INFLATION AND ECONOMIC GROWTH IN SRI LANKA: AN ARDL BOUND TESTING APPROACH

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Abstract:

Nowadays, number of researchers empirically confirmed that the inflation and economic growth equally move together in negative liaison. But, in Sri Lankan context, this relationship was inferentially not proofed. Therefore, this study was empirically going to test this relationship. The objective of this study was to test the long run nexus between the inflation and economic growth in Sri Lanka. To test this objective, this study used the annual time series data during the periods of 1970 to 2014. And, the multiple regressions model was employed with support of the Auto Regressive Distributed Lag (ARDL) technique which was newly introduced by Pesaran et al., (2001). In this study, the economic growth was used as dependent variable and the inflation rate, exchange rate, and money supply were considered as independent variables. In these independent variables, the inflation rate was considered as key variable and others were exercised as control variables. Based on the ARDL technique, this study selected the lag- 2 model for interpreting the findings which was selected by Akaike Info Criterion (AIC) and Schwarz Bayesian Criterion (SBC). Furthermore, this study fitted a long run nexus model using ordinary least square method with support of ARDL technique. Based on this model, this study confirmed that both the inflation and the economic growth maintain the long run nexus between them with appearing of negative sign. Therefore, this study recommends that, when the development policy makers frame the development policy they should consider this nexus.

Keywords: *Inflation rate, Exchange rate, Broad Money, Economic Growth*

Introduction

In the view of macroeconomics, inflation relates with economic growth which was empirically confirmed by the experience of countries. The economic growth depends on capital formulation which expedites by investment and savings. In the meantime, the investments and savings are determined by the interest rate. The investment and saving have been impactedby the inflation. Therefore, it is confirmed a connection between the inflation and the economic growth.

The connection between the inflation and the economic growth was empirically well documented by numbers of studies. But in this research, the following studies: *Datta and Mukhopadhyay (2011), Hussain and Malik (2011), Gunasinghe (2007), Naqvi and Kahan (1989), Barro (1995), Sarel (1995)* are selected as literatures. In these literatures, the researchers used mixed methodsto attain their objectives but

none of them used the Auto Regressive Distributed Lag (ARDL) technique. In Sri Lankan context, it has been identified as a study gap. Therefore, the ARDL technique is applied to reach the objective of this study and also, this study is separated as the following sub - section: Introduction, Objective, Research Methods, Results and Conclusion.

Objective

The objective of this study is to test the ***long- run***nexus between the inflation and the economic growth in Sri Lanka.

Research Methods

In this study, to perform objectivethe Auto Regressive Distributed Lag (ARDL) bound testing approach was employed which was originally introduced by *Pesaran and Shin (1999)* and further extended by *Pesaran et al.,* (2001). Actually this approach builds based on the Unrestricted Error Correction Model (UECM) which has more advantages compared with the conventional cointegration approaches. Therefore, this study used the ARDL bound testing approach to achieve the objective.
Moreover, in this study, the economic growth was used as dependent variable, whilethe inflation rate, exchange rate and money supply were considered as independent variables. And also, the annual time series data during the period of 1970 to 2014 of these variables were used which were gathered from annual reports of the Central Bank of Sri Lanka from the mentioned years. In the meantime, the multiple regression model was used which was formulated by Ordinary Least Squared Method (OLS). The model shows as follows (all variables were converted into natural logarithmic form):

$$Ec_t = f(INF_t, EXR_t, MS_t) \ldots\ldots\ldots\ldots (1)$$
$$\log Ec_t = \beta_0 + \beta_1 logINF_t + \beta_2\ logEXR_t + \beta_3 logMS_t + U_t \ldots\ldots\ldots (2)$$

Where: Ec_t: Economic growth; INF_t: Inflation; EXR_t: Exchange rate; MS_t: Money supply; U_t: Error tern; β: Coefficients of the model; log: Natural logarithm.
As mentioned earlier, the ARDL Un - restricted Error Correction Modelwas applied which is defined as follows:

$$\Delta \log Ec_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta \log Ec_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta logINF_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta logEXR_{t-i} + \sum_{i=0}^{n} \alpha_{4i} \Delta logMS_{t-i} + \gamma_1 logEc_{t-1} + \gamma_2 logINF_{t-1} + \gamma_3 logEXR_{t-1} + \gamma_4 logMS_{t-1} + e_t \ldots (3)$$

Where: Δ: First difference operator; α: the drift component; e_t: White noise residuals.

Results

In this study, to test the long run nexus between the inflation and the economic growth, first of all, this study selects the suitable ARDL model using the Akaike Info Criterion (AIC) and Schwarz Bayesian Criterion (SBC). To select the suitable model, this study fitted several lag models. After that, the optimum value of the AIC and SBC model among the models is preferredto explain the long run relationship.The following table shows the AIC and SBCs' values at different lags.

