



Solving Stock Price-Gross Domestic Product Puzzle: Evidence from Sri Lanka

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ABSTRACT

This paper investigates the macroeconomic factors influencing on stock market performances in the long run while solving “stock price-gross domestic product (GDP) puzzle” in the Sri Lankan market. The results show that money supply and inflation are positively related with stock market performances and exchange rate, GDP and interest rate are negatively related to the stock market performances. “stock price- GDP puzzle” was solved by adding the balance of trade in the model where it finds positive association between GDP and stock price indicator. This study contributes to the literature on the relationship between stock market performances and macro economic factors while solving “stock price-GDP puzzle”.

Keywords: All Share Price Index, Market Capitalization, Macro Economic Factors, Sri Lanka

JEL Classifications: E44, F36, G00, O16

1. INTRODUCTION

Stock market is seen as a very significant component of a financial system in any country. It is playing a vital role in mobilization of capital within developing countries. The stock market is arguably the best place for an investor to invest in the shares of listed companies. It helps investors to sell their securities at a higher price. It is a known fact that most of the people invest in shares with the intention of selling the share at a higher price in future. If there is a well functioning share market, investors always invest their money in shares of different companies and it will help to increase the economy of a country and people’s income indirectly. Many researchers like Demircuc-Kunt and Levine (1996a), Singh (1997), and Levine and Zervos (1998) found that stock market development plays an important role in economic growth. Jahfer and Inoue (2014) studied the relationship between stock market development and economic growth in Sri Lanka for the period from 1996 to 2011 and they concluded that stock market development does positively contribute to economic growth and stock market development is the key aspect of economic development in Sri Lanka.

Over the past few decades, the interaction of the capital market and the economic growth has been a subject of interest among financial economists and practitioners. It is often argued that stock market performances are determined by some fundamental macroeconomic variables such as gross domestic product (GDP), exchange rate, inflation, money supply, interest rate, balance of trade and etc. Investors generally believe that monetary policy and macroeconomic events have a large influence on the volatility of the stock prices. This implies that macroeconomic variables could exert effect on share returns and influence investors’ investment decisions. In the past, many researchers (Asprem, 1989; Yusof and Majid, 2007; Rahman et al., 2009; Singh, 2010; Hsing, 2011; 2014; Eita, 2012; Quadir, 2012; Naik and Padhi, 2012; Jauhari and Yadav, 2014; Khan, 2014; Pradhan and Saraswari, 2010; Bhatta, 2010 and Regmi, 2012, investigated the relationships between stock market performances and macroeconomic variables and proved the relationship.

The objective of this paper is to investigate the factors influencing the stock market performances in the long-run and to solve “stock price-GDP puzzle in the case of Sri Lanka. To the best our knowledge, there are no study attempted to solve “ Stock price-GDP puzzle” in an emerging market.

The rest of paper is organized as follows: Section 2 summarizes the literature review. Section 3 describes the data and methodology. Section 4 presents empirical evidence of the study. Section 5 concludes the research.

2. LITERATURE REVIEW

There are number of empirical studies examining the relationship between financial market performances and macroeconomic factors and most of studies found that financial sector development contributes positively to economic growth. Mookerjee and Yu (1997) investigated the effect of macroeconomic variables on Singapore stock market and found that stock prices are cointegrated with both measures of the money supply (M1 and M2) and aggregate foreign exchange reserves. But stock prices and exchange rates do not have a long-term relationship. Ibrahim and Aziz (2003) investigate the relationship between stock prices and industrial production, money supply, consumer price index, exchange rate in Malaysia. Stock prices are found a positive long-run relationships with industrial production and consumer price index. On the contrary, stock prices have a negative association with money supply and exchange rate. According to Büyüksalvarcı, 2010; Erdogan and Ozlale, 2005, Macroeconomic factors like inflation, industrial production, exchange rate, money supply, unemployment, risk premium, and rate of interest etc. have large influences on stock market operations. This is mainly because economic forces affect the discount rates, the ability of firms to generate cash flows and future dividend payments. Arbitrage pricing theory introduced by Ross (1976) suggest that an understanding of the macroeconomic context is essential for investors and policy makers in making effective investment decisions.

Liu and Shrestha (2008) investigate the relationship between Chinese stock market and a set of macroeconomic variables, i.e., money supply, industrial production, inflation, exchange rate and interest rate using heteroscedastic cointegration. and found stock performance is positively related to that of macro economy in the long term while inflation, exchange rate and interest rate have a negative relationship with the Chinese stock market index. Adam and Tweneboah (2008) studied the impact of macroeconomic variables on stock prices in Ghana using quarterly data from 1991 to 2007. They examined both the long-run and short-run dynamic relationships between the stock market index and the economic variables-inward foreign direct investment, Treasury bill rate, consumer price index, average oil prices and exchange rates using cointegration test, vector error correction model (VECM). They found that there is a cointegration between macroeconomic variable and stock prices in Ghana indicating long-run relationship.

