AN EMPIRICAL INVESTIGATION OF THE RELATIONS BETWEEN MACROECONOMIC VARIABLES AND THE INDUSTRIAL SECTOR PERFORMANCE IN SRI LANKA

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Thesis/Dissertation submitted in partial fulfillment of the requirements
for the
Degree Master of Science in Business Statistics

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May 2015

DECLARATION OF CANDIDATE AND SUPERVISOR

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ABSTRACT

The study investigates the nexus between macroeconomics behaviour and industry indices performance including all share price index (ASPI) movements in Sri Lanka for the period 1994-2013, using monthly series of the corresponding variables. The objective was achieved by identifying the influence of macroeconomic variables on major industrial price index and ASPI. The statistical techniques used include the unit root Augmented Dickey Fuller test in order to fulfill the objective of stationary for all the time series. The Johansen co-integration test was used to investigate whether the variables are co-integrated of the same order taking into account the trace statistics and the maximum Eigen-value tests. The variables were found to be co-integrated with at least one co-integrating vector. A Granger causality test was used in order to find the direction of causality between industry performance and macroeconomic behaviour and finally Vector Error Correction Model (VECM) was developed to forecast the long term behaviour. The findings imply that the causality between industry performance and macroeconomic variables runs unilaterally or entirely in one direction. The results reveal that the average prime lending rate (AWPR), inflation rate, exchange rate of Britain Pounds (GBP) and Japanese Yen (JPY) affect all the five major industries while exchange rate of USD does not influence on telecommunication industry. Moreover, all the macroeconomic variables have significant influence on diversified holding industry and hotel and travel industry. Therefore, the best fitted VECM was established in diversified holdings industry and hotel industry indices. From the results, it was inferred that the movement of industry indices reflect the macroeconomic condition of the country and can therefore be used to predict the future path of industry indices behaviour. The results derived in this study can be effectively used for investment and finance decisions.

Keywords: Average Weighted Deposit Rate, All Share Price Index, Average Weighted Prime lending Rate, Exchange Rates, Macro economy

ACKNOWLEDGEMENT

I would like to extend sincere gratitude and respect to my supervisor, Prof. T.S.G Peiris, for his patience and guidance. He provided the necessary and valuable advice and support that made completion of this dissertation possible.

I would also like to express my deepest appreciation to my husband for his understanding, patience and encouragement throughout this dissertation. Without his dedicated support, I could never have succeeded in this endeavour. I also wish to sincerely thank my mother, father, and brother for the joy, care, encouragement and moral support they have given me throughout my life.

Last but not least, I would like to thank CINEC Campus who gave me study leave to complete the dissertation as well as all the other people who helped and supported me throughout my post graduate journey.

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LIST OF ABBREVIATIONS

ADF	**Augmented Dickey Fuller Test**
APT	**Arbitrage Pricing Theory**
ASPI	**All Share Price Index**
AWDR	**Average Weighted Deposit Rate**
AWPR	**Average Weighted Prime Lending Rate**
BFI	**Banking, Finance and Insurance**
BFT	**Beverage, Food, Tobacco**
BSE	**Bombay Stock Exchange**
CSE	**Colombo Stock exchange**
CV	**Coefficient of Variation**
DIV	**Diversified Holdings**
GBP	**Great Britain Pounds**
GDS	**Gross Domestic Savings**
HTL	**Hotel, Travel and Leisure**
KLSE	**Kuala Lumpur Stock Exchange**
LM	**Lagrange Multiplier**
M2	**Broad Money Supply**
SDR	**Standard Drawing Rights**
SES	**Stock Exchange of Singapore**
S&P	**Standard and Poor's Index**
TLE	**Telecommunication**
USD	**United States Dollar**
VAR	**Vector Auto Regression**
VEC	**Vector Error Correction**
VECM	**Vector Error Correction Model**

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

The dynamic relationship between macroeconomic variables and stock market returns is well-documented in the literature (Bilson et al, 2001; Gunasekarage et al, 2004; Husam et al, 2009). However, absence in the past literature related to examine the co-integration between macroeconomic variables and stock market's sector indices in Sri Lanka. In Sri Lanka, Colombo Stock Exchange (CSE) consists of twenty sector wise price indices and macroeconomic variables may affect sector wise price indices differently. Also, these macroeconomic variables affect investment decisions and financing decisions in corporate sector.

The stock exchange acts as the most important market for capital and companies get the ability to find sources of finance from the capital market. A well-developed capital market is essential to promote economic development in a country. The Sri Lankan government has been offering a number of incentives to enhance the share market. Specially, foreign investors are granted substantial incentives to invest in Sri Lankan company shares in budget 2013 (Ministry of Finance, 2013). Furthermore, companies listed in the CSE are already involved in the development of infrastructure in the country of the areas of Power and energy sector, Information technology sector and Telecommunication sector. Furthermore, banking and finance sector covers whole financial infrastructure in the country.

