



THE LONG-TERM IMPACT OF MACROECONOMIC STABILITY VARIABLES ON STOCK PRICE VOLATILITY

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Abstract

The stock market of a country can be used to explain the behavior of its economy. This study examines the impact of macroeconomic stability variables on stock price volatility in the long term, with reference to the Colombo Stock Exchange (CSE). Previous empirical evidence has shown that the CSE exhibits stock price volatility characteristics similar to those of developed equity markets, even though the CSE has been categorized as a developing equity market. Therefore, it is important to examine the factors influencing this abnormal stock price volatility in the CSE. There is a lack of research examining the long-term impact of macroeconomic stability factors on stock price volatility in the Sri Lankan context. This study employed the Autoregressive Distributed Lag (ARDL) model, as many similar studies have used the ARDL model to identify the impact of macroeconomic stability factors on CSE stock price volatility from a long-term perspective. Five macroeconomic variables- GDP, inflation, money supply, interest rate, and exchange rate were analyzed over a 10-year period from 2010 to 2019. Findings revealed that CSE price volatility does not show a long-term impact from macroeconomic stability variables. However, it shows a considerably less short-term impact on interest rates and exchange rates. Further, these findings suggest that stock price volatility in the CSE may be driven more by market specific factors. Furthermore, due to the absence of strong macroeconomic influence, it can be suggested that there is information asymmetry, investor sentiment, and irrational market behavior in the CSE which affects stock price volatility.

Keywords: Colombo Stock Exchange, Macroeconomic Stability, Long-term Relationship, Stock Price Volatility

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1. INTRODUCTION

1.1. Background of Study

The Colombo Stock Exchange (CSE), which has 289 listed businesses in 20 sectors, is Sri Lanka's only stock exchange. It functions on an electronic trading platform and is the primary channel for investing in stocks, bonds, derivatives, and mutual funds. With regional offices spread around the nation, the CSE maintains its headquarters in Colombo.

This study examines the relationship between macroeconomic stability variables and stock price volatility on Sri Lanka's Colombo Stock Exchange (CSE). The influence of important macroeconomic stability variables on market activity is examined, including GDP, inflation, interest rate, money supply and exchange rate. While inflation, as determined by the Colombo Consumer Price Index (CCPI) shows percentage change in prices. GDP calculates the monetary value of the final goods and services those produced and purchased in a nation during a specific time period. Another important consideration is interest rates, especially the Average Weighted Deposit Rate. A key component of assessing equity value is stock price volatility, which is defined by both upward and downward movements in stock prices. Peiris & Peiris (2012) describe volatility as the upward and downward movements of the stock market and note its sensitivity to macroeconomic shocks. In order to forecast and manage risk, the standard deviation of returns is typically used as a measure of volatility. The behavior of equities prices is influenced by asymmetric volatility patterns, which are especially important in emerging markets like the CSE and arise from disparities in the availability of information. CSE is the only stock market in Sri Lanka. The CSE price index acts in a way that makes sense for a developing stock market. Nonetheless, the CSE's price index frequently exhibits traits of an established stock market that are unaffected by the core variables that are pertinent to this market. The CSE demonstrates extremes compared to developed markets, despite being categorized as an emerging market.

Omodero & Mlenga (2019) conducted research on the impact of macroeconomic variables on stock market performance in Nigeria from 2009 to 2018 using macroeconomic factors such as exchange rate, interest rate, inflation rate and gross domestic product. The economic a priori anticipation is that these variables mentioned above will significantly and positive influence the share price index. Macroeconomic variables such as gross domestic product, inflation and money supply, gross domestic product is a major variable that affect the share price (Pradhan & Dahal, 2016). Liu & Shrestha (2008) investigate the relationship between Chinese stock market and a set of macroeconomic variables, found stock performance is positively related to that of macro economy in the long term. Ratanapakorn and Sharma (2007) revealed stock prices negatively relate to the long-term interest rate, but positively relate to the money supply, industrial production, inflation, the exchange rate and the short-term interest rate in United State.

Fernando (2017) has conducted research on “Macroeconomic Impact on Stock Market Returns and Volatility: Evidence from Sri Lanka” using Vector Error

Correction Model (VECM) and Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) models. It has found that the stock returns and market volatility are dependent on macroeconomic variables. Hewamana et al. (2022) found that macroeconomic variability has a significant impact on explaining the future conditional volatility which has been used EGARCH model. According to Badullahewage (2018) investigated the effects of macroeconomic factors on the performance of stock market in Sri Lanka, the results of the analysis revealed that all these factors have an inseparable impact over the performance of the stock market and Sri Lankan stock market performance has eventually over gone through many ups and downs because of them as well. In different countries there are different findings, further there are different findings which used different statistical models.

While there is empirical evidence, there is insufficient research on the impact of macroeconomic variables on stock price volatility in the Sri Lankan context. This study measures the long-term impact of macroeconomic stability variables on stock price volatility and evaluates the fitness of the ARDL model in determining this impact.

