

Analysis of the Relationship between Inflation, Budget Deficit, and Money Supply in Sri Lanka

W. C. L. Weerakkody

Department of Social Statistics, University of Kelaniya
chathurikalakshani97@gmail.com

Abstract

Price stability, or maintaining a low and stable inflation rate, is a primary objective of an economy. Several variables can impact inflation. It is essential to identify those factors that control inflation. Therefore, this study focuses on the relationships among inflation, the budget deficit, and the money supply in Sri Lanka, using annual time-series data from 1972 to 2021. In there, the inflation rate (CPI), the budget deficit as a percentage of GDP (BD), and the consolidated broad money supply as a percentage of GDP (M2b) are considered. Using the Autoregressive Distributed Lag (ARDL) modeling approach, the relationship has been examined, considering the inflation rate as the dependent variable and the budget deficit and money supply as independent variables. According to the findings, there is a significant positive relationship between inflation and budget deficit in Sri Lanka, while the money supply has an insignificant negative relationship with inflation. Further, the study has made some recommendations, including whether the government can reduce its expenditure, especially in unproductive sectors of the economy. The government can increase its income by strengthening revenue-generating mechanisms, such as taxes. Further, necessary actions should be taken to increase the national production to accelerate economic growth. On the other hand, the monetary authorities in Sri Lanka, especially the Central Bank of Sri Lanka, should take fiscal reforms into account when conducting monetary policy.

Keywords: *Inflation Rate, Budget Deficit, Money Supply, Sri Lanka, Autoregressive Distributed Lag (ARDL)*

Introduction

Among the key objectives of central banks worldwide, price stability is an important one. Price stability indicates the maintenance of low and stable inflation in the country. Then, inflation plays a key role in stimulating economic development. On the other hand, government budgeting also attempts to stabilize the economy by controlling government revenue and expenditure. (Devapriya, 2012).

A budget deficit occurs when government expenditure exceeds government revenue. (Barone, 2022). The inflationary impact depends on how the budget deficit is financed. If the government finances the budget deficit through bond sales, this may lead to inflation due to monetary expansion. (Sahin, 2019). Further, governments may borrow more to finance the budget deficit, thereby increasing the money supply. Then, an increase in the money supply causes inflation. The budget deficit can also be financed by printing money. It also affects the money supply and inflation. (Pettinger, 2016).

Therefore, this study investigates the relationship between the budget deficit, the money supply, and inflation in Sri Lanka from 1972 to 2021. That is because identifying the

relationship among these three variables helps manage the budget deficit properly and thereby reduces the inflationary impact on the economy.

Theoretical Background

According to Milton Friedman, an economist, inflation is always and everywhere a monetary phenomenon. As he said, a country's monetary authority should maintain a sustainable inflation rate by controlling the money supply. As some policymakers indicated, not only the money supply but also government budget deficits can be inflationary, depending on the method of financing. (Devapriya, 2012). Further, according to him, inflation is generated to achieve public-sector policy goals, such as generating government revenue, preventing unemployment, and increasing production. (Sahin, 2019). From that perspective, fiscal policy can also help control a country's inflation rate. (Devapriya, 2012).

Keynesian theorists argue that budget deficits affect interest rates, private investment, and inflation through monetary policy and aggregate demand and supply. (Devapriya, 2012). In addition, Keynes has indicated that budget deficits arising from increases in public expenditures or decreases in tax revenues raise total demand and thus affect inflation. (Sahin, 2019). Monetarists argue that government budget deficits affect the money supply positively and, through financing methods, inflation. (Devapriya, 2012).

According to the fiscal theory of the price level (FTPL), introduced by Leeper (1991), Sims (1994), and Woodford (2001), the long-run price level is determined by fiscal deficits and public debt stocks. Further, as indicated, when the overall price level increases, public debt decreases. Therefore, an increase in the budget deficit leads to a rise in total demand, with public expenditure and the inflation rate rising as well. It indicates that the financing method for public expenditure determines the inflation rate. (Sahin, 2019).

