








## **Analysing the Role of Money Supply on Inflation: A case Study of Pakistan**

Asghar Ali Gola<sup>1</sup>, Ghulam Muhammad Qamri<sup>2</sup>, Abdullah Panhyar<sup>3</sup>, Qasim Raza Khan<sup>4</sup>,  
Imran Ali<sup>5</sup>

<sup>1</sup> Scholar, Department of Economics, University of Sargodha, Punjab Pakistan. Email: asgharaligola88@gmail.com

<sup>2</sup> Research Associate, Institute of International Economics and Collaborative Innovation Center for China Economy Nankai University Tianjin 300071, China. Email: gmqammar@hotmail.com

<sup>3</sup> Scholar, Department of Economics, University of Sargodha, Punjab, Pakistan. Email: abdullahpanhyar668@gmail.com

<sup>4</sup> Lecturer, Department of Management Sciences, COMSATS University Islamabad, Lahore Campus, Pakistan. Email: qasi.raza@gmail.com

<sup>5</sup> Scholar, Business Administration, University of Sargodha, Punjab, Pakistan. Email: alikhosa224@gmail.com

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### **ABSTRACT**

Monetary tools, money supply, and exchange rates play a significant role in a country's growth and substantially impact its development trajectory. In order to address this issue, the study empirically examines the relationship between money supply, exchange rate, and Inflation in Pakistan. The study utilized annual time series data from 1990-2020 from the State Bank of Pakistan (SBP) and World Development Indicators (WDI). To avoid spurious results, the Phillips-Perron unit root test and the Augmented Dickey-Fuller test were applied to check the data stationarity, which was integrated at different orders of integration. The exchange rate and inflation are stationary at the 1st difference  $I(1)$ , while the money supply is stationary at the same level  $I(0)$ . The Autoregressive Distributed Lag (ARDL) model analyzes the variables' short- and long-term relationships. The study confirms the presence of both short-run and long-run relationships among the variables. The results show that money supply and exchange rates significantly impact inflation positively. A negative and significant error correction term (ECT) indicates strong equilibrium convergence among variables. The upper and lower bounds values are below the F-statistics, indicating a significant long-term association between the statistically significant variables. The research contributes to current knowledge by presenting new awareness into the dynamic relations among money supply, exchange rate, and inflation. Furthermore, this study will help to design monetary policy to achieve specific targets to control inflation and volatility in exchange rates. It will help regulators and policymakers stabilize financial markets and the supply and demand of products, prevent pricing mechanisms and import exports, and increase the balance of payment accounts.

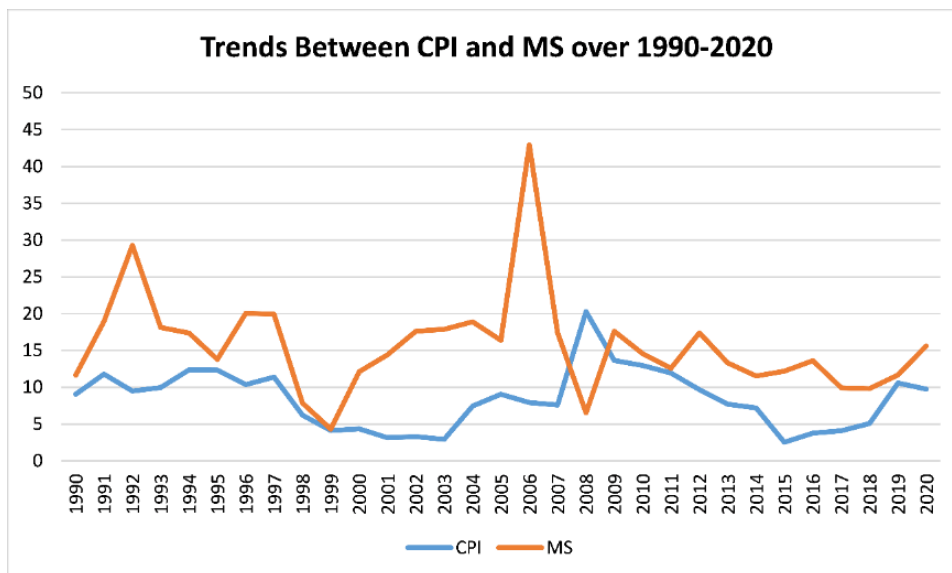


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## 1. Introduction

A stable financial system is crucial and a driving factor for economic growth. Some financial indicators, like inflation and exchange rate, directly impact economic stability. Inflation and exchange rates directly and indirectly affect trade, money supply, consumption patterns, demand and supply, balance of payment account, public investment, poverty, foreign direct investment, and policy implications. Instability in these indicators leads to many economic issues in an economy. Strong policy development and impacts are essential for long-term and stable economic growth (Qamri, Sheng, Adeel-Farooq, & Alam, 2022). This study empirically investigates the effects of these variables from the perspective of Pakistan. The inferences drawn based on this study can be applied to developing countries. Many economists from diverse fields have different definitions for inflation, but they all agree on one basic idea. Economists recognize that inflation is an increase in the average price level (Akinmulewo, Aiyedun, Idisi, & Oladimeji, 2023; Bryan & Cecchetti, 1994; Kanwal, Ahmad, Hafeez, & Qamri, 2020; Okeke, 2023; Pigou, 1947; Qamri, Haq, & Akram, 2015).

Reconcile the fact by explaining inflation as the continuous tendency for the general price to increase. Inflation can also be defined as a gradual increase in all reasonable prices. A strong financial system is vital in attracting FDI (Babalola, Aderogba, & Adetunji, 2022; Ding, Zheng, Cui, & Du, 2023; Khan, Anwar, Muhammad, Ghafoori, & Ahmad, 2024; Qamri et al., 2022). Inflation is generally a broad measure, such as a rise in the overall prices or the living expenses in a country. Chatterjee, Chaudhuri, Grandhi, and Galati (2023); McMahan, Schipke, and Xiang (2019); Pandiangan, Wau, Ariawan, Napu, and Nuryanto (2023) describe a rise in the price of goods and services, while Amadeo (2020) and Wulandari and Ajija (2023) described it as the point where the overall price of goods keeps rising. The living standard declines as a result automatically.



