Nexus between Selected Macro Economic Variables and Stock Market Performance in Sri Lanka During (2017-2022): An Econometric Analysis

Yogendran Induja[1], Sinnathurai vijayakumar[2]

[1]**induja199612@gmail.com**

[2]**svijay@univ.jfn.ac.lk**

Abstract: Stock market contributes to the economic growth of the country in various ways. In other words, efficient allocation of domestic resources among developing sectors is seen as one of the main roles played by stock markets in the development process. Focusing on examining the relationship between stock market performance and macro-economic variables in Sri Lanka. Money supply, exchange rate, index of industrial production and interest rate used as independent variables and all share price index as dependent variable. It has been carried out with a focus on monthly time series data from January 2017 to December 2022. Eview includes the econometric procedures of augmented dickey fuller unit root test, heteroscedasticity test, serial correlation LM test, omitted variable test, stability diagnostic test, normality test, auto regressive distributed lag model bound test used to test the long run relationship between the variables and error correction model used to test the short run relationship between the variables. The test is revealed that there is positive and significant impact of money supply, exchange rate and index of industrial production on stock market performance while interest rate has negative significant impact on stock market performance in the long run. Further, it is found that there is a negative and significant impact of money supply on stock market performance while exchange rate has a significant positive impact on stock market performance in the short run. Interest rate does not significant impact on stock market performance in the short run. In order to attract stock market investments, the government should take measures such as maintaining stable stock prices, maintaining political and economic stability and developing market facilities and infrastructure facilities. Advances in block chain technologies will open up new avenues for modern stock market transactions.

Keywords: Stock market performance, Money supply, Exchange rate, Interest rate, Index of industrial production

01. INTRODUCTION

Stock exchanges have emerged as one of the main drivers of the modern world economy by facilitating efficient allocation of funds while enabling investors to generate returns from diversified portfolios of their choices. While stock markets are beneficial to the developing country like Sri Lanka are more significant. Because in developing countries seen as a solution to the lack of capital equipment by regulating funds towards business expansion and stimulating innovation in product management. Stock exchange can be defined as the formal structure or infrastructure that facilitates the trending of share capital of a company. Here investors buy and sell shares that represent ownership claims publicly traded companies. Participants in sharing trading vary from small individual investors to large institutional investors such as financial investors, pension funds, and insurance funds. The primary objective of the stock market is to enable businesses to grow by raising sufficient capital for business expansion and innovation. A platform where investors buy and sell stocks, bonds or other securities is called stock market. In Sri Lanka such transactions take place through a regulated stock market called the Colombo stock exchange. Historically, Share trading in Sri Lanka is considered to have started in 1896. Based on this, 127 years have passed since the start of share trading in Sri Lanka. The main reason for the introduction of the stock market in Sri Lanka in 1896 was the need to raise capital for popular tea plantations from 1820 to 1896. (Lalith, 2011, pp. 2-5) In 1904, its members dissolved the stock broker's association and formed the Colombo broker's association (CBA). The period from 1948 to 1977 was not the best political, economic and legal environment for the stock market. The open economic policy of the government that took office 1977 led to an increase in the role of the private sector in economic activity, which created a favorable environment for the stock market. In 1979, tax on capital gains available from acquisitions of listed companies was abolished. Also in the year the contribution of local and foreign private sector was given a place in the banking sector. (Lalith, 2011, p.4) The Colombo stock exchange is a secondary market that facilitates the exchange of shares between investors. Currently 289 companies are listed in it. Various variables influence the performance of the stock market. This study includes Broad Money supply, Exchange rate, Index of industrial production and interest rate.