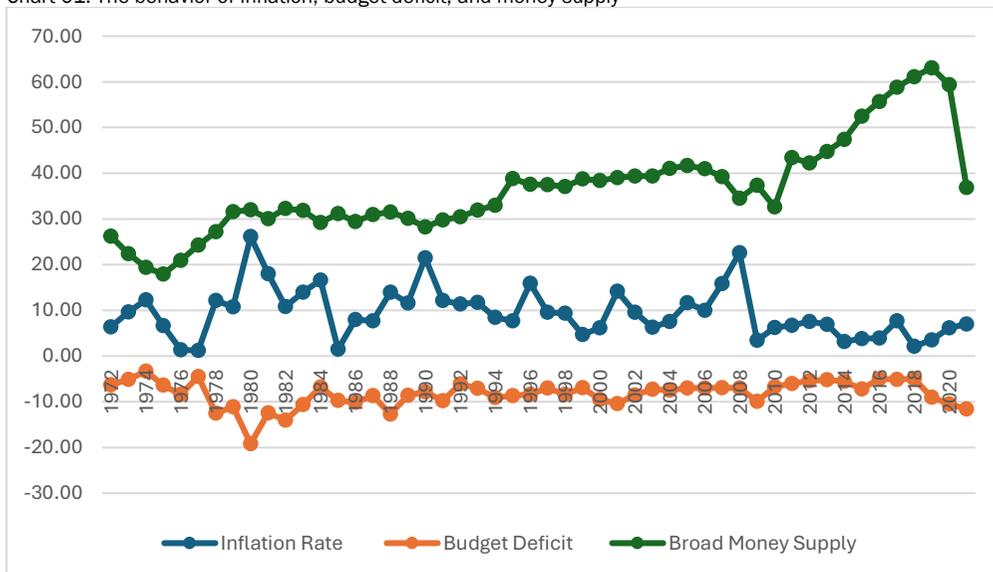
Overview of the budget deficit, money supply, and inflation in Sri Lanka

Like most developing countries, Sri Lanka has high inflation and large budget deficits. Therefore, it suggests the link between inflation and the budget deficit. For the last 50 years (1972 -2021), the behavior of inflation, the budget deficit (as % of GDP), and the broad money supply (as % of GDP) of Sri Lanka is indicated in the following charts.

According to Chart 01, all three inflation rates, the budget deficit, and the broad money supply show fluctuations from 1972 to 2021.

When it comes to the budget deficit, the highest (19.2) was reported in 1980, while the lowest (3.3) was in 1974. Over the last five years (2016 to 2021), the budget deficit has increased gradually. Moreover, the inflation rate was highest in 1980 and lowest in 1977, while the broad money supply was highest in 2019 and lowest in 1975.

Chart 01: The behavior of inflation, budget deficit, and money supply



Source: Central Bank of Sri Lanka

Table 01: Average inflation rate, average budget deficit, and average broad money supply

Period	Average Inflation Rate	Average Budget Deficit as a % of GDP	Average Broad Money Supply as a % of GDP
1972 - 1981	10.44	8.92	25.19
1982 - 1991	11.78	9.88	30.46
1992 - 2001	9.92	8.16	36.26
2002 - 2011	9.99	7.38	38.96
2012 - 2021	5.19	6.95	52.18

Source: Created by the author

The summarized data on the inflation rate, budget deficit, and broad money supply for the last 50 years are shown in Table 01. According to Table 01, both the inflation rate and the budget deficit increased from 1972 to 1991. While the budget deficit shows a gradual decrease from 1992 to 2021, the inflation rate first decreased from 1992 to 2001 and then decreased again from 2012 to 2021 after increasing from 2002 to 2011. The broad money supply in Sri Lanka has increased gradually from 1972 to 2021.

Given the above behavior of the inflation rate, the budget deficit, and the broad money supply, it is important to identify the relationships among these three variables.