Hasan and Ahmad (2012) investigated the impact of macroeconomic factors on Amman Stock Market Returns of Jordan employing monthly data from 1991 to 2010. They used six macroeconomic factors: Real money supply, real GDP, consumer price index, real exchange rate, weighted average interest rates on loans and advances, and a dummy variable. They have applied normality test and unit root tests on the data. Also, OLS, ARCH/GARCH models are utilized. They show that real money supply, consumer

price index, real exchange rate, weighted average interest rates and the Dummy Variable have a negative role on the on Amman Stock Market Returns and the real GDP has a positive impact.

Gunasekarage et al. (2004) examined the impacts of macroeconomic variables namely money supply, treasury bill rate (as a measure of interest rates), consumer price index (as a proxy for inflation) and exchange rate on stock market performance index using monthly data for the above variables. Their results from estimating VECM model reveal that the rate of inflation, the money supply and the Treasury bill rate have statically significant influence on the stock market index. Guneratne (2011) analysed both short and long-run causal relationships between stock prices and macroeconomic variables for Sri Lanka. Their results indicate that there are both short and long-run causal relationships between stock prices and macroeconomic variables.

From the literature review, there are evidences that macro economic factors are negatively as well as positively associated with stock market performance based on economy. And also, less attention has been paid to study about the association between stock prices and GDP in emerging markets. However, we observed the existence of “stock price-GDP puzzle”. from our analyses in Sri Lanka. Therefore, we are encouraged to solve “Stock price-GDP puzzle” in the Sri Lankan market while identifying the macroeconomic factors influencing on stock market performances in the long run.

3. DATA AND METHODOLOGY

3.1. Data

Quarterly time series data are used for the analyses during the period 1996 to 2014. Ratanapakorn and Sharma (2007), Eita (2012), and Kemboi and Tarus (2012) also use quarterly data for examining the relationship between stock market performance macroeconomic factors. The data are collected from International Financial Statistics (IFS) published by the International Monetary Fund, Colombo Stock Exchange (CSE) data library 2015 and Annual Reports of Central Bank of Sri Lanka. All Share Price Index (ASPI) and market capitalization (MSIZ) are used to measure the stock market performance. The ASPI indicates the price fluctuations of all the listed companies in the CSE and covers all the traded companies during a market day. Therefore, the best measure which reflects all the CSE performance is the ASPI and, it can be used to examine the effect on CSE operations due to changes in selected variables of Sri Lankan economy. There are few literatures on MSIZ as a stock market performance indicator (e.g. Levine and Zervos [1998] used the stock MSIZ to GDP ratio as an indicator of market development). The assumption behind this measure is that overall market size is positively correlated with the ability to mobilize capital and diversify risk of an economy.

Macro economic factors such as GDP, money supply (M2), interest rate (INTEREST), exchange rate (EXR), inflation rate (INF) and balance of trade (BOT) are used as independent variables. Following common practice in the literature, economic growth is measured by the real GDP (Constant 2005). Money supply is one of the monetary policy tools which is measured by M2. Maku and

Atanda (2010) find that NSE ASPI is more responsive to changes in money supply. In the case of Japan, the study shows that money supply is positively related to stock market. Consistently, Maysami and Koh (2000) support the view of Mukherjee and Naka (1995) for both long run and short run dynamic interaction between money supply and stock returns for the case of Singapore. The exchange rate is defined as domestic currency units (Rs.) per unit of US dollar. Adam and Tweneboah (2008) find that the exchange rate demonstrates weak influence on price changes. In addition, Ibrahim (2000) suggest no long run relationship between stock market and exchange rate using three different exchange rates, in the case of Malaysia. Inflation is measured by consumer price index. Marshall (1992) argued that the negative relationship between stock returns and inflation will be less pronounced during periods when inflation is generated primarily by monetary fluctuations, while Mukherjee and Naka (1995) and Chen et al. (1986) show a negative relationship. Interest rate is used for money market interest. Liu and Shrestha (2008) find negative impact on share prices. Bulmash and Trivoli (1991) also find a negative relationship between interest rate and stock prices for the USA. Balance of trade is used as a proxy of the world wide business cycle or the business cycle of developed countries.

Table 1 provides the summary of descriptive statistics of the variables uses in this study. All the data except balance of trade are transferred to natural logarithms for conventional statistical reasons.

Figures 1-4 show the patterns of macroeconomic factors and indicators of stock market performance for the study period 1996-2014. It can be observed from the Figures 1 and 2 that a significant development in the stock market performances after 2009¹. That is after the domestic war. There is also significant

