural change at both 1990Q1 and 2010Q1 (Table 4). Specifically, the null hypothesis of coefficient stability is rejected at 1990Q1 ($F = 3.074$, $p = 0.012$) and strongly rejected at 2010Q1 ($F = 29.93$, $p < 0.001$). These results support treating the sample as comprising distinct policy regimes and motivate the regime-wise estimations reported in the subsequent analysis.

Table 4

Chow Structural break tests at policy regime dates

Break date	Equation tested	F-statistic	p-value	Decision
1990Q1	LNCPI = LNM2 + LNOER + LNGDPSA + LNBD	3.074	0.012	Reject stability (break)
2010Q1	LNCPI = LNM2 + LNOER + LNGDPSA + LNBD	29.93	<0.001	Reject stability (break)

(Round F to 3 decimals; for 2010Q1 p-value, you can write "<0.001" or "<0.0001".)

Structural stability of the main inflation equation is also examined using the Bai–Perron multiple breakpoint framework reported in Table 5. The sequential tests reject the null of coefficient stability at the 5% level and support the presence of structural change. The repartition (jointly optimised) estimates locate breakpoints around 1994Q3 and 2013Q1, implying that the long-run inflation relationship may vary across sub-periods. This evidence motivates reporting regime-wise estimates in addition to full-sample results.

Table 5

Bai–Perron Multiple Break Point Test

Sequential test (L vs. L + 1 breaks)	Scaled F-statistic	Bai–Perron 5% critical value	Decision
0 vs. 1 break	37.784	18.23	Reject stability (≥1 break)
1 vs. 2 breaks	15.756	19.91	Results indicate 2 breaks at 5%.

Note: Critical values follow Bai and Perron (2003). Break dates reported from the repartition solution (joint

Note: Critical values follow Bai and Perron (2003). Break dates reported from the repartition solution (joint optimisation)

ARDL Bound Test

Table 6 reports the ARDL bounds test results for Models 1–6. In each specification, the computed F-statistic exceeds the corresponding upper critical bound, I(1), at the conventional significance levels (10% and 5%).[11] Therefore, the null hypothesis of no levels (long-run) relationship is rejected, providing evidence of co-integration between inflation and the included determinants. This implies that the variables move together eventually and that a stable long-run equilibrium relationship exists within each model's specification.

Table 6

Results of the ARDL bound test

Model	Independent Variables	k	Selected ARDL order	F-statistic	Critical values (5%) I(0)–I(1)	Conclusion
(1) Baseline	LNM2, LNOER, LNGDPSA, LNBD	4	ARDL(2,0,1,0,2)	8.583	2.56–3.49	Co-integration
(2) M2×regimes	M2*D1, M2*D2, M2*D3, LNOER, LNGDPSA, LNBD	6	ARDL(2,0,0,0,1,0,2)	6.848	2.27–3.28	Co-integration
(3) Inside money	LNINSIDE, LNOER, LNGDPSA, LNBD	4	ARDL(2,0,0,1,0)	12.869	2.56–3.49	Co-integration
(4) Inside×regime	INSIDE*D1, INSIDE*D2, INSIDE*D3, LNOER, LNGDPSA, LNBD	6	ARDL(2,0,0,0,1,0,2)	6.850	2.27–3.28	Co-integration
(5) Outside money	LNOUTSIDE, LNOER, LNGDPSA, LNBD	4	ARDL(2,0,1,0,2)	9.468	2.56–3.49	Co-integration
(6) Outside×regime	OUTSIDE*D1, OUTSIDE*D2, OUTSIDE*D3, LNOER, LNGDPSA, LNBD	6	ARDL(2,0,0,0,0,1,0)	10.475	2.27–3.28	Co-integration

Notes: (i) *k* denotes the number of regressors in the levels (long-run) equation excluding the dependent variable and deterministic terms.

(ii) The null hypothesis has no levels relationship. Co-integration is concluded when the F-statistic exceeds the upper-bound critical value I(1) at the chosen significance level.