Investors must analyze stock price volatility to manage their portfolios, evaluate their current holdings, and make future decisions. To reduce the detrimental effects of macroeconomic factors on performance, business managers need to plan effectively. Empirical studies, such as Fernando (2017), indicate that the CSE has comparatively higher volatility behavior. Understanding the connection between macroeconomic variables and share values is critical for making wise investment decisions. Policymakers must comprehend stock market volatility and its causes to predict the effects of various factors. Furthermore, regulators such as the Securities and Exchange Commission must investigate stock price volatility to monitor and reduce it. Researchers should examine stock price volatility as both a dependent and independent variable. There are a limited number of studies examining the influence of macroeconomic variables such as GDP, inflation, money supply, interest rate, and exchange rate on stock market volatility within a single research framework. Most of the research has been conducted to find the impact for Stock market performance not mainly on volatility. Volatility is a kind of risk which is crucial in determining stock prices.

1.2. Research Questions

Main question

What is the impact of macroeconomic stability variables on stock price volatility in the long term?

Sub questions

What is the impact of inflation on stock price volatility in the long term?

What is the impact of money supply on stock price volatility in the long term?

What is the impact of interest rate on stock price volatility in the long term?

What is the impact of exchange rate on stock price volatility in the long term?

What is the impact of GDP on stock price volatility in the long term?

1.3. Research Objectives

Main objective

To find the impact of macroeconomic stability variables on stock price volatility in the long term.

Sub objectives

To find the impact of inflation on stock price volatility in the long term.

To find the impact of money supply on stock price volatility in the long term.

To find the impact of interest rate on stock price volatility in the long term.

To find the impact of exchange rate on stock price volatility in the long term.

To find the impact of GDP on stock price volatility in the long term.

2. LITERATURE REVIEW

This section provides an overview of relevant theories and empirical findings concerning the relationship between macroeconomic stability variables and stock market volatility.

2.1. Theoretical Literature

Arbitrage Pricing Theory (APT) is one of the asset pricing theories that can be used to value financial assets. APT, a multi-factor asset pricing model, was created by Stephen Ross in 1976. It forecasts an asset's returns by analyzing its linear relationship with macroeconomic factors that represent systematic risk. Although APT is thought to be better than the Capital Asset Pricing Model (CAPM), its data and statistical requirements make it more difficult to implement. It functions based on three fundamental assumptions. These assumptions are:

Asset returns are explained by systematic factors

Investors can build a portfolio of assets where specific risk is eliminated through diversification

No arbitrage opportunity exists among well-diversified portfolios. If any arbitrage opportunities do exist, they will be exploited away by investors.

The following is the formula for the Arbitrage Pricing Theory Model.

$$E(R_p) = R_f + \beta_1 f_1 + \beta_2 f_2 + \dots + \beta_n f_n$$

where: $E(R_p)$ =Expected return, R_f =Risk-free return, β_n =Sensitivity to the factor of n , f_n =nth factor price

This theory is useful for exploring how macroeconomic stability variables impact asset prices and their volatility over time. Since APT incorporates multiple factors, it provides a robust framework for analyzing long-term volatility patterns. This study focuses on the long-term impact of macroeconomic stability variables on stock price volatility in Sri Lanka, the APT framework is particularly appropriate as it allows for

the inclusion of multiple macroeconomic stability factors such as inflation, money supply, interest rate, exchange rate, and GDP. Using APT, the research gains a theoretical basis for exploring the systematic influence of these factors on volatility.

Although APT enables analysts and investors to personalize their studies, its implementation is difficult because it takes a lot of effort to find all the pertinent factors affecting an asset's value. According to the theory, asset returns typically follow a linear trend, and arbitrage can be used to exploit discrepancies. In order to ensure risk-free earnings, arbitrage entails concurrently purchasing and selling an item on several markets.

2.2. Empirical Literature.

2.2.1. Stock Price Volatility

There is both international and domestic literature concerning stock price volatility. Peiris & Peiris (2012) describe volatility as the upward and downward movements of the stock market and note its sensitivity to macroeconomic shocks. Kaur (2004) defines volatility as the degree of risk and uncertainty associated with a specific stock, where higher volatility implies greater risk.

The Efficient Market Hypothesis (EMH) suggests that stock prices reflect all available information, and therefore, volatility arises from new information or events. However, this view has been challenged by the asymmetric volatility theory, which suggests that markets tend to react more strongly to bad news than good news. This phenomenon is supported by studies such as Jegajeevan (2010), who emphasized the asymmetric nature of volatility in stock returns. Moreover, the dispersion of beliefs theory (Harris & Raviv, 1993; Shalen, 1993) argues that volatility can result from differences in investor interpretation of the same information, leading to high trading volumes and excessive market movements. The authors found that trading volume and the arrival of new information are major contributors to market volatility, and these effects can vary across time periods and market conditions.

