Is Inflation in Sri Lanka always and Everywhere a Monetary Phenomenon?

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Abstract

This study addresses the issue as monetarist's claim that inflation is always and everywhere a monetary phenomenon. Using annual data obtained from annual report of central bank of Sri Lanka over the period of 1977-2019, we tested the relationship between inflation and real GDP, broad money supply, velocity of money and nominal wages of government sector using ARDL technique. Results clearly indicates that there is a long-run and short-run relationship between inflation and other independent variables. Secondly, estimated results further indicates that velocity of money and broad money supply strongly linked in both long-run and short-run so much so that the results suggesting that money policy tools may be effective in controlling inflation in Sri Lanka. This study has number of policy implications for policy makers in Sri Lanka. Sri Lanka has been continuously based its monetary policy strategy on the premise that money supply and inflation has strong relationship. In other words, as Milton Friedman put forward "inflation is always and everywhere a monetary phenomenon". .

Keywords: Inflation, ARDL, Co-integration, Money supply, Velocity, Real GDP.

Introduction

As Milton Friedman once postulated, "inflation is always and everywhere a monetary phenomenon" (Friedman, 1956). His argument was based on the classical quantity theory of money through which a direct functional relationship between the money and inflation was established (Lothian, 2009; Selgin, 2000). Given the explanation that put forward by the Friedman, there is an increasing interest to examine empirically whether inflation is a monetary phenomenon that is the causal relationship between money supply and price levels in the economy. As Friedman (1956) put forward that any changes that are taking place in the money supply and general price levels in the economy can have a very high correlation. Inflation can be defined as the persistent rise in the general price level across the economy over time (De Alwis and Dewasiri, 2022: Chaudhary and Xiumin (2018).

"Price Stability" is the economic term used to refer to a situation where the general price level covering consumer goods remains unchanged or if it does change, it happens at a low rate so that it is not strong enough to make any significant influence on economic decisions of participants in an economy, viz. households and firms (Central Bank of Sri Lanka, Annual report, 2005 pp.02). When prices are considered, it can take different forms. Hence, especially in the market economy, price changes are a common incident depending on the demand for and supply of goods and services. When the price changes take place in different direction and scale, it is a challenge to figure out the movements of price changes through the examination of individual price changes in isolation. The concept of "General Price Level" therefore has been used in order to apprehend the overall price movement. Hence the "Price Stability" has been defined as "a relative stability in the general price level in the economy", but not the stability of the individual price/s.

The Central Bank of Sri Lanka (CBSL) which was established in 1950 under the Monetary Law Act (MLA) No. 58 in 1959, authorized to initiate monetary policy in Sri Lanka to accomplish price stability, exchange rate convertibility and long-term growth and development (60th Anniversary Commemoration Volume, CBSL). On top of said objectives, CBSL acts as a bankers' bank in addition to the role of the government's bank. Hence it uses narrow money and an array of policy instruments such as reserve ratio[1], bank rate[2], credit ceilings and moral suasion[3] to control the money supply through which CBSL expects to stabilize the prices in the economy while maintain a low inflation.

The motivation for this paper is to examine the hypothesis whether inflation is always a monetary phenomenon in Sri Lanka in a more inclusive dynamic way unlike previous empirical studies. Theoretically, monetarists and structuralists have rooted this relationship. The quantity theory of money (QTM) believes that inflation is purely a monetary phenomenon and thus a continuous increase of prices in the economy is caused by the excessive expansion of the money supply. In another terms, there will be a causality running from money supply to inflation (aggregate prices). Following the introductory section, the other parts of the paper is structured as follows. Section two is discusses the mandate of the central bank of Sri Lanka (CBSL) while section three is on why Price Stability is Important? Section four deals with factors influencing the Price Stability. Literature review is on section five followed by theoretical explain on section six, and seven and eight is dedicated to model and conclusions and recommendation respectively.

Mandate of the Central Bank of Sri Lanka

According to the Governing Law, CBSL has been mandated to pursue 'economic and price stability too' as the co-objectives. This was the new mandate which was entrusted with the CBSL in 2002 by Monetary Law Act (MLA) (Wijewardena, 2017). These co-objectives can be termed as new developments in Sri Lanka as compared to Central Banks in the rest of the world which have been assigned with only 'price stability'. This move was in part of the programme which the CBSL initiated in 2000. Before the new measures were adopted, the CBSL has been undertaking multitude of objectives[4]. However, these objectives as Wijewardena (2017) pointed out, brought conflicts when CBSL wanted to control inflation; it had to curtail credit expansion which had the negative impact on the economic growth and vice a versa. Accordingly, the CBSL could not arrive at a point of intersection through which it could reach both objectives. As Wijewardena (2017) further affirms, this led to some difficulties as CBSL could not achieve its task of taming inflation and set the ground for price stability in the country. Based on these grounds, it was agreed that CBSL should priorities' its objectives to a single one as achieving of price stability.

However, according to Weerasinghe (2018) the prime objective of any Central Bank, irrespective of the country situation, is to maintain prices at a stables level in the economy. This is no different to Sri Lanka. As Karunaratne (2000) indicated that CBSL as the "prime architect of the monetary policy of Sri Lanka. This is the mandate that the CBSL is carrying on as the sole authority of the country. This is an important measure that CBSL should concentrate on as low and stable inflation is an integral part for growth and stability of the economy. Especially during the hyperinflation, prices in the country tend to go up in every moment. In such a situation, the demand for local currency started to deteriorate as no one wants to hold them. This will create a chaos in the economy as people will make more withdrawals from the banks based on the fear that their currency holding will lose its value. This may cause the financial sector in the country to collapse. The citizens of a country lose the trust they have kept on the domestic currency totally. This makes the transactions more difficult in the economy. Hyperinflation can also bring adversaries such as damaging the real income of fixed earners such as workers and pensioners, real value of the middle income savings, and so on (Weerasinghe,2018) The experience amply shows and conform the above statement[5]. In addition to hyperinflation, other extreme case is "deflation" too can bring about detrimental impact to any economy[6]. Sri Lanka as a developing nation, has never experienced such extreme conditions, but went through a double-digit inflation in the country. Yet, double-digit period, as per empirical evidence, (Kesavarajah, 2019; Karunaratne, 2000) have clearly proven that it is bad for sustained growth.

Why Price Stability is Important?

It is important to measure the changes in the general price level. It can be measured using the price index which is a weighted average of prices of a basket of selected goods and services. The weights assign to each good or services are an indication of relative importance in the basket. Using different price indices such as Consumer price index (CPI), wholesale price index (WPI) and producer price index (PPI), relative importance is reflected from the total value of the basket. A consumer price index as the name indicates measures the movements of prices of a

representative basked of consumer goods and services. These goods are services are allocated with certain weights according to their relative importance in the total expenditure. Meaning that goods and services that claim the largest portions of the total expenditure will be assigned greater weights. The changes in the consumption expenditure (also called 'cost of living') can take place due to different conditions. When the consumption basket changes without changes in the prices or due to price changes but no change in the consumption basket or another situation is a change in both the prices as well as basket. It is assumed that this 'basket of goods and services' remains stable for 3-5 years period and it get adjusted gradually during these years. Also if the basket does not change, so that its impact is only on the price changes of the items.