1 The Colombo Stock Exchange (CSE) recorded a sharp growth in the first 9 months of 2014, with the All Share Price Index (CSEALL) increasing by 22.6% to 7,252.1 points and the Blue chip S&P SL 20 index growing by 23.7% to 4,038.3 points as of 30th September 2014. This continuous growth was on the back of 4.8% growth in CSEALL and 5.8% rise in the S&P SL 20 index during the year 2013. With this growth CSE is continuing to be the best performing frontier market and also enjoys the pole position among all regional markets. While the fall in interest rates have helped to boost market activity many initiatives taken by the Securities and Exchange Commission of Sri Lanka (SEC) and the CSE since 2013 were instrumental in increasing daily market liquidity. As of 26th September 2014 total market turnover surpassed the total annual turnover in 2013 of LKR 200.4 Billion and was recorded at LKR 226.4 Bn. Foreign investor participation was at 29.7% while the balance was from local investors, which managed to increase the average daily turnover by 60% to LKR 1,322 million during the first nine months of the year. The initiatives taken by the SEC and CSE together with other market participants to organize overseas investor forums and attract foreign investors have no doubt contributed to the growth of the foreign investor contribution in 2014. Further steps taken by the SEC to increase market liquidity through introducing minimum public holding criteria for the listed companies has also positively affected the market performance. As of September 2014, a total of LKR 21.3 billion was raised through the Capital Market with LKR 13.9 billion raised as equity IPO's, LKR. 2.7 billion as debt IPO's and LKR 4.7 billion by way of rights issues. The proactive approach taken by the SEC and other market intermediaries in further developing the Capital Market since 2013 has been validated by the market performance and the growth in IPO's and rights issues witnessed thus far in 2014.

improvement in the money supply and GDP after 2009. And also, we shall observe that there stock price of Sri Lanka was experienced a sharp fall after 2007 and then there is a sharp increase in the share price after 2009. This may be due to Lehman Shock².

Figure 3 shows the trends of inflation rate, interest rate, treasury bill rate during the period 1996-2014 in Sri Lanka. It is clear from the figure that there is a significant decline of inflation rate, interest rate, treasury bill rate after 2009. It was the peak period in 2007 and 2008.

Figure 4 shows the trends of exchange rate between US\$ and Sri Lanka rupees over the period 1996-2014 in Sri Lanka. Exchange rate has been gradually increased from 1996.

Figure 5 shows the trend of export in Sri Lanka over the period 1996-2014. It shows a close relationship between stock prices and exports.

Figure 6 shows the balance of trade in Sri Lanka rupees over the period 1996-2014. It shows continuously increasing negative balance .

3.2. Methodology

At first, the co-integration tests were done among the variables using the Johansen (1998) co-integration tests. Since Johansen co-integration is sensitive to the lag length, we used Schwarz Information Criterion in the VAR to determine the appropriate number of lag. Second, , we analyze the relationship using different methods in line with Liu and Shrestha (2008) methodology that is Autoregressive Conditional Heteroskedasticity (ARCH) and ordinary least square (OLS) method.

Since macroeconomic time series data contain unit root, variables used in the study are tested for stationary before analyses. For this purpose, unit roots are tested using Augmented Dickey-Fuller (ADF) (1979) test. After confirming that the variables are integrated of order one, then it is tested the existence of co-integration relationship between the variables.

The following models are tested to examine the relationship between selected macro economic variables and stock market performance.

Model 1

$$ASPI = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 M2_t + \beta_4 EXR_t + \beta_5 IR_t + U_t$$

2 Lehman shock refers to the shock 2008 filing of bankruptcy in of Lehman Brothers, one of the US and the world's largest financial services firm. In the US alone, Lehman's bankruptcy was considered the biggest in financial history with assets of the organization reported to be around 600 billion US dollars. It was in September 25, 2008 when Lehman Brothers finally succumbed to the ongoing mortgage crisis in the US and eventually ended its reign as one of the world's largest and soundest financial firm. This particular event in history eventually became known as Lehman shock because it really shocked not only the US but also the whole world because it is such a large firm and not many people saw it's fall to actually happen back in 2008.

Table 1: Descriptive statistics

	ASPI	MSIZ	EXR	GDP	INF	M2	BOT	INTEREST
Mean	3.2148	5.6354	1.9752	5.7827	0.9016	5.9681	-101916	0.9237
Median	3.2143	5.6891	2.0077	5.7036	0.9415	5.9616	-66540	0.9583
Maximum	3.8605	6.4866	2.1212	6.3976	1.4238	6.5207	9621	1.0923
Minimum	2.6059	4.9054	1.7337	5.1954	0.0205	5.4350	-330600	0.6848
Standard deviation	0.4122	0.5324	0.1113	0.3670	0.2745	0.3348	96727	0.1133
Observations	75	75	75	75	75	75	75	75

ASPI: All share price index, MSIZ: Market capitalization, GDP: Gross domestic product, M2-Money supply, INTEREST: Interest rate, EXR: Exchange rate, INF: Inflation rate, BOT: Balance of trade