Many researchers believe that investment influence on economic growth and economic development (Aydemir and Demirhan, 2009). Country's business investment environment reflects by the stock exchange market which helps in distributing nation's wealth by enabling wide ownership of public company stocks. Investors get an ability to buy shares of publicly listed companies which enable them to be the owners of the businesses and earn dividends according to their invested capital. Stock market performance is highly

volatile to countries economic and political conditions. Theoretically, the interest rate has a negative impact on stock market performance because an increase of interest rate would evade investors making high risk stock market investments compare to low risk interest bearing security investments (French et al., 1987).

Few related papers in a Sri Lankan context, focuses on examining impacts of macroeconomic variables on the stock market performance (Samarakoon, 1996; Gunasekarage et al., 2004; Wickramasinghe, 2011). However, these studies do not specifically focuses on exploring the dynamic relationships between macroeconomic variables and sector indices performance in CSE. Therefore, this study aims to explore the dynamic relationship between sector wise indices as a measure of performance of the industrial sector listed in CSE in Sri Lanka and macroeconomic variables.

The theoretical motivation for undertaking the study on the effect of macroeconomic variables on stock prices and industrial index performance can be discussed as follows. The relations between exchange rate movements and share prices are based on the rise in the domestic interest rate. Upward movement in interest rates leads to capital inflows and therefore it makes the appreciation of exchange rate. This suggests that export dominant industries have a negative effect of reduction in exports and stock prices in such industries do not perform well. In contrast, currency appreciation boosts the share market for import dominant industries due to increase in imports. Also, whenever the interest rate on treasury securities increases, investors tend to sell stocks, causing stock prices to fall.

The effects of inflation on the financial assets returns have been an important theoretical issue for many years. The basic theoretical concept in this area is commonly endorsed to Irving Fisher (1930) who stated that the nominal interest rate fully reflects the available information concerning the possible future values of the inflation rate. This hypothesis widely accepted among economists and has played an important role in the monetary economic theory, finance theory and macroeconomics. All the above considerations motivated to conduct the study in the Sri Lankan context for different industrial index performance.

In finance, Arbitrage pricing theory (APT) is a general theory of asset pricing that holds the expected return of a financial asset can be modeled as a linear function of various macro-economic factors or theoretical market indices. Macro economic factors and market indices are sensitive towards changes in pricing of the asset. Therefore, The APT essentially seeks to measure the risk premium attached to various factors that influence the returns on assets. Accordingly, Chen, Roll and Ross (1986), illustrated that economic forces affect on discount rates for the pricing of assets, also the ability of firms to generate cash flows, and future dividend payouts. This sense provided the basis for the belief that a long-term equilibrium existed between macroeconomic variables and share prices in CSE.

1.1.1 Colombo Stock Exchange

The CSE has two main price indices called All Share Price Index (ASPI) and Standard and Poor Index (S&P). Index values are calculated an on-going basis during the trading session, with the closing values published at the end of each session. The CSE has 293 companies representing 20 business sectors as at 31st March 2014, with a Market Capitalization of Rs. 2,498 Billion in 2014 (Colombo Stock Exchange, 2014).

Public Companies incorporated under the Companies Act No.7 of 2007 or any other statutory corporation, incorporated or established under the laws of Sri Lanka or established under the laws of any other state (subject to Exchange Control approval) are eligible to seek a listing on the CSE to raise Debt or Equity from public. In order to secure a listing of the company's securities, they will be required to comply with the relevant provisions of the above act, the Securities and Exchange Commission Act No.36 of 1987 (as amended) and the Listing Rules of the Exchange (Security Exchange Commission, 2014).

1.1.2 Sector Indices

CSE holds 20 sector indices. These sector indices are calculated based on an on-going basis and closing values are published at the end of trading daily. These price indices reflect the price movements of companies in the 20 respective service sectors. The sector price indices will therefore be an indication as to the trends of the market. The Table 1.1 represents the market capitalized percentage of index covered by ASPI in 2013 (http://www.cse.lk/home.do, 2013).