1.1 Importance of study and objective of study

The period from 2017 to 2022 was seen as challenging in Sri Lanka. Because Easter Sunday attack, covid-19 impact and the economic crisis have had an impact on economy. But there is a significant upward trend in the performance of stock market even though the variables of Broad money supply, exchange rate, index of industrial production and interest rate have shown sharp fluctuations. The Colombo stock exchange has emerged as one of the market in the Asian region that has recovered the fastest from the impact of covid-19 global pandemic. Therefore this study is necessary to find ways to maintain this growth trend and to predict the trend of the stock market in the future. The objective of the study is to find out the relationship between stock market performance and the variables of Broad money supply, exchange rate, industrial production and interest rate in the last period from January 2017 to December 2022. And to find out the impact of Broad money supply, exchange rate, index of industrial production and interest rate on stock market performance.

02. LITERATURE REVIEW

2.1 Theoretical study

The efficient market hypothesis was proposed by Samuelson and Fume. A highly efficient market is one in which all information about asset price is available to borrowers and lenders at very low cost. The efficient market hypothesis is a financial theory that suggests that financial markets are informationally efficient, meaning that asset prices fully reflect all available information at any given time. This implies that it is impossible to consistently achieve higher than average returns through stock picking or market timing because any new information is quickly incorporated into stock prices. Accordingly no profitable opportunity is missed here. Also the information available will not be wasted and will be utilized. And like the stock market here too every investor acts rationally. Also the actual market price will reflect all the available information. In general, no one can make a profit because everyone has equal access to information in this market. Hence expected effect and actual effect will be equal.

The great fool theory proposes that you can profit from investing as long as there is a greater fool than yourself to buy the investment at a higher price. This mean that you could make money from an overpriced stock as long as someone else is willing to pay more to buy it from you. Investing according to the greater fool theory means ignoring valuations, earnings reports and all other data.

Classical economist theory introduced in the 18th and 19th centuries and expanded by fisher in 1930. According to them, savings or investment and the demand of investment determine interest rates. Saving can be undertaken by the housing sector, the corporate sector and the government sector. However interest rate is necessary to stimulate saving. So there is a positive correlation between saving and interest rate. The rational expectations theory states that the payers in an economy will act in a way that confirm to what can logically be expected in the future. That is, a person will invest, spend etc. Although this theory has become quite important to economics, its utility is doubt full.

2.2 Empirical study

Devkota and Dhungana (2019) investigated the relationship between stock market index and four macro-economic variables in Nepal. Time series data collected from 1994 to 2017. Nepal stock index (NDX) was used as dependent variable and broad money supply, gold price, interest rate, exchange rate used as independent variables. ARDL model and bound test techniques were used by researchers. This study concluded that interest rate was the most determining factor for the stock market index. Gold price had insignificant impact on the stock market. The real exchange rate had insignificant effect on the stock market.

Khan and Khan (2018) examined effect of various macro-economic variables on stock market price of Pakistan but analyzing the monthly data from May 2001 to Aug 2016. KSE-100 index was used as dependent variable and interest rate, inflation, money supply, exchange rate, industrial manufacturing production index, exports as independent variables. ADF test, PP test, Breusch pagan- Godfrey test, ARDL approach of bound test techniques were used. The findings suggested that stock price of Karachi stock exchange in long term were significantly affected by money supply, exchange rate and interest rate. In short term all the variables were insignificant except exchange which was negatively co integrated with stock prices.

Hsing (2011) examined the effects of selected macro-economic variables on stock market index by using 2005 data as the base year in South Africa. South African stock market index was used as dependent variable and real output, government deficit, money supply, domestic real interest rate, nominal effective exchange rate, inflation rate, world stock market index, world interest rate as independent variables. ADF test, GARCH model were used in this study. Finding revealed that South Africa's stock market index was positively influenced by the growth rate of real GDP, the ratio of the money supply, US stock market index negatively affected by the ratio of the government deficit to GDP, domestic interest rate, nominal effective exchange rate.