Figure 1: All share price index

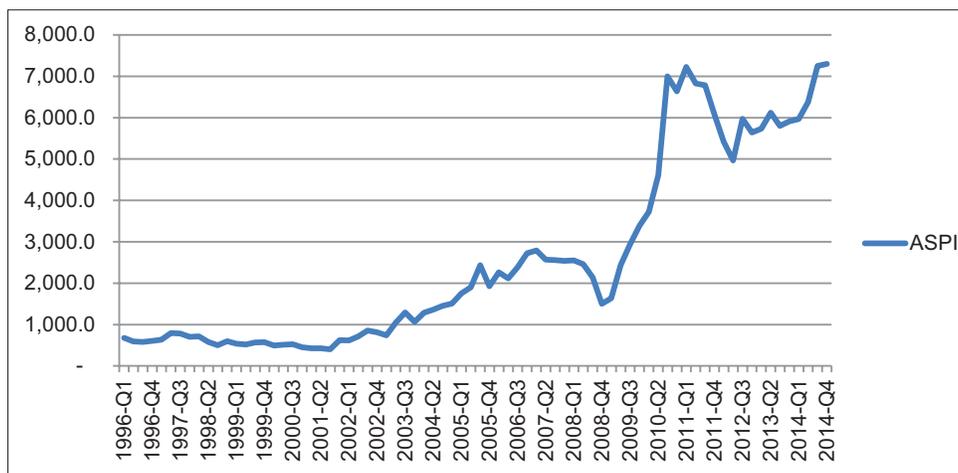
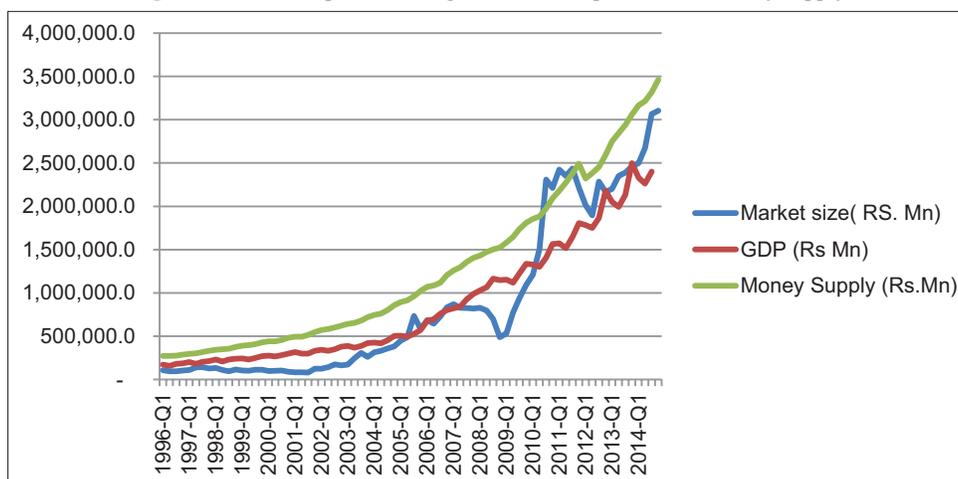


Figure 2: Market capitalization, gross domestic product and money supply



Model 2

$$MSIZ = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 M2_t + \beta_4 EXR_t + \beta_5 IR_t + U_t$$

When tested the above two models, it was realized the existence of “stock price-GDP puzzle”.

Then to solve “stock price-GDP puzzle”, we estimated the following models Models 3 and 4.

Model 3

$$ASPI = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 M2_t + \beta_4 EXR_t + \beta_5 IR_t + \beta_6 BOT_t + U_t$$

Model 4

$$MSIZ = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 M2_t + \beta_4 EXR_t + \beta_5 IR_t + \beta_6 BOT_t + U_t$$

Where, ASPI is all share price index; MSIZ is stock market capitalization; GDP is Real GDP; INF is inflation rate; M2 is money supply; EXR is exchange rate; IR is interest rate; BOT is the balance of trade and U_t is error term of regression.

Further, if cointegration detected between variables, then it is known that there exists a long term equilibrium relationship between them, then we use standard generalized Autoregressive Conditional Heteroskedasticity (GARCH) model as follows.