**Figure 1: Trends between CPI and MS over 1990-20 for Pakistan**

Literature has witnessed that money supply and inflation have a long-running association. Many theories and studies confirm the association of this relationship. When rise in money supply by the state bank increases the availability of or eases access to money, which causes an increase in prices and decreases the value of money. Figure 01 draws on data from

1990-2020 and confirms this association; if we see the line trends as the money supply increases, CPI trends also show an increase. Based on raw data, we can also develop an inference that a rise in money supply will also increase inflation, which is in line with the hypothesis witnessed by financial theory and previous studies.

Since the most widely held theory regarding inflation is that it is a monetary phenomenon, reducing inflation is primarily the responsibility of money management. This line of reasoning, predicated on the QTM, states that inflation is exclusively based on the shift in the relative supply of goods and money. A nation's financial and economic status is determined mainly by its finances by the Central Bank of that country. Most people concur that monetary policy can maintain pricing to support long-term growth steadiness.

The State Bank's indirect role in managing the money supply also includes controlling the price level. The case made by monetarists demonstrates that financial processes directly contribute to long-term price increases. Numerous studies show that monetary policies are crucial to inflation dynamics Hanif and Malik (2015) and (Munir, Tufail, & Ahmed, 2023). The QTM demonstrates a notable proportional connection between price increases and the supply of money, meaning that any shift in one of them on any side and the other variable will subsequently move in a similar direction. Thus, monitoring the increase in the quantity of money in use is necessary to prevent Inflation (Aksoy & Piskorski, 2006; Ejaz & Azam, 2024; Khan, 2023).

Every world economy is interdependent through the asset and goods market following globalization. This linkage makes it possible for the world's nations to transact with one another. Consequently, these transactions among nations create financial obligations, thus creating the need for Foreign Exchange. The need to settle financial commitments among nations arising from trade across borders necessitates foreign exchange. Nwinee and Olulu-Briggs (2016) observed that the basis of dealings on foreign exchange stems from international trade due to cross-border money and capital movements or financial transactions. Therefore, foreign exchange is the cost of overseas currency in terms of a homeland or local currency. There have been significant exchange rate management market-based flexible exchange rate systems in Pakistan since May 1999, aiming to ensure stable exchange rates and price stability.

The system of exchange rates affects a nation's economic growth significantly. The exchange rate serves as a gauge of a nation's financial competitiveness on a worldwide scale. Its exchange rate directly impacts the imports and exports of a country. While currency depreciation raises the cost of imports, appreciation damages exports. Exchange rate volatility has an impact on central banks' inflation targets. Economic growth and the exchange rate system are intimately related. The exchange rate is linked to inflation and general economic growth, notwithstanding the difficulty in establishing a direct or indirect relationship. Changes in the price of foreign currencies have the most significant impact. Over the years, the dismal performance of many third-world countries' exchange rates versus important trading currencies such as Euro, the US dollar (USD\$), and the British pound has been a severe cause for concern. It is thought that exchange rates have the power to influence domestic policy since weak exchange rate performance, particularly in import-dependent nations like Pakistan, can lead to price volatility in the economy.

For the past few decades, Pakistan has been dealing with a concerning inflation situation. Since the beginning, policy discussions in Pakistan have revolved around the issue of inflation. The government implemented several measures to rein in inflation. The PMLN elected government's policies in 2013 caused the inflation rate to drop from 11.01% to 7.36%. 2015 saw a global decline in petroleum prices, which favorably affected the 4.53% inflation rate. Then, it was 2.86 in 2016. However, because of the tumultuous political environment in 2017, it rose to 4.15%. Pakistan has been able to keep inflation double-digit under control thus far.

In the context of Pakistan, numerous studies investigate the origins of inflation and its effects on other macroeconomic variables. The study examines how the exchange rate and the money supply impact Pakistan's Inflation. The objectives also include determining the short- and long-run factors affecting money supply, inflation, and exchange rates. The remaining sections of the analysis are organized as follows: a review of the literature is covered in the second section; a theoretical framework is covered in the third section; data and methods are discussed in the fourth section; the conclusion and the policy implications of the investigation are explained in the fifth section; and possible solutions to Pakistan's inflation issue are suggested in the final section.

## **2. Review of Related Literature**

In this section, the study examines earlier research on how money supply and exchange rate influence inflation. The literature contains a wealth of research papers that examine the factors that influence inflation; some of these are covered briefly in this section. Originating from the earlier Quantity Theory of Money, the supply of money and inflation are directly proportionate (Haider, Raza, Jameel, & Pervaiz, 2019; Khan & Billah, 2023). The hypothesis states that prices would rise proportionately if the money supply doubled. Following this paradigm, numerous studies have concluded that the money supply positively affects both developed and developing countries' inflation.

Much empirical research that has been undertaken to relate factors of increasing prices in Pakistan and elsewhere has identified the exchange rate as another inflation-determining variable. Sultana, Koli, and Firoj (2019) use monthly time series data to investigate the connection in Bangladesh between inflation and money supply. By applying VECM and co-integration approaches, the research demonstrates that neither the money supply nor inflation is directly impacted by one another. This study shows a sustained, two-way causal link between inflation and the money supply. In a complementary analysis, Lane (2023) confirm that both during the periods of Euro depreciation (1999–2001) and appreciation (2022–2003), the currency rate had an impact on the EMU inflation rate.

Inflation is considered the regressand variable in this research, and the factors influencing inflation are the independent variables. The money supply grows due to government borrowing, which raises Inflation (Akbar, 2023; Khan & Billah, 2023; Musa, 2023). Agustina and Permadi (2023) explain that the exchange rate directly relates to the money supply. Akinbobola (2012) investigated the relations between the supply of money (M2), the exchange rate (ER.), and Inflation (CPI). The research analyzed annual time series data from 1970 to 2016 using an ECM and a co-integration test to examine the short- and long-term dynamical relationship among the variables under discussion. Ditimi and Sunday (2018) demonstrate that money supply has little impact on inflation when the country is in recession, and for both cases, the long and short run.

Bhattarai (2011) inspected the inflation from the supply of money. According to the Granger causality test results, inflation and the quantity of money in circulation are unrelated throughout time and vice versa. Lowe (2019), the exchange rate variable and inflation have no relations. Ng and Geetha (2020) investigated the direct relationship between inflation and the exchange rate. Khan, Johl, Kumar, and Luthra (2023) utilized yearly time series data from 1987 to 2019 to investigate the relations between unemployment, money supply, inflation, and interest rates in Pakistan. Inflation is the regressand variable, whereas the interest rate, unemployment, and money supply (M2) are included as controlled variables. The discount rate is a representation of the interest rate. The ADF results show variations in the variables' order of integration. The ARDL technique was applied in the study to test the variables' long- and short-term presence. The results showed that the variables have a relationship over the short and long terms. Shafiullah, Miah, Alam, and Atif (2021) discovered a connection between the Jordanian economy's inflation and money supply (M1) between 1980 and 2019. The following

tests were conducted using the econometric analysis of the time series approach to meet the study's objective. The study suggests that changes in the money supply M1 are responsible for variations in the Jordanian economy's consumer price index (CPI).