'Price stability' as the word defines, sets the prices of the economy into a stable level where any economy can enjoy a number of benefits. However, if a nation fails to maintain its prices at a stable level, can results in series of adverse impacts. According to the empirical investigations, price stability promotes economic growth as when the prices are prevailed at a stable level, it facilitates everyone in the economy to make better decisions on what and how to produce using most efficient allocation of resources (Bandoi, Berceanu and Danciulescu, 2009; Haruhiko Kuroda, 2015). On the other hand, it can prevent economic agents diverting the resources to others sectors where are prices high in the economy. Furthermore, investors and savers would not demand for high interest rate in order to compensate for the risk associated with their savings and investments and the opposite is true when the prices are unstable. It also can create inconsistencies in the economy as most vulnerable segment of the society will be affected as their inability to hedge against the inflation with their limited income sources (Monetary Policy Report: Bank of Canada, 2013). Continuous price instability leads to inflation to upsurge to high level and making volatility and in its extreme conditions of "hyperinflation" can cause public unrest leading to economic, social and political unrest in the country. Therefore, it is not only achieving a low and a stable price stability but also maintain it, is an imperative for the foundation for many economic and social objectives that most nations would like to see achieved in their economy. Also it is crucially important to achieve sustainable growth momentum that will create higher GDP growth and more employment opportunities in the economy.

It can be concluded that 'price stability' as a policy can provide everyone in the economy a favourable economic condition through which people can improve their quality of life while the inflation and deflation can have negative impacts on economy, society and political system in the country.

Factors Influencing the Price Stability

Prices in a free market economy plays a vital role as it is an indicator of demand and supply situation in addition to the changes that is taking place in the economy. There are large number of factors, for example - social and cultural events, weather patterns, preferences, productivity of the country, advancement of the technology and purchasing power can have the impact on demand and supply situation in the short run. Most of the factors listed above are seasonal and temporary so that prices get re-adjusted itself accordingly. When people demand more goods and services, the aggregate demand tend to rise up parallel to the expansion of money in the economy provided the supply of goods and services does not increase at the same rate as the demand. The supply side factors have its own limitations (technology and resources).

Yet, impact from the demand side is opposite to supply side factors as it arising out of availability of more money in the economy without proportionate increase in goods and services which is called demand-pull inflation. This situation according to Monetarist theory of inflation is "too much money chasing too few goods" which explains the correlation between money supply and inflation.

The figure 01 illustrate the monetary theory of inflation in relation to Sri Lanka condition as explained by Friedman (1977)
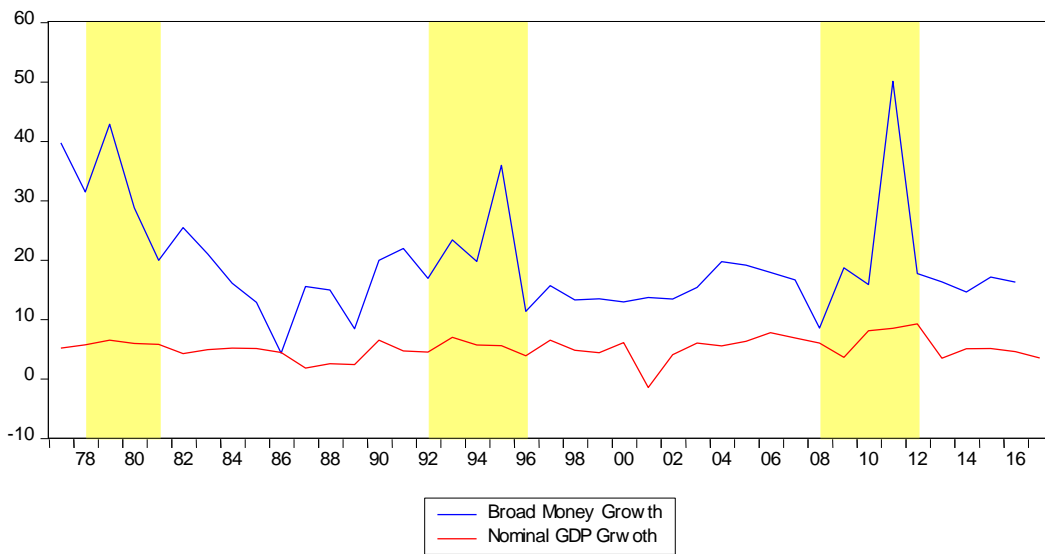

Figure 1. Broad Money Growth and Nominal GDP Growth

Conversely, if the average price levels are increased due to lack of money in the hands of people and this will hamper the production as the demand conditions in the economy is less which will lead to low economic growth(see figure 01) and higher unemployment. This may cause one-off price escalation. This conditions as per economic interpretation cannot be considered as long run inflationary situation unless it is fueled by the increase in money supply. Milton Friedman in his Nobel Laureate lecture where he confirmed that "inflation is always and everywhere a monetary phenomenon" (Friedman, 1977).

