# MODELLING THE CONSUMER PRICE AND PRODUCER PRICE INDICES WITH RELATED ECONOMIC VARIABLES


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Degree Master of Science in Business Statistics


Department of Mathematics

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# DECLARATION

I declare that this is my own work and this Dissertation does not incorporate without acknowledgement any material previously submitted for a Degree of Diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books)

Signature: Date: 10-04-2023

The supervisor should certify the Dissertation with the following declaration.

The above candidate has carried out research for the Name of the Degree Dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Dr.(Mrs). S. C. Mathugama
Senior Lecturer
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Signature of the Supervisor: Date: 12-04-2023

## ABSTRACT

This research intends to assess the relationship between Consumer Price Index (CPI) and Producer Price Index (PPI) in Sri Lanka with the related macroeconomic variables such as Broad Money Supply, Imports, and Exchange Rate for the period of January 2014 to June 2021 for the Sri Lanka. The Multivariate Time Series Analysis methods and stochastic forecasting methods based on the Root Mean Square Error (RMSE) are engaged in the analysis. The log transformation is used to stabilize the variation of data in each variable. At their first differences, the log transformed Consumer Price Index, Producer Price Index, Broad Money Supply and Imports variables are stationary, but those variables are non-stationary at their level. Hence, the co-integration test is applied to the non-stationary variables that are at the first order of integration. The Johansen co-integration test results, confirmed that the Consumer Price Index, Producer Price Index, Imports and Broad Money Supply have a significant long run equilibrium relationship. In the long run, the Producer Price Index and the Broad Money Supply both have a positive effect on the Colombo Consumer Price Index, while Imports have a negative effect. Granger causality test results under Vector Error Correction model (VECM) revealed that there is a bidirectional causal relationship between Consumer Price Index and Producer Price Index. The VEC model's short run estimation results show that the Producer Price Index, Imports and Broad Money Supply are weakly exogenous to the Consumer Price Index. The Akaike Information Criteria (AIC), Schwarz Criteria (SC) and F-statistics indicated a fairly good fit of the VEC model. The impulse responses also suggested that both short-run and long-run factors affected to the Consumer Price Index, are Producer Price Index, Board Money Supply and Imports. Under variance decomposition, Consumer Price Index contributions to other variables are exogenous for the three periods. After three periods, Producer Price Index is only a marginally exogenous variable in predicting Consumer Price Index. The diagnostic tests of the VEC model proved that the residual assumptions of no serial correlation, no heteroskedasticity and multivariate normally distributed are satisfied. The RMSE evaluated by the stochastic forecast under the dynamic method revealed that the fitted model is validated to the test data set showing the actual CPI figures from July 2021 to December 2021 are in both the forecast upper and lower bounds.

**Keywords:** Consumer Price Index, Producer Price Index, Broad Money Supply, Johansen co-integration, VEC model,

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| | |
|---|---|
| CCPI | - Colombo Consumer Price Index |
| PPI | - Producer Price Index |
| M1 | - Narrow Money Supply |
| M2 | - Board Money Supply |
| IMP | - Imports |
| EXP | - Exports |
| ER | - Exchange Rate |
| RICE | - Rice Price Index |
| GDP | - Gross Domestic Product |
| TB | - Treasury Bill Interest Rate |
| ADF | - Augmented Dickey-Fuller test |
| AIC | - Akaike Information Criterion |
| SC | - Schwarz Criterion |
| HQ | - Hannan-Quinn |
| FPE | - Final Prediction Error |
| LR | - sequential modified LR test statistic |
| VAR | - Vector Autoregressive |
| VECM | - Vector Error Correction Model |
| IRF | - Impulse Response Function |
| RMSE | - Root Mean Square Error |
| LM | - Lagrange Multiplier |
| DCS | - Department of Census and Statistics |
| CBSL | -Central Bank of Sri Lanka |

# LIST OF ANNEXURES