Madurapperuma (2023) explains that the economic theories of Milton Friedman, Irving Fisher, and Karl Marx all hold that inflation results from a persistent rise in the money supply. An econometric model using Fisher and Friedman's economic theories determines the relationship between economic growth, inflation, and money supply. The information was collected from secondary sources between 1990 and 2021. The study demonstrates that money supply is directly associated to economic growth and an inextricable relation between inflation and the supply of money. Therefore, the government should have recommendations and a suitable monetary policy to manage inflation and promote economic growth. Imimole and Enoma (2011) utilized the Autoregressive Distributed Lag (ARDL) methods to examine how the exchange rate devaluation affected Nigerian inflation between 1986 and 2008. According to the study, the primary factors influencing Inflation in Nigeria are the money supply, real GDP, and exchange rate depreciation. Naira devaluation is beneficial and has a substantial long-term impact on Inflation in Nigeria. This suggests that the exchange rate depreciation may raise Nigeria's inflation rate.

Lim and Sek (2015) examined inflation in two countries: the low-inflation group and the high-inflation group. The findings indicate that GDP growth and imports of goods and services significantly influence inflation in nations with low level of inflation rates. The studies indicates that in high-inflation nations, the main factors influencing long-term Inflation are GDP growth, national spending, and the money supply. Islam, Ghani, Mahyudin, and Manickam (2017) explored the several causes of Malaysia's Inflation. The study aims to indicate the variables that significantly affect Malaysian inflation. Abrar-ul-haq, Shah, and Ghulam (2016); Sudaryanto, N ARI SUBAGIO, Awaliyah, Wulandari, and Hanim (2019); Yolanda (2017) seek to check the relations between the Indonesian Bank (B.I.) rate, forex rates, supply of money, gold and petroleum prices, and inflation, as well as how these factors affect the country's poverty and human development index (HDI). The research's outcomes indicate that several important factors simultaneously affect Indonesia's inflation rate, including the Indonesia Bank rate, foreign exchange rates, and supply of money, gold, and petroleum prices. The findings also demonstrated that, in contrast to the exchange rate variable, which has no impact on inflation rates, the variables Indonesia Bank rate, supply of money, petroleum, and gold price all positively and significantly influence the degree of inflation.

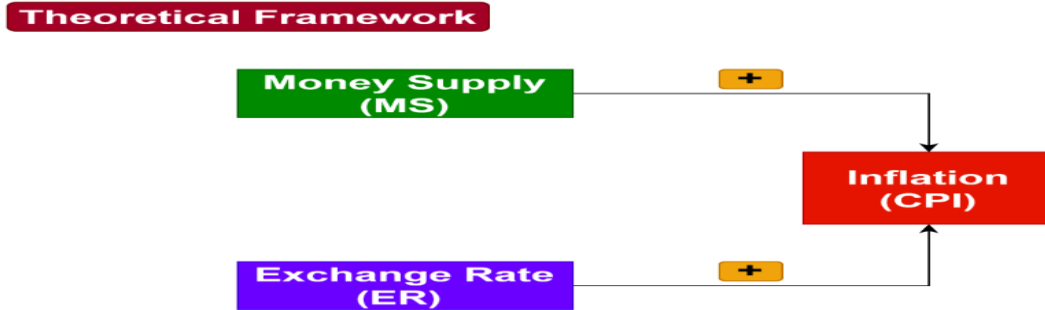
Majumder (2016) explored the relationship between Bangladesh's economic growth and inflation. Stationery is tested using the ADF unit root test. This study uses Granger causality and the ECM to demonstrate the interrelation between economic growth and Inflation in Bangladesh from 1975 to 2013. To examine the data, the model is constructed using three variables: inflation, money supply, and remittances, which are the independent variables, and the economic growth of the GDP, which is the regressand variable. The findings show that the GDP growth rate and the inflation rate have a statistically significant positive long-term correlation, according to the VECM. Bangladesh has demonstrated a statistically significant positive relations between GDP growth and the rate of inflation over the long term.

### **3. Theoretical Framework**

This study's theoretical framework is derived from the Quantity Theory of Money (QTM), the Monetarism theory of inflation, the Keynesian demand-pull theory, the Structuralist theory, and Friedman's View. The Quantity theory of money states that the increase in money supply will increase the prices of goods and services. Central banks use different tactics, such as reserve requirements, discount rates and open market operations, to control the money supply

in the market. So, based on this, the expected relation is that the money supply increases inflation.

Exchange rates and inflations are also interconnected and volatile, and increased exchange rates cause inflation. The purchasing power parity theory states that exchange rates and inflation have a long-term relationship. The high inflation in one country will decrease the currency's value, reducing the country's purchasing power for imports and increasing the demand for the local industry, eventually raising the prices at the domestic level. Figure 02 below explains the theoretical framework among the variables.



**Figure 2: Theoretical Framework**

It states that money supply and exchange rate positively contribute to inflation. When the money supply increases, it creates inflation. Maali, Rakia, and Khaireddine (2021) also support our study. The same applies to the exchange rate when a depreciation in local currency causes inflation.

### 3.1. Quantity Theory of Money

The Quantity Theory of Money, the transactions approach, is among contemporary economic doctrine's most significant and ancient theoretical proposals (Tule, Okafor, Ajilore, Afangideh, & Udoh, 2017). The Quantity Theory of Money (QTM) was primarily developed by the French social philosopher Jean Bodin. The theory was first proposed by Jean Bodin in the 16th century, who connected the enormous import of monetary metals (gold and silver) from South American mines to the spike in prices of goods that were then on the rise in Western Europe. By the 20th century, David Hume, Richard Cantillon, and John Locke had advanced and expanded, and they improved the QTM to the point where the mainstream of the orthodox monetary school adopted it. It currently forms the basis of traditional economic analysis and offers the preeminent conceptual framework for comprehending and interpreting financial occurrences. The theory is still alive and well in the monetarist ideology today. The Quantity Theory of Money hypothesizes how money's buying ability affects the costs of products and services.