The case of broad money growth as against the growth of inflation is illustrated in figures 02. Also shaded area in the figures is an episode of co-movements of money growth and inflation growth during 1977-2019 in Sri Lanka. The shaded areas in both figures illustrate that as Friedman (1977) stated "Inflation is always and everywhere a monetary phenomenon" which is more appropriate to inflationary situation in Sri Lanka during this study period.
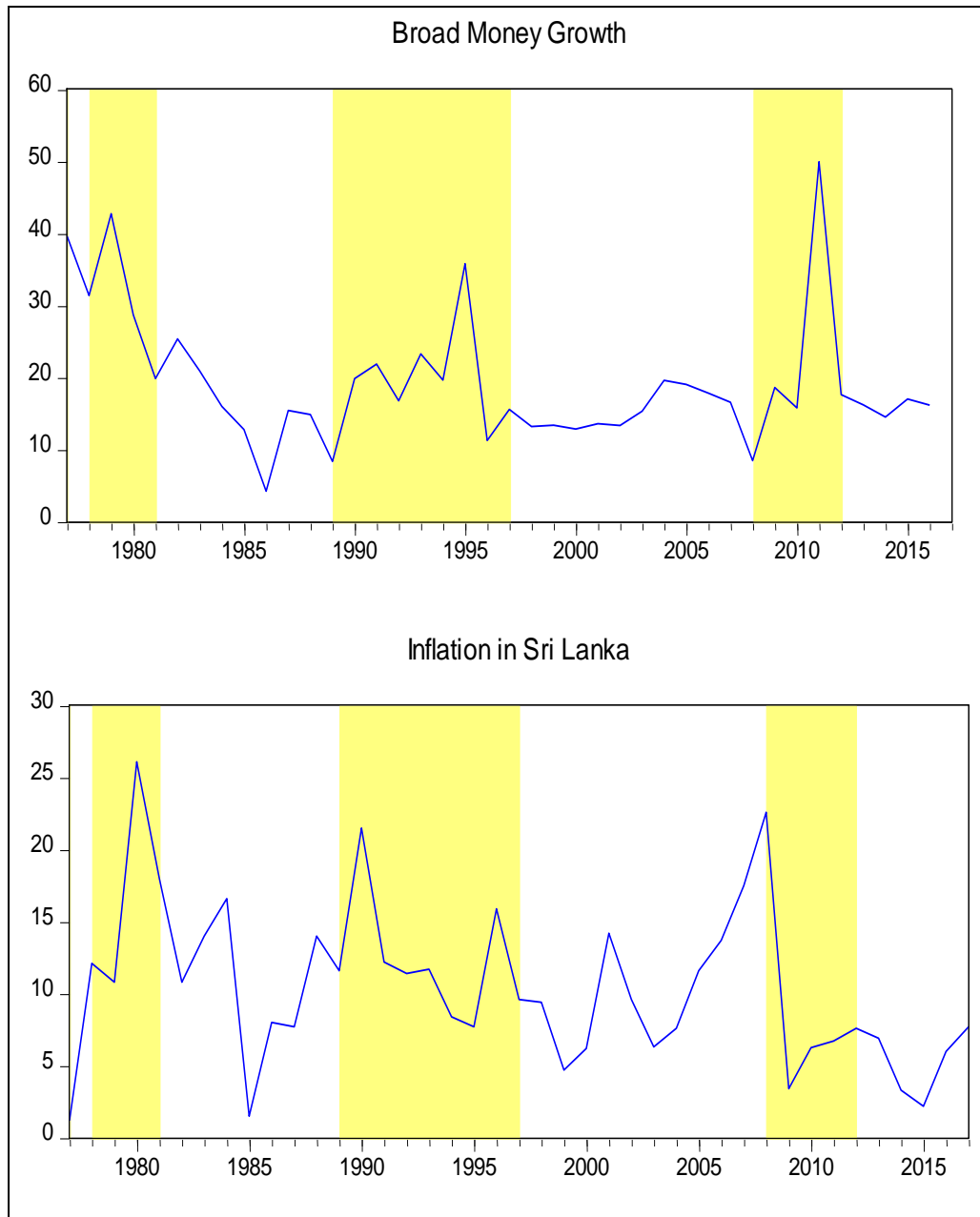
Figure 02. Broad Money Growth and Inflation in Sri Lanka

Literature Review

In order to have a common consensus between monetarists and strucuturalist, academics empirically investigated the causal relationship between money supply and inflation in both developed and developing countries.

Colombage (2005) empirically investigated using the econometric method the determinant of inflation in Sri Lanka and found that money supply has a significant influence on the general price levels in Sri Lanka. He found that money supply plays a very important role in the economy in deciding the inflation. He concluded that inflation in Sri Lanka was a monetary phenomenon.

Another empirical study by Deyshappriya, (2014) has proven that the inflation in Sri Lanka during 198-2010 was driven mainly by the monetary expansion that took place in the country. The author has used both Johansen Co-integration and VECM technique to arrive at his conclusion. Thus he has suggested that controlling unnecessary money expansion in the country as a measure to control inflation.

Kulatunaga (2013) examined the dynamics of inflation in Sri Lanka covering the period of 2000-2013 using quarterly data. According to her findings, money supply impacted the long-run and short-run inflation in Sri Lanka. As per her findings, when the money supply was increased, it exert positive impact on domestic price levels in the economy. As a result aggregate demand tend to go up causing inflation to rise up.

By applying the Pooled Mean Group (PMG) estimation- based error correction model and Panel differenced General Method of Moment (GMM) Nguyen (2015) estimated the Effects of fiscal deficit and money M2 supply on inflation on selected economies of Asia which included Bangladesh, Cambodia, Indonesia, Malaysia, Pakistan, Philippines and Sri Lanka. The study confined to the period of 1985-2012. The found that broad money supply has significant positive impact on inflation in these selected Asian economies. Both model established the same results.

The aim of the study of Kesavarajah and Amirthalingam (2012) was to examine the relationship between money supply and inflation in Sri Lanka during 1978-2010. The Authors used Johansen and Juselius Multivariate cointegration test and Granger causality test to find the long-run relationship between the two variables. The findings of the study revealed that inflation was mainly due to monetary expansion in the country especially the post liberalization period.

Economists argue that money supply has positive impact on economy. Aslam (2016) in the Sri Lankan context investigated the impact of money on inflation. He considered the study period from 1959-2013. As per findings obtained through multivariate econometric method, money supply did have impact on the economy at large. Therefore, money supply was positive with 92% R-squred value which indicated that the used model was accurate.

Similar to other authors, Jayawardana and Jayasinghe (2016) too found that increased money supply was one of the major variables in contributing the inflation in Sri Lanka. This study inquired into the short-run and long-run determinants of inflation in Sri Lanka using annual data for the period from 1977 to 2014. ARDL approach was used to find the results. They further concluded that both demand and supply side influenced inflation in Sri Lanka.

Theoretical Explanation

The quantity theory of money (QTM) claims that aggregate price levels in the economy (P) and the quantity of money (M) both are linked as per the equation $P = VM / Y$ (Y- real out , V- velocity of money). The QTM can be denoted as $p = v + m - y$ (p - as the rate of inflation; y- growth rate of output; v - velocity; m- money stock). The main theoretical explanation of the QTM is that a given change in the money growth exerts an equal change in the inflation rate. Thus it prompted Milton Friedman to assert that "inflation is always and everywhere a monetary phenomenon" (Friedman, 1970)

According to quantity theory of money there is a direct proportional relationship between changes in money supply and inflation. This suggests that money growth follows same change in inflation. Therefore, using the QTM it can be arrived at to explain to which extent monetary forces trigger changes in price movement in the economy. By using the QTM, it can be explained to which extent monetary forces trigger changes in the price levels in the economy.

The central assumption behind Friedman's claim was that the velocity of money or its growth rate remain constant thus money growth has no real impact on real GDP growth especially in the long-run.

Model, Variables and Theoretical Inter-relations with Inflation

Model Specification

In this study, we link the theoretical expounding that the inflation is always and everywhere a monetary phenomenon, the classical QTM which is the work of Friedman. Thus, there is a direct proportional association between changes in the money supply and inflation in the economy. Therefore, in this study using the QTM, it will be attempted to explain the extent to which the following equation (01) can establish the famous equation of exchange.

Equation below shows the equation of exchange.

MY= PY (01)

M can be considered as a most suitable measure of money supply in Sri Lanka. Therefore, M2, i.e. broad money supply can be used.

P denotes the aggregate price level which represents the CCPI, where it is used as a proxy for inflation in Sri Lanka.

Y is the real gross domestic product GDP

Equation 01 in growth form ……..

m + v = p + y (02)

Equation 02 can be used to derive the inflation equation as follows:

p = m - y + v

Therefore, equation 02 indicates the basic element of the quantity theory of money as follows:

1) Long-run proportional relationship exists between growth in money supply and in the general price levels in the economy.
2) Increase in the growth of money supply does not affect output and velocity in the long-run.
3) Using the QTM, it can be estimated the time it takes growth in the price level to respond to changes in the growth in money supply and output.