(iii) Critical values reported are the asymptotic bounds (n = 1000) from the EViews 10 ARDL output under ARDL conditions.

(Case 2: restricted constant, no trend). These critical values are the same as those proposed by Pesaran et al. (2001).

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[11] Critical values for F-Bound testing reported by Eviews-10 are those used by Pesaran, Shin, and Smith (2001). We used these values to determine the existence of co-integration in our model.

Following confirmation of co-integration via the ARDL bounds test, short-run dynamics are examined using the error-correction specification. ARDL lag selection criteria and diagnostics are reported in Appendix (Tables A1–A3), whereas the error-correction results and corresponding long-run and short-run estimates are presented in Appendix (Table A4). P-values of the BG LM test of serial correlation reported in column 1 of Table A4.2 clearly reports the acceptance of the null hypothesis of no serial correlation for all models. P-values of the White test of heteroscedasticity reported in column 2 of Table A4.2 suggest the acceptance of the null hypothesis of no heteroscedasticity in the case of all models. The last column of the same table indicates that most of our models meet the model specification requirements as suggested by Ramsey reset test.

Once co-integration is established through bound testing, we can work out the long-run parameter estimates of included variables using fully modified ordinary least squares. By applying FMOLS, the findings for almost all models are consistent with the theoretical propositions discussed earlier. Money supply has been found to be a significant determinant of inflation not only regarding its main effect but also its regime-wise impact. The similar behaviour is found even when we classify money into its inside and outside components. The detailed results of each model have been discussed separately in the following section:

Fully Modified Ordinary Least Square Estimation Results

Table 7

FMOLS Long-run Estimates: Baseline Specifications (p-values in parentheses)

Variables	(1) Money supply	(3) Inside money	(4) Outside money
ln(M2)	0.766*** (0.000)	—	—
ln(Inside)	—	0.600*** (0.000)	—
ln(Outside)	—	—	0.442*** (0.000)
ln(OER)	0.391*** (0.000)	0.221*** (0.006)	0.537*** (0.000)
ln(RGDP_SA)	−0.326*** (0.000)	−0.692*** (0.000)	−0.727** (0.020)
ln(BD)	0.101*** (0.000)	0.117*** (0.000)	0.174*** (0.000)

*Notes: FMOLS long-run coefficients reported. p-values in parentheses. ***, **, and * denote significance at 1%, 5%, and 10% levels.*

Table 7 reports the long-run estimates of our empirical models (1), (3), and (4). The findings of model 1 (Column 1), reveal there exists a positive and statistically significant relationship between money supply (M2) and inflation. The coefficient of money supply, 0.766, implies that a 1% increase in money supply leads to about 0.76 increase in the general price level. This empirical result is in line with the Quantity Theory of Money, which was presented by classical economists; QTM states that as money supply increases, more funds will be available to invest in the economy, more investment will be made, more jobs will be created, aggregate demand will rise, and the price level will rise as a result of the increased money supply. It has an impact on the price level based on demand side effects. This result is consistent with previous empirical studies by Qayyum (2006) and Mohamed et al. (2016).

Furthermore, the official exchange rate (OER) has a positive and significant effect on inflation in the estimated model. This result suggests that a 1% increase in the official exchange rate will bring about a

0.39% increase in the price level in Pakistan's economy. This finding is consistent with the theory of Hendry (1980), which explained that as the foreign exchange rate rises, domestic goods become more affordable to overseas consumers, resulting in an increase in exports, overall demand, and prices. The rate of inflation increases as the foreign exchange rate increases. However, our findings are not conclusive. Differ from the empirical study of Choudhri and Khan (2002), which concluded that devaluation is not the cause of inflation in the long run in the case of Pakistan.

Additionally, the results of model 1 reveal that there exists a negative relationship between real GDP (RGDPSA) and inflation in the model. The coefficient of real GDP (-0.326) indicates that a 1% increase in real GDP will bring around 0.32% decrease in price level over the sample range. There will be less inflation if we keep other things steady while increasing output. The result is supported by the Keynesian cross model; if aggregate demand is less than aggregate supply, there will be a deflationary gap in the economy. These results are also in line with the empirical studies of Nasim (1995), Khan, and Qasim (1996).

