MENTOR | The Journal of Business Studies
Faculty of Commerce and Management, Eastern University, Sri Lanka
JBS

THE NEXUS BETWEEN INFLATION AND MONEY SUPPLY IN SRI LANKA: AN ARDL BOUNDS TEST

S.J. Francis,[a*] B.M.A. Basnayake[b], C. T. Danthanarayana[c]
[abc]Department of Economics, University of Colombo.

Received: 12th January 2024

Reviced: 10th April 2024

Accepted: 01st May 2024

Published: 26th August 2024

Keywords:

ARDL model
Error correction model
Inflation
Money Supply

ABSTRACT

Monetary tools, money supply, and exchange rates play a significant role in a country's growth and significantly impact its development trajectory. Sri Lanka is currently concerned about high inflation. Inflation is a monetary phenomenon, and it has been caused by monetary policies in several nations. The relationship between money supply and inflation has been a topic of enduring interest and debate in economics. This paper aims to investigate the examine the causal relationship between money supply and inflation. This empirical study analyses short run and long run relationship between inflation and money supply, during 1978-2023 in Sri Lanka. Annual data for the period 1978-2023, obtained from annual reports of Central Bank of Sri Lanka were used for this study. This study employs Autoregressive Distributed Lag (ARDL) Bounds test to identify the long run and short run relationship between inflation and its causes. The findings of the study indicate that nominal exchange rate has both short run and long run relationships with inflation while nominal money supply and nominal interest rate have a long run relationship with inflation but not a short run relationship.According to results of the study, money supply and inflation have a positive relationship in the long run. Thus, classical quantity theory of money and Cambridge equation as well as monetarist view on inflation is valid in the long run in Sri Lanka. When considering the nexus between inflation and interest rate, it is concluded to have a positive relationship in Sri Lankan context. A positive relationship can be seen in between nominal exchange rate and inflation in both short term and long term. Therefore, in order to achieve price stability, proper control over monetary policy and proper management of exchange rates are important.

**Corresponding joseph@econ.cmb.ac.lk*

1. Introduction

"Money also referred to as the money supply, is defined as anything that is generally accepted as payment for goods or services or in the repayment of debts" (Mishkin, 2019). Money plays a huge role in an economy as a medium of exchange, a unit of account, and a store of value. In Sri Lanka, the

Central Bank of Sri Lanka (CBSL) influences the money supply using monetary policy instruments such as Statutory Reserve Ratio, Open Market Operations, and Interest rates. According to Classical economists, money supply (monetary aggregate) acts a huge role in determining interest rates which influence the financial sector of an economy while according to Keynesians, the money supply can influence the real sector in the short term as well. Inflation is the continuous increase in price levels that has an impact on individuals, businesses, and the government (Mishkin, 2019). The fundamental form of inflation is an imbalance between aggregate demand and aggregate supply both of these are considered feeds, with a greater nominal solvent artificially supported, in comparison to the real offer of products in a given period. Usually, when inflation occurs fixed income earners, savers, and lenders are worse off while borrowers are better off. Higher inflation can adversely affect the economy in general as inflation causes losing value and faith in money (Ciumara & Ciutacu, 2003).

In the past few decades, inflation has become a prominent topic, influencing headlines in newspapers and capital talk shows in various countries. This issue is not exclusive to developing countries; it affects both developing and developed countries equally. The impact of inflation on an entire economy is significant, especially on aspects like growth and unemployment, and it creates uncertainty among individuals (Steindel *et al.,* 2000). In any economy, price stability is one of the main goals of monetary policy and one of the major pillars for macroeconomic stability which affects economic growth and development, the climate of investments, external stability, etc. Price stability means a lower level of inflation; inflation at less than 5 percent. The classical and monetarist theories highly believe in a strong causal relationship between money supply and inflation while Keynesian and Institutional Economics theories do not heavily emphasize the relationship between money supply and inflation. It is important to examine the possible causal relationship between the growth of money supply and inflation since the price stability of a country is an important pillar of its economic development.

The objective was to examine the causal relationship between money supply and inflation in Sri Lanka, during 1978 -2023. Money supply and volatility inflation are most frequently discussed in the current context of Sri Lanka. With the increasing inflation rate and food inflation along with the expansionary monetary policy implemented by the CBSL as the bank of the government the relationship between money supply and inflation gained high attention. The reason for the selected time period is, in 1977 Sri Lanka opened the economy to foreign trade. Therefore, since 1978 not only internal factors but external factors (foreign exchange rate, level of imports) could also influence inflation. Thus, studying the relationship between money supply and inflationfrom 1978 until 2023 will be useful to systematically explain the prevailing discourses as well. Even though there are numerous studies have been done in this arena, it was observed that major shocks that affected Sri Lankan economy and society have been neglected. The Covid-19 (2020-2023), and economic and political crisis in 2023 are some major shocks that affected Sri Lankan economy during the past decades. In this study (CBSL), dummy variables will be created to capture the impact of such shocks.