In order to estimate the long-run and short-run relationship between inflation and money supply, the present study used Autoregressive Distributed Lag (ARDL) model technique. ARDL approach is much more suitable than the other statistical techniques (De Alwis and Dewasiri, 2022; Romanus, Ngozi and De Alwis, 2020). ARDL technique can be applied to variables with different order of integration (Pesaran and Pesaran, 1997). Consequently, to test the proposed relationship between inflation and money supply which is drawn from the equation 01, we express the ARDL equation form of the model as follows:

Data and Methodology

This study uses rate of inflation as dependent variables (Colombo Consumer's Price Index (CCPI)).The CCPI series has been rebased to one base year (2013=100). The CCPI is the most widely used inflation indicator for Sri Lanka. The explanatory variable includes real gross domestic product (real GDP), broad money supply (M2) velocity (velocity of money) and nominal wages of government sector (wages_govt). The data covers the period from 1977 to 2019 and are of annual frequency. Descriptive statistics are used to describe the basic features of the data in this study. They provide simple summaries about the sample and the measures and also they form the basis of every quantitative analysis of data. Descriptive statistics help to simplify large amounts of data series in a sensible way that with a simple summary.

Table 01. Descriptive Statistics

	INF	RGDP	M2	Velocity	Nominal Wages_ GOVT
Mean	9.89	56572.2	1210250	3.43	28.80
Median	9.4	44605.6	316174	3.45	11.74
Max	26.1	131653	6912710	4.84	104.9
Min	1.2	17949.7	8717	2.25	1.02
Std. Dev.	5.61	34934.2	1845615	0.45	33.37
Kurtosis	3.60	2.58	5.27	5.09	2.93
J-Bera	5.74	6.72	32.92	7.8	9.35
Proba	0.06	0.03	0	0.019	0.0093
Obser.	43	43	43	43	43

** Notes: inflation (INF), real GDP (RGDP), broad money supply (M2), velocity (velocity of money), Wages_govt.(nominal wages government)

Source: Authors' computations

Table 01 provides the descriptive statistics for all variables under consideration. The table reveals that the average INF rate is 9.89. Similarly the average value of variables starting from real GDP, broad money supply, velocity and nominal wages government are shown respectively. Almost all the variables except velocity have non-zero standard deviation (St.dev). Skewness which is a measure of the asymmetric distribution of the series around its mean denotes that it has long left-tail. The variables which take the values of zero (INF-0.84, RGDP: 0.95, velocity: 0.06) are normally distributed. The Kurtosis which is the measure of the peakedness or flatness of the distribution of the series reveals that the variables: INF, RGDP and WAGES_GOVT. are all less than 3 meaning that the distribution is normal (Mesocratic).The standard deviation (st.dev)

which tells how the calculation for a group are spread out from the average (mean) or the expected value. A low St.dev of inflation, velocity and wages_ govt indicate low St.dev meaning that they are very close to the sample average. However, St.dev with high value indicates that variables are greatly dispersed from the average group mean indicating high disparities. For example, St.dev of RGDP (3493418), M2 (1845615) indicates very high dispersion. The table indicates Jarque-Bera (JB) statistics for all the variables. The JB statistics measures whether the series is normally distributed or not, rejects the null hypothesis of normal distribution.

When dealing with a time series analysis, visual examination about the stationarity of the variables is not appropriate (as shown in graphical explanations above). It is therefore, necessary to scientifically ascertain that the series do not show a unit root to avoid obtaining spurious results. Therefore variables used in this study must show stationarity conditions (Adeleye,Ogundipe, Ogundipe, Ogunrinola, Adediran,2019; Adeleye, Osabuohien, Bowale, Matthew, and Oduntan, 2018; Romanus, Ngozi and De Alwis, 2020). Realization and establishment of the presence of unit root can be done more efficiently through ADF and Phillip Perron test. Therefore primarily under the test for unit root, two hypothesis are established in ADF and PP. According to null hypothesis, it establishes that there is unit root means that the series is not stationary. On the other hand, alternative hypothesis indicates that there is no unit root meaning and that the series is stationary. When the null hypothesis is rejected at level order (*=0) then need to take the first difference of the series through which stationary process can be achieved. If the null hypothesis is rejected, that means that the alternative hypothesis is accepted. This indicates that the series is stationary at first difference I~ (I). Therefore to determine the stationarity of the variables in this study, Augmented Dickey Fuller (1982) and Phillips-Perron (1988) approaches are used to test the stationarity of the variables used in the study.

Table 02. Results of Unit Root Test

| Variables | Results of Unit Root Test | | | | Order of Integration |
| | ADF | | PP | | |
	Levels	First Difference	Levels	First Difference	
Inf	-4.664979*** (0.0005)	-9.347774*** (0.0000)	-4.768232*** (0.0004)	-19.66441*** (0.0000)	I(0),I(I)
LnRGDP	-	-5.868135*** (0.0000)	-	-5.868135*** (0.0000)	I(I)
LnM2	-	-2.738415 (0.0764)	-	-2.605826** (0.1000)	I(I)
LnVelocity	-	-.180582*** (0.0286)	-	-6.07100*** (0.0000)	I(I)
LnWages_govt.	-	-5.131698*** (0.0000)	-	-5.140270*** (0.0001)	I(I)

Notes: inf (inflation), LnRGDP (log of real GDP), LnM2 (log of brood money supply), LnVelocity (log of velocity of money), LnWages_govt (log of nominal wages of government) P-values are in parenthesis. P-value, *p< 0.1,**p<0.01,***p<0.05 denotes rejection of the null hypothesis of a unit root at 10%,1% and 5% levels of significance respectively

Source: Computed by Authors using Eviews 10

As per Table: 02 all the variables became stationary after taking into their first difference except inflation. Optimal lag lengths are determined by the Akaike Information Criterion (AIC). I (0) stand for order of integration at order zero while I (I) stands for integration at order one. The results of the unit root tests are presented in table 02. All series are transformed into log form except inflation. The table reveals that after taking first differences of the variables, Real GDP, broad money supply, velocity of money and nominal wages of government become stationary meaning that they are all integrated of order I (I). The variable that are at stationary at level is inflation meaning that they are integrated of order I (0)

The joint null hypothesis that inflation in Sri Lanka is not always and everywhere a monetary phenomenon, H_0: $\propto_1 = \propto_2 = \propto_3 = \propto_4 = 0$ is tested against alternative hypothesis that is, there is a long-run relationship between the variables. H_1: $\propto_1 \neq \propto_2 \neq \propto_3 \neq \propto_4 \neq 0$

Lag Selection Criterion

In order to choose the appropriate optimal lag length for ARDL model, there are different lag selection criteria that have been used in empirical studies. Akaike information criterion (AIC), the Schwarz information criterion (SIC) and the Hannan–Quinn information criterion (HQ). Therefore, in this study Akaike criterion is used with following lags. Thus this study selects the ARDL MODEL 1-1(1,0); MODEL 1-2(1,3); MODEL 1-3 (1,0); MODEL 1-4(1,0) to test the objectives.