Figure 3: Inflation rate, interest rate

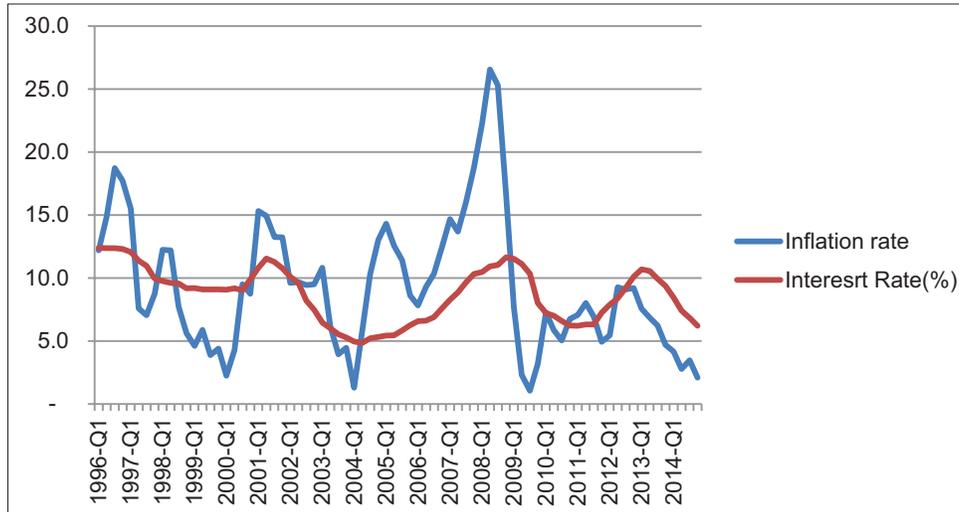


Figure 4: Exchange rate

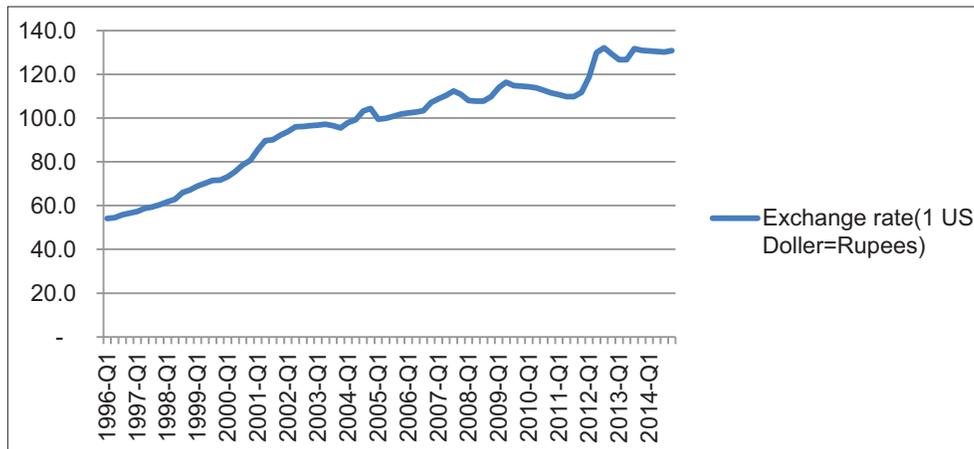
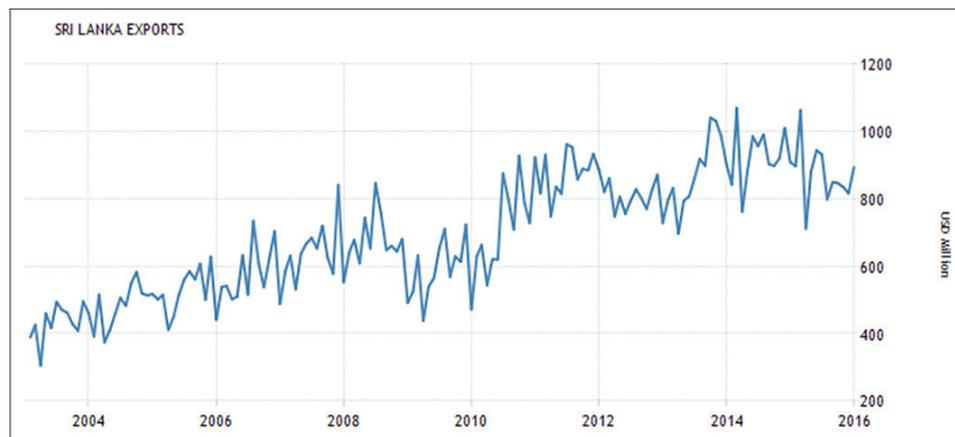


Figure 5: Exports



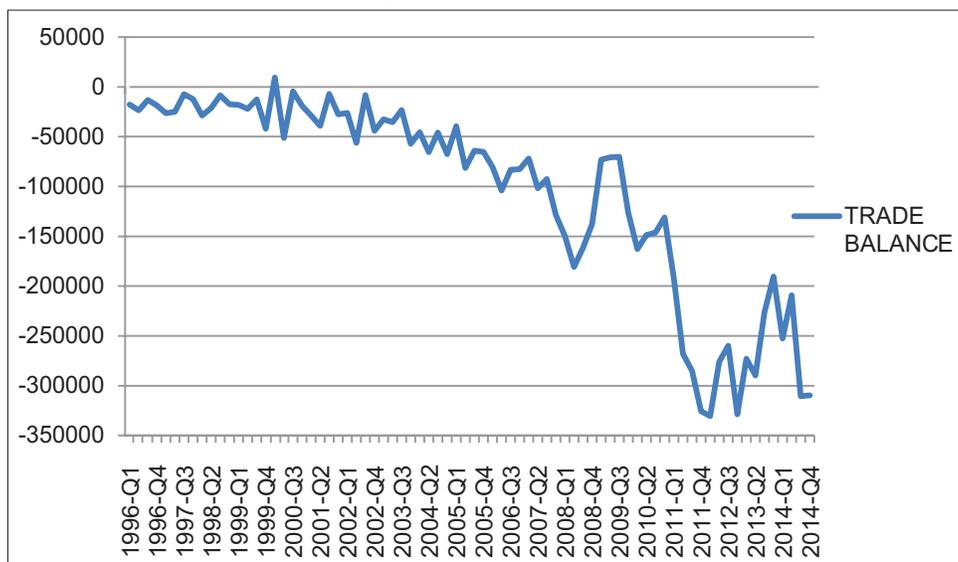
$$y_t = \alpha_0 + \alpha_1 x_{1t} + \alpha_2 x_{2t} + \varepsilon_t, \quad \varepsilon_t / \Omega_{it} \sim N(0, ht)$$

$$h_t = w_0 + w_1 h_{t-1} + w_2 \varepsilon_{t-1}^2$$

The Autoregressive Conditional Heteroskedasticity (ARCH) model, introduced by Engle (1982) has now become widely

used in modeling the behavior of financial time series. One of the main advantages of ARCH models is its ability to capture the non-linearity and volatility clustering in stock return data. This model was later extended by Engle and Bollerslev (1986) to the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model which incorporates the lagged values of