Literature Review

Several studies examine the relationships among inflation, budget deficits, and the broad money supply across countries. The relationships among those variables vary by country. In 2022, a study titled “Money supply, budget deficit and inflation dynamics in Ghana: An empirical investigation” was conducted. As indicated, inflation is a key macroeconomic indicator because it affects people’s investments, consumption, and savings. As well as affecting budget allocation and ultimately retard economic growth. According to this study’s findings, there is a unidirectional causal relationship running from the money supply, the budget deficit, and real income to inflation. There is also a unidirectional causal relationship that runs from the money supply to the budget deficit. In addition to

indicating that the money supply has a significant negative relationship with inflation, the budget deficit is found to exert a significant positive effect on inflation in Ghana. This study has some policy implications for the government and for countries with characteristics similar to Ghana's. The positive effect of the budget deficit on inflation suggests that reducing government spending in unproductive sectors of the economy would lower inflation. In addition, the study indicated that policymakers should focus on the budget deficit rather than the money supply (Duodu, 2022).

An increase in the budget deficit leads to higher loan volumes and interest rates. Then, with an increase in the money supply, inflation rises. A study conducted by Sahin to examine the relationship among the money supply, inflation rate, and budget deficit in Turkey indicates that the budget deficit has a positive and significant effect on inflation in both the short- and long-term. Therefore, monetary policy and fiscal discipline are both important in combating inflation. This study then suggested harmonizing monetary and fiscal policy and accelerating structural reforms to reduce inflation. (Sahin, 2019). Research titled "Budget deficits, money growth and inflation: the Turkish evidence" indicates that monetization of budget deficits can be a primary cause of inflation, especially in developing countries. According to the findings of this study, the long-run currency growth-inflation relationship with budget deficits has no significant role. Moreover, it has also indicated that broad money growth increases with budget deficits and inflation. (Koru, 2019).

Based on the West African Economic and Monetary Union (WAEMU), a study has been conducted on "Oil Price, Budget Deficit, Money Supply and Inflation in WAEMU Countries". According to this study, inflation in WAEMU countries depends on volatile oil prices, imported inflation, food production, and weather vagaries. According to this research's findings, there is a positive and significant relationship between budget deficits and price levels in Burkina Faso and Niger. As the study notes, the budget deficit shows a positive, insignificant relationship with the price level in Benin and Mali. In contrast, the negative relationship between the budget deficit and the price level in Côte d'Ivoire, Senegal, and Togo indicates that deficits decrease prices in these countries. On the other hand, in Burkina Faso, Mali, and Togo, there is a positive relationship between monetary expansion and price level. (Herve, 2018).

In 2018, research on the topic "Causality Analysis between Inflation, Budget Deficit and Money Supply: Empirical Evidence from Bangladesh" indicated that budget deficits are a common feature in underdeveloped countries. The budget deficit puts pressure on the money supply, which, in turn, leads to inflation. With that in mind, monetary policy tools may be ineffective in controlling inflation. The findings from the Granger Causality test and the vector error-correction model indicate a unidirectional causal relationship running from the budget deficit to inflation in the short run. In contrast, no causality is found between the money supply and inflation in both the short- and long-run (Murshed, 2018). Based on some Asian economies, Nguyen has indicated that most Asian countries have relatively high budget deficits and a money supply that has increased due to increased government expenditure to accelerate economic growth and create employment. According to this study's findings, the broad money supply (M2) has a significantly positive impact on inflation in Asian economies. When it comes to the policy implications that have been indicated in this study, it says that when applying the fiscal and monetary policies to foster the economy, governments of Asian countries should be careful with money supply, fiscal deficit, government expenditure, and interest rate, because they can contribute to high inflation for the economy. (Nguyen, 2015).

“Inflation, Budget Deficit and Money Supply in Nigeria: A New Outlook” is a 2013 study that notes that Nigeria has had a consistent budget deficit and relatively high inflation since the 1980s. With government expenditure expanding, Nigerian inflation has risen into double digits. As this study’s findings revealed, the relationships between inflation, the budget deficit, the interest rate, and the lag of inflation are negative. In contrast, the relationship between inflation and the exchange rate is positive. Also, the inflation rate in the preceding period had a significant impact on the following period. The policy implication of these was that, since all the estimated variables are monetary phenomena, adequate monetary policy should be employed to balance the role of the money supply in the budget deficit and interest rates, and, consequently, to moderate inflation and stabilize the economy. (Odeleye, 2013).