Budget deficit (BD) has a positive and statistically significant effect on inflation. It indicates that a 1% increase in the budget deficit will bring about a 0.10% increase in the price level in Pakistan's economy. Higher deficits, as predicted by theory, contribute to inflationary pressures. This finding is in line with the theories of Sergent and Wallace (1981) and Keynes (1923). When the government's budget shortfall is paid by printing money, it raises aggregate demand but does not increase the supply of products, resulting in a price spiral. The result of the study varies from the empirical research of khan and gill (2010), which reports that budget deficits play an insignificant role in boosting inflation in the long run.

After examining the main effects of money supply on inflation (model 1), we classified money into inside and outside components to assess the influence of monetary policy on inflation more dynamically. Money issued through private intermediaries in the form of debt or credit is referred to as "inside money." This money is in the form of demand deposits or other deposits, and it constitutes a portion of the money supply. Accepting deposits, extending loans, discounting bills of exchange, and transferring money all influence inflation. Outside money is the obligation of the State Bank of Pakistan. The State Bank of Pakistan (SBP) uses standard monetary policy tools—such as open market operations and liquidity management—to steer monetary conditions, which are closely linked with inflation dynamics.

The results for inside and outside money suggest that the deposit-based component of money (inside money) shows a relatively stronger and more consistent relationship with inflation than currency in circulation (outside money) in several specifications. This indicates that developments in bank deposits may carry substantial information about inflation behaviour in Pakistan, alongside the role of exchange rate movements, real activity, and fiscal conditions. The inside–outside decomposition provides an additional and policy-relevant perspective by distinguishing which monetary component is more closely associated with inflation over the sample period.

The findings of Models 3 and 4 reveal that inside and outside money both have a positive and statistically significant impact on inflation in Pakistan. The coefficient of inside money is 0.600, which implies that a 1% increase in inside money affects the price level by 0.60%. The coefficient of outside money is 0.442, which implies that a 1% increase in outside money will affect inflation by 0.44%. These results suggest that inside money appears to be relatively more closely associated with inflation dynamics than outside money in Pakistan. These findings are consistent with the empirical studies of Tobin, J. (1978) and King & Plosser (1982), as these studies have concluded that it is not monetary policy actions that are important rather than private agents like commercial banks in the market. This result is also consistent with the theory of Fontana (2003) and Rochon and Rossi (2013), both have emphasised the importance of bank lending (commercial banks). According to these theories, money supply in a country is controlled by the demand for bank credit and

causally reliant upon the economic variables that impact the level of output. Furthermore, other variables like the official exchange rate (OER) and budget deficit (BD) also have a positive and significant effect on inflation in the estimated model of inside and outside money. This result shows that a 1% increase in the official exchange rate and budget deficit will bring about 0.22% and 0.11% increases in the model estimation of inside money. While the same brings about 0.53% and 0.17% increases in the estimated model of outside money. However, a negative relationship exists between real GDP (RGDPSA) and inflation in the models of both inside and outside money. The coefficients of real GDP (-0.692) and (-0.727) signifies that a 1% increase in real GDP will bring around 0.69% and 0.72% decrease in the general price level.

Table 8

FMOLS Long-run Estimates: Regime-wise Interaction Effects (p-values in parentheses)

Variables	(2) M2 × Regime dummies	(5) Inside × Regime dummies	(6) Outside × Regime dummies
ln(OER)	0.433*** (0.000)	0.462*** (0.000)	0.580*** (0.000)
ln(RGDP_SA)	−0.405* (0.097)	0.567*** (0.000)	−0.411* (0.097)
ln(BD)	0.063*** (0.001)	0.056*** (0.000)	0.114*** (0.000)
Money × D1	0.481*** (0.000)	0.058** (0.029)	0.338*** (0.000)
Money × D2	0.433*** (0.000)	0.079*** (0.003)	0.349*** (0.000)
Money × D3	0.419*** (0.000)	0.052* (0.054)	0.337*** (0.000)

Notes: 'Money × Di' refers to the interacted monetary variable in each model (M2, Inside, or Outside) with regime dummy Di. p-values are in parentheses.

the link between monetary aggregates and macroeconomic variables, as a result of structural changes in financial markets and the creation of new financial instruments, has become unstable over time. Therefore, it is crucial to determine whether money supply and inflation relationship has been stable or unstable in a regime-wise manner in Pakistan. The results reported in Table 8 (Column 1) are presented to examine the stability of the relationship between money supply and inflation over different regimes in the case of Pakistan.