Figure 6: Balance of trade



conditional variance and therefore is able to capture the leptokurtosis, skewness, and volatility clustering in the time series data. The GARCH methodology also takes into account past variances in explaining future variances, and therefore when the data suffers from heteroscedasticity, the expected value of the error term is not constant. Furthermore, all ARCH/GARCH models explain the importance of the degree of persistence of shocks to volatility in returns and macroeconomic variables. These models are also useful in examining the simultaneous interaction among stock market returns and variation in macroeconomic factors.

4. EMPIRICAL RESULTS

4.1. Unit Root Test

To check the stationarity of the variables, the ADF test was employed. The test is conducted with intercept only and intercept and trend respectively on the level and first differences of the variables. It finds all variables are stationary on first differencing. The results of ADF test are shown in Table 2.

4.2. Cointegration Tests

Having confirmed that all variable are integrated of order (1), the cointegration tests were done among the variables using the Johansen’s cointegration tests to investigate long-term equilibrium relationship among the variables. Number of lags is selected using an optimal lag structure in the unrestricted VAR. Johansen’s approach derives two likelihood estimators for the cointegration rank: A trace test and a maximum Eigen value test. Table 3 presents summarized cointegration results estimated using EViews software. Cointegration results indicate the existence of long-run association between stock market performance and macro economic factors in Sri Lanka.

4.3. Ordinary Last Square Results

Table 4 reports the results under OLS. R-squared value of this models are 95.52% and 97.02% respectively which are higher than 80%. It indicates the models are fitted nicely or data is fitted

nicely. All macro economic variables are significant to explain both indicator of stock market performances. Money supply and Inflation are significantly positively associated with ASPI and MSIZ while exchange rate, GDP and interest rate are significantly negatively associated.

Lagrange Multiplier (LM) test for both ASPI and MSIZ are highly significant. This indicates the presence of heteroscedastic in the long run cointegrating regression and it was estimated accordingly.

4.4. Autoregressive Conditional Heteroskedasticity (GARCH)

Estimated results of the Autoregressive conditional Heteroskedasticity (GARCH) between stock market indicators and macroeconomic factors are presented in Table 5. The unit root tests on the standardized residuals are highly significant for both indicators of stock market performances which indicates heteroscedastic relationship to be stationary. The results using heteroscedastic shows similar results like OLS model. We could not find any different results from OLS model. Accordingly, money supply and inflation are positively related with stock market performances while the GDP, exchange rate and interest rate are negatively related to the stock market performances.

The above analyses show a negative relationship between GDP and stock prices which doesn’t seems plausible in the long-run even though there are some preceding researches with negative coefficients of GDP. The reason for the negative coefficient of GDP may be the stock prices were affected by Lehman Shock . But it is surprising that GDP was not affected much.. At the same time, when we look at the relationship between stock price and export, it seems that stock prices and export are closely related. It is clear from regression results and the Figures 3 and 5. It shows the existence of “stock Price-GDP puzzle” in Sri Lanka.

Further, we regressed between stock market indicators and macro economic factors including export for the period 1996 to 2014 and

Table 2: Augmented Dickey-Fuller (ADF) unit root test results

Variables	Level			First difference			Number of observations (after adjustments)
	Test with intercept	Test with trend and intercept	Lag length	Test with intercept	Test with trend and intercept	Lag length	
ASPI	-0.0960	-2.498	0	-8.159*	-8.133*	0	74
MSIZ	0.055	-2.285	0	-8.182*	-8.149*	0	74
GDP	0.331	-2.291	4	-3.608*	-3.549**	3	74
INF	-2.798	-2.969	0	-7.625*	-7.580*	0	74
M2	0.039	-2.948	0	-8.456*	-8.392*	1	73
EXR	-2.314	-2.135	2	-5.419*	-5.783*	1	73
IR	-2.927	-3.072	1	-3.320**	-3.284**	0	74
BOT	-0.2209	-3.125	1	-11.345*	-11.394*	0	74

***Indicates significance at the 1%, and 5% level respectively. Critical values with intercept and trend and intercept are for all tests are -3.522, -2.901, and -4.087, -3.472 at the 1%, and 5% levels of significance in that order. Number of lags is selected automatic based Schwarz Information Criterion (SIC)