In 2011, research was conducted titled “Budget Deficit and Inflation: A Sensitivity Analysis to Inflation and Money Supply in Iran”. It has been mentioned that, while the government budget deficit may cause higher inflation, government expenditure and revenue, and therefore the government budget deficit, are themselves affected by the inflationary process. Further, it is indicated that in countries where seigniorage is an important component of government finance, the government budget deficit and inflation are empirically linked. In contrast, in countries with independent monetary authorities, the link between budget deficit and inflation is weak. As this study’s findings reveal, the budget deficit has a positive and significant impact on monetary variables and, in turn, on inflation. Further, the price index has a positive and significant impact on the budget deficit (Samimi, 2011).

When it comes to Ethiopia, research has been done on the topic of “BUDGET DEFICITS, MONEY AND INFLATION: THE CASE OF ETHIOPIA” in 2008. In this study, the researcher has mentioned that large and persistent budget deficits are the root cause of monetary expansion, persistent inflation, and macroeconomic instability. In addition to that, especially in developing countries, the public sector “far from being the ‘balancing factor’..., has often been an accomplice - if not the main culprit - in generating major macroeconomic imbalances”. Using the bounds test approach, a modified version of the Granger causality test, the dynamic ordinary least squares (DOLS), and the fully modified ordinary least squares (FMOLS), the study has revealed that there was a long-run cointegrating relationship among the series with a unidirectional Granger causality running from money supply to inflation and from budget deficits to inflation. In contrast, fiscal policy does not appear to affect the growth of the money supply. The implication is that fiscal balance and control of the money supply are essential policy tools for long-run macroeconomic stability in Ethiopia. (Rufael, 2008).

Methodology

Data set and Model

This is a quantitative study that uses annual time-series data on inflation, the money supply, and the budget deficit in Sri Lanka from 1972 to 2021 (50 years) to identify the relationships among these three variables.

These data are collected from the Central Bank of Sri Lanka, the World Bank, and the Ministry of Finance, Economic Stabilization, and National Policies. By using these data to identify the relationship, the data are defined as follows.

Dependent Variable

Inflation Rate - INF

Simply put, inflation is the rate of increase in prices. Maintaining low and stable inflation is the key objective of an economy's monetary authorities, aimed at achieving price stability. For this study, the annual inflation rate is based on the consumer price index.

Independent Variables

Money Supply - M2b

The consolidated broad money supply as % of GDP is used for this study. In Sri Lanka, the consolidated broad money includes currency held by the public, demand deposits held by the public with commercial banks, time and savings deposits held by the public with commercial banks, and a portion of commercial banks' foreign currency deposits.

Budget Deficit - BD

When the government expenditure exceeds the government revenue, a budget deficit occurs. This affects a country's financial health. The annual budget deficit as % of GDP is used for this study to analyze.

The model in which the relationship between inflation, money supply, and budget deficit has been investigated is as follows:

$$INF_t = \alpha_0 + \alpha_1 M2b_t + \alpha_2 BD_t + u_t$$

Research Methodology

To analyze the long-term relationships between variables, cointegration tests are used. Commonly, the Johansen Cointegration Test and the Granger Cointegration Test are used as they are equally stationary. However, the variables used in this study's model become stationary at different levels. Therefore, the ARDL (Autoregressive Distributed Lag) is used for this study. The ARDL model is used to describe the cointegration relations among series with different degrees of root causes.

The hypotheses of the study are as follows.

H0: There is no significant relationship between the lag values of inflation (INF), the budget deficit (BD), and money supply (M2b).

H1: There is a significant relationship between the lag values of inflation (INF), the budget deficit (BD), and money supply (M2b).