According to the theory, variations in the amount of money in circulation affect how much money is worth. The father of monetarism, Milton Friedman, maintained that domestic inflation is a monetary phenomenon that happens everywhere (Ehsan et al., 2018). He goes on to say that the only thing that can be responsible for the shifts in the general prices of all commodities and services is the monetary phenomenon. The fundamental idea is that an economy with more money in circulation is one in which more money is buying fewer goods. This will result in higher demand and consumption for goods and services, driving up the price of the overall goods. Conversely, if there is less money in circulation overall, people's purchasing power increases, and general prices of goods and services decrease (Singh, Vaish, & Singh, 2015). In short, according to QTM, the primary factor influencing the price levels (P) of commodities and services is the amount of money in use or the stock of money. The Fisher

equation below shows how the amount of money in circulation and the level of prices are related in an economy.

### **Fisher Equation:**

$$MV = PY$$

*M = Quantity of money in circulation*  
*V = Velocity of circulation of money*  
*p = Price level*  
*Y = Real Natinal Income*

The Fisher equation includes the related postulates that support the concise result and the general conclusion that the prices of goods and services are affected by the amount of money in circulation. The proportionality between the amount of money in circulation (represented by the letter "M") and the price level (represented by the letter "P"), as well as the money's causal involvement in the monetary transmission mechanism, are the two most important of these postulates. The proportionality postulate demonstrates that changes in the amount of money (m) and the level of prices (p) are proportionately related. This claim is based on the supposition that, at the actual output level representing the economy's maximum potential, each individual would have a fixed amount of essential cash balance (or "M/P") for the transaction. According to the second crucial postulate of the QTM, a unidirectional causal correlation exists between price level (P) and the amount of money in circulation (M). This implies that shifts in the money supply lead to adjustments in price points. The money supply is considered the independent variable in this causal relationship, while the price level is the regressand variable.

### **3.2. The Monetary Theory of Inflation**

According to the monetary theory of Inflation, Inflation is brought about by a rise in the money supply. Inflation increases quickly when the money supply expands quickly. In particular, inflation rises by 1% for every 1% increase in the money supply. All other factors stay the same, but the money supply and price level are proportionate.

### **3.3. The Keynesian View**

According to Keynes's economic theory, money supply changes do not directly affect prices; instead, observable inflation results from financial pressures expressed in prices and has no direct connection to the money supply. Nevertheless, they stressed that demand-pull inflation and cost-push factors two types of fiscal divergence in the economy—are the leading causes of inflation (O'Sullivan, 2003; Schiffrin & Fagan, 2013). Thus, it was determined that the reasons behind high inflation in emerging nations like Pakistan are increased public and private spending, natural disasters, rising prices, and a wage spiral.

### **3.4. Structuralist Theory**

Prof. Gardner Ackley first proposed this theory, according to which inflation results from an unchanged economic structure in every nation. Moreover, proponents of structural theories held that certain institutional aspects of the business environment or national structural maladjustments cause inflation. As a result, they suggest using monetary and fiscal policies to tackle this economic issue.

### **3.5. Friedman's View**

Friedman's successors in modern quantity theory asserted, "Inflation is a global monetary phenomenon that results from rapid increases in the money supply relative to total

earning." He observes that a change in the money supply will essentially cause a shift in nominal income. He talks about how monetary growth will raise output levels initially if the public's little income increases.

#### 4. Data and Methods

In this study, we used yearly times series data from 1990 to 2020 for Pakistan. The data has been gathered from the Central Bank of Pakistan and World Development Indicators (WDI). Money supply (M2) and exchange rate (E.R.) are the independent variables, while inflation is the regressand variable in this study. M2 has been used as a proxy of the supply of money (Broad money supply), also used by Akinbobola (2012); Maali et al. (2021). The dollar price is a proxy of the exchange rate used in (Hoang, Thi, & Minh, 2020). Numerous studies have used CPI as a proxy for inflation (Akinbobola, 2012; Shafiullah et al., 2021).

$$INF = \beta_0 + \beta_1(M2) + B2(ER) + U \tag{1}$$

Where, *M2* = Money supply, *INF* = Inflation, *ER* = Exchange rate, *U* = Error term

**Table 1**  
**Variables and Measurements**

Variables	Measurements	Source
Inflation	Annual inflation rate(CPI)	WDI
Money supply	Broad money(M2)	SBP
Exchange rate	Price of dollar	WDI

#### 5. Results and Discussion

##### 5.1. Results of Unit Root Tests

The ADF and Phillips-Perron tests were utilised in this study to check whether the data was stationary. After examining the data's trend, I used the trend and intercept model in the unit root analysis. The study includes three variables the money supply, inflation rate and exchange rate. The ADF and Phillips-Perron tests show that the money supply is stationary at a certain level, whereas the inflation and exchange rate are stationary at the 1<sup>st</sup> difference.

**Table 2**  
**Results of ADF Unit Root Test**

Variable	level	First difference
Inflation	-2.49464	-6.548907
Exchange rate	1.616471	-3.686119
Money Supply	-4.277077	

Note: \*\*5% significance, \*\*\* 10% significance level

**Table 3**  
**Phillips-Perron Unit Root Result**

Variables	level	1 <sup>st</sup> difference
Inflation	-2.594308	-6.562502
Exchange rate	2.13498	-2.647120
Money supply	-4.302076	

##### 5.2. ARDL Co-integration Technique Results

The results of ADF and Phillips-Perron demonstrate that our order of integration differs. Due to the different order of integration, we applied the ARDL model in our study. Shafiullah et al. (2021) also used the ARDL model to explore the short-term and long-term relation to check the correlation between variables and applied the Autoregressive Distributed Lag technique.



Two components comprise the co-integration, for the short and long run. Model selection for long-term identification of ARDL has been utilized using the Akaike information criterion. The variables have a long-run relations if the F-statistic value is larger than the upper and lower bonds. Here, long-run relationship between the variables are indicated by an F-statistic value more significant than the lower and upper bounds. Dalimunthe, Sulistiana, Saputra, Aldila, and Pririzki (2023) and Maali et al. (2021) these studies also support our results.