The result of Model 2 (column 1) indicates that all three interactive dummies with respect to money supply have positive and statistically significant effect on inflation. The coefficients of interactive terms also indicate that the relationship between money supply and inflation has remained stable in the specified regimes.

Official exchange rate (OER), budget deficit (BD), and real GDP (RGDPSA) have retained their respective signs and significance as observed in model 1 (Table 7; Column 1). The results report that a 1% increase in the official exchange rate and budget deficit will bring about 0.43% and 0.06% increases in the price level in Pakistan's economy. The coefficient of real GDP (-0.405) that a 1% increase in real GDP will bring around 0.40% decrease in price level over the sample range.

The findings of the regime-wise effect of inside and outside money (models 5 and 6) on inflation show that both inside and outside money are positive and statistically significant in controlling inflation in a regime-wise manner in Pakistan.

The results of Models 5 and 6 (reported in Table 8) suggest that outside money is relatively strongly associated with inflation than inside money in the regime-wise specifications for Pakistan. This differs from the baseline specifications of Models (3) and (4), where the inside-money measure cast a relatively stronger impact on inflation. Rather than viewing this as a contradiction, the difference is consistent with changes in model specification and regime interactions: the estimated money–inflation relationship can vary when monetary aggregates are decomposed and interacted with regime indicators and when the relative importance of currency versus deposits differs across periods. In addition, the inside and outside components are closely related measures of liquidity, so estimates may shift across specifications due to re-parameterisation and differences in variability across regimes. Accordingly, the regime-wise results are interpreted as evidence that the relative strength of the inflation–money relationship differs across regimes.

Conclusion and Policy Recommendations

This study empirically investigates the money supply's impact on inflation. It evaluates this relationship across the entire sample and within different regimes to assess its stability over time. Using co-integration tests and FMOLS on quarterly data from 1982q1 to 2019q4, the study confirms a stable, long-run relationship between money supply and inflation in Pakistan. This shows that the central bank of Pakistan should constantly regulate and monitor the supply of money in order to stabilise inflation and meet its long-term targets. Although after financial sector reforms, Pakistan's monetary policy has made transition towards using interest rate as a policy instrument, in demand-driven (consumption-based) societies like Pakistan, policymakers often face a strong tradeoff in setting targets regarding interest rates and money supply. In lieu of accommodating the economy, often money supply targets are compromised, which leads to a transmission towards inflation. Within this context, although official declaration may be to use interest rate as a policy instrument, on grounds choice may still be in favour of money supply as a policy instrument. The use of money supply targeting is suggested to be discontinued only when the relationship between money supply and inflation proves unstable and unpredictable overtime; however, our study finds that in Pakistan, this relationship is quite stable overtime; therefore, money supply targeting may prove prolific in controlling inflation in Pakistan.

The study's second objective is to compare the association of inflation with inside money (deposit-based money created via private financial intermediation) and outside money (currency and central bank-backed components). Across specifications, the estimated long-run coefficients show that the deposit-based component exhibits a relatively stronger and more robust long-run co-movement with inflation over the sample period. This decomposition provides an informative way to distinguish which monetary component is more closely linked with inflation dynamics in Pakistan.

From a policy perspective, these findings highlight that developments in banking-sector deposit creation may carry important information for inflation monitoring alongside other macroeconomic determinants. Accordingly, policy discussions on inflation should consider the behaviour of monetary aggregates and their composition, while recognising that the estimated relationships are based on long-run equilibrium co-movement rather than direct causal control.