Table 1.1 Sector Index as a Market Capitalized Percentage of ASPI

SECTOR	% of ASPI	Cumulative %
BANKS, FINANCE & INSURANCE	**22%**	**22%**
DIVERSIFIED HOLDINGS	**21%**	**43%**
BEVERAGE, FOOD & TOBACCO	**20%**	**63%**
HOTELS & TRAVELS	**9%**	**72%**
TELECOMMUNICATION	**6%**	**78%**
MANUFACTURING	5%	83%
OIL PALMS	4%	87%
HEALTH CARE	2%	89%
CONSTRUCTION & ENGINEERING	2%	91%
LAND & PROPERTY	2%	92%
INVESTMENT TRUSTS	1%	94%
POWER & ENERGY	1%	95%
TRADING	1%	96%
PLANTATIONS	1%	97%
MOTORS	1%	98%
CHEMICALS & PHARMACEUTICALS	1%	99%
FOOTWEAR & TEXTILES	0%	99%
SERVICES	0%	100%
STORES & SUPPLIES	0%	100%
INFORMATION TECHNOLOGY	0%	100%
ASPI	100%	

Source: Author

As shown in Table 1.1, 78% of the market capitalization covered by BFI sector, DIV sector, BFT, HTL sector, and TLE sector in ASPI. This weighting system allows the price movements of above mentioned industries to have a greater impact on the index. Furthermore, the percentage contribution of each sector is at least 5% in ASPI.

1.2 Statement of Problem

The financial markets are influential in the advancement of macroeconomic development and macroeconomic variables behaviour of an economy change the direction of financial market development. This is evident that well-developed financial markets encourage investors and corporations to increase saving and allocate capital to productive investments efficiently, which leads to an increase in the rate of economic growth. Therefore, stock market performance and macroeconomic variables behaviour has been a popular topic for policy holders, corporations and investors where they need to find out whether there is a relationship among macro economic variables and stock exchange. It was concluded that macro economy and share market performance were the two most appropriate concepts for this study. Accordingly, the broad questions for the study were:

1. What is the relationship between macroeconomic variables and ASPI in Sri Lankan Context?
2. What is the relationship between macroeconomic variables and industry indices in Sri Lankan Context?

1.3 Objectives

On view of the above discussions, the main objectives of the study are:

- To investigate causal relationship between macroeconomic variables and ASPI
- To investigate causal relationship between macroeconomic variables and sector indices performance in CSE
- To identify the short term and long term relationship between macroeconomic variables and ASPI
- To identify the short term and long term relationship between macroeconomic variables and sector indices performance in CSE.

1.4 Significance of the Study

Sri Lanka is quickly emerging as a prominent contender within the region. There is an evolving interest among the new generation of investors in the Sri Lankan stock exchange Market. This study will enhance potential investors to make investment decisions in Sri Lankan capital market and will certainly help in fast tracking such investments to Sri Lankan capital market with the dynamic change in macroeconomic factors. The literatures which examine the relation of macroeconomic variables on individual stock market indices are very limited. It is important to test how each and every twenty sector index perform in relation to the macroeconomic variable changes. The proposed study serves the investors as their reference or guide in selecting best industry to invest when macroeconomic environment changes. Also, it supports government to make macroeconomic policies and see the effect of those policy actions on stock exchange as well as the industry performance. The findings of the study hold practical implications for various parties. Therefore, a study of this nature is timely and essential.

Policy makers should plan for national macroeconomic policies without the fear of influencing behaviour of capital flow and the stock trade process. Moreover, economic and finance theory suggests that stock prices should reflect expectations about potential corporate performance generally reflect the level of economic activities. The stock prices should be employed as leading indicators of future economic activities if stock prices accurately reflect the underlying fundamentals. Therefore, the causal relations and dynamic interactions among macroeconomic variables and ASPI are important in the formulation of the nation's macroeconomic policy.

1.5 Outline of the Essay

The Chapter one provides a detailed introduction in to background of the study explaining the way of thinking that lead to this study. The introduction also covers the rationale and significant of the study for policy makers and investors.

Chapter two presents the literature review focusing on the key areas namely Stock Returns and Macroeconomic Variables in South Eastern Asian Countries, Stock Return and Domestic Macroeconomic Variables, and Stock Return and Domestic Macroeconomic Variables in Emerging Capital Markets.

Chapter three describes the identification of key variables and the procurement of data followed by an illustration of the statistical methodology adopted in data analysis. The conceptual framework and model specifications present in the chapter to achieve the research objectives

Chapter four represents the analytical process and highlights the outcomes with descriptive statistics, tests for stationary of the data set and causality test. In addition VECM developed for each and every major industry in Sri Lanka

Chapter five, conclusions are drawn based on outcome and implications and suggestions are outlined. Further, limitations and further research areas has been discussed in this chapter.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature relevant to macroeconomic variables and stock exchange performance to provide the theoretical foundation for model development. The literature of the impact of macroeconomic variables on share returns focused on both developed and emerging capital markets context. Sections 2.2 and 2.3 provide a review of stock returns and macroeconomic variables in Asian and European countries and the next section of literature reveals relationships between individual macroeconomic variables and stock returns as discussed in further.