Kengatharan and Dimon (2021) they analyzed the macro economic variables on stock market performance with a focus on Sri Lanka for the period of 1990-2019. This research carried out using Auto regressive distributed lag bound test method, Augmented Dicky fuller test techniques. Here all stock price index was used as dependent variable and real exchange rate, interest rate, inflation rate as independent variables. The conclusion here was that interest rate and inflation rate had a negative impact on stock market performance. Exchange rate had no impact in the long run. It has been clarified that interest rate had a negative impact on stock market performance in the short run.

Fernando (2017) examined the relationship between stock market and selected macro- economic variables while investigating the impact of uncertainty of macro- economic variables on stock market volatility with a focus on Sri Lanka over the period from 1998 to 2016. As far as this study was concerned vector error correction model (VECM) and exponential generalized Auto regressive conditional heteroscedasticity (EGARCH) Techniques were used in this study. Here all share price index was used as dependent variable and monthly average three month Treasury bill, monthly inflation, monthly broad money supply and LKR currency exchange rate against USD at the end of the month as independent variables. The conclusion was that the ratio of treasury bills and currency exchange rate had a negative effect on the stock market, while money supply and inflation has a positive effect in the long run.

03. DATA AND METHODOLOGY

This analysis was done by using the quantitative analysis method. Especially time series data is analyzed by using multiple regression analysis. This study allows to analyze the relationship between selected macro-economic variables and stock market performance in Sri Lanka. Monthly time series data from January 2017 to December 2022 have been used to find this study. Data related to the dependent variable, all share price index used for this analysis. Data related to independent variables such as Broad money supply (M2b), Real effective exchange rate index (REERI), Index of industrial production (IIP), Weight average prime lending rate (WAPLR) have been obtained from the annual report of the central bank of Sri Lanka and department of census and statistics.

Mostly ARDL model can be used to separate long run and short run effects and to test for co-integration. It is appropriate model for mixture of level (I_0) and 1st difference (I_1) variables. Therefore, ARDL model has been selected for this research. Unlike VAR, which requires all variables to be stationary (I (0)), and VECM, which requires all variables to be integrated of order one (I (1)), ARDL can handle a mix of (I (0)) and (I (1)) variables without requiring strict stationarity. VAR does not explicitly separate long-run and short-run effects, and VECM is only applicable if co-integration exists.The models were used in the time series data with the help of various tools such as unit root test (Augmented dickey fuller test), and diagnostic test (Ramsey reset test, cusum test,

Heteroscedasticity test, normality test, serial co relation LM test), Auto regressive distributed lag model, ARDL bound test, Error correction model.

$LASPI_t = \beta_0 + \beta_1 LM2b_t + \beta2 LREERI_t + \beta_3 LIIPt + \beta_4 WAPLR_t + U_t$

Where:

        LASPI- Log of All share price index

        $\beta_1, \beta_2, \beta3, \beta4$ - Regression Coefficient

        LM2b- Log of broad money supply

        LREERI - Log of real effective exchange rate index

        LIIP - Log of index of industrial production

        WAPLR-Weight average prime lending rate

        U_t – White noise error term

According to the model specification, All share price index used as dependent variable and Broad money supply, Real effective exchange rate index, Index of industrial production , Weight average prime lending rate were used as independent variables. All share price index (ASPI) utilized as the proxy for stock market performance, Broad money supply (LM2b) utilized as the proxy for money supply, real effective exchange rate index (REERI) utilized as the proxy for exchange rate and weight average prime lending rate(WAPLR) utilized as the proxy for interest rate.