2. Literature Review

Theoretical Framework

There are numerous theories and views on the nexus between inflation and money supply. Recent theories of inflation, developed in the past few years, highlight the significance of factors such as political stability, policy credibility, government reputation, and political cycles in elucidating and determining inflation. Additionally, a substantial body of research has focused on investigating the impact of money supply on inflation. Among them, Classical, Keynesian and Monetarists theories and views are noteworthy. Economic theory has shown the existence of a connection between the existing level of money in circulation and the general price level. Thus, there is a consensus among the different schools of thought that the level of liquidity in the economy has a causal relationship with inflation. Classical economists, for instance, held that changes in the supply of money exert proportionate change in prices (ceteris paribus), just as Keynesians believe that excess aggregate demand, which outpaces the economy's productive capacity following an increase in cash balances, drives inflation (Humphrey, 1975) and (Ireland, 2014).

The quantity theory of money (QTM) is one of the earliest classical explanations that explains a one-for-one relationship between money supply and inflation. Classicaleconomists viewed money as merely a medium of exchange and neglected the other roles of money. The QTM is built upon this view. In addition, Classical economists assume money supply is perfectly under the control of monetary authority. There are two versions of QTM; Fisher's velocity approach and cash-balance (Cambridge) approach. Using Fisher's equation of exchange, the association between monetary aggregates and inflation can be expounded.

MV=PT…….....(01)

Where M is money supply, V is velocity; the average number of times that one unit of currency changes hands in purchasing the output of the economy, P is price index of all commodities sold and T is the quantities of all goods sold during the period.It was predicted that V and T remain unchanged. The QTM equation is recently expressed in terms of output (GNP) instead of transactions.

$$MV = PY \text{ …….....(02)}$$

Where M is money supply, V is income velocity, P is the GNP price index and Y is real GNP. V and Y are treated as constants. Therefore, Fisher's identity showed a one-for-one, positive connection between M and P. Subsequently, the Cambridge equation was developed to formulate a more satisfactory quantity theory of money.

$$M = kPY \text{……..(03)}$$

Where M, P, and Y are the same as in Fisher's exchange equation while *k* denotes the reciprocal of V in the above equation. Unlike Quantity theorists, Cambridgetheorists considered holding money as an

outcome of the rational choice of theindividuals. The assumptions of the Cambridge theorists are; the average value of *k* is constant in the short and medium run while changes in the long run, can be taken into account with ease, and long run real income level is determined by real factors which implies monetary aggregates do not influence Y in the long term. Therefore, the Cambridge equation also demonstrates the one-for-one, positive relationship between money supply and inflation. Hence, the quantity theory of money under both Fisher's exchange equation andCambridge equation concludes that an increase in money supply will result in an equation proportionate increase in the price level and vice versa.

J.M. Keynes identified the excess demand in the economy as the root cause ofinflation. He recognized aggregate demand as a principal component of the economy. If any economic agent increases its expenditure which results in an expenditure level that is greater than the expenditure level that corresponds to the full employment outputlevel of the economy, inflation will rise due to the excess demand. According to Keynes, public sector spending on war and other interventions which increases the budget deficit is the major reason for inflation. In order to control inflation, the countryshould implement demand management policies. For instance, contractionary fiscal policies like reducing government expenditure and increasing taxes.

Empirical Literature

Table 1. Summary of previous studies

Author/ Year and Country	Period	Methodology	Variables		Conclusion (Findings)
			Dependent variable	Independent variables	
Lim & Sek (2015) USA	1970-2011	ARDL	Inflation	Money supply, national expenditure, imports of goods and services and GDP growth	A positive impact on inflation but money supply implies a negative impact on inflation while in low inflation countrie's GDP growth has a negative impact on inflation imports have a positive impact on inflation.
Gbadebo & Mohammed (2015) Nigeria	1980-2012	ARDL method	Inflation	Money supply, exchange rate, interest rate, oil price and Gross Domestic Production (GDP)	Money supply shows a significant positive impact on inflation both in the short and long run.

Kahssay (2017) Ethiopia	1975-2014	Ordinary Least Squares (OLS) method with co-integration and EC	Inflation	Money supply GDP, credit facility, exports, imports, and gross national saving	Interest rate, exchange rate, money supply and oil-price have a significant long run relations impact on inflation.
Hussain and Zafar (2018) Pakistan	1972-2015	ARDL and Error Correction Model (ECM)	Inflation	Money supply, government expenditure, and economic growth	Its found long run relationship between real government expenditure and economic growth, as well as inflation and economic growth. However, there is no long run relations between money supply and inflation in the short run.
Hicham (2020) Algeria	1970-2018	Co- integration and causality analysis	Inflation	Growth of narrow money supply	without structural breaks there is no long run relationship between variables. However, with structural breaks it is found that there is a long run relationship between variables when the economic growth served as the dependent variable.
Kulatunge (2015) Sri Lanka	2000–2013	VECM approach	Inflation	Exchange rate, money supply, GDP, government expenditure, oil prices and interest rate	exchange rate, money supply, GDP, government expenditure, oil prices and interest rate have a positive impact on inflation in both short and long run.
Jayasooriya (2015) Sri Lanka	1953-2012.	VAR	Inflation	Growth rate of money supply, the growth rate of aggregate output, and budget deficit as a percentage of GDP	Inflation causes to increasing budget deficit. Expansionary monetory policy also increase the budget deficit.