According to Chen, Roll, & Ross (1986), stock price movements are significantly influenced by macroeconomic variables such as industrial production, inflation, and interest rates. Moreover, Pradhan and Dahal (2016) empirically identified GDP growth, inflation, interest rates, and money supply as key factors affecting stock prices in emerging markets. Similarly, Schwert (1990)

Since investors primarily consider share prices when making investment decisions in the stock market, the share price plays a major role in determining that decision. Volatility is a key input in calculating Value at Risk (VaR), making it critical for effective risk management. Since volatility is closely related to common risk measures, accurate estimation and prediction of volatility is crucial for major financial institutions. However, share prices fluctuate daily due to various internal and external factors. Therefore, in order to make the best investment choice, investors need to be knowledgeable about the variables that affect share price.

While these studies provide valuable insights, there is a lack of consistency in integrating theoretical frameworks with empirical results. For instance, while the asymmetric volatility theory and dispersion of beliefs theory offer strong conceptual backing, many empirical studies in the Sri Lankan context do not explicitly align with these models. Additionally, there is a need for more context-specific empirical analysis in developing country market, where market inefficiencies and behavioral factors may play a more dominant role than in developed markets.

Hence, this study aims to bridge the gap by critically examining the long-term impact of selected macroeconomic stability variables such as inflation, money supply, interest rates, exchange rate and GDP on stock price volatility in Sri Lanka

2.2.2. Gross Domestic product.

GDP is the total monetary value of all final goods and services produced within a country over a specific period, typically one year. It is universally recognized as a primary indicator of a nation's economic health and a central variable in macroeconomic stability. From a theoretical perspective, GDP influences expectations regarding future corporate earnings, which in turn impacts stock prices. An increase in GDP generally implies rising future cash flows, potentially leading to an increase in stock prices, while a decline in GDP, especially during recessions, tends to have the opposite effect.

APT provides a foundational framework for understanding the role of macroeconomic factors like GDP in determining stock prices. According to APT, systematic risk factors including GDP impact asset returns by influencing expected future cash flows and discount rates. This theory supports the inclusion of GDP as a determinant of stock price volatility, as changes in economic output can lead to fluctuations in the overall market valuation.

A number of empirical studies have established a positive relationship between GDP and stock market performance. For instance, Geske & Roll (1983), Chen et al. (1986), and Sharma (2002) found that current stock market levels are positively correlated with future levels of real economic activity, as measured by GDP. Similarly, Diebold & Yilmaz (2008) analyzed the connection between macroeconomic factors and stock return volatility in emerging Asian and African markets and reported a strong positive correlation between GDP, consumption, and stock returns. These findings suggest that GDP growth enhances investor confidence and strengthens market performance in the long run. Omodero & Mlangi (2019) conducted a study using annual time series data from 2009 to 2018 in Nigeria, finding a significant and favorable effect of GDP on the share price index. This reinforces the notion that economic expansion leads to improved stock market conditions, especially in emerging economies.

Contrary to these findings, some empirical evidence challenges the significance of GDP as a determinant of stock prices. Singh (2018) examined the share price determinants of 26 non-financial companies listed on the Muscat Securities Market in Oman. The results indicated that GDP growth was not a significant variable in explaining stock price movements in that context. Such discrepancies may be due to

differences in market structure, investor behavior, or the time horizons under consideration.

While many studies support the relevance of GDP in predicting stock price volatility, there remains inconsistency across empirical results. This may stem from variations in data frequency, market maturity, or the set of control variables included in the models. Furthermore, most studies have not sufficiently examined the long-term dynamic impact of GDP on stock price volatility, especially in emerging market like Sri Lanka. Therefore, a critical gap exists in understanding how macroeconomic stability particularly through GDP growth shapes the volatility structure of stock markets over time.

2.2.3. Inflation

Inflation is generally defined as the gradual increase in the general price level of goods and services in an economy over a period of time. In Sri Lanka, the Colombo Consumer Price Index (CCPI) is commonly used to measure inflation trends. Inflation is considered a key macroeconomic indicator that influences resource allocation, consumer purchasing power, investment decisions, and the cost of capital. In the context of financial markets, inflation introduces uncertainty and can distort the real value of returns, thereby increasing stock price volatility. High inflation tends to raise the cost of living and may lead to a reallocation of resources away from investment towards consumption, which in turn can impact firm performance and investor sentiment.

From a theoretical perspective, several economic models suggest that inflation has a significant effect on stock market performance. Fama, E. (1965) argues that expected inflation is negatively correlated with anticipated real activity, which in turn is positively related to returns on the stock market and also expect that high inflation will predict downturn in the economy and keeping and firms start selling of their stock. Supply pressure of stocks will reduce the stock prices. This theoretical contribution suggest that inflation negatively affects stock prices and could increase their volatility, particularly when inflation is volatile or unanticipated.