This study follows quantitative technique to estimate coefficients that the inflation in Sri Lanka is not always and everywhere a monetary phenomenon and hence the objective of the analysis to see whether it is true or false using the historical data (Dewasiri et al., 2017; Dewasiri et al., 2018). Thus the study specifies the following model.

H0: Inflation in Sri Lanka is not always and everywhere a monetary phenomenon. $\text{Inf}_t = \delta_0 + \delta_1 rgdp_t + \delta_2 m2_t + \delta_3 velocity_t + \delta_4 Nwages\_govt_t + u_t \dots (01)$. δ_0 is the constant term and δ_1 - δ_4 are the coefficients of the equation 01 above.

Bound Test Approach to Co-Integration

To study the co-integration relationship between variables, Autoregressive Distributed Lag (ARDL) bound test is used in this study as suggested by Pesaran , Shin, Smith (2001). Table No 03 indicates the bound test results with their individual values during the study period. According to the bound test, if calculated F-statistics is greater than critical value of upper bound, co-integration among the variables can be found and it has been confirmed according the results given in table No 03. If F-statistics is lower than the upper bound critical value, it shows existence of no co-integration among the variables. (Raza, Shahbaz and Nyugen, 2015; Raza, 2015; Raza, Shahbaz and Paramati, 2016). Therefore, according to results of table No.03 there is a co-integration between Inflation vs. LNRGDP, Inflation vs. LNM2, and Inflation vs. LNVELOCITY and, Inflation vs. LNWAGES_GOVT. Table 03 confirm co-integrating relationships among variables in the study. Wald Test (F-statistics) is used in this study to check the existence of long-run relationship among the variables.

Table 03. ARDL Bound Test

	MODEL 1-1	MODEL 1-2	MODEL 1-3	MODEL 1-4
Significance Levels	5%	5%	5%	5%
F- Statistics	9.13	18.98	7.16	20.50
Critical Value:				
LOWER BOUND I(0)	3.15	4.94	3.15	4.94
UPPER BOUND I(1)	4.11	5.73	4.11	5.73
Conclusion	Co-integration	Co-integration	Co-integration	Co-integration

Note: Model: Model: 1-1: INF Vs. LNRGDP, Model: 2-2: INF Vs. LNM2, Model: 1-3: INF Vs. LNVELOCITY, Model: 1-4 INF Vs. LNNWAGES_GOVT. When All the Variables Run Together: F-Statistics(18.15).

Source: Computed by the Authors using Eviews 10

Co-Integration Equations

Co-Integrating Equation-Individual

The co-integration equations for model are expressed as:

Cointeq = INF - (2.1200*LNRGDP)

Cointeq = INF - (0.2052*LNM2)

Cointeq = INF - ((8.3131*LNVOLOCITY)

Cointeq = INF - (3.1941*LNNWAGES_GOVT)

The co-integration equation for model is expressed as:

Cointeq = EC= INF – (2.249*+ LNRGDP-2.5817*LNM2-1.1717* LNVELOCITY+2.0108*LNNWAGES_GOVT)

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Table 04. ARDL Long-Run Results

	ARDL Long-Run Results			
	MODEL 1-1	MODEL 1-2	MODEL 1-3	MODEL 1-4
LNRGDP	2.11 (0.0000)**			
LNM2		1.71 (0.0000)**		
LNVELOCITY			8.31 (0.0000) **	
LNNWAGES_GOVT				3.19 (0.0000) **

Note: LNRGDP (log of real GDP),) LNM2 (log of broad money supply) LNVELOCITY(log of velocity of money), LNNWRI_GOVT (log of nominal wages rate of government). Model: Model: 1-1: INF Vs. LNRGDP; Model: 2-2: INF Vs. LNM2, Model: 1-3: INF Vs. LNVELOCITY, Model: 1-4 INF Vs. LNWAGES_GOVT; *P< 0.10; **P≤0.05; ***P≤ 0.01

Source: Computed by the Authors using Eviews 10

ARDL long-run results are presented in table-04 with their respective individual coefficient values which clearly show the relationship each variable has on inflation in Sri Lanka during 1977-2019.

Is Inflation in Sri Lanka Always and Everywhere a Monetary Phenomenon? ARDL Short-Run Relationships?.

Table 05. ARDL Short-Run Results

	Demand Driven Factors of Inflation in the Short-Run			
	ARDL Short -Run Results			
	MODEL 1-1	MODEL 1-2	MODEL 1-3	MODEL 1-4
LNRGDP	2.11 (0.000)**			
LNM2		0.89 (0.0005)**		
LNVELOCITY			8.31 (0.0000)**	
WAGES_GOVT.				3.19 (0.0000)**

Note: LNRGDP (log of real GDP),) LNM2 (log of broad money supply) LNVELOCITY(log of velocity of money), LNNWRI_GOVT (log of nominal wages rate of government); Model: Model: 1-1: INF Vs. LNRGDP, Model: 2-2: INF Vs. LNM2, Model: 1-3: INF Vs. LNVELOCITY, Model: 1-4 INF Vs. LNWAGES_GOVT; *P< 0.10; **P≤0.05; ***P≤ 0.01

Source: Computed by the Author using Eviews 10

The fundamental feature in the short-run results is basically the speed of adjustment time. Speed of Adjustment term illustrates that how much time will be required in an economy to recover from any external or internal shock and to reach at long-run equilibrium. Short-run determinants and their respective elasticities are tabulated in Table 05. Short-run determinants and their respective elasticities are presented in Tables 06. The short-run results according to the model, reveal that the error term is negative and significant. More specifically 1.7% deviation from the long-run equilibrium following a short-run disturbance that occurred during the last time period which is corrected in the current time period. A highly significant error correction term (ECT) is further proof of the existence of a stable long-term relationship in the estimated model.

Serial Correlation LM Test

The table 06 reports the results of the diagnostic test of autocorrelation. The null hypotheis (H0) claims that there is no autocorrelation while the alternative hypothesis (H1) should be rejected if the p-value of observed R-squared is less than the 0.05 level of significance. Therefore, there is no presence of serial correlation in the estimated model since the p-values are greater than the 0.05 level of significance in both models. As the corresponding p-values of the Breusch–Godfrey serial correlation LM test given in Table 07 are greater than at 5% significance level, the estimated models in this study do not suffer from the autocorrelation issues.

Table 06. Results of Serial Correlation

		F-statistics	Obs*R-squared	Probability
LNRGDP	-MODEL: 1-1	0.39	0.85	(2,38) 0.6755
LNM2	-MODEL: 1-2	1.82	3.77	(2,37) 0.1755
LNVELOCITY	-MODEL: 1-3	0.35	0.83	(2,33) 0.7068
LNWAGES_GOVT	-MODEL: 1-4	0.23	0.52	(2,38) 0.7886

Notes: LNRGDP (log of real GDP), LNNWRI_GOVT (log of nominal wage rate of government) LNM2 (log of broad money supply).