3. Research Methodology

Data Source and Variables description

This study uses annual data for the period from 1978-2023 All the required datawere obtained from annual reports, and economic data published by Central Bank of SriLanka (CBSL. In addition, when collect monthly or quarterly data, the seasonal changes and shocks should be included. With the given time constraint, it is impossible to use monthly or quarterly data from 1978.

In Sri Lanka, price changes are captured by four price indices, namely the Colombo Consumers' Price

Index (CCPI), National Consumers' Price Index (NCPI), Wholesale Price Index (WPI), and GDP deflator. However, for measuring inflation, CCPI which is computed by the Department of Census and Statistics has been utilised as the official price index since 1953. The base year of CCPI was initially 1952 and revised later to 2002, 2006/7 and 2013. However, in this study inflation measured using CCPI with 1952 as the base year is used for the dependent variable. The required data for 2008-2022 were obtained through splicing method. The reason for obtaining the CCPI data for the same base year is; along with the base year, the value of the basket, the weight for each category and the sample also change. Therefore, to ensure the consistency, it is important to obtain CCPI data for one base year. Using the CCPI data, inflation rate is calculated.

For the money supply, different studies use different definitions of monetary aggregates. The nominal money supply will be selected since QTM also emphasized nominal money supply. The broad money supply is selected over narrow money supply (M1). (Ratnasiri, 2009) and (Jayawardana and Jayasinghe, 2016) show that broad money supply is better at predicting inflation than narrow money supply. Even though there are several broad money supply definitions, M2 definition was chosen due to the availability of data for the period of consideration. To capture the influence of exchange rate on inflation, the exchange rate that highly represent the effect on inflation should be chosen (Francis and Ganeshamoorthy, 2017). Although the nominal effective exchange rate (NEER) could perfectly reflect the impact on inflation, due to the unavailability of data nominal exchange rate is selected. The bilateral exchange rate between Sri Lankan rupee and US dollar is used as the nominal exchange rate (Francis and Ganeshamoorthy, 2017). This selection is also consistent with the previous studies of (Cooray, 2008), (Ratnasiri, 2009), (Jayawardana and Jayasinghe, 2016) and (Batarseh, 2021).

The annual overall deficit of government fiscal operations is chosen to represent the budget deficit. The difference between total government revenue including grants and total government expenditure for a given year is used as the budget deficit. In terms of interest rate, even though there are numerous interest rates, the interest rate for 91 days treasury bills at the primary market is employed. The reason for selecting this interest rate is data availability from 1978. This selection is also consistent with previous studies of (Ratnasiri, 2009), (Kulatunge, 2015) and (Otekunrin *et al*., 2022). (Sultana *et al.,* 2018), and (Uddin *et al.,* 2019) have concluded that money supply has a positive, long run impact on inflation. Since the model use natural logarithms of the above variables, the growth of each variable will be considered. For instance, model takes into account the growth of money supply, not absolute money supply values. In addition to above variables, dummy variables have been used to capture the impact of supply shocks on inflation. Inflation is captured by using two dummy variables for the effects of the Covid-19 pandemic, economic crisis, and political instability in 2023.

The Proposed Econometric Model

The Ordinary Least Squares (OLS) technique is used to develop the model. Since the selected macroeconomic variables are more likely to have non-linear relationships, all the variables have been converted into linear form by taking natural log values. The model given by equation (4) is proposed to

analyse the relationship between inflation and money supply, and the determinants of inflation in Sri Lanka.

$$lnP_t = \beta 0 + \beta_1 lnM_t + \beta_2 lnER_t + \beta_3 mBD_t + \beta_4 lnR_t + \beta_5 DC + \beta_6 DEC + Ut \text{......................(04)}$$

Where Pt is price level represented by the Colombo Consumers' Price Index, Mt is nominal broad money supply (i.e. M2), ERt is nominal exchange rate between theSri Lankan rupee and the US dollar, BDt is annual budget deficit of government fiscaloperations, Rt is nominal interest rate, DC, EC are dummy variables to capture impact of Covid-19 pandemic, and economic crisis in 2022 on inflation respectively. Since the model in equation 1 has a possibility of having econometric issues,the first difference of each variable will be taken to avoid the possible econometric issues. The equation 5 shows the model consist of the first difference of each series.

$$\Delta lnPt = \beta 0 + \Delta\beta_1 lnM_t + \Delta\beta_2 lnER_t + \Delta\beta_3 lnBD_t + \Delta\beta_4 lnR_t + \beta_5 DC + \beta_6 DEC + Ut \text{.....................(05)}$$