**Table 4**  
***A Long-run Result of the ARDL Co-integration Approach***

<b>Repressor</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>Prob</b>	
CPI (-1)	-0.589519	.148134	0.0009	
ER	0.214073	.501531	0.0173	
MS (-1) 0.6537	0.602971	0.177670	0.0032	
F-statistic	95% upper Bond	95%lower Bond	90% Upper Bond	90% Lower Bond
5.066899	3.87	3.1	3.35	2.63

The model for the short run needs to be checked after the long run results have been verified. The Error Correction Term (ECM) can be used to identify the short-term outcomes. As we know that ECM operate under two primary presumptions like value must be in the negative sign, and value must lie between 0 and 1. Since it meets both of the assumptions, the ECM results show that there is a short-term connection between the variables. ECM has a value of 0.589519, indicating strong equilibrium convergence in case of any disruption caused by independent variables. The findings from the ARDL co-integration approach shed light on the dynamics of Pakistan's economy, particularly in terms of inflation (CPI), exchange rate (ER), and money supply. The negative coefficient of CPI (-1) at -0.589519, with a statistically significant p-value of 0.0009, indicates an intriguing self-correcting mechanism inside the country's inflationary patterns. This finding is consistent with the adaptive expectancies hypothesis, which holds that previous inflation rates influence future inflation expectations and, as a result, inflation itself (Nelson, 1976). This suggests that in the event of an inflationary surge during a specific period, market adjustments or corrective measures may be prompted, resulting in a subsequent decline in inflation. Currency depreciation affects inflation, as evidenced by the favorable exchange rate (ER) coefficient of 0.214073 and p-value of 0.0173. According to the exchange rate pass-through, a local currency depreciation raises import prices, fueling domestic inflation (Krugman & Taylor, 1978). This connection is vital for economies like Pakistan, which get many goods and materials from other countries. The importance of this relationship shows how global financial markets and domestic economic situations are linked.

Furthermore, the p-value of 0.0032 indicates a positive relationship between money supply and inflation, which lags at 0.602971. This relationship is consistent with the fundamental ideas of the Quantity Theory of Money. A basic tenet of monetary economics, this theory posits that all else being equal, an economic expansion results in a corresponding surge in inflation (FRIEDMAN, 2024). The empirical data from this study supports this link in the context of Pakistan and emphasizes how crucial monetary policy is in containing inflation. An F-statistic of 5.066899 from the limits test findings of the ARDL model provides additional support for a substantial long-term link between these variables. This analytical result not only validates that the ARDL technique is suitable for investigating the co-integration of these variables, but it also complies with macroeconomic theory and prior empirical studies that have highlighted the long-term interdependence of inflation, exchange rates, and money supply (Pesaran, Shin, & Smith, 2001).

In short, current economic theories and literature provide strong support for the empirical results of this study. They shows important perceptions for policymakers by highlighting the complex interactions between Pakistan's money supply, currency rates, and inflation. Policymakers can improve economic stability and growth by understanding these

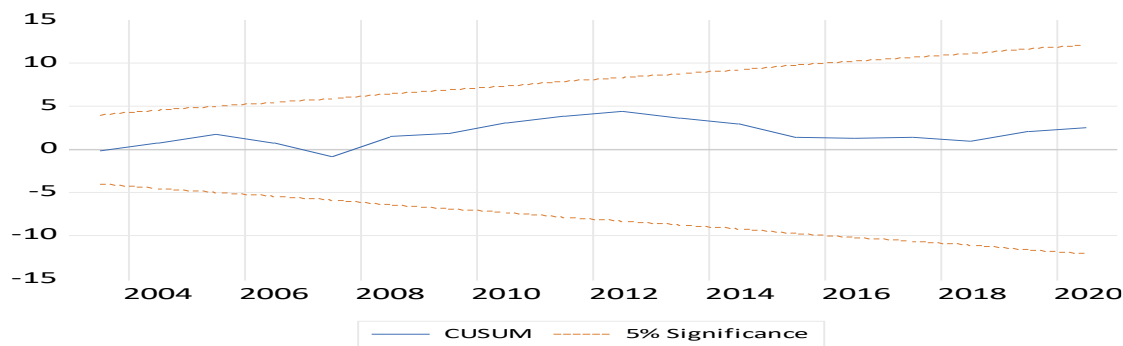
dynamics and designing more effective monetary policies. Even though these findings are particular to Pakistan, they add to the conversation on how monetary policy affects inflation and currency rates and highlight the value of thorough empirical research in formulating economic policies.

**TABLE 5**  
**Error Correction Model (ECM) Results of ARDL Co-integration Techniques**

Variables	Coefficient	Stad Error	P- Values
DCPI	0.54	0.204253	0.017
DMS2	0.56965	0.05797	0.3455
DER	0.214073	0.057029	0.0013
ECM	-.589519	0.121234	0.0001
R-Square	0.733804	R- Bar-Square	0.670424
S.E of Regression	2.072317	S.D. dependent VAR	3.60976
sum squared resid	90.18442	Akaike info criterion	4.48834
log likelihood	-54.59261	Hannan Quinn criterion	4.57396
Durbin-Watson Stat	2.246153		

### 5.3. Stability Tests

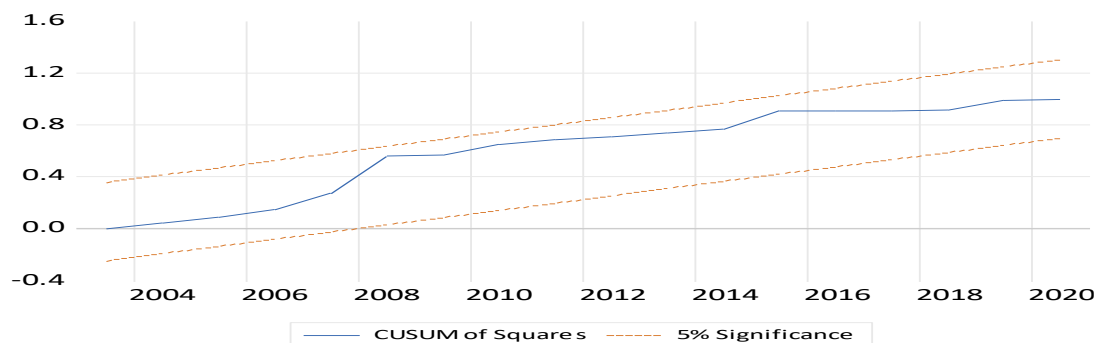
#### 3.3.1.CUSUM Test



**Figure 3: Plot of Cumulative Sum**

We are now verifying the stability of our ARDL model using the Cumulative Sum (CUSUM) provided by Brown, Durbin, and Evans (1975). The CUSUM stability test is applied to check whether or not a model is structurally stable. In this case, the test finds that our model is structurally stable because the plot stays between critical bounds at a significance level of 5%.