Empirical studies conducted in foreign markets provide varying results on the relationship between inflation and stock market performance. Thobarry (2009) found in his research which he found that inflation give both negative and significant influence to the stock price index. Spyrou (2001) studied the relationship between inflation and stock returns for the Greece economy, found that inflation and stock returns having negative relationship only up to 1995, after 1995 relationship became insignificant. Similarly, Omodero & Mlenga (2019) reported a significant negative effect of inflation on share price indices in Nigeria, reinforcing the argument that inflation weakens market performance in developing economies. Ibrahim & Agbaje (2013) examined the Nigerian stock market from 1997 to 2010 and found evidence of a long-term relationship between inflation and stock returns, indicating that inflation may have a persistent impact on market dynamics.

Contrasting results emerge from other regions. Liu & Shrestha (2008) studied the Chinese stock market and found that stock performance was positively related to macroeconomic fundamentals in the long run, although the relationship with inflation remained weak and less consistent. Geetha et al. (2011) conducted a cross-country analysis covering Malaysia, the United States, and China. They concluded that there was no long-term relationship between inflation and stock returns in Malaysia and the U.S., but such a relationship was evident in China. Their findings also suggested that investors should consider equities as long-term hedges against inflation's erosion of purchasing power. Supporting this notion, Vanita & Arnav (2014) found a substantial inverse relationship between inflation and stock market indices in Russia, India, and China, but acknowledged that equities still functioned as inflation hedges over time due to their tendency to appreciate with inflationary pressures.

In the Sri Lankan context, several empirical studies have examined the impact of inflation (as measured by CCPI) on stock market performance. Menike (2006), using monthly data from September 1991 to December 2002, found that inflation had a significantly negative effect on stock prices, along with Treasury bill rates and exchange rate fluctuations. This study highlighted the vulnerability of the Colombo Stock Exchange to domestic macroeconomic instability. Interestingly, the inflation rate showed a positive relationship with share prices in some sectors, suggesting sector specific sensitivities to inflationary conditions. Hemamala & Jameel (2016) conducted a study using monthly data from June 2005 to July 2015, comprising 120 observations. Their results were mixed: under bivariate analysis, inflation exhibited a significant negative relationship with stock market returns, whereas under multivariate analysis, the relationship became positive when controlling for other macroeconomic factors. These contrasting findings underscore the complexity of influence of inflation, which may be mediated by monetary policy, investor expectations, or the interaction with other variables such as interest and exchange rates.

Critically evaluating the literature, it is clear that inflation plays a significant but inconsistent role in influencing stock market behavior across different economies and time periods. While most studies identify a negative relationship between inflation and stock market performance, some findings highlight positive or insignificant effects depending on market structure, investor expectations, and data models. A notable gap in the existing literature is the lack of focus on stock price volatility, as most empirical work tends to concentrate on average stock returns. Additionally, long-term effects of inflation particularly in emerging markets like Sri Lanka have not been extensively studied in the context of volatility dynamics. This study aims to fill that gap by investigating the long-term impact of inflation (CCPI) as a macroeconomic stability variable on stock price volatility, thus contributing to a deeper understanding of inflation induced market risk in Sri Lanka.

2.2.4. Interest rate

The amount of interest due each period expressed as a percentage of the amount lent, deposited, or borrowed is known as an interest rate. In the Sri Lankan context, the Commercial Bank Deposit Rate is often represented by the Weighted Average

Deposit Rate (WADR). Interest rate fluctuations are key macroeconomic indicators that influence financial markets, particularly in terms of capital allocation, investment decisions, and stock price movements over the long term.

According to Fisher's Hypothesis, the market interest rate is included the expected real rate of interest and expected inflation. This forms a foundational theory explaining how interest rates integrate inflation expectations into financial decision-making. Supporting this theoretical view, Arbitrage Pricing Theory (APT) also implies that macroeconomic variables such as interest rates influence stock valuations by altering discount rates and risk premiums.

Empirical studies provide mixed evidence regarding the impact of interest rates on stock prices. Several researchers (Kwanchanok, 2000; Liangnakthongdee, 1991; Mukherjee & Naka, 1995; Narayan & Narayan, 2012) have identified a negative relationship between interest rates and stock prices. Thobarry (2009) emphasizes that higher interest rates increase borrowing costs, discouraging investment and thus reducing stock prices. Conversely, lower interest rates enhance liquidity and stimulate both economic and market activity, leading to rising stock values. Similarly, Liu and Shrestha (2008) documented a negative relationship between interest rates and stock indices in China. Further, Maysami et al. (2004) argue that as interest rates rise, the opportunity cost of holding stocks increases, prompting investors to shift toward interest-bearing securities, which in turn reduces demand for equities and depresses stock prices. Ratanapakorn & Sharma (2007) discovered a negative long-term relationship between stock prices and long-term interest rates using the Vector Error Correction Model (VECM). Interestingly, their findings also revealed positive relationships between stock prices and other macroeconomic factors such as industrial production, money supply, inflation, exchange rate, and short-term interest rates in United State.