Autoregressive Distributed Lag (ARDL) Bounds Testing approach has been selected to find and analyse the cointegration between the variables in equation (4). The main advantage of employing ARDL approach is that, while other cointegration approaches require all regressors to be integrated at the same order, ARDL can be employed irrespective of their order of integration (Danthanarayana *et al*., 2024). The key logic behind the ARDL process is that the lags of independent variables and dependent variable can be affect the dependent variables (Francis *et al*., 2021). Therefore, it is important to add lags of independent variables and dependent variable. The model with lagvariables is stated below as equation (6).

$$\Delta lnP_t = \alpha_0 + \theta_0 lnP_{t-1} + \theta_1 lnM_{t-1} + \theta_2 lnER_{t-1} + \theta_3 lnBD_{t-1} + \theta_4 lnR_{t-1} + \sum_{i=1}^{p} \alpha_{1i} \mathrm{d}lnPt{-}1 + \sum_{i=1}^{q} \alpha_{2i} \mathrm{d}ln\mathrm{Mt} - 1 + \sum_{i=1}^{q} \alpha_{3i} \mathrm{d}ln\mathrm{ERt} - 1 + \sum_{i=1}^{q} \alpha_{3i} \mathrm{d}ln\mathrm{BDt} - 1 + \sum_{i=1}^{q} \alpha_{3i} \mathrm{d}ln\mathrm{Rt} - 1 \text{......(06)}$$

In respect of the unrestricted error correction model mentioned in equation (3),the joint null hypothesis to be tested is $\theta 0 = \theta 1 = \theta 2 = \theta 3 = \theta 4 = 0$ which implies absence of a long run association between price level and the explanatory variables included in the model. The statistical significant of coefficients of explanatory variablesis measured using F test. However, in ARDL modeling, the standard critical values of the F statistic is not effective. Pesaran *et al.* (2001) suggests two sets of alternative critical values for each significant levels, based on the level of integration; I (0) or I (1).One set of critical values represents the lower bound which assumes that all independentvariables are I (0) while the other set of critical values represents the upper bound whichassumes that all independent variables are I (1). If the computed F statistic is less than the lower bound, then the null hypothesis cannot be rejected. Alternatively, if the computed F statistic is greater than the upper bound, then the null hypothesis can be rejected and it implies there is a long term relationship between the price level and at least one of the explanatory variables.

However, if the computed F value lies between the lower and upper bound critical values, the inference is said to be inconclusive. In such situations, the order of integration of the variables has to be examined further. Within ARDL cointegration analysis, unit root test and error correction model are also used. Unit root test is a test of stationarity that is mainly use for time-series analysis. This test is used to verify the stationarity of series which eventually use to avoid spurious regression. There are several types of tests under unit root tests and Augmented Dicky-Fuller test is used in this study. Error correction model (ECM) is used to estimate both short run and long run effects of one time on another. In this study,ECM is used to estimate short run effects of one series on another (Gujarati and Porter, 2009).

Conceptual Framework

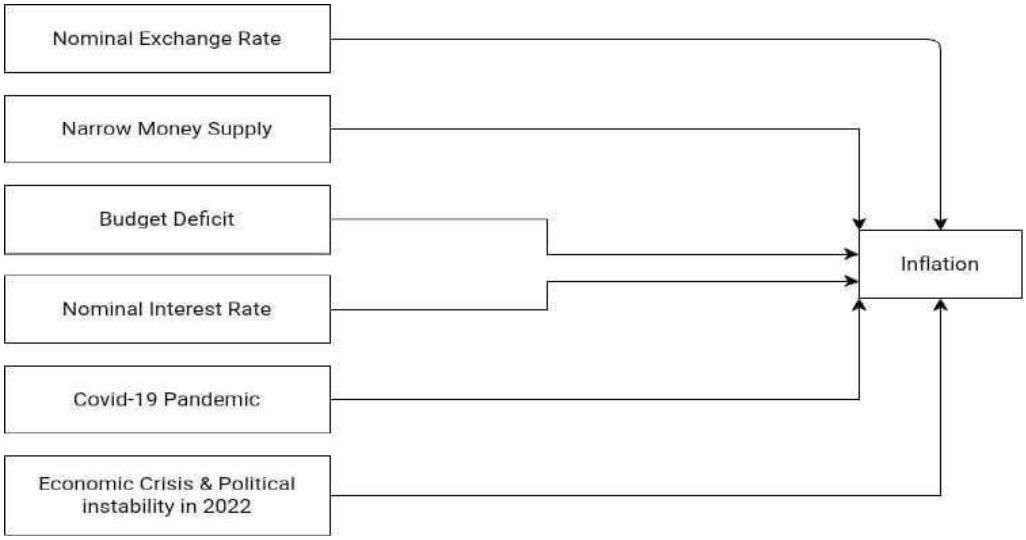

Figure 1: Conceptual Framework

4. Analysis and Discussion

Two models were created due to prevailing econometric issues

Econometric Model 1

This model is the model mentioned in the methodology; equation 1. All the series were obtained in natural lag form. Augmented Dicky-Fuller (ADF) test under Akaike Information Criterion (AIC) was employed to check the stationarity of the series (Francis and Amirthalingam 2020). The unit root test results for model 1 is shown in Table 2. All the series were checked for stationary with intercept and trend, since the intercept and trend terms were significant at 5%.