The model first specified the unrestricted error-correction model. Thus, the F test is applied to the lags of the dependent and independent variables to test for cointegration. The test statistics in the model are based on the Wald or F test, which yields common significance levels.

In there, the computed F statistic is compared with the critical values provided by Pesaran et al. (2011). If the computed F statistic is greater than the critical value, the null hypothesis is rejected; on the other hand, if the F statistic is less than the critical value lower bound, the null hypothesis is accepted, indicating there is no cointegration between variables. If the F statistic is between the upper bound and lower bound, no decision is made.

Unit Root Test

The variables must be stationary to identify significant relationships. Due to the non-stationary variables, a false regression issue can arise. Therefore, unit root tests are used to check for stationarity (i.e., a constant mean and a constant variance over time). In there, according to the Augmented Dickey-Fuller (ADF) test, the null hypothesis is that the variables are non-stationary, while the alternative hypothesis is that they are stationary.

Analysis and Findings

The objective of this research is to analyze the relationship between inflation, the budget deficit, and the money supply in Sri Lanka. To achieve this objective, two hypotheses are tested using the ARDL model. As mentioned in the research methodology, the hypotheses are as follows.

H0: There is no significant relationship between the lag values of inflation (INF), the budget deficit (BD), and money supply (M2b).

H1: There is a significant relationship between the lag values of inflation (INF), the budget deficit (BD), and money supply (M2b).

In there, inflation is the dependent variable, while the budget deficit and the money supply are the independent variables.

Descriptive Statistics for the Data

According to Table 1, the broad money supply in Sri Lanka has averaged 36.6% of GDP over the last 50 years. The budget deficit shows a mean of 8.3.

Table 02: Descriptive Statistics

	M2b	BD
Mean	36.61030	8.258000
Median	35.70642	7.650000
Maximum	63.08525	19.20000
Minimum	17.94634	3.300000
Std. Dev.	10.41642	2.845267
Skewness	0.799793	1.261615
Kurtosis	3.465524	5.806365
Jarque-Bera	5.782056	29.67162
Probability	0.055519	0.000000
Sum	1830.515	412.9000
Sum Sq. Dev.	5316.592	396.6818
Observations	50	50

Source: Survey Data

Model Specification

Unit Root Test

Time series data must be stationary, meaning it has a constant mean and variance over time, to increase the generalizability of its findings. Here, the Unit Root test is used to assess the data's stationarity.

The results obtained by checking stationarity using the Augmented Dickey-Fuller (ADF) test for the original data are as follows.

Table 03: ADF Unit Root Test Results

Variable	ADF Test Statistics Level
INF	0.0007
M2b	0.0186
BD	0.0192

Source: Survey Data

In there, the P value of the F-statistic should be less than 0.05 to reject the null hypothesis, which indicates that there is a unit root. Then, according to Table 03, all variables are stationary at the data level.

Checking the Multicollinearity

Multicollinearity is the occurrence of high intercorrelations among two or more independent variables. When there is multicollinearity among the independent variables, it can complicate the interpretation of the results.

Table 04: Checking the multicollinearity

Coefficient Variance	Uncentered VIF
0.075091	1.000000

Source: Survey Data

Since the VIF is less than 4, there is no multicollinearity among the independent variables.

Identification of the most suitable ARDL model

Table 05: Most suitable ARDL model estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF (-1)	0.211179	0.136815	1.543532	0.1297
M2b	-0.107300	0.070966	-1.511993	0.1375
BD	0.629014	0.251801	2.498060	0.0162
C	6.250580	3.912303	1.597673	0.1171
R-squared	0.278019	Mean dependent var		9.528494
Adjusted R-squared	0.229887	S.D. dependent var		5.488726
S.E. of regression	4.816691	Akaike info criterion		6.060159
Sum squared resid	1044.023	Schwarz criterion		6.214593
Log likelihood	-144.4739	Hannan-Quinn criterion.		6.118751
F-statistic	5.776173	Durbin-Watson stat		1.991883
Prob(F-statistic)	0.001981			

Source: Survey Data

In the estimation, the dynamic regressors are inflation (INF) and money supply (M2b), while the fixed regressor is the budget deficit (BD).