04. RESULTS AND DISCUSSION

4.1 ADF Unit root test

Table 4.1

ADF Unit root test

Variables	**Level (Trend & intercept)**			**1st Different (Trend & intercept)**		
	ADF Statistics	Critical t statis-tics 5%	Probability Value	ADF Statistics	Critical t statis-tics 5%	Probability Value
LASPI	-2.042927	-3.478305	0.5674	-5.827958	-3.478305	0.0000***
LM2b	-1.996200	-3.475305	0.5931	-6.376804	-3.475305	0.0000***
LREERI	-4.813885	-3.475305	0.0011***	-6.334153	-3.477275	0.0000***
LIIP	-5.018143	-3.475305	0.0006***	-10.92293	-3.475305	0.0000***
WAPLR	-0.242355	-3.475305	0.9908	-4.680904	-3.475305	0.0017***

Source: - Output for use data sheet E-views 10

Note: Significant levels- at 1% - *** 5% - **10% - * respectively

According to the (table 4.1), absolute value of ADF statistic for all variables are greater than t critical value at 5% significance level. Variables are stationary in which P value also confirmed that variable in use in this analysis are stationary after 1st difference in order one. It is the fact that residuals do not have unit root problem in this analysis. Since the variable taken in this analysis were taken at different scales, residuals are non-normal which

means they are skewed and have outliers. Therefore, variable are converted into log transformation and make them more symmetrical.

4.2 Autoregressive distributed lag model

Table: 4.2 *Auto regressive distributed lag Model selection: ARDL (1, 1, 4, 0, 4)*

Variable	Coefficient	Std.error	t- Statistic	Probability
LnASPI(-1)	0.732391	0.067396	10.86694	0.0000***
LM2b	-3.018057	0.067396	10.86694	0.0036**
LM2b(-1)	3.455763	1.016961	3.398129	0.0013***
LREERI	0.666054	0.326874	2.037644	0.0468**
LREERI(-1)	-0.754926	0.485338	-1.555465	0.1260
LREERI(-2)	0.184637	0.414581	0.445358	0.6579
LREERI(-3)	1.542875	0.527713	2.923702	0.0051**
LREERI(-4)	-0.918948	0.363916	-2.525167	0.0147**
LIIP	0.260250	0.112383	2.315739	0.0246**
WAPLR	-0.017424	0.112383	2.315739	0.2309
WAPLR(-1)	0.021695	0.021552	1.006669	0.3188
WAPLR(-2)	0.011378	0.016716	0.680657	0.4992
WAPLR(-3)	0.027666	0.018449	1.499583	0.1399
WAPLR(-4)	-0.050320	0.013100	-3.841364	0.0003***
C	-8.958974	3.061603	-2.926239	0.0051
R^2	0.947928	Mean dependent Var		8.840108
Adjusted R^2	0.933634	S.D dependent var		0.224355
S.E of regression	0.057797	Akaike info criteria		-2.667031
Sum squared resid	0.170367	Schwarz criterion		-2.169382
Log likelihood	103.0120	Prob (F-statistic)		0.0000
		Durbin- Watson Stat		1.942154
F- Statistic	66.31576	Breusch – Godfrey (Chi- Square-P)		0.8300

Source: - Output for use data sheet E-views 10

Note: Significant levels- at 1% - *** 5% - **10% - * respectively

R^2 is an important indicator for the fitness of the model, model should be all most goodness of fitness if the value of R^2 is around 60% (0.06). Accordance with this model, R^2 is 0.94 (94%), which means that virtually 94% of variation in all share price index is explained jointly by independent variables. And the value of adjusted R^2 is 0.93 (93%). The rest of 6% variation in all share price index can be explain by residual or other variables. R^2 of 0.94 indicates that the statistical fitness of model.

1 year past value of all share price index significantly positive impact on current year all share price index. Current year Broad money supply impact on stock market performance negatively. Current year exchange rate and

index of industrial production have a significant and positive impact on stock market performance. Current year interest rate does not have significant impact on stock market performance.

Table: 4.3: *ARDL Bound test and results*

t- statistic	Value	K
F-statistic	6.006906	4

Critical value bounds significance	Lower bound (I₀)	Upper bound (I₁)
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

According to the (table 4.3 and 4.4), the statistic at 5% confidence level is 6.006906 and the upper bound value is 3.49 (I_1), so here the F statistic is found to be greater than the upper bound value. There for null hypothesis is rejected. And there is co- integration relationship between the variables.