Table 2 shows that the series are integrated at different orders. Nominal money supply, budget deficit, and nominal interest rate are integrated at level while price level and nominal exchange rate are integrated at first difference. Since the seriesare integrated at different orders, ARDL bounds test will be employed. The optimal number of lags were obtained using AIC.

Table 2: Unit root Test Results for Model 1

Variable on Level	Level form	First different form	Order of Integration
lnP	-2.85	-3.42*	I (1)
lnM	-3.23*	-5.65***	I (0)
lnER	-1.97	-3.51*	I (1)
lnBD	-4.29***	-9.53***	I (0)
lnR	-3.99**	-4.99***	I (0)

*Note. 10%, 5%, 1% statistical significance level are denoted by *, **, and *** respectively*

Source: Authors' calculation

According to the results, one lag for price level, money supply, and exchange rate; three lags for budget deficit and four lags for interest rate should be used. Therefore, maximum four lags were selected for repressors.

Table 3: Output of Error Correction Model for Model 1

Test Statistic	Value	Significance Level	I (0)	I (1)
F- statistic	9.94	10%	3.03	4.06
K	4	5%	3.47	4.57

Variable	Coefficient
Constant	-0.91***
Trend	0.01***
1st lag of $lnBD_{t-1}$	-0.16***
2nd lag of $lnBD_{t-2}$	-0.07**
lnR	0.09***
Error Correction Term (-1)	-0.21***

*Note: 5%, 1% statistical significance level are denoted by **, and *** respectively*

Source: Authors' calculation

When considering the short run relationship between price level and other variables, Table 3 shows the results of error correction model. According to Table 3, the F-statistic is greater than the lower bound [I (0)] and upper bound [I (1)] at 10%, 5%, and 1% significance level which means the relationships are conclusive. The one period lagged error correction term implies 21% of speed of adjustment from short run to long run, when any disequilibrium occurs. The intercept, trend variable, first and second lag terms of the budget deficit, and interest rate have a short run relationship with price level. In the short run, when other things remain constant, when the budget deficit of the previous year increases by 1%, price level will be decreased by 16%. When the budget deficit of the year before previous year increases by 1%, price level will be decreased by 7%. In addition, when nominal interest rate increases by 1%, price level will be increased by 9%. The error correction model has an adjusted R-square of 76% which implies a good fitted model. The Durbin- Watson test statistic is 2.45, which implies a negligible negative autocorrelation.

Table 4: Results of Long Run ARDL Bounds test for Model 1

Test Statistic	Value	Significance Level	I (0)	I (1)
		Asymptotic:n=1000		
F- statistic	9.94	10%	3.03	4.06
K	4	5%	3.47	4.57
		1%	4.40	5.72
Actual Sample Size	42	Finite Sample: n=40		
		10%	3.33	4.44
		5%	3.96	5.23
		1%	5.38	7.09

Variable	Coefficient
Constant	-0.91***
Trend	0.01***
1st lag of $lnBD_{t-1}$	-0.16***
2nd lag of $lnBD_{t-2}$	-0.07**
lnR	0.09***
Error Correction Term (-1)	-0.21***

*Note:5%, 1% statistical significance level are denoted by **, and *** respectively*
Source: Authors' calculation

The long run nexus between price level and other regressors is demonstrated in Table 4. According to Table 4, the F-statistic is greater than the lower bound [I (0)] and upper bound [I (1)] at 10%, 5%, and 1% significance level which means the relationships are conclusive. According to statistics, only money supply, budget deficit, and interest rate have a long run relationship with price level. In the long run, when other things remain unchanged, when the money supply increases by 1%, price level will be decreased by 67%. When the budget deficit increases by 1%, price level will be increased by 144%. In addition, when nominal interest rate increases by 1%, price level will be increased by 78%.

Table 5: Results of VIF for Model 1

Variable	Uncentered VIF	Centered VIF
Constant	18507.42	NA
Trend	5040.16	1059.09
1st lag of $lnCCPI_{t-1}$	1634.58	157.96
lnM	27465.84	499.48
lnER	2872.22	72.68
lnBD	5419.41	96.68
lnR	107.43	2.91

Source: Authors' calculation

According to Table 5, VIF of almost all the variables are higher than 5 which implies severe multicollinear issues in the model. As a remedy, the 1st differences of each variable were taken. When

Model 1 is employed, a major error occurred. Even though the quantitative variables can be estimated by Model 1, when I tried to estimate 'dummy variables' using the same model 'Near Singular Matrix Error' occurred. According to Arshad (2023), this error occurs in E-views due to either multicollinearity problem or inadequate degrees of freedom in the model. To detect possible multicollinearity, Variance Inflation Factors (VIF) is used.

Econometric Model 2

This is the model that stated in the equation 2. First difference of all the seriesin Model 1 are included in Model 2. ADF test under AIC was employed to check the stationarity of the series. The unit root test results for model 2 is shown in Table 6. Price level and money supply were checked for stationary with intercept, since the intercept was significant at 5%. Other variables were checked for stationary without either intercept or trend.