2.2 Studies on Stock Returns and Macroeconomic Variables in Asian Countries

Maysami and Sims (2002, 2001) examine the relationship between macroeconomic variables and stock returns in Hong Kong and Singapore. The scholar used the Error-Correction Modelling technique to investigate such relationship among macroeconomic variables and stock returns. Also Mukherjee and Naka (1995) applied Johansen's Vector error correction model (VECM) to analyze the relationship between the Japanese Stock Market and macroeconomic variables. This study uses exchange rate, inflation, money supply, real economic activity, long-term government bond rate, and call money rate as macroeconomic variables. They concluded that a co-integrating relation existed and that stock prices contributed to this relation.

Islam (2003) simulated the many studies to examine the short-run dynamic adjustment and the long-run equilibrium relationships between four macroeconomic variables namely interest rate, inflation rate, exchange rate, and the industrial productivity with the Kuala Lumpur Stock Exchange (KLSE) composite index. His conclusions were that there is a statistically significant short-run (dynamic) and long-run (equilibrium) relationships among the macroeconomic variables and the KLSE stock returns.

Ibrahim (1999) used macroeconomic variables of industrial production index, money supply M1 and M2, consumer price index, foreign reserves, credit aggregates and exchange rate and found the dynamic relationships between the KLSE Composite Index, and seven macroeconomic variables. He concluded that Malaysian stock market was informationally inefficient by observing that macroeconomic variables behavior and Malaysian stock indices behavior.

High correlation among six Singapore sector indices in the period 1975 to 1984 and the overall stock exchange of Singapore (SES) market return is observed by Ta and Teo (1985).The scholar used the variables of All-S Equities Industrial and Commercial Index, SES All-S Equities Finance Index, SES All-S Equities Property Index, SES All-S Hotel Index, SES All-S Plantation Index and SES All-S Mining Index. They had concluded that sector returns were highly correlated to each other, although such correlations did not remain stable by using daily data.

Karam Pal and Ruhee Mittal (2008) used the Indian capital markets indices and key macroeconomic variables such as interest rates, inflation rate, exchange rates and gross domestic savings (GDS). He found that there is a co-integration between macroeconomic variables and Indian stock indices which is indicative of a long-run relationship. The Error Correction Model shows that the rate of inflation has a significant impact on the Bombay stock exchange (BSE) Sensex, the S&P CNX and Nifty. Interest rates on the other hand, have a significant impact on S&P, CNX, and Nifty only.

2.3 Studies on Stock Returns and Macroeconomic Variables in European Countries

Stuart Hyde (2007) investigates that significant level of exposure to exchange rate risk in industries in all four markets in addition to significant market risk. Significant levels of interest rate risk are only identified in Germany and France. All three sources of risk contain significant information about future cash flows and excess returns. As future research, the paper could investigate the extent of exposure in other markets, or investigate whether the findings change at the firm level. Furthermore, Kiymaz (2003) investigates that Turkish firms specialized in textile, chemical, machinery and financial services are highly exposed to exchange rate risk. He reports that 47 per cent of all firms face significant exchange rate risks.

Joseph (2002) examines the impact of both interest rates and exchange rates on UK stock returns, focusing on the chemical, electrical, engineering and pharmaceutical industries. He finds that interest rate changes have a greater impact on exchange rate changes.

Husam Rjoub et al (2009) examine six pre-specified macroeconomic variables of the term structure of interest rate, unanticipated inflation, risk premium, exchange rate and money supply. In this study, the authors develop one more variable namely unemployment rate, which has a relation with the stock return. Their results show that there are big differences among market portfolios against macroeconomic variables through the variation of R^2. In the remaining portfolios; there was no evidence to suggest.

2.4 Studies on Relationship between Stock Return and Interest Rate Variable

Premawardane (1997) studied that the relationship between stock returns and interest rates in Sri Lanka. He found a negative relationship while in contrast Hasan et al. (2000) found a positive relationship in between stock return and interest rates.

Bilson et al. (2001) examined whether domestic macroeconomic variables namely money supply, goods prices and real product activity level have explanatory power over stock returns in 20 exchange emerging markets for the period 1985-1997. The results indicate that the exchange rate and money supply variable is clearly the most influential macroeconomic variables.

2.5 Studies on Relationship between on Stock Return and Inflation Rate Variable

The stock returns are negatively affected by both expected and unexpected inflation found by Gallagher and Taylor (2002) empirically. Fama (1981) explains the negative linkage among stock returns and inflation based on the demand of money and the quantity theory of money. Kaul (1990) explains the relationship between stock returns and unanticipated changes in