Source: Computed by the Author using Eviews 10

Heteroscedasticity Test: ARCH heteroscedasticity

The test is for heteroscedasticity where the null hypothesis (H0) claims that residuals are homoscedasticity and the alternative hypothesis (H1) claims that the residuals are heteroscedastic and thus the variance is not constant. The rejection rule states that the null hypothesis should be rejected if the probability value of observation R-squared is less than the 0.05 level of significance. Since the probabilities values of Chi-Square are greater than 0.05 in the estimated model as shown in table 07, thus the test fails to reject the null hypothesis of constancy of variance among the residuals in the model, and thus is deemed to be homoscedastic.

Table 07. Results of Heteroskedasticity Test of ARCH

Heteroskedasticity Test: ARCH MODEL				
		F-statistics	Obs*R-squared	Probability
LNRGDP	-MODEL: 1-1	1.09	2..23	(2,39) 0.3448

LNM2	-MODEL: 1-2	0.90	2.79	(3,38) 0.4483
LMVELOCITY	- MODEL:1-3	1.46	7.09	(5,34) 0.2269
LNWAGES_GOVT	-MODEL: 1-4	1.53	3.06	(2,39) 0.2279

Notes: MODEL: 1-1(Inflation vs. log of real GDP); MODEL:1-2(Inflation vs. log of broad money supply); MODEL:1-3(Inflation vs. log of velocity of money supply);MODEL:1-4(Inflation vs. log of nominal wages_ govt.)

Source: Computed by the Author using Eviews 10

CUSUM and CUSUM Squares

Centered on cumulative sums of scaled recursive residuals, the CUSUM test statistics (Brown, Durbin, and Evans, 1975) map the cumulative sum along with the 5% critical lines against time. If the total sum goes below the critical lines of 5%, so the test reveals volatility of the parameter. The cumulative sum (CUSUM) and the cumulative sum of squared (CUSUM SQUARE) added in the analysis to measure the consistency of the long-run coefficients along with the short-run dynamics. The graphical illustration of the CUSUM AND CUSUM OF SQUARE is presented in Figures 03 and 04. Each variable used in both models are plotted against inflation.
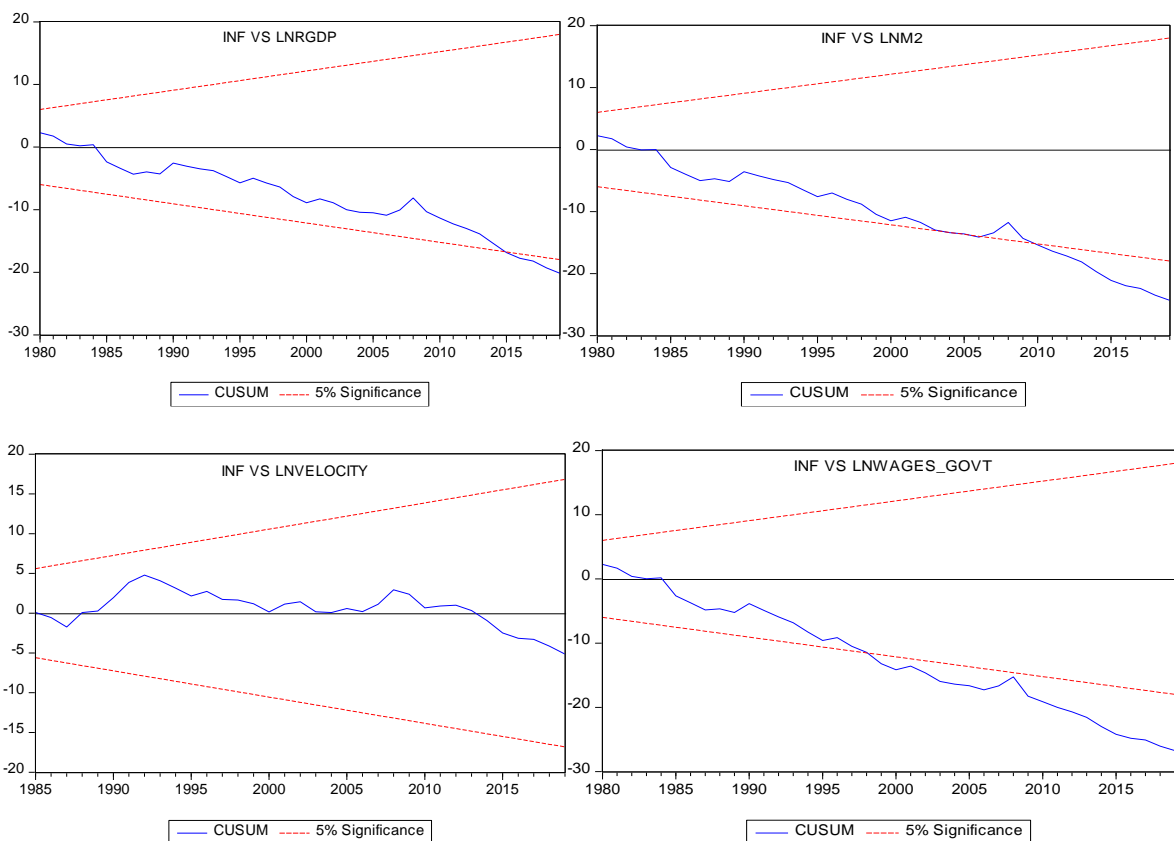

Figure 03. CUSUM Test

Plots of CUSUM

The CUSUM test in figures 03 plots the limits and is thus statistically proved to be the consistency of the model's short-run and long-run coefficients.

As it lies between the two borders even though towards the latter part it has gone out of the boundary, the model is stable. The dependent variable (inflation) has equilibrium and become a continuous variable.