Table 6: Unit root Test Results for Model 2

Variable on Level	Level form	First different form	Order of Integration
dlnCCPI	-3.53**	-6.61***	I (0)
dlnM	-5.68***	-5.79***	I (0)
dlnER	0.01	-4.55***	I (1)
dlnBD	-0.18	-6.72***	I (1)
dlnR	-5.30***	-4.74***	I (0)

*Note. 5%, 1% statistical significance level are denoted by **, and *** respectively*

Source: Authors' calculation

Table 6 shows that the series are integrated at different orders. Nominal exchange rate and budget deficit are integrated at order 1 while other variables are integrated at level form. Since the series are integrated at different orders, ARDL bounds test will be employed here as well. The optimal number of lags were obtained using AIC. According to the results, zero lags for price level, money supply, and exchange rate; four lags for budget deficit and three lags for interest rate should be used.Therefore, maximum of four lags and one lag were selected for independent variables and the dependent variable respectively.

Table 7: Output of Error Correction Model for Model 2

Test Statistic	Value	Significance Level	I (0)	I (1)
F- statistic	10.14	10%	2.45	3.52
K	4	5%	2.86	4.01
		1%	3.74	5.06

Variable	Coefficient
DLNER	0.32***
Error Correction Term (-1)	-0.72***

*Note. 1% statistical significance level is denoted by ***.*

Source: Authors' calculation

Table 7 shows the error correction model which depicts the short run relationship between price level and independent variables. According to Table 7, theF-statistic is greater than the lower bound [I (0)] and upper bound [I (1)] at 10%, 5%, and 1% significance level which means the relationships are conclusive. The one periodlagged error correction term implies 72% of speed of adjustment from short run to longrun, when any disequilibrium occurs. Only first difference of nominal exchange rate has a short run relationship with price level. In short run, when other things remain constant, when the change in nominal exchange rate increases by 1%, the change in price level will increase by 32%. The error correction model has an adjusted R-square of 68% which implies a good fitted model. The Durbin-Watson test statistic is 2.0, which implies absence of autocorrelation problem.

Table 8: Output of Long Run Bounds test for Model 2

Test Statistic	Value	Significance Level	I (0)	I (1)
			Asymptotic:n=1000	
F- statistic	10.14	10%	2.45	3.52
K	4	5%	2.86	4.01
		1%	3.74	5.06
Actual Sample Size	43		Finite Sample: n=40	
		10%	2.66	3.84
		5%	3.20	4.54
		1%	4.43	6.25

Variable	Coefficient
dlnM	0.28**
dlnER	0.85***
dlnR	0.09*

*10%, 5%, 1% statistical significance level are denoted by *, **, and *** respectively*

Source: Authors' calculation

The long run nexus between price level and other regressors is demonstrated in Table 8. According to Table 8, the F-statistic is greater than the lower bound [I (0)] and upper bound [I (1)] at 10%, 5%, and 1% significance level which means the relationships are conclusive. According to statistics, only nominal money supply, nominal exchange rate, and interest rate have a long run relationship with price level. In the long run, when other factors remain unchanged, when the change in money supply increases by 1%, the change in price level will be increased by 28%. When the change in nominal exchange rate increases by 1%, the change in price level will be increased by 85%. In addition, when the change in nominal interest rate increases by 1%, the change in price level will be increased by 9%.

Table 9: Results of VIF for Model 2

Variable	Uncentered VIF	Centered VIF
Constant	10.28	NA
1st lag of $dlnCCPI_{t-1}$	6.27	1.36
dlnM	6.91	1.27
dlnER	2.57	1.62
1st lag of $dlnER_{t-1}$	2.72	1.21
dlnBD	1.40	1.04
dlnR	1.80	1.79

Source: Authors' calculation

To detect any possible econometric issues in Model 2, VIF test for multicollinearity and Breusch-Pagan-Godfrey test for heteroskedasticity are employed.Table 9 proves the absence of multicollinearity in Model 2. Taking the first differenceof each variable led to eliminate multicollinarity problem in Model 1.

Table 10: Results of Breusch-Pagan-Godfrey test for Model 2

Heteroskedasticity Test: Breusch-Pagan Godfrey H0: Homoskedasticity			
F-statistic	0.51	Prob. F(6,36)	0.79
Obs*R-squared	3.39	Prob. Chi-Square (6)	0.76
Scaled explained SS	1.86	Prob. Chi-Square (6)	0.93

Source: Authors' calculation

Table 10 shows the results of Breusch-Pagan-Godfrey test. According to the results, null hypothesis of homoskedasticty cannot be rejectedat 5% of significance level. Therefore, Breusch-Pagan-Godfrey test statistics proved the absence of heteroskedasticity problem According to the results, null hypothesis of homoskedasticty cannot be rejected at 5% of significance level. Therefore, Breusch-Pagan-Godfrey test statistics proved the absence of heteroskedasticity problem.