Table 3: Johansen Co-integration test results

Hypothesized	Trace test			Maximum eigenvalue test			
	No. of CE (s)	Test statistic	Critical value 5%	P**	Test statistic	Critical value 5%	P**
(i) ASPI EXR GDP INF IR M2							
None*	144.8310	95.75366	0.000	50.40190	40.07757	0.002	
At most 1*	94.42909	69.81889	0.000	40.82369	33.87687	0.006	
At most 2*	53.60541	47.85613	0.013	26.27494	27.58434	0.072	
At most 3	27.33046	29.79707	0.093	17.26346	21.13162	0.159	
At most 4	10.06700	15.49471	0.275	9.461107	14.26460	0.249	
At most 5	0.605892	3.841466	0.436	0.605892	3.841466	0.436	
(ii) MSIZ EXR GDP INF IR M2							
None*	123.7690	95.75366	0.0002	48.64310	40.07757	0.004	
At most 1*	75.12591	69.81889	0.0177	27.85222	33.87687	0.220	
At most 2	47.27368	47.85613	0.0566	20.20768	27.58434	0.327	
At most 3	27.06600	29.79707	0.1000	12.93907	21.13162	0.457	
At most 4	14.12693	15.49471	0.0795	10.48758	14.26460	0.181	
At most 5	3.639352	3.84146	0.0564	3.639352	3.841466	0.056	
(iii) ASPI EXR GDP INF IR M2 BOT							
None*	217.240	125.615	0.000	107.244	46.231	0.000	
At most 1*	109.996	95.753	0.003	46.825	40.077	0.007	
At most 2	63.170	69.818	0.151	25.659	33.877	0.341	
At most 3	37.511	47.856	0.323	20.356	27.584	0.317	
At most 4	17.154	29.797	0.628	7.870	21.131	0.911	
At most 5	9.283	15.494	0.339	5.838	14.264	0.634	
At most 6	3.445	3.841	0.063	3.445	3.841	0.063	
(iv) MSIZ EXR GDP INF IR M2 BOT							
None*	217.000	125.615	0.000	111.335	46.231	0.000	
At most 1*	105.665	95.753	0.008	41.721	40.077	0.032	
At most 2	63.943	69.818	0.134	25.359	33.876	0.361	
At most 3	38.583	47.856	0.277	20.146	27.584	0.331	
At most 4	18.437	29.797	0.533	8.568	21.131	0.865	
At most 5	9.868	15.494	0.291	6.524	14.264	0.546	
At most 6	3.343	3.841	0.067	3.343	3.841	0.067	

*Denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) P values

before Lehman shock that is from 1996 to 2008 and the results are presented in Table 6. Table indicates we can point out that the coefficients of GDP with export are positive and sometimes significant at 10% level. The coefficients of GDP before Lehman are positive and sometimes significant.

We solve the “stock price-GDP puzzle” by adding Balance of Trade as given in the Models 3 and 4. The reason for adding the balance of trade is Balance of Trade or Export is working as the proxy of the world wide business cycle or the business cycle of developed countries or big countries. The economy or the stock price are affected by the world wide business cycle. For the small

economy or developing country in the early stage, the influence of the world economy may be large and independent from the domestic macro-economic variables.

Table 7 presents the estimated results with balance of trade. The unit root tests on the standardized residuals are highly significant for both indicators of stock market performances which indicates heteroscedastic relationship to be stationary. The results using heteroscedastic shows that GDP, money supply, balance of trade and inflation are positively related with stock market performances but exchange rate and interest rate are negatively related to the stock market performances. So, When we introduce the balance

Table 4: OLS results

Dependent variable	ASPI		MSIZ	
	Coefficient	t-statistic	Coefficient	t-statistic
C	-3.67436	-7.706**	-3.64119	-7.088**
EXR	-2.62981	-7.817**	-2.73725	-7.552**
GDP	-1.02772	-2.302**	-1.16496	-2.423*
INF	0.16100	3.460**	0.16511	3.294**
M2	3.06739	5.392**	3.62810	5.919**
IR	-0.40198	-3.561**	-0.36108	-2.969**
R ²	0.9572		0.9702	
Adjusted R ²	0.9541		0.9681	
Breusch-Godfrey serial correlation				
LM test	30.9774		30.9774	
P-value	0.0000		0.0000	

* and **denote the significance level at 5% and 1% level, respectively. ASPI: All share price index, MSIZ: Stock market capitalization, GDP: Real gross domestic product, INF: Inflation rate; M2: Money supply, EXR: Exchange rate, IR: Interest rate

Table 5: Autoregressive conditional Heteroskedasticity (GARCH) results

Dependent variable	ASPI		MSIZ	
	Coefficient	Z-statistic	Coefficient	Z-statistic
C	-3.665354	-10.387**	-3.088932	-5.824**
EXR	-2.650003	-8.558**	-2.741962	-7.702**
GDP	-1.027689	-3.208**	-0.946212	-2.133*
INF	0.147640	3.647**	0.138749	2.752**
M2	3.065976	7.494**	3.352670	5.952**
IR	-0.346270	-16.663**	-0.499760	-3.610**
R ²	0.9565		0.9685	
Adjusted R ²	0.9512		0.9647	
Variance equation				
C	0.000238	0.413585	0.005586	1.603808
RESID(-1) ²	-0.112841	-1.217509	0.404808	1.187925
GARCH(-1)	1.089772	7.907737	-0.048862	-0.116747
Unit root	-14.1809			
P-value	0.0000		-14.4704	0.0000