The CUSUM OF SQUARE in figures 04 is also within the boundaries. The plots of both the CUSUM and CUSUM SQUARE are within the boundaries and hence statistically proven the stability of the short-run and long-run coefficients of the repressors that have an impact on the level inflation in Sri Lanka during the study period. Therefore, according to the CUSUM and CUSUM OF SQUARE, the estimated model seems to be stable and properly specified through marginal deviation in the CUSUM test as none of the two tests deviate out the bounds of 5% level of significance. The stability of the inflation equations (Equation No.01) are examined by application of CUSUM and CUSUM OF SQURE test which detects systematic changes in regression coefficients (Brown, Durbin, and Evans, 1975; Fahmida and Mazbahul, 2012). The plot of CUSUM and CUSUM OF SQUARE fall within the critical bound lines at 5% level of significance meaning that the estimated coefficients in ARDL model in the study is stable over the sample period from 1977-2019. Therefore, evidences indicated that the estimated model can well be used for policy making purposes in Sri Lanka.
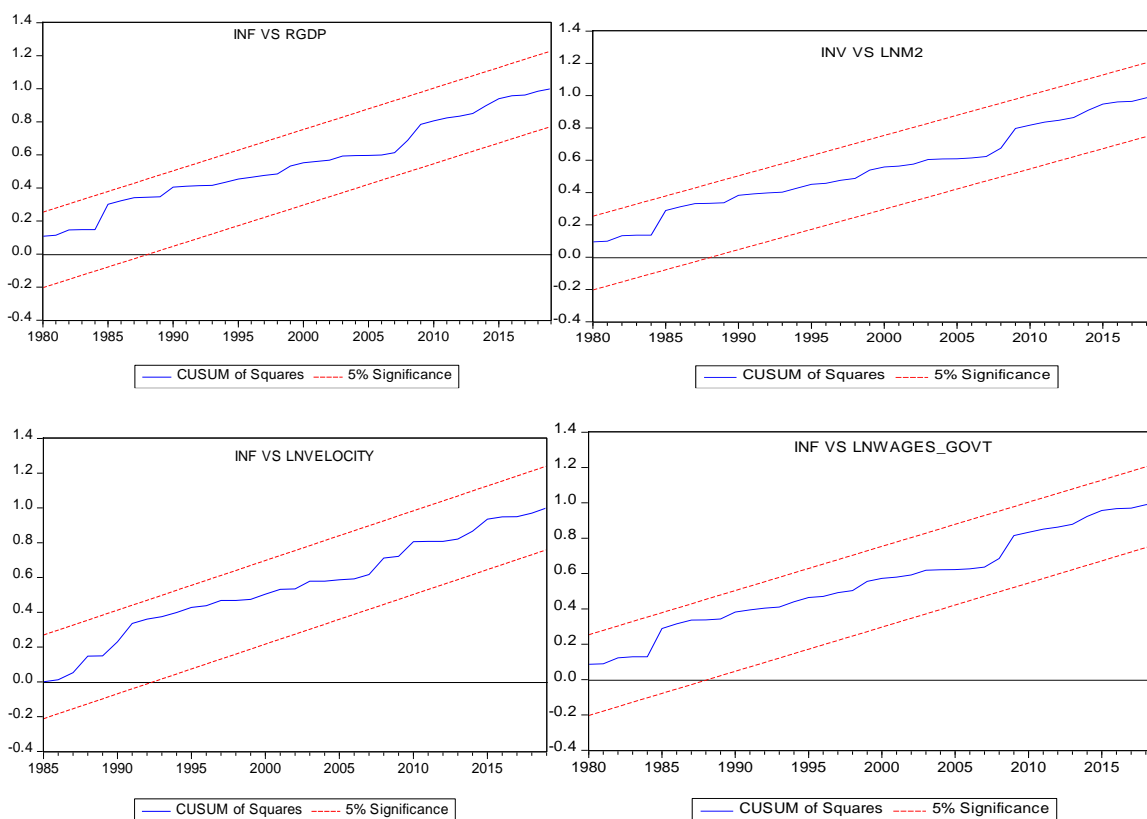

Figure 04. CUSUM of Square Test

Table 08 presents the result of the post estimation analyses. Linearity of the ARDL model estimated was assessed using the Ramsey RESET tests (CUSUM AND CUSUM OF SQUARE) and the results confirmed the linearity of the estimated model implying that the model is well specified. The varying degree of the variance of error term across the changing value of regressors (heteroscedasticity) is a violation of the basic OLS assumption and this portends danger for econometric models. Therefore, the ARCH-LM test was used to test for the presence of heteroscedasticity in estimated-models. Given the probability level which was more than the acceptable level of 5%, the null hypothesis of "no heteroscedasticity" could not be rejected. It was therefore concluded that the estimated model was homoscedastic. The normality of the distribution of the model residuals was examined with Jaque-Berra test and the results showed that the residuals were normally distributed. Finally, serial correlation test was conducted and estimated on both models, the estimated Breusch-Godfrey test confirmed the absence of Autocorrelation of the residuals. The favourable outcomes of the post-estimation diagnoses tests revealed that the estimated models were free from fundamental econometric problems.

Table 08. Summary Diagnostic and Stability Tests

	Model -01			
	1-1	1-2	1-3	1-4
Heteroscedasticity (ARCH-LM)	0.3448	0.4483	0.2269	0.2279
Normality (JARQUE-BERA)	5.17 (0.07)	4.25 (0.12)	7.92 (0.13)	3.98 0.0002)
Serial Correlation (BREUSCH-GODFREY)	0.6755	0.1755	0.7068	0.7886
CUSUM	Stable	Stable	Stable	Stable
CUSUM OF SQUARE	Stable	Stable	Stable	Stable

Notes: MODEL:1-1(Inflation vs. log of real GDP); MODEL:1-2(Inflation vs. log of broad money supply); MODEL:1-3(Inflation vs. log of velocity); MODEL:1-4(Inflation vs. log of nominal wage of government).

Source: Author's Computation

Pairwise Granger Causality Test on Direction of Causality

Using the Granger causality test in the analysis, the direction of the variables in the study it can be determined, i. e. whether X causes Y or X variable influences on the movement of Y variable. It is assumed that variables do influence each other; therefore the Granger causality test has been used in this study. Accordingly, direction of the causality between variables in the study can be estimated (Granger, 1988). Through the Granger causality test it is possible to figure out the direction of the relationships as there are three possible outcomes can be identified such as uni-directional(only X to Y or Y to X), bi-directional(X to Y and Y to X) and independent causality(X ≠ Y) . Tables 09 present the results of Granger causality test for the estimated.

Table 09. Results of Granger Causality Test

Null Hypothesis	Probability	Conclusion
(1) H0: REAL GDP does not Granger Cause INFLATION	0.0144	**Reject H0:** because REAL GDP causes INFLAITON
(2) H0: INFLATION does not Granger Cause REAL GDP	0.2472	**Do Not Reject H0:** because INFLATION does not Granger causes REAL GDP
(1) H0: BROAD MONEY does not Granger Cause INFLATION	0.0.0022	**Reject H0:** because BROAD MONEY causes INFLATION
(2) H0: INFLATION does not Granger Cause BROAD MONEY	0.2242	**Do Not Reject H0:** because INFLATION does not Granger causes BROAD MONEY
(1) H0: VELOCITY does not Granger Cause INFLATION	0.0998	**Reject H0:** because VELOCITY causes INFLAITON
(2) H0: INFLATION does not Granger Cause VELOCITY	0.3288	**Do Not Reject H0:** because INFLATION does not Granger causes VELOCITY
(1)H0: WAGES_GOVT does not Granger Cause INFLATION	0.0027	**Reject H0:** because WAGS_GOVT causes INFLATION
(2) H0: INFLATION does not Granger Cause WAGES_GOVT	0.6641	**Do Not Reject H0:** because INFLATION does not Granger causes WAGES_BOARD

Source: Authors' elaboration

Table 09 presents the results of Granger causality test of the study for the estimated model with single equation. As is reported in the table 09 there is uni-directional causality as follows:

- Changes in the real gross domestic product (RGDP) Granger cause changes in the inflation(INFLATION) as the corresponding p-value is less than 0.05
- Changes in the broad money supply(M2) Granger cause changes in the inflation(INFLATION) as the corresponding p-value is less than 0.05
- Changes in the velocity of money(VELOCITY) Granger cause changes in the inflation(INFLATION) as the corresponding p-value is less than 0.05
- Changes in the nominal wages of government (WAGES_GOVT) Granger cause changes in the inflation(INFLATION) as the corresponding p-value is less than 0.05

It can be concluded that according to the estimated model, real GDP, broad money supply, velocity of money and nominal wages of government may cause inflation in Sri Lanka during 1977-2019 period. According to the Table 10, all the variables show one way causation (unidirectional causality) with inflation.