Table 11: Results of Breusch-Godfrey Serial Correlation LM test for Model 2

Breusch-Godfrey Serial Correlation LM Test H_0: No serial correlation at up to 2 lags			
F-statistic	0.14	Prob. F(2,34)	0.87
Obs*R-squared	0.35	Prob. Chi-Square (2)	0.84

Source: Authors' calculation

According to Table 11, null hypothesis of absence of autocorrelation cannot be rejected at 5% of significance level. Therefore, Breusch-Godfrey Serial Correlation LM test statistics also proved the absence of autocorrelation. The results of Cumulative Sum (CUSUM) of squares test. According to the test, the cumulative sum of squares lays in between the boundariesof 5% significant level in both long run and short run. Therefore, it is concluded that both long run and short run models are stable. Even when Model 2 is employed, when I tried to estimate 'dummy variables' using the model 2, 'Near Singular Matrix Error' occurred. According to Arshad (2023),this error occurs due to either multicollinearity problem or inadequate degrees of freedom. As shown in Table 9, in Model 2, there is no evidence for the presence of multicollinearity. Therefore, the reason for 'Near Singular Matrix Error' in Model 2 could be inadequate degrees of freedom. However, increasing number of degrees of freedom is impossible. Since the study focus on the economy after implementing the open economy policy, annual data of years prior to 1978 cannot be included. Since monthly or quarterly data are unavailable for some variables, it is impossible to increasethe sample size. I also tried to reduce the number of independent variables and estimatevalues for dummy variables. However, it was impossible to estimate the dummy variables for Model 2 as well. Since the majority of econometric issues are excluded in Model 2, Model 2 willbe a better fit. Therefore, results of Model 2 will be more precise.

5. Conclusion

This study inquired into the relationship between inflation and money supply inlong run and short run, in Sri Lanka for the period 1978-2022. In addition, thedeterminants of inflation in Sri Lanka are investigated as well. According to empirical findings, in short run, only nominal exchange rate has an impact on inflation. When other factors remained unchanged, in short run, 1% increase in the change in nominal exchange rate will lead to 32% increase in the change in price level. In addition, resultsof error correction model suggest a high speed of convergence towards equilibrium, when a disequilibrium occurs. The results also provide evidence for long run relationship between inflation, and nominal money supply, nominal exchange rate and nominal interest rate. When other factors remained unchanged, in long run, 1% increase in the change in money supply will result in 28% increase in the change in price level; 1% increase in the changein exchange rate will lead to 85% increase in the change in price level; and 1% increasein the change in interest rate will lead to 9% increase in the change in price level.

All in all, according to the findings, in Sri Lankan context, nominal exchange rate has both short run and long run relationships with inflation while nominal money supply and nominal interest rate have a long run relationship with inflation. This explains that in Sri Lankan context, in terms of inflation determination, supply-sided factors like nominal exchange rate has played a significant role in both short term and long term. In addition, since money supply influences the price level in long term, the classical quantity theory of money and Cambridge equation as well as monetarist viewon inflation is valid in the long run in Sri Lanka. Since the nominal interest rate also affect inflation, the significant impact of monetary policy on inflation is again concluded. Which means in Sri Lanka, demand-sided factors also affect inflation evenonly in long run. When considering the nexus between inflation and interest rate, according to empirical evidence, it is said to be a negative relationship.

However, in this study inflation and interest rate concluded to have a positive relationship. According to the results, budget deficit is not significant in determining inflationin Sri Lanka. Therefore, Keynesian explanation on inflation is not visible in Sri Lankan context. The impact of Covid-19 pandemic and economic crisis and political instabilityin 2022 on inflation are inconclusive due to the inadequate degrees of freedom. According to the findings of the study, monetary policy of the country has a significant impact on inflation in the long run. Moreover, the nominal exchange rate has an impact on inflation in both long run and short run. The money supply, interest rate, and exchange rate of Sri Lanka are controlled or monitored by CBSL. Therefore, in order to achieve price stability, proper control over monetary policy and proper management of exchange rates are important.

Competing Interests: The authors declare that they have no competing interests.

Acknowledgement: Authors are grateful to thank two anonymous referees of this journal for useful comments and the editorial board for constructive criticism on the earlier drafts. Views expressed by the authors are personal.

References

Batarseh, A. (2021). "The nature of the relationship between the money supply and inflation in the Jordanian economy (1980–2019)". Banks and Bank Systems, 16(2), pp. 38–46. https://doi.org/10.21511/bbs.16(2).2021.04

Central Bank of Sri Lanka. (2023b), "CBSL Annual Report 2022 Special StatisticalAppendix. Colombo 01" Central Bank of Sri Lanka.

Cooray, A. (2008). "A Model of Inflation for Sri Lanka". Review of Applied Economics, 4, pp. 35–44.

Ciumara, M., & Ciutacu, C. (2003). Inflation in Romania. Expert Publishing House.