Table- 1: SIC and AIC values at different lags

Lag	Schwarz Bayesian (SIC)	Akaike Info Criterion (AIC)
2	2.0	1.5
4	2.5	1.6
6	3.0	1.8

(Source: Estimated from secondary data)

In the table -1, SBC and AIC values are shown with different lags. Among the mentioned lags in the able- 1, the lag –2is chosen as best model because this modelhas minimum SBC and AIC values compared with other lags model.Therefore, the lag -2modelis selected to explain the long run nexus between the inflation rate and the economic growth. The following table shows the outcome of lag -2:

Table – 2: ARDL consequence of lag -2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.318582	0.455047	0.700106	0.4894
D(LOG(GDP(-1)))	1.110179	1.844442	0.601905	0.5519
D(LOG(GDP(-2)))	0.074671	1.609675	0.046389	0.9633
D(LOG(INF(-1)))	0.737843	1.899599	0.388420	0.7005
D(LOG(INF(-2)))	-0.204128	1.658527	-0.123078	0.9029
D(LOG(EXR(-1)))	0.996343	2.085976	0.477639	0.6365
D(LOG(EXR(-2)))	0.354026	1.827110	0.193763	0.8477
D(LOG(MS(-1)))	-1.857389	1.524460	-1.218391	0.2329
D(LOG(MS(-2)))	1.538686	1.688117	0.911481	0.3696
GDP(-1)	-0.000127	7.45E-05	-1.710537	0.0978
INF(-1)	0.000148	0.000228	0.647814	0.5222
EXR(-1)	-0.020178	0.007032	-2.869352	0.0076
MS(-1)	2.41E-06	9.30E-07	2.587308	0.0150

R-squared	0.511364	Mean dependent var	0.065230
Adjusted R-squared	0.309169	S.D. dependent var	0.550489
S.E. of regression	0.457546	Akaike info criterion	1.522793
Sum squared resid	6.071089	Schwarz criterion	2.060643
Log likelihood	-18.97866	F-statistic	2.529069
Durbin-Watson stat	2.114725	Prob(F-statistic)	0.020261

(Source: Estimated from secondary data)

After estimating of the suitable ARDL model, this study checks the autocorrelation effect of estimated model using the Breusch-Godfrey Serial Correlation LM Test. The following table shows Breusch-Godfrey Serial Correlation LM test result of the estimated ARDL model.

Table- 3: The results of Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.602584	Probability	0.219945
Obs*R-squared	4.456755	Probability	0.107703

(Source: Estimated from secondary data)

In the table- 3, the probability value of F- statistic is 21% which means that the estimated model is not suffering from the auto -correlation effect because the corresponding probability value is greater than at 5% significant level.
In this study for testing the long run nexus (bound test), the Wald testing approach is considered. The following table shows the results of bound testing approach.

Table – 4: Wald test for bound testing approach

Test statistic	Value	df	Probability
F- statistic	6.273905	(4, 30)	0.0009
Chi- squared	25.09562	4	0.0000

(Source: Estimated from secondary data)

As shown in the table- 4, the computed F- statistic is 6.2739 which compare the different critical values of the table at 1%, 5% and 10%.The following table shows the different critical values at mentioned significant levels.

Table- 5: the critical values of bound test

Computed F- statistic: 6.2739	Critical values	
	Lower bound I(0)	Upper bound I(1)
1% significant level	4.280	5.840
5% significant level	3.058	4.223
10% significant level	2.525	3.517

(Source: Estimated from secondary data)

In this study, the computed F – statistic exceeds the upper bound critical values of entire significant levels. The guide line says that if the computed F- statistic is

greater than the upper critical value, the variables maintain the long run nexusamong them. In this circumstance, the variables of this study follow the long run nexus among them, which mean that the variables in this study move together, because the F- statistics exceeds the upper bound position of the all significant level (see: table - 5). Therefore, based on the ARDL approach the long run nexus model is as follows:

Table – 6: the long run model of this study

$\log Ec_t = 6.175882 - 1.001858 logINF_t - 1.213833 logEXR_t + 1.038724 logMS_t$				
C	6.175882	0.214919	28.73591	0.0000*
LOG(INF)	-1.001858	0.015949	-62.81480	0.0000*
LOG(EXR)	-1.213833	0.090645	-13.39103	0.0000*
LOG(MS)	1.038724	0.040186	25.84810	0.0000*
R- squared : 0.99		F- statistic: 3786.609		

(Source: Estimated from secondary data)

*significant at 1% level

In the table – 6, all independent variables are significantly impact on the economic growth in Sri Lanka at 1% level. The key independent variable (inflation) negatively impacts on the economic growth which means, if the inflation increases by one percent the economic growth decline by one percent. Likewise, if the inflation is decreased by one percent, the economic growth will be increased by one percent.

Conclusion

In this study the Auto Regressive Distributed Lag model was employed to test the long - run relationship between the inflation and economic growth in Sri Lanka. Here, the economic growth was utilized as the dependent variable and the inflation rate, exchange rate, and money supply were considered as independent variables. Moreover, in this study the annual time series data were deemed during the period of 1970 to 2104. At last, this study found that the inflation kept the negative relationship with the economic growth in Sri Lanka and alsoboth the economic growth and the inflation had preserved long run nexus during the study periods. Therefore, this study recommends that, when the development policy makers frame the development policy they should consider this nexus.

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