Limitations and Future Research

Few limitations of this study should be noted that may provide a future road map for the extension of the results on the given subject matter of the study. Firstly, the regime classification is based on historically motivated breakpoints—such as major policy reforms and the introduction of the interest rate corridosr —rather than being determined endogenously by the data. While this approach is consistent with the study's policy narrative, future research could complement the analysis using regime-switching or multiple-

structural-break models that estimate regimes and transition dates endogenously, for example through Markov-switching specifications or break tests with unknown break dates.

Secondly, monetary policy is proxied primarily through monetary aggregates. Although this captures the quantity-based transmission channel emphasised in the analysis, it may not fully reflect periods in which the operational framework relied more heavily on interest rate instruments. Extensions incorporating policy rates or interest-rate corridor measures could provide a more complete characterisation of monetary transmission.

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Appendix

Table A1

Selected ARDL Orders

Model	Specification (short label)	Selected ARDL order	Lag criterion
Model 1	Baseline (M2)	ARDL (2,0,0,1,2)	AIC
Model 2	Regime-wise (M2×D)	ARDL (2,0,0,0,1,2)	AIC
Model 3	Baseline (Inside)	ARDL (2,0,1,0,0)	AIC
Model 4	Baseline (Outside)	ARDL (2,0,0,1,2)	AIC
Model 5	Regime-wise (Inside×D)	ARDL (2,0,0,0,0,1,2)	AIC
Model 6	Regime-wise (Outside×D)	ARDL (2,0,0,1,0,0)	AIC

Note: ARDL orders are selected using the Akaike Information Criterion in EViews 10 (Case 2: restricted constant, no trend).

Table A2

ARDL Diagnostic Tests

ARDL model	BG LM (p)	White het. (p)	RESET (p)
Model 1	0.8896	0.3283	0.5009
Model 2	0.7456	0.5459	0.5264
Model 3	0.7736	0.0887	0.0223
Model 4	0.6687	0.3420	0.8946
Model 5	0.7168	0.9606	0.6227
Model 6	0.3300	0.5877	0.1212

Notes: Reported values are p-values. BG LM = Breusch–Godfrey serial correlation LM test; White = White heteroskedasticity test; RESET = Ramsey RESET functional form test.

Table A3

Endogeneity Test

Null hypothesis: LNM2 LNBD LNGDPSA LNOER is exogenous

Specification: LNCPI C LNM2 LNBD LNGDPSA LNOER

Instrument specification: C LNM2(-1) LNBD(-1) LNGDPSA(-1) LNOER(-1)

Endogenous variables to treat as exogenous: LNM2 LNBD LNGDPSA LNOER

	Value	df	Probability
Difference in J-stats	9.85782	4	0.042

Note: Endogeneity tests are conducted using lagged values of regressors as instruments. The test performed rejects the null hypothesis of exogeneity.

Table A4

ARDL Long- and Short-Run Results

Table A4.1

Model 1: Baseline (M2)

Variable	Coefficient	t-stat	p-value
Panel A: Long-run			
LNM2	0.204255	0.762	0.4473
LNOER	0.143070	0.670	0.5038
LNGDPSA	0.575752	0.708	0.4801

Variable	Coefficient	t-stat	p-value
LNBD	0.162611**	2.281	0.0240
C	−8.677014	−1.079	0.2826
Panel B: Short-run			
D(LNCPI(-1))	−0.205542	−2.657972	0.0088
D(LNOER)	0.247019	2.308229	0.0225
D(LNBD)	0.111192	2.668452	0.0085
D(LNBD(-1))	−0.118794	−2.711693	0.0075
ECT (-1)*	−0.081151***	−7.303095	0.0000

Selected ARDL order: ARDL (2,0,1,0,2) (Case 2: restricted constant, no trend)