Turning to the Sri Lankan context, Gunasekarage et al. (2004) analyzed the effects of macroeconomic variables on the Colombo Stock Exchange (CSE) using monthly data. Their study found that the Treasury bill rate, as a proxy for interest rates, along with money supply and consumer price index (CPI), had a statistically significant influence on the stock market performance index. Additionally, Shafana (2014) explored the impact of macroeconomic variables on different industry sectors in the Sri Lankan stock market. Her findings suggested that the Treasury bill rate negatively affected most sectors, except for the Information Technology and Telecommunications sectors. This highlights sector specific sensitivities to interest rate changes, indicating that macroeconomic stability variables like interest rates can have heterogeneous impacts across different segments of the market.

However, contrasting findings were reported by Omodero & Mlenga (2019), who concluded that interest rates and exchange rates did not have a statistically significant impact on the share price index in Nigeria.

Interest rate is a highly relevant macroeconomic variable for this research because it directly influences investment decisions, corporate financing costs, and investor behavior. Lower interest rates typically reduce borrowing costs, encouraging business

expansion and boosting stock prices. Most of the studies found that there is a negative relationship between interest rate and stock prices. However, the strength of impact of interest rates on stock price volatility can vary across time, countries, and market structures. For example, in some markets, interest rates may have a less direct or delayed effect due to market inefficiencies.

2.2.5. Money Supply

In macroeconomics, the money supply refers to the total volume of money held by the public at a particular point in time. narrow money (M1) includes currency held by the public and demand deposits held by the public with commercial banks. Broad money (M2) includes narrow money supply and time and savings deposits held by the public with commercial banks.

Gupta (1974) says that the money supply can be utilized for predicting the development of stock markets. Pearce & Roley (1985) in their research concluded that there is an inverse relationship between the non-anticipative money supply and the development of the stock prices. Bernanke (2003) found that the anticipative change in the money supply will have no effect on the development of prices of financial assets. Sprinkel (1964), found that there is a strong relationship between the change in the U.S. money supply and stock prices in the observed period of 1918-1960. Maysami & Koh (2000) found that Asian market revealed a positive relationship between the money supply and the development of the SGX index (Singapore stock exchange).

Wickremasinghe (2011) results of the variance decomposition indicated that the money supply and GDP are crucial factors in the longer-term forecasting of stock price variance in Sri Lanka. However, Menike (2006) found no strong predictive power of money supply on stock prices, suggesting a weaker link in developing markets.

while theory supports including M2 as a key macroeconomic variable, empirical findings are inconsistent, especially in emerging markets. Therefore, this research aims to examine its long-term impact on stock price volatility within Sri Lanka's context. M2 is used in measuring money supply here.

2.2.6. Exchange rate

The exchange rate refers to the price of one currency in terms of another currency. It plays a central role in international trade and investment. Exchange rates fluctuate based on the supply and demand for foreign currency, influenced by interest rates, inflation, and capital flows.

Nouzad (2009) found that increased exchange rate volatility positively and significantly affects stock return volatility, highlighting its role as a risk factor. Similarly, Khan & Ali (2015) observed that exchange rate fluctuations could either drive or be driven by stock market dynamics, depending on prevailing macroeconomic conditions.

In the Sri Lankan context, Badullahewage (2018) identified the exchange rate as one of several macroeconomic factors that have a combined and inseparable impact on stock market performance. Further, Omodero & Mlangi (2019) emphasized the need for regulatory control over macroeconomic variables such as exchange rate, inflation, and interest rates to maintain stable financial markets.

A critical review of these findings suggests that while exchange rate volatility is theoretically justified and supported by some empirical studies, its effect is neither uniform nor consistent across different markets. In developing countries like Sri Lanka, where foreign investment plays a substantial role, exchange rate movements can influence investor sentiment and capital flows, thereby impacting stock price volatility. Additionally, the integration of global markets has made exchange rate exposure a crucial component of portfolio risk for international investors. The relationship between exchange rate volatility and stock price movements has been extensively examined but remains inconclusive. Therefore, the inclusion of exchange rate as a variable in this research is justified due to its dual role as a macroeconomic stability indicator and as a determinant of investor behavior in both domestic and international contexts. However, the mixed empirical evidence underlines the need for context-specific analysis, particularly over the long term.

Referring to empirical and theoretical literature both we can see there are studies conducted to find the impact of macro-economic stability variable on stock price. There is a research gap to find the long-term impact of macroeconomic stability variables on stock volatility. The gap can be clearly expressed as there is fewer number of studies conducted to find the impact of macro-economic variables as GDP, inflation, money supply, interest rate, exchange rate on stock price volatility in one research. Volatility is a kind of risk. Stock prices are very much crucial. Sometimes stock prices behave as independent variable and as well as dependent variables. There are few studies which conducted in Sri Lanka to find the impact of all five macro stability variables in one research. Most research has focused on stock market performance rather than directly examining volatility.