Danthanarayana, C.T., Francis, S. J., & Kumarage, A.S. (2024). "Determinants of Financial Shortfalls in State-Owned Railway Systems: An ARDL Approach for Sri Lanka Railways". International Journal of Accounting & Business Finance, 10(1), pp.86 – 116. https://doi.org/10.4038/ijabf.v10i1.153

Gbadebo, A. D., & Mohammed, N. (2015). "Monetary Policy and Inflation Control inNigeria". Journal of Economics and Sustainable Development, 6(8), pp 108–116.

Francis, S. J., & Amirthalingam, K. (2020). "Nexus between Government Revenue and Economic Growth in Sri Lanka during 1980-2018: A Time Series Analysis". Sankhya-International Journal of Management and Technology, 8 (1), pp. 217-232.

Francis, S. J., and Ganeshamoorthy, M. (2017), "The impact of exchange rate volatility on Sri Lanka's export growth". Strengthening Economic Resilience for Inclusive Growth Sri Lanka Economics Research Conference 2017, pp. 287 – 292.

Francis, S. J., Ravinthirakumaran, N., & Ganeshamoorthy, M. (2021). "The impact of macroeconomic variables on stock prices in Sri Lanka: a bounds testing approach". International Journal of Accounting & Business Finance, 7(Special), pp. 68 – 91. https://doi.org/10.4038/ijabf.v7i0.108

Francis, S., and Ganeshamoorthy, M. (2017), "Impact of Major Macroeconomic Variables on Stock Prices in Sri Lanka: An Econometric Analysis", Papers on Peace, Reconciliation and Development Challenges, Proceedings of the 2nd International Conference on Humanities & Social Sciences, Mihintale: Rajarata University of Sri Lanka, 126-141.

Hicham, A. (2020). "Money Supply, Inflation and Economic Growth: Co-Integration and Causality Analysis". Studia Universitatis Babeç-Bolyai Oeconomica, 65(2), pp. 29–45. https://doi.org/10.2478/subboec-2020-0008

Hussain, M. I., & Zafar, T. (2018). "The Interrelationship between Money Supply, Inflation, Public Expenditure and Economic Growth". European Online Journal of Natural and Social Sciences 7(1), pp. 1–24.

Ireland, P. (2014, November), "The classical theory of inflation and its uses today. In Shadow Open Market Committee Meeting". New York: Economic Policies for the 21st Century.

Jayasooriya, D. (2015). "Money Supply and Inflation: Evidence from Sri Lanka". Asian Studies International Journal, 1(1), pp. 22–28.

Jayawardana, D., & Jayasinghe, P. (2016). "An Inquiry into the Causes of Inflation in Sri Lanka: An Eclectic Approach". NSBM Journal of Management, 2(1), pp. 92– 105.

Kahssay, T. (2017). "Determinants of Inflation in Ethiopia: A Time-Series Analysis". Journal of Economics and Sustainable Development, 8(19), pp. 1–6.

Kulatunge, S. (2015). "Inflation Dynamics in Sri Lanka: An Empirical Analysis". StaffStudies of Central Bank of Sri Lanka, 45(1), pp. 31–66.

Lim, Y. C., & Sek, S. K. (2015). "An Examination on the Determinants of Inflation". Journal of Economics, Business and Management, 3(7), pp. 678–682.https://doi.org/10.7763/JOEBM .2015.V3.265

Mishkin, F. S. (2019), "The Economics of Money, Banking, And Financial Markets (12th ed.). Pearson Education.

Otekunrin, A. O., Jisike, O., Eluyela, D. F., John, O. N., Chima, A., Ebube, O., & Awe, T. E. (2022). "Money Supply as A Mediator In The Inflation-Output Nexus". International Journal of Entrepreneurship, 26 (S6), pp. 1–12.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). "Bounds Testing Approaches to The Analysis of Level Relationships".Journal of Applied Econometrics, 16, 289–326. https://doi.org/10.1002/ jae.616.

Ratnasiri, H. P. G. S. (2009). "The Main Determinants of Inflation in Sri Lanka - A VAR based Analysis". Staff Studies of Central Bank of Sri Lanka, 39(1), pp. 1–14.

Steindel, C., Cecchetti, S. G., & Chu, R. (2000). "The unreliability of inflation indicators". Journal of Current issues in economics and finance, 6 (4).

T.M. Humphrey, (1975), "A monetarist model of the inflationary process", Econ. Rev. 61 pp. 13–23.

Sultana, N., Koli, R., & Firoj, M. (2018). "Causal Relationship of Money Supply And Inflation: A Study Of Bangladesh". Asian Economic and Financial Review, 9(1), pp. 42–51. https://doi.org/10.18488/journal.aefr.2019.91.42.51

Uddin, Md. N., Uddin, M. J., & Ahmmed, M. (2019). "Money and Inflation Nexus In Bangladesh". Asian Economic and Financial Review, 9(6), pp. 702–711. https://doi.org/10.18488/journal.aefr.2019.96.702.711

World Bank. (2023, May 10). "Inflation, consumer prices (annual %) - South Asia", World Bank Open Data. https://data.worldbank.org/indicator/F