Since the regression output indicates that the ARDL(1,0) model is best, the equation can be written as follows.

$$INF = 6.250580 + 0.211179 INF(-1) - 0.107300 M2b + 0.629014 BD$$

Checking the Long Run Relationship

Bound Test

The bound test is an econometrics method used to capture short- and long-run causal relationships. In this study, the bound test has been used to identify the long-run relationship among inflation, the money supply, and the budget deficit.

Table 06: Bound Test for the Long-Run Relationship

Test Statistic	Value	K
F-statistic	10.73446	1
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.02	3.51
5%	3.62	4.16
2.5%	4.18	4.79
1%	4.94	5.58

Source: Survey Data

According to Table 06, the calculated F statistic (10.73446) exceeds the 10%, 5%, 2.5%, and 1% significance levels. Then, a long-run relationship between the dependent variable (INF) and the independent variables (M2b, BD) can be indicated.

Table 07: Level Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BD	0.655791	0.255173	2.569980	0.0136
M2b (-1)	-0.059995	0.070752	-0.847960	0.4009
C	4.011871	3.825281	1.048778	0.2999

Source: Survey Data

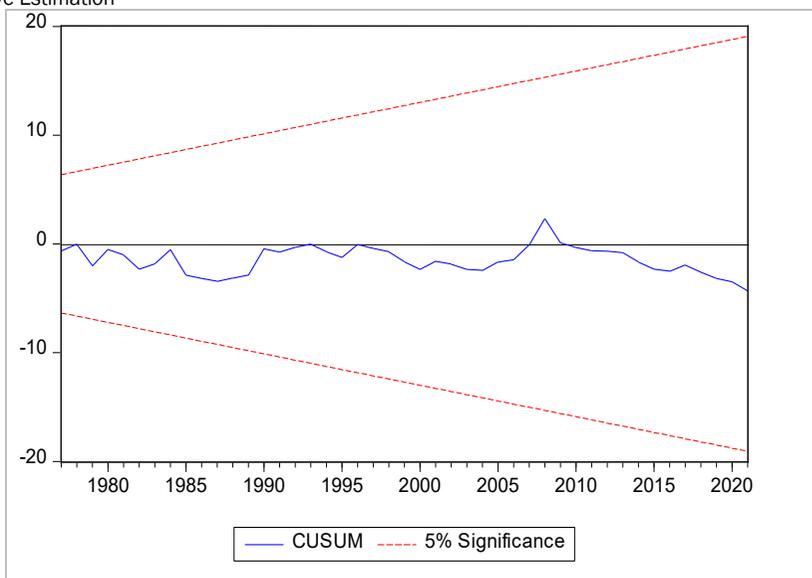
According to the coefficient values, Budget Deficit (BD) has a positive coefficient (0.655791), which is significant at 5% significance level (as 0.0136 < 0.05). It can be concluded that the Sri Lankan budget deficit has a significant positive impact on inflation. That means when the budget deficit increases by 1%, the inflation increases by 65%. The broad money supply (M2b) has an insignificant effect on Sri Lankan inflation at the 5% significance level.

Residual Diagnostics

Stability Diagnostic Test

To confirm the reliability of the ARDL estimate, the cumulative sum of squares test can be used.

Chart 02: Recursive Estimation



Source: Survey Data

As the recursive residuals are within the 5% significance boundaries, the selected ARDL model is stable.

Serial Correlations of Error Terms

Table 08: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.004018	Prob. F (1,44)	0.9497
Obs*R-squared	0.004474	Prob. Chi-Square (1)	0.9467
Test Equation:			
Dependent Variable: RESID			
Method: ARDL			
Date: 12/06/22 Time: 09:30			
Sample: 1973 2021			
Included observations: 49			
Pre-sample missing value lagged residuals set to zero.			
Variable	Coefficient	Std. Error	t-Statistic
INFLATION_RATE (-1)	0.019750	0.340909	0.057933
BROAD_MONEY_SUPPLY	0.003024	0.086174	0.035092
BUDGET_DEFICIT	-0.007420	0.280255	-0.026477
C	-0.235818	5.430718	-0.043423
RESID (-1)	-0.023720	0.374208	-0.063388
R-squared	0.000091	Mean dependent var	-6.43E-16
Adjusted R-squared	-0.090809	S.D. dependent var	4.663741
S.E. of regression	4.870896	Akaike info criterion	6.100884
Sum squared resid	1043.928	Schwarz criterion	6.293927
Log likelihood	-144.4717	Hannan-Quinn criterion.	6.174124
F-statistic	0.001005	Durbin-Watson stat	1.988486
Prob(F-statistic)	0.999998		

Source: Survey Data

To check the serial correlation, the Breusch-Godfrey Serial Correlation LM Test is used. The null hypothesis is that there is no serial correlation, and since the P-value is greater than 0.05, it indicates that there is none in the error terms.

Heteroskedasticity

Heteroskedasticity violates the assumption that the error variance is constant. To test for heteroskedasticity in this ARDL model, the Breusch-Pagan-Godfrey test is used. In there, the null hypothesis is that heteroskedasticity exists.

Table 09: Breusch- Pagan- Godfrey Test

F-statistic	2.056926	Prob. F (3,45)	0.1194	
Obs*R-squared	5.909000	Prob. Chi-Square (3)	0.1161	
Scaled explained SS	7.059734	Prob. Chi-Square (3)	0.0700	
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 12/06/22 Time: 09:28				
Sample: 1973 2021				
Included observations: 49				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.06187	28.50497	0.668721	0.5071
INFLATION_RATE (-1)	1.619889	0.996832	1.625037	0.1111
BROAD_MONEY_SUPPLY	-0.523718	0.517055	-1.012886	0.3165
BUDGET_DEFICIT	0.737030	1.834618	0.401735	0.6898
R-squared	0.120592	Mean dependent var	21.30659	
Adjusted R-squared	0.061965	S.D. dependent var	36.23491	
S.E. of regression	35.09432	Akaike info criterion	10.03206	
Sum squared resid	55422.50	Schwarz criterion	10.18650	
Log likelihood	-241.7855	Hannan-Quinn criterion.	10.09066	
F-statistic	2.056926	Durbin-Watson stat	1.836789	
Prob(F-statistic)	0.119361			

Source: Survey Data

Since the P-value is greater than 0.05, heteroskedasticity is present in this model.

Conclusion

Maintaining price stability, which involves keeping inflation low and stable, is a primary objective of an economy. Several variables can impact inflation. It is essential to identify those factors that control inflation.

Therefore, this study examines the relationships among inflation, the budget deficit, and the money supply in Sri Lanka, using annual time-series data from 1972 to 2021. There, the inflation rate according to the consumer price index (CPI), the budget deficit as % of GDP (BD), and the consolidated broad money supply as % of GDP (M2b) are considered. Using the Autoregressive Distributed Lag (ARDL) modeling approach, the relationship has been examined, considering the inflation rate as the dependent variable and the budget deficit and money supply as independent variables.

According to the findings, there is a significant positive relationship between inflation and budget deficit in Sri Lanka, while the money supply has an insignificant negative relationship with inflation.

Recommendations

Based on the findings of this study, it can be said that although the monetary authorities have conducted monetary policy to control inflation by affecting the money supply, the fiscal policy has been a major cause of inflation in Sri Lanka over the last 50 years.

Here are some recommendations to control inflation in Sri Lanka through fiscal measures. The government can reduce its expenditure, especially on unproductive sectors of the economy. The government can increase its income by strengthening its income-generating mechanisms, such as taxation. Further, necessary actions should be taken to increase the national production to accelerate economic growth. On the other hand, the monetary authorities in Sri Lanka, especially the Central Bank of Sri Lanka, should take fiscal reforms into account when conducting monetary policy.

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