4.5 Long run Relationship between variables

According to the (Table 4.5), shows that results of long run correlation between variables obtained based on ARDL (1, 1, 4, 0, 4) as co-integration relationship between dependent variable and independent variables is confirmed.

Table 4.5: *long run results(ARDL bound test)*

Independent variables	Co efficient	Probability
LM2b	1.635620	0.0000***
LREERI	2.689341	0.0031***
LIIP	0.972499	0.0370**
WAPLR	-0.026175	0.0438**

Source: - Output for use data sheet E-views 10

Note: Significant levels- at 1% - *** 5% - **10% - * respectively

Long run Equation

$LASPI_t = \alpha_0 + \alpha_1 LASPI_{t-1} + \alpha_2 LM2b_{t-1} + \alpha_3 LREERI_{t-1} + \alpha_4 LIIP_{t-1} + \alpha_5 WAPLR_{t-1} + \mu_t$

According to the ARDL bound test conducted to find out the co integration relationship and long run relationship between the variables. The independent variables, Broad money supply, exchange rate and index of industrial production have a positive impact on stock market performance. And interest rate has a negative impact on stock market performance. So there is positive relationship between Broad money supply, exchange rate and index of industrial production and stock market performance. And interest rate has a negative relationship with stock market performance.

4.6 *Error correction model*

Short run results (Error correction model)

Variable				
	0	**1**	**2**	**3**
D(LM2b)	-3.018057			
	(0.0001)***			
D(LREERI)	0.666054	-0.808564	-0.623927	0.918948
	(0.0172)**	(0.0064)**	(0.0473)**	(0.0009)***
D(WAPLR)	-0.017424	0.011277	0.022655	0.050320
	(0.1709)	(0.3242)	(0.0441)**	(0.0001)***
Coint eq (-1)	-0.267609			
	0.0000			

Source: - Output for use data sheet E-views 10

Note: Significant levels- at 1% - *** 5% - **10% - * respectively

Short run Equation

$$\Delta LASPI_t = \delta_0 + \sum_{i=1}^{p} \delta_{1i}\Delta LASPI_{t-i} + \sum_{i=1}^{q1} \delta_{2i}\Delta LM2b_{t-i} + \sum_{i=1}^{q2} \delta_{3i}\Delta LREERI_{t-i} + \sum_{i=1}^{q3} \delta_{4i}\Delta LIIP_{t-i} + \sum_{i=1}^{q4} \delta_{5i}\Delta LWAPLR_{t-i} + \lambda ECT_{t-1} + \varepsilon_t$$

The different lag lengths (1-year, 2-years, 3-year lags) of a variable's effects in economics lead to different impacts because of how economic systems adjust over time. The impact of a variable may change due to several reasons, such as policy effectiveness, market responses and structural adjustments. For example short term (1 year lag) effects: some economic variables react quickly. If interest rates rise, stock market and exchange rates may respond almost immediately. Short term can responses can be more unpredictable, influenced by temporary shocks like political events or natural disaster. Medium term (2-year lag) initial short term fluctuations may stabilize as market absorb information and adjust expectations. Long term (3 year or more logs) larger economic adjustments (e.g, technological innovation, infrastructure development, labor market shifts), prolonged economic shocks such as financial crisis may lead to permanent effects on employment, capital investment, and economic potential.

According to the error correction model results, there is current year Broad money supply has a Negative relationship with stock market performance. Current year exchange rate and affect the all share price index positively in the short run. Which means positive relationship between current year exchange rate and stock market performance. Current year does not have relationship with stock market performance.