Table A4.2

Model 2: M2 by Regimes

Variable	Coefficient	t-stat	p-value
Panel A: Long-run			
LNBD	0.122819	2.087931	0.0386
LNGDPSA	0.646577	1.020266	0.3094
LNOER	0.172123	0.851312	0.3961
M2*D1	0.141883	0.662551	0.5087
M2*D2	0.151466	0.714247	0.4763
M2*D3	0.131620	0.608950	0.5436
C	−8.553448	−1.384148	0.1685
Panel B: Short-run			
D(LNCPI(-1))	−0.205542	−2.650874	0.0090
D(LNOER)	0.247019	2.679201	0.0083
D(LNBD)	0.111192	2.776516	0.0063
D(LNBD(-1))	−0.118794	−2.745081	0.0069
ECT (-1)*	−0.106774***	−7.586831	0.0000

Selected ARDL order: ARDL (2,0,0,0,1,0,2)

Table A4.3

Model 3: Inside Money

Variable	Coefficient	t-stat	p-value
Panel A: Long-run			
LNINSIDE	−0.131403***	−3.501	0.0006
LNGDPSA	1.392390***	3.950	0.0001
LNBD	0.063360	1.237442	0.2180
LNOER	0.302423	3.950427	0.0001
C	−14.945210***	−3.781	0.0002
Panel B: Short-run			
D(LNCPI(-1))	−0.209219	−2.755906	0.0066
D(LNGDPSA)	−0.281102	−1.382476	0.1690
ECT(-1)*	−0.086588	−8.940678	0.0000

Selected ARDL order: ARDL (2,0,0,1,0)

Table A4.4

Model 4: Inside Money by Regimes

Variable	Coefficient	t-stat	p-value
Panel A: Long-run			
LNGDPSA	0.928573**	2.331	0.0212
LNBD	0.155827*	1.810352	0.0724
LNOER	0.191909	0.871860	0.3848
INSIDE*D1	0.004365	0.360	0.7195
INSIDE*D2	−0.039020	−0.266	0.7907
INSIDE*D3	−0.016025	−1.567168	0.1194
C	−11.00250**	−2.451	0.0155
Panel B: Short-run			
D(LNCPI(-1))	−0.208492	−2.729002	0.0072
D(LNOER)	0.267827	2.588552	0.0107
D(LNBD)	0.126744	3.048734	0.0028
D(LNBD(-1))	−0.128549	−2.944097	0.0038
ECT (-1)*	−0.100246**	−7.588383	0.0000

Selected ARDL order: ARDL (2,0,0,0,1,0,2)

Table A4.5

Model 5: Outside Money

Variable	Coefficient	t-stat	p-value
Panel A: Long-run			
LNOUTSIDE	0.395967	1.515	0.1320
LNBD	0.200783**	2.352	0.0201
LNOER	−0.194866	−0.489995	0.6249
LNGDPSA	0.403321	0.653277	0.5146
C	−7.246392	−1.129	0.2608
Panel B: Short-run			
D(LNCPI(-1))	−0.242708	−3.122433	0.0022
D(LNOER)	0.194667	1.797095	0.0745
D(LNBD)	0.126956	3.063807	0.0026
D(LNBD(-1))	−0.126155	−2.909101	0.0042
ECT(-1)*	−0.060195	−7.670401	0.0000

Selected ARDL order: ARDL (2,0,1,0,2)

Table A4.6

Model 6: Outside Money by Regimes

Variable	Coefficient	t-stat	p-value
Panel A: Long-run			
LNBD	0.050767	1.060932	0.2905
LNOER	0.181864	0.832071	0.4068
LNGDPSA	1.452651***	3.635	0.0004
OUTSIDE*D1	−0.144983**	−2.568	0.0113

Variable	Coefficient	t-stat	p-value
OUTSIDE*D2	−0.139550**	−2.250	0.0260
OUTSIDE*D3	−0.162811***	−2.632	0.0094
C	−15.187720***	−3.505	0.0006
Panel B: Short-run			
D(LNCPI(-1))	−0.231996	−3.082948	0.0025
D(LNGDPSA)	−0.226568	−1.172957	0.2428
ECT(-1)*	−0.095447	−9.380213	0.0000

Selected ARDL order: ARDL (2,0,0,0,1,0)