#### 5.3.2.CUSUM of Square



**Figure 4: Plot of Cumulative Sum of Squares**

It is now necessary to verify the stability of the selected ARDL utilizing the CUSUM SQUARE provided by Brown et al. (1975). The CUSUM SQUARE test is utilised to find out

whether or not a model is structurally stable. The test finds that our model is structurally stable because the plot stays at a 5% significance level between critical bounds.

## **6. Conclusion and Policy Recommendations**

The study empirically explores the association of the dynamic linkages between money supply and exchange rates on inflation in Pakistan from 1990-2020. The study highlighted the most challenging issue of developing countries, especially Pakistan, and provided policy implications based on the empirical results. Resolving this issue will remove the most significant barrier to growth and development. Money supply, which lowering purchasing power and deteriorates the standard of living and exchange rate, is the most crucial factor influencing inflation, particularly in less developed nations like Pakistan. One of the prime objectives of the modern economy is to ensure the stability of prices; thus, tracking that nation's economic activity and formulating future monetary policy requires looking at the causes of inflation and how it relates to other macroeconomic factors, given that a rise in the money supply and price of foreign currencies is what causes inflation. Lowering the rate of monetary growth is the solution. Prices will be most able to rise if the amount of money increases proportionately to the growth in commodities and different types of services that can be bought, making the exchange rate stable through other mechanisms.

The basic goal of this study is to examine the relations between inflation and the supply of money in Pakistan. M2 is used as a proxy for the money supply, and the dollar's value has been used as a proxy for the exchange rate, while we used CPI as a proxy for inflation. To avoid spurious regression, Phillips-Perron and ADF unit root tests were used to solidify data; ADF and Phillips-Perron test results show that two variables, exchange rate, and inflation, are stationary at I (1) while the money supply is at I (0). Our order of integration differs, so our study applied the ARDL technique to check the short-run and long-run relations between variables. The study discovered both short-run and long-run relations among variables. The findings demonstrate that the money supply has a short-term positive related to inflation. However, this is insignificant Anachedo, Okeke, and Ubah (2023); Benjamin et al. (2018); Jawo, Jebou, and Bayo (2023), but these studies are consistent with our results. The exchange rate also has a positive relation with inflation, which is significant Amanda, Akhyar, and Ilham (2023); Valogo, Duodu, Yusif, and Baidoo (2023) these studies support our results. The favorable links between money supply and exchange rates and inflation that have been observed highlight these variables' widespread impact on the economy's overall state.

The result emphasizes how the economic system self-corrects in response to deviations from long-run equilibrium by implying that the variables tend to move toward an equilibrium state over time. The study provides policymakers with a comprehensive picture of the economic factors at work by carefully examining both short- and long-term linkages. This empirical study has certain limitations despite its valuable contributions. The research does not include interest rates, which limits its scope. Furthermore, their generalizability is limited because the results are exclusive to Pakistan and cannot always hold for other economies. These limitations indicate that interpretations must be made carefully and offer directions for further study to overcome them. These findings support the idea of a regulated monetary policy, which aims to reduce inflationary pressures by aligning the money supply's growth with the economy's growth. Exchange rate stability measures such as accumulating and maintaining foreign exchange reserves should be prioritized. Strengthening the institutional structure, implementing multi-faceted inflation control measures, and improving surveillance skills are critical for the effective implementation of policy. Building public trust, regulating markets, and resolving structural concerns can be facilitated by open communication regarding monetary policies, cooperation with market and price control bodies, and inclusive economic policies. Ensuring a responsive and successful policy framework emphasizes continuous monitoring, capacity building, and adaptability. These suggestions, taken together, pursue to steer

Pakistan toward long-term prosperity by striking a balance between promoting economic growth and upholding stability. The empirically-based policy recommendations provide a road map for attaining price stability, economic growth, and long-term development in Pakistan.

### Authors' Contribution

Asghar Ali Gola: Data collection and Estimation.

Ghulam Muhammad Qamri: Writing and Draft Preparation.

Abdullah Panhyar: Conceptualization, Reviewing and Editing.

Qasim Raza Khan: Writing and Draft preparation.

Imran Ali: Conceptualization, Reviewing, and Editing.

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The authors declared no potential conflict of interest w.r.t the research, authorship and/or publication of this article.

### References

- Abrar-ul-haq, M., Shah, S. W. A., & Ghulam, M. Q. (2016). POVERTY PROFILE AND CORRELATES OF POVERTY IN PAKISTAN: EVIDENCE FROM DISTRICT VEhari. *Science International*, 28(1).
- Agustina, I. A. S., & Permadi, I. K. O. (2023). The Impact of the Money Supply, Exchange Rate and Fuel Prices on the Inflation Rate. *Ekonomis: Journal of Economics and Business*, 7(1), 32-36.
- Akbar, M. (2023). Effects of inflation uncertainty and exchange rate volatility on money demand in Pakistan: Bayesian econometric analysis. *International Journal of Finance & Economics*, 28(2), 1470-1487. doi:<https://doi.org/10.1002/ijfe.2488>
- Akinbobola, T. (2012). The dynamics of money supply, exchange rate and inflation in Nigeria. *Journal of Applied Finance and Banking*, 2(4), 117.
- Akinmulewo, B., Aiyedun, E., Idisi, E., & Oladimeji, Y. (2023). ASSESSMENT OF THE CONTRIBUTION OF GURARA DAM IRRIGATION SCHEME TO POVERTY REDUCTION AMONG FARMING HOUSEHOLDS IN KADUNA STATE, NIGERIA. *Journal of Agricultural Economics, Environment and Social Sciences*, 9(2), 22-34.
- Aksoy, Y., & Piskorski, T. (2006). US domestic money, inflation and output. *Journal of Monetary Economics*, 53(2), 183-197. doi:<https://doi.org/10.1016/j.jmoneco.2005.01.002>
- Amadeo, K. (2020). Inflation, How It's Measured and Managed. In: Retrieved from The Balance: <https://www.thebalance.com>.
- Amanda, S. T., Akhyar, C., & Ilham, R. N. (2023). THE EFFECT OF INFLATION, EXCHANGE EXCHANGE, INTEREST RATE ON STOCK PRICE IN THE TRANSPORTATION SUB-SECTOR, 2018-2020. *Journal of Accounting Research, Utility Finance and Digital Assets*, 1(4), 342-352.
- Anachedo, C. K., Okeke, I., & Ubah, C. B. (2023). Monetary Policy A Catalyst for Inflation and Booster for Economic Growth; Evidence from Nigeria. *Iconic Research and Engineering Journals*, 6(11), 423-433.
- Babalola, A. J., Aderogba, A. M., & Adetunji, O. O. (2022). Inflation and Cost Overrun in Public Sector Construction Projects in Nigeria. *ECS Transactions*, 107(1), 16137. doi:<https://doi.org/10.1149/10701.16137ecst>
- Benjamin, D. J., Berger, J. O., Johannesson, M., Nosek, B. A., Wagenmakers, E.-J., Berk, R., . . . Camerer, C. (2018). Redefine statistical significance. *Nature human behaviour*, 2(1), 6-10. doi:<https://doi.org/10.1038/s41562-017-0189-z>
- Bhattarai, K. (2011). Further Economic Analysis. *University of Hull Business School*.
- Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 37(2), 149-163. doi:<https://doi.org/10.1111/j.2517-6161.1975.tb01532.x>