Conclusion and Recommendations

This study originally set out to address the monetarist's claim that inflation is always and everywhere a monetary phenomenon. Using annual data obtained from central bank of Sri Lanka over the period of 1977-2019, it was tested that the quantity theory of money proposition there exists a long-run proportional relationship between inflation and real GDP, broad money supply velocity of money and nominal wages of government sector. From the regression results obtained, it is evident that there is a long-run and short-run relationship between inflation and other independent variables. Secondly, estimated results indicated that velocity of money and broad money supply to be strongly linked in both long-run and short-run so much so that the results suggesting that money policy tools may be effective in controlling inflation in Sri Lanka.

Real GDP is positively affecting inflation in Sri Lanka as the estimated coefficient of real GDP showed value of 2.11 indicating that 1% increase in real GDP will raise inflation by 2.11 %. These results are in line with Kulatunga (2013); Bandara (2011); Bhattacharya (2014); Greenide and DaCosta (2006) have found that GDP is a key driver. Broad money supply (M2) too indicates the positive impact on inflation in Sri Lanka with a positive value of 1.71 at 5% significance level. Kulatunge (2013); Jayewardene and Jayasinghe (2016) too confirmed same findings through their studies. The velocity variable had the right sign and showed positive and statistically significant relationship to inflation in Sri Lank as the coefficient value indicated as 8.31 at 5% level. Nominal wages of private sector show a coefficient value of 3.19 and nominal wages of government as 3.19 at 5% significance level.

Policy Implication

This study has number of policy implications for policy makers in Sri Lanka. Sri Lanka has been continuously based its monetary policy strategy on the premise that money supply and inflation has strong relationship. In other words, as Milton Friedman put forward "inflation is always and everywhere a monetary phenomenon". As per obtained results, it is true for Sri Lanka that the continuous use of monetary policy tool to maintain price stability is likely to yield the desired long-run and short-run money policy goals.

Real GDP is one of the main factors which can affect inflation in Sri Lanka. Hence it can be suggested that creating a stable macroeconomic policy situation to promote growth in an effort to maintain the price levels in the country is much needed requirement. Further when formulating economic policies, policy designers should give their attention on inflation-growth relationship. Trying to bring the inflation to very low level (near zero level) may have adverse effects on economic growth. Therefore, it a real challenge to policymakers to maintain the growth rate at an appropriate level which is consistent with a stable inflation in the country. Although the country has to make sure that the inflation is maintained at a level which is conducive to growth yet high growth rate may also accelerate the inflation in the country.

One of the theories that can be used to explain inflation is the Monetarist view that as per Milton Friedman "*Inflation is always and everywhere a monetary phenomenon*". Inflation occurs because there is too much money available to buy the same amount of goods and services produced in

the economy. This view can also be represented by the so-called "*quantity theory of money*" which relates the general price level, the total goods and services produced in a given period, the total money supply and the speed (velocity) at which money circulates in the economy in facilitating transactions in the following equation:

MV = PQ

If the velocity of money is increasing, then the velocity of circulation is an indicator that transactions between individuals are occurring more frequently. A higher velocity is a sign that the same amount of money is being used for a number of transactions. A high velocity indicates a high degree of inflation.

As broad money supply plays a significant role as one of the factors of inflation the policy makers should be concerned in bringing the broad money supply down as a monetary policy tool to control inflation. Since the short-run effect of the broad money supply is statistically proven it is necessary to control the money supply as it can increase growth of money supply in the short-run. The reserve money component of money supply is within full control of the CBSL and it is important that the bank keeps on eye on reserve money as an operating target. The broad money is a product of reserve money and the money multiplier. Therefore, CBSL can easily control these two components as these are easily trackable variables. Results show unidirectional causality running from broad money supply to inflation in Sri Lanka which means inflation is accompanied by expansion of money supply in the economy. Having identified a relationship between money supply growth and inflation, it is recommended that efforts should be geared towards improving stabilization programmes especially in the form of using the interest rate variable and OMO under flexible inflation targeting. OMO also helps to increase or reduce reserve money in the system. Since the results indicated that the increase in money supply will increase domestic price levels in the economy because higher money incomes will chase behind too little supplies in the system.

This study finds the links between inflation and government sector wage effects. It is evident that increases in wages are inflationary. Policy makers should, when they design salary scales, try to minimize its adverse impact on inflation. It is recommended that the labour market regulators should be more vigilant when making wage increments in both sectors. Since the wages government sector caused inflation in the country, the country requires a proper policy formulation in adjusting wages. When wage increments are considered, consumption patterns should be thoroughly studied and make the recommendation accordingly. Based on the findings it can be recommended that responsible authorities need to make necessary wage adjustments for government sector employees in accordance with the skills and the level of education which would help to increase the contribution much to the GDP of the country.

Endnotes

1. Also known as Cash Reserve Ratio, it is the percentage of deposits which commercial banks are required to keep as cash according to the directions of the central bank. The reserve ratio is an important tool of the monetary policy of an economy and plays an essential role in regulating the money supply. When the central bank wants to increase money supply in the economy, it lowers

the reserve ratio. As a result, commercial banks have higher funds to disburse as loans, thereby increasing the money supply in an economy – Wikipedia.

2. A bank rate is the interest rate at which a nation's central bank lends money to domestic banks, often in the form of very short-term loans. Managing the bank rate is a method by which central banks affect economic activity. Lower bank rates can help to expand the economy by lowering the cost of funds for borrowers, and higher bank rates help to reign in the economy when inflation is higher than desired – Wikipedia.

3. Monetary authorities, mainly the central banks, have several apparatus in their tool box in the conduct of monetary policy to achieve specific statutory mandate. The mandate usually comprises of price stability, and may sometimes include economic growth and development on a wider scale. The monetary policy tools or instruments are used to control interest rates, inflation, exchange rate and other macroeconomic aggregates, in order to achieve price stability. Moral suasion is one major policy instrument that is used by most central banks or monetary authorities in the conduct of monetary policy. Moral suasion is a strategy used by a monetary authority (e.g. Central Bank of Sri Lanka) to influence and pressure, but not force, banks and other economic agents into adhering to its policy and guidelines. It is a qualitative, not measurable but direct instrument aimed at pressuring different economic agents to comply with monetary authority's policy guidelines. Therefore, moral suasion is a direct, non-market based policy instrument used mainly as a last resort in monetary policy implementation.

4. Attaining domestic price stability, taking part in the economic related activities, safeguarding the local currency, protecting the banking sector and maintaining the financial system stability.

5. Hyperinflation in Germany and Australia during 1920s and later in Latin American countries and in Zimbabwe shows how these economies were destroyed by so called "hyperinflation".

6. Japan experienced deflation in early 1990s due to decline in prices in the country. From the consumers perspective, it bring many benefits, but not to the economy. This may lead to (as it happened in Japan) negative economic growth together with decline in nominal GDP, wages, interest rates.

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