* and **denote the significance level at 5% and 1% level, respectively. ASPI: All share price index, MSIZ: Stock market capitalization, GDP: Real gross domestic product, INF: Inflation rate; M2: Money supply, EXR: Exchange rate, IR: Interest rate

Table 6: Autoregressive conditional Heteroskedasticity (GARCH) results with export

Dependent variable	1996-2014				1996-2008			
	ASPI		MSIZ		ASPI		MSIZ	
	Coefficient	Z-statistic	Coefficient	Z-statistic	Coefficient	Z-statistic	Coefficient	Z-statistic
C	-2.705	-13.262	-2.039	-11.112	-4.056	-20.100	-2.719	-5.217
EXR	-2.724	-24.508	-2.679	-15.368	-3.000	-17.888	-3.411	-9.126
GDP	0.166	3.808	0.316	6.636	0.136	1.798	0.211	0.972
INF	0.087	3.527	0.113	4.934	0.104	5.303	0.114	2.404
M2	2.070	18.986	2.575	31.318	2.355	31.906	2.864	11.322
IR	-0.635	-13.052	-0.707	-13.331	-0.692	-15.111	-0.785	-5.958
EXP	-0.103	-0.667	-0.356	-3.640	-0.054	-0.489	-0.261	0.911
R ²	0.96		0.98		0.87		0.95	
Adjusted R ²	0.95		0.97		0.85		0.94	
Variance equation								
C	0.0073	4.881	0.0089	4.327	0.000	2.327	0.007	2.148
RESID(-1) ²	0.4987	5.673	0.4080	4.550	1.275	5.320	0.554	1.682
GARCH(-1)	-0.6247	-5.561	-0.697	-4.986	-0.025	-0.322	-0.617	-1.768
Unit root	-13.382		-13.53		-7.566		-8.386	
P-value	0.000		0.000		0.000		0.000	

* and **denote the significance level at 5% and 1% level, respectively. ASPI: All share price index; MSIZ: Stock market capitalization; GDP: Real gross domestic product; INF: Inflation rate; M2: Money supply; EXR: Exchange rate; IR: Interest rate; EXP: Export

of trade in the model, the results are dramatically changed. That is GDP become positive association with stock prices.

In addition, there is a structural change of stock price because the coefficients of GDP before Lehman were positive and weakly

Table 7: Autoregressive conditional Heteroskedasticity (GARCH) results with balance of trade

Dependent variable	ASPI		MSIZ	
	Coefficient	Z-statistic	Coefficient	Z-statistic
C	-3.246	-16.142**	-2.731	-12.936**
EXR	-2.527	-19.666**	-3.033	-25.076**
GDP	0.118	1.414	0.163	2.029*
INF	0.087	4.059**	0.133	6.124**
M2	2.009	35.070**	2.508	41.869**
IR	-0.635	-18.220**	-0.751	-17.306**
BOT	0.0234	1.884	0.0285	2.491*
R ²	0.96		0.975	
Adjusted R ²	0.95		0.972	
Variance equation				
C	0.0055	4.693**	0.0067	2.994**
RESID(-1) ²	0.5490	4.653**	0.4729	4.344**
GARCH(-1)	-0.486	-4.921**	-0.565	-3.194**
Unit root	-16.786		-16.643	
P-value	0.000		0.000	

* and **denote the significance level at 5% and 1% level, respectively. ASPI: All share price index, MSIZ: Stock market capitalization, GDP: Real gross domestic product, INF: Inflation rate, M2: Money supply, EXR: Exchange rate, IR: Interest rate, BOT: Balance of trade

significant without Balance of Trade. It may suggest that Stock Prices have come to depend more on Balance of trade or Export.

This study contributes to the literature on the relationship between stock market performances and macro economic factors while “solving the stock price-GDP Puzzle” using heteroskedasticity cointegration on an emerging economy Sri Lanka.

5. CONCLUSION

The objective of this paper is to identify the macroeconomic factors influencing on stock market performances in the long run solve “stock price-GDP puzzle” using quarterly data of economic variables for the period 1996 to 2014 in the Sri Lankan market. The data are collected from IFS published by the International Monetary Fund, CSE data library 2015 and Annual Reports of Central Bank of Sri Lanka. ASPI and MSIZ are used to measure the stock market performance. The stationary of the data are tested using ADF test. It was found that all variables are stationary on first differencing. The relationships between macro economic variables and indicators of stock market performance are investigated using Johansen co-integration tests, and autoregressive conditional heteroskedasticity cointegration. Co-integration results indicate the existence of long-run relationship between macro economic factors namely; GDP, money supply, interest rate, exchange rate, inflation rate balance of trade and stock market performance indicators such as ASPI and MSIZ in the Sri Lankan market. Analyses show that money supply and inflation are positively related with stock market performances and exchange rate, GDP and interest rate are negatively related to the stock market performances. And it was realized the existence of “Stock price - GDP Puzzle” in Sri Lanka. This was solved by addition the balance of trade in the model where it finds positive association between GDP and stock price indicator. This study contributes to the literature on the relationship between stock market performances and macro economic factors while solving “stock price-GDP puzzle” using heteroskedasticity cointegration in an emerging economy Sri Lanka.

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