- Bryan, M. F., & Cecchetti, S. G. (1994). Measuring core inflation. In *Monetary policy* (pp. 195-219): The University of Chicago Press.
- Chatterjee, S., Chaudhuri, R., Grandhi, B., & Galati, A. (2023). Evolution of strategy for global value creation in MNEs: Role of knowledge management, technology adoption, and financial investment. *Journal of International Management*, 29(5), 101057. doi:<https://doi.org/10.1016/j.intman.2023.101057>
- Dalimunthe, D. Y., Sulistiana, I., Saputra, D., Aldila, H., & Pririzki, S. J. (2023). PROJECTION OF THE INFLATION RATE IN PANGKALPINANG CITY USING THE AUTOREGRESSIVE MOVING AVERAGE (ARMA). *BAREKENG: Jurnal Ilmu Matematika dan Terapan*, 17(3), 1513-1520. doi:<https://doi.org/10.30598/barekengvol17iss3pp1513-1520>
- Ding, S., Zheng, D., Cui, T., & Du, M. (2023). The oil price-inflation nexus: The exchange rate pass-through effect. *Energy Economics*, 125(9), 106828. doi:<https://doi.org/10.1016/j.eneco.2023.106828>
- Ditimi, A., & Sunday, K. (2018). Dynamic interrelationship between macroeconomic fundamentals and stock prices in Nigeria. *J Fin Mark. 2018; 2 (1): 50-59. J Fin Mark 2018 Volume 2 Issue 1, 51(1)*, 17-20.
- Ehsan, S., Nazir, M. S., Nurunnabi, M., Raza Khan, Q., Tahir, S., & Ahmed, I. (2018). A multimethod approach to assess and measure corporate social responsibility disclosure and practices in a developing economy. *Sustainability*, 10(8), 2955. doi:<https://doi.org/10.3390/su10082955>
- Ejaz, M., & Azam, A. (2024). Impact of Capital Inflows on Exchange Rate in Developing Economies: A Panel Data Analysis. *Pakistan Journal of Social Sciences*, 44(1), 41-52. doi:<https://doi.org/10.5281/zenodo.10512954>
- FRIEDMAN, M. (2024). Inflation and the Rise. *A Monetary and Fiscal History of the United States, 1961–2021*, 27.
- Haider, M. A., Raza, Q., Jameel, S., & Pervaiz, K. (2019). A comparative study of operational efficiency of Pakistani and Malaysian islamic banks: Data envelopment analysis approach. *Asian Economic and Financial Review*, 9(5), 559. doi:<https://doi.org/10.18488/journal.aefr.2019.95.559.580>
- Hanif, M. N., & Malik, M. J. (2015). Evaluating performance of inflation forecasting models of Pakistan. *11(1)*.
- Hoang, T., Thi, V., & Minh, H. (2020). The impact of exchange rate on inflation and economic growth in Vietnam. *Management Science Letters*, 10(5), 1051-1060. doi:<https://doi.org/10.5267/j.msl.2019.11.004>
- Imimole, B., & Enoma, A. (2011). Exchange rate depreciation and inflation in Nigeria (1986–2008). *Business and Economics Journal*, 28(1), 1-11.
- Islam, R., Ghani, A. B. A., Mahyudin, E., & Manickam, N. (2017). Determinants of factors that affecting inflation in Malaysia. *International Journal of Economics and Financial Issues*, 7(2), 355-364.
- Jawo, A., Jebou, M., & Bayo, L. F. (2023). The Relationship between Inflation, Exchange Rate, Money Supply and Economic Growth in The Gambia. *Technium Soc. Sci. J.*, 40, 213.
- Kanwal, W., Ahmad, H. R., Hafeez, H. A., & Qamri, G. M. (2020). Determinants of voluntary and involuntary underemployment in Pakistan. *Empirical Economic Review*, 3(1), 59-84. doi:<https://doi.org/10.29145/eer/31/030104>
- Khan, M. F. H., & Billah, M. M. (2023). Macroeconomic factors and Stock exchange return: A Statistical Analysis. *arXiv preprint arXiv:2305.02229*. doi:<https://doi.org/10.48550/arXiv.2305.02229>
- Khan, P. A., Johl, S. K., Kumar, A., & Luthra, S. (2023). Hope-hype of green innovation, corporate governance index, and impact on firm financial performance: a comparative study of Southeast Asian countries. *Environmental Science and Pollution Research*, 30(19), 55237-55254. doi:<https://doi.org/10.1007/s11356-023-26262-4>
- Khan, Q. R. (2023). From industrialization to dehumanization: understanding the deriving forces of environment and implications for sustainable development. *Environmental Science and Pollution Research*, 30(59), 123396-123411. doi:<https://doi.org/10.1007/s11356-023-30983-x>