3. METHODOLOGY

In this study, all companies listed on the Colombo Stock Exchange (CSE) are examined. The monthly time-series data, including stock prices and four macroeconomic variables that influence volatility, spans a decade (2010–2019). This time frame was selected to avoid the influence of extreme events such as the COVID-19 pandemic.

3.1. Conceptual framework

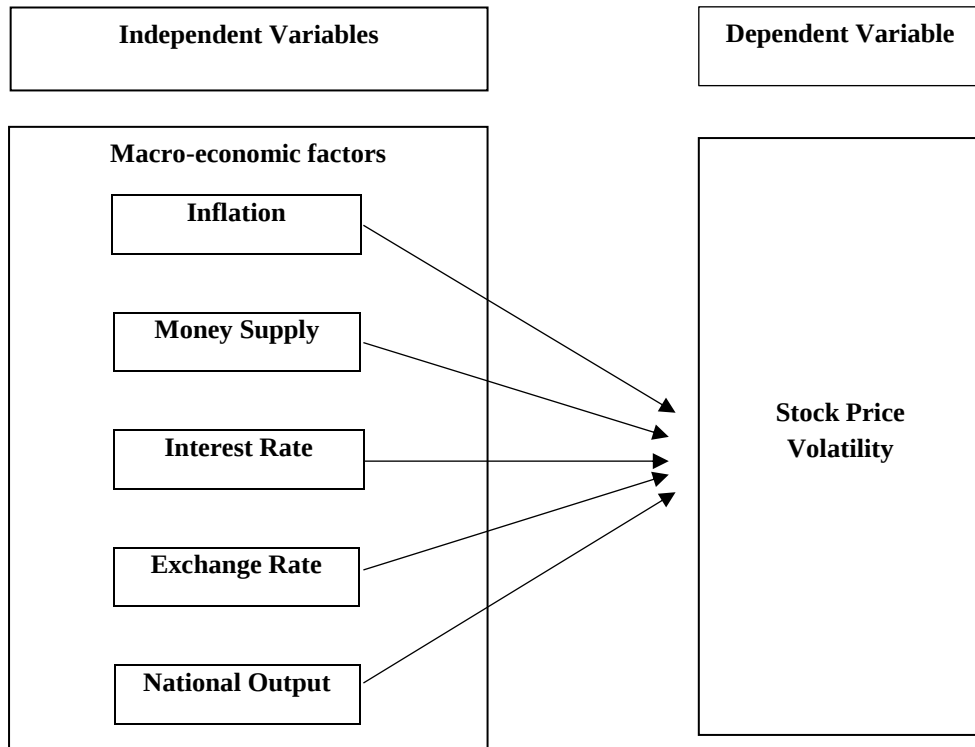


Figure 01: Conceptual Framework

Source: (Dilhani,2009)

3.2. Formation of Hypotheses

H₁: There is a relationship between macroeconomic stability variables and stock price volatility in the long term.

H₂: Inflation has a relationship between stock price volatility in the long term.

H₃: Money supply has a relationship between stock price volatility in the long term.

H₄: Interest rates have a relationship between stock price volatility in the long term.

H₅: Exchange rates have a relationship between stock price volatility in the long term.

H₆: GDP has a relationship between stock price volatility in the long term.

Data were collected from publicly available secondary sources. The data were primarily obtained from company financial reports and annual reports of the Central Bank of Sri Lanka (CBSL), which are more reliable. Most of the data were sourced from CBSL reports. Stock price data is taken from Investing.com. All data related to inflation, money supply, interest rates, and exchange rates were recorded on a

monthly basis, except for GDP. GDP data were available on a quarterly basis and were converted into monthly data using the Quadratic Interpolation Method (QIM) via EViews software. Ju et al. (2014) proposed the “Quadratic Interpolation Method” (QIM) for converting the macroeconomic data into smaller frequencies.

Following table shows the descriptions of variable definition, data sources, measurement of each an ever variable.

Table 1 - Variables and Data Sources

Variable	Definition	Measurement	Data Source
Stock Price Volatility	Upward and downward movements of the stock market prices	Monthly change in ASPI	CSE Market
GDP Growth Rate	percentage change in a country's Gross Domestic Product over a period of time	Monthly change in GDP	CBSL
Inflation Rate	Gradual increase in the price level of goods and services over a period of time	Monthly change in Inflation rate	CBSL
Interest Rate	Amount of interest due each period expressed as a percentage of the amount lent, deposited, or borrowed	Monthly change in WADR	CBSL
Money Supply	Total amount of money and liquid assets in a nation's economy on a certain date.	Monthly change in M2	CBSL
Exchange Rate	Price of one currency in terms of another currency	Monthly change exchange rate (USD/RS)	CBSL

In the dataset, no missing values were identified for any of the macroeconomic variables. A total of 120 observations were available for each variable: GDP, inflation, interest rate, money supply and, exchange rate covering the period from January 2010 to December 2019. Stock market volatility was represented by monthly changes in the All-Share Price Index (ASPI).