05. CONCLUSION AND RECOMMENDATIONS

The paper has analyzed the relationship between selected macro-economic variables and stock market performance in Sri Lanka with the use of various econometric methods. According to the Auto regressive distributed lag model, Current year Broad money supply impact on stock market performance negatively while 1 year past value of Broad money supply has a significant and positive impact on stock market performance. Current year exchange rate and 3 years past value of exchange rate have a significant and positive impact on stock market performance while 1 year past value of exchange rate and 2 years past value of exchange rate do not have significant impact on stock market performance. Current year index of industrial production impact on stock mar-

ket performance positively. 1 year past value of interest rate, 2 years past value of interest rate and 3 years past value of interest rate do not have significant impact on stock market performance. But 4 years past value interest rate has a significantly negative impact on all share price index.

According to the ARDL bound test conducted to find out the co integration relationship and long run relationship between the variables. The independent variables, Broad money supply, exchange rate and index of industrial production have a positive relationship with stock market performance. And interest rate has a negative relationship with stock market performance. So there is positive relationship between Broad money supply which is consistent with the findings of (Hsing 2011), exchange rate and index of industrial production and stock market performance. And interest rate has a negative relationship with stock market performance which is consistent with the findings of (Kengatharan & Dimon, 2021)

Error correction model is used to find out the short run correlation between the variables. According to the error correction model, current year Broad money supply has a negative relationship with stock market performance. Current year exchange rate and 3 years past value of exchange rate have a positive relationship with stock market performance. 1 year past value of exchange rate and 2 year past value of exchange rate have a negative relationship with stock market performance. Current year of interest rate and 1 year past value of interest rate do not have relationship with stock market performance. Since 2 year past value of interest rate and 3 year past value of interest rate have a positive relationship with stock market performance.

Since the stock market is seen as the main revenue generating sector of the government, effective adjustments should be made in the system of influencing variables. In order to attract stock market investments, the government should take measures such as maintaining stable stock prices, maintaining political and economic stability and developing market facilities and infrastructure facilities. The government should implement policies to facilitate easy participation in stock exchange transactions by developing new technology such as information and communication technology.

Exchange rate, interest rate and Broad money supply can be used as policy instruments to maintain stock market performance. So the government should implement appropriate monetary reforms policies to increase stock market efficiency. Reducing interest rates can decrease borrowing costs, encourage corporate expansion, and make stock market investments more attractive than fixed income securities. Avoid sudden interest rates hikes, as they can create uncertainty and drive investors towards safer assets like bonds. While increasing money supply can boost investment, it should not lead to excessive inflation, which can erode real terms, expanding the money supply through controlled monetary expansion can enhance investor confidence and ensure sufficient funds for stock market investments. Avoid excessive volatility in the real exchange rate, as currency instability can deter foreign investors.

The policy makers and government should maintain the interest rate at lower level to attract more investment in stock market. Currently Sri Lanka has continuously depreciated against the dollar which would create an unfavorable effect on stock market performance. Therefore exchange rate should be kept stable. And also an economy focus on manufacturing and industrial sectors to develop their industrial productions. So index of industrial production is high then economic growth will also be high. This attracts investors and makes more investments in the stock market.

Spreading investments across different sectors and asset classes reduces risk. Investors should consider passive investing strategies like index funds instead of actively picking stocks. Inflation, interest rates and economic growth directly impact stock prices. Investors should stay updated on economic indicators to make informed decisions. Higher returns usually come with higher risk. Investors should assess their risk tolerance and invest accordingly. Analyzing financial statements, earnings reports, and industry trends helps investors choose solid companies rather than relying on speculations.

Future researchers will be stimulated to do the research wider into the impact of macro- economic variables on stock market performance of several emerging country's economies. It will be helpful to policy makers, stock market analysts, investors and security analysts to make appropriate decisions based on stock market performance. Both domestic and international investors should be more awareness in the situation of Sri Lankan stock market trend and significant impact of money supply, interest rate, exchange rate and index of industrial production on stock market performance. I strongly believe that these findings will be useful to investors both domestic and internationals and policy makers for make better investments.

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