- Khan, Q. R., Anwar, A., Muhammad, T., Ghafoori, N., & Ahmad, M. (2024). Asymmetric effects of high-tech industry and presence of pollution-haven hypothesis in APEC countries: fresh evidence with panel quantile regression. *Clean Technologies and Environmental Policy*(1), 1-18. doi:<https://doi.org/10.1007/s10098-023-02703-z>
- Krugman, P., & Taylor, L. (1978). Contractionary effects of devaluation. *Journal of international economics*, 8(3), 445-456. doi:[https://doi.org/10.1016/0022-1996\(78\)90007-7](https://doi.org/10.1016/0022-1996(78)90007-7)
- Lane, P. R. (2023). *Inflation and monetary policy*. Paper presented at the Presentation at the New Economy Forum in Berlin.
- Lim, Y. C., & Sek, S. K. (2015). An examination on the determinants of inflation. *Journal of Economics, Business and Management*, 3(7), 678-682. doi:<https://doi.org/10.7763/JOEBM.2015.V3.265>
- Lowe, A. B. (2019). The impact of exchange rate on inflation: A case study of the Gambia (1978-2016). *European Scientific Journal*, 15(10), 261-277. doi:<https://doi.org/10.19044/esj.2019.v15n10p261>
- Maali, K., Rakia, R., & Khaireddine, M. (2021). How corporate social responsibility mediates the relationship between corporate governance and sustainability performance in UK: a multiple mediator analysis. *Society and Business Review*, 16(2), 201-217. doi:<https://doi.org/10.1108/SBR-12-2020-0143>
- Madurapperuma, W. (2023). Money supply, inflation and economic growth of Sri Lanka: co-integration and causality analysis. *Journal of Money and Business*. doi:<https://doi.org/10.1108/JMB-08-2022-0039>
- Majumder, S. C. (2016). Inflation and its impacts on economic growth of Bangladesh. *American Journal of Marketing Research*, 2(1), 17-26.
- McMahon, M., Schipke, A., & Xiang, L. (2019). Monetary policy communication: Frameworks and market impact. *The Future of China's Bond Market*, 295.
- Munir, M., Tufail, S., & Ahmed, R. M. (2023). REVISITING THE ROMER'S HYPOTHESIS AND OPENNESS AND INFLATION RELATIONSHIP FOR PAKISTAN. *Gomal University Journal of Research*, 39(1), 91-104.
- Musa, A. M. A. (2023). Assessment of some economic factors affecting inflation in Sudan: An econometric study. 05(01). doi:<https://doi.org/10.53022/oarjet.2023.5.1.0066>
- Nelson, C. R. (1976). Inflation and rates of return on common stocks. *The journal of Finance*, 31(2), 471-483. doi:<https://doi.org/10.1111/j.1540-6261.1976.tb01900.x>
- Ng, M. C., & Geetha, C. (2020). THE IMPACT OF MONETARY VARIABLES ON EXCHANGE RATE IN MALAYSIA FROM 2013 UNTIL 2015. *Malaysian Journal of Business and Economics (MJBE)*, 7(2), 215-215. doi:<https://doi.org/10.51200/mjbe.vi.2893>
- Nwinee, B. F., & Olulu-Briggs, O. V. (2016). Trade openness, financial development, and the Nigerian economy. *American International Journal of Contemporary Research*, 6(3), 170-183.
- O'Sullivan, M. (2003). The political economy of comparative corporate governance. *Review of International Political Economy*, 10(1), 23-72. doi:<https://doi.org/10.1080/0969229032000048899>
- Okeke, C. C. (2023). The Impact of Money Supply on Inflation in Nigeria (1981-2021). *European Journal of Theoretical and Applied Sciences*, 1(5), 236-253. doi:[https://doi.org/10.59324/ejtas.2023.1\(5\).16](https://doi.org/10.59324/ejtas.2023.1(5).16)
- Pandiangan, S. M. T., Wau, L., Ariawan, A., Napu, F., & Nuryanto, U. W. (2023). The Role of Business Education in the Implementation of Financial Check List in Financial Management Courses. *Edumaspul: Jurnal Pendidikan*, 7(1), 174-179.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, 16(3), 289-326. doi:<https://doi.org/10.1002/jae.616>
- Pigou, A. C. (1947). Economic progress in a stable environment. *Economica*, 14(55), 180-188. doi:<https://doi.org/10.2307/2549787>
- Qamri, G. M., Haq, M. A. U., & Akram, F. (2015). The impact of inflation on stock prices: Evidence from Pakistan. *Microeconomics and Macroeconomics*, 3(4), 83-88. doi:<https://doi.org/10.5923/j.m2economics.20150304.01>



- Qamri, G. M., Sheng, B., Adeel-Farooq, R. M., & Alam, G. M. (2022). The criticality of FDI in Environmental Degradation through financial development and economic growth: Implications for promoting the green sector. *Resources Policy*, 78(9), 102765. doi:<https://doi.org/10.1016/j.resourpol.2022.102765>
- Schiffrin, A., & Fagan, R. (2013). Are we all Keynesians now? The US press and the American Recovery Act of 2009. *Journalism*, 14(2), 151-172. doi:<https://doi.org/10.1177/1464884912458663>
- Shafiullah, M., Miah, M. D., Alam, M. S., & Atif, M. (2021). Does economic policy uncertainty affect renewable energy consumption? *Renewable Energy*, 179(12), 1500-1521. doi:<https://doi.org/10.1016/j.renene.2021.07.092>
- Singh, N., Vaish, B., & Singh, S. (2015). Three level supply chain model with variable demand rate under partial trade credit policy. *International Journal of Services and Operations Management*, 21(4), 479-503. doi:<https://doi.org/10.1504/IJSOM.2015.070254>
- Sudaryanto, S., N ARI SUBAGIO, N., Awaliyah, I. N., Wulandari, D., & Hanim, A. (2019). Influence of brand image, price and promotion on consumer's buying decision of fast moving consumer's goods with culture as a moderating variable in basmallah retail store in Indonesia.
- Sultana, N., Koli, R., & Firoj, M. (2019). Causal relationship of money supply and inflation: A study of Bangladesh. *Asian Economic and Financial Review*, 9(1), 42-51. doi:<https://doi.org/10.18488/journal.aefr.2019.91.42.51>
- Tule, M. K., Okafor, P. N., Ajilore, T. O., Afangideh, U. J., & Udoh, E. A. (2017). GDP REBASING AND IMPLICATIONS FOR MONETARY FOR MONETARY POLICY IN NIGERIA. *WEST AFRICAN FINANCIAL AND ECONOMIC REVIEW*, 71.
- Valogo, M. K., Duodu, E., Yusif, H., & Baidoo, S. T. (2023). Effect of exchange rate on inflation in the inflation targeting framework: Is the threshold level relevant? *Research in Globalization*, 6(6), 100119. doi:<https://doi.org/10.1016/j.resglo.2023.100119>
- Wulandari, C. R., & Ajija, S. R. (2023). IMPACT OF COVID-19 CASES ON INFLATION IN ASEAN. *Journal of Developing Economies (JDE)*, 8(2). doi:<https://doi.org/10.20473/jde.v8i2.45863>
- Yolanda, Y. (2017). Analysis of factors affecting inflation and its impact on human development index and poverty in Indonesia.