To run a regression model, the data must be stationary. Diagnostic tests were conducted at three levels using the following methods

- Augmented Dikey-Fuller test.
- Philips Person test.
- Kwiatkowski-Philips-Schmidt-Shin test (KPSS)

Table 2- Unit Root Test

Augmented Dikey Fuller			Philips Person			Kwiatkowski-Philips-Schmidt-Shin		
Level	1 st Difference	2 nd Difference	Level	1 st Difference	2 nd Difference	Level	1 st Difference	2 nd Difference

EX	0	0	0	0	0	0.0001	0.11 21	0.0329	0.0869
GDP			0	0.00		0.0001	0.08		0.5000
mn				06			70		
INF			0	0		0.0001	0.50		0.2188
							00		
MS			0	0		0.0001	0.39		0.1273
							49		
INT			0	0.37	0				0.0493
				73					

Source: Author's estimations from E-views

The stationarity of the dataset was examined using the Augmented Dickey-Fuller (ADF) test, the Phillips-Perron (PP) test, and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test. In both the ADF and PP tests, a P-value less than 0.05 indicates that the data is stationary. Conversely, in the KPSS test, a P-value greater than 0.05 suggests stationarity. These tests were conducted at three levels: level stationary, 1st difference, and 2nd difference.

The exchange rate was found to be non-stationary at 1st difference according to the KPSS test, making it unsuitable for inclusion in a standard regression model at this level. Similarly, the interest rate variable was identified as non-stationary at Level using the PP test and also non-stationary at 2nd difference in the KPSS test. Due to these inconsistencies in stationarity, a conventional Ordinary Least Squares (OLS) regression approach would be inappropriate.

As a result, the Autoregressive Distributed Lag (ARDL) model was employed, which accommodates a combination of level stationary, 1st difference, and 2nd difference. This method is particularly advantageous in situations where the variables are integrated at different orders. In cointegration testing, no such dependence relationship exists between the variables. Pesaran et al. (2001) introduced the ARDL bounds testing strategy as a cointegration technique to examine the existence of a long-term link between the variables. In this approach, if the F-statistic exceeds the upper bound critical value, it confirms the existence of cointegration. In this study, the results of the bounds test (presented in Table 03) indicated that the F-statistic exceeds the upper bound, thereby confirming the presence of cointegration among the variables. Accordingly, the ARDL model was deemed appropriate for further analysis.

Table 3 - ARDL Cointegration Bound Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX	0.767264	0.424177	1.808829	0.0734
GDPMN	0.057434	0.053658	1.070378	0.287
INF	2.549274	1.285078	1.983751	0.05
INT	0.036828	0.351602	0.104744	0.9168
MS	-0.386411	1.207765	-0.319939	0.7497

C	-0.000221	0.034244	-0.00646	0.9949
EC = STOCKV - (0.7673*EX + 0.0574*GDPMN + 2.5493*INF + 0.0368*INT -0.3864*MS -0.0002)				
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	14.36187	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	117		Finite Sample: n=80	
		10%	2.303	3.154
		5%	2.55	3.606
		1%	3.351	4.587

Source: *Author's estimations*

4. RESULTS AND DISCUSSION

The results derived from the ARDL model are summarized below. The goodness-of-fit of the multiple regression model is assessed using the adjusted R-squared value. Initially, the model produced an adjusted R-squared of 0.300153, indicating that approximately 30% of the variation in stock price volatility is explained by the included macroeconomic variables. This suggests a relatively weak explanatory power. The adjusted R-squared decreased to 0.189286, implying that only 19% of the variation in stock price volatility could be explained. Relatively low explanatory power indicates that stock price volatility remains a complex phenomenon and warrants further investigation, possibly through the inclusion of additional economic, behavioral, or institutional variables.

$$\log(\text{stockv}) = \log(\beta_1 \text{ex-2}) + \log(\beta_2 \text{gdpmn}) + \log(\beta_3 \text{inf}) + \log(\beta_4 \text{int-1}) + \log(\beta_5 \text{ms}) + \varepsilon$$

stocv – Stock Price Volatility

ex – Exchange Rate

gdpmn – GDP
inf – Inflation
int – Interest rate
ms – Money Supply

Table 4 – Output from ARDL Log Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LSTOCK(-1)	0.015096	0.091895	0.164275	0.8698
LEX(-2)	0.583956	0.179015	3.262062	0.0015
LGDPMN	0.108144	0.059388	1.820982	0.0716
LINF	0.197289	0.151164	1.305126	0.1948
LINT(-1)	-13.8453	5.424127	-2.552545	0.0122
LMS	0.012097	0.113326	0.106744	0.9152
C	0.318518	0.584388	0.545046	0.5869
R-squared	0.300153	Mean dependent var		-0.93762
Adjusted R-squared	0.189286	Durbin-Watson stat		1.944936
S.E. of regression	0.169424	S.D. dependent var		0.188166
Sum squared resid	2.899158	Akaike info criterion		-0.58025
Log likelihood	51.23485	Schwarz criterion		-0.18109
		Hannan-Quinn criter.		-0.41818

Source: *Author's estimations*

Based on the findings, the relationship between stock prices, exchange rates, interest rates, and stock price volatility can be expressed using the following equation

$$stockv = 0.584(lex-2) -13.845(1int-1) + \varepsilon$$

The Durbin-Watson (DW) statistic is close to 2, indicating no evidence of autocorrelation in the residuals. The Durbin-Watson (DW) statistic tests for the presence of autocorrelation in the residuals of a regression model. The DW statistic ranges between 0 and 4, where a value close to 2 suggests no autocorrelation. This implies that the current stock price is not significantly influenced by its value in the previous month.

According to the ARDL model results, a statistically significant long-term relationship exists between the interest rate and stock price volatility in Sri Lanka, with a one-month lag (p-value = 0.0122 < 0.05). The coefficient of -13.84 indicates that a 1% increase in the interest rate results in a 13.84-unit decrease in stock price volatility, confirming an inverse relationship. This finding is consistent with monetary theory, which posits that higher interest rates raise the cost of borrowing, dampen investor demand for equities, and ultimately contribute to reduced stock price volatility.

Similarly, the exchange rate exhibits a statistically significant relationship with stock price volatility at a two-month lag (p -value=0.0015), with a positive coefficient of 0.58. This suggests that a 1% depreciation in the local currency leads to a 0.58 unit increase in stock price volatility after two months. This result is in line with the flow-oriented model proposed by Dornbusch & Fischer (1980), which argues that exchange rate depreciation affects trade balances, corporate earnings, and ultimately stock valuations. It also supports the findings of Nouzad (2009), who demonstrated that exchange rate volatility positively and significantly affects stock return volatility.

This lagged effect may reflect delayed market responses to macroeconomic shocks, potentially due to information diffusion lags or gradual investor adjustments within Sri Lanka's emerging financial market. Considering the study period and nature of the data, the ARDL bounds testing approach is appropriate. The significant lag effects suggest that macroeconomic variables influence stock price volatility with a delay, underscoring the importance of timely policy responses.

When considering the overall impact of all macroeconomic variables, Hypothesis 1 (H1) is rejected. Therefore, it can be concluded that there is no statistically significant long-term impact of macroeconomic variables on stock price volatility in the Colombo Stock Exchange.

5. CONCLUSION

This study explored the long-term effects of key macroeconomic variables: Gross Domestic Product, inflation, interest rate, money supply, and exchange rate on stock price volatility in Sri Lanka using the Autoregressive Distributed Lag (ARDL) model with monthly data from 2010 to 2019. The presence of a long-run equilibrium relationship among the variables was confirmed through the ARDL bounds testing approach, with the calculated F-statistic exceeding the upper critical bound. This indicated that the chosen macroeconomic indicators collectively influence stock price volatility in the long term.

The estimation results revealed that the exchange rate exerts a statistically significant and positive impact on stock price volatility. With a two-month lag, it showed a coefficient of 0.5839 and a probability value of 0.0015. This suggests that greater fluctuations in the exchange rate contribute to increased uncertainty and currency risk in the market, leading to higher stock price volatility. In contrast, the interest rate variable displayed a statistically significant negative impact, with a coefficient of -13.845 and a probability value of 0.0122, indicating that higher interest rates tend to reduce stock price volatility, possibly due to the tightening of liquidity and a shift from equity to fixed-income investments. However, GDP, inflation, and money supply were not found to have a statistically significant effect on stock volatility during the sample period, suggesting that their roles in driving long-term volatility in the Sri Lankan context may be limited or influenced by other mediating factors.

The model's explanatory power, as measured by the R-squared value of 0.30, indicates that approximately 30 percent of the variation in stock price volatility is explained by the macroeconomic variables considered. The adjusted R-squared of

0.189 further supports this moderate fit. The Durbin-Watson statistic, which was close to 2 (1.944), suggests the absence of serious autocorrelation in the model residuals.

These findings highlight that while not all macroeconomic variables are individually significant, exchange rate and interest rate dynamics play a crucial role in shaping long-term stock market behavior in Sri Lanka. The results imply that policymakers and investors should closely monitor these two variables when assessing future stock market volatility. Moreover, the study underscores the importance of context-specific modeling when analyzing developing markets, where structural characteristics and external shocks can alter the typical macro-financial relationships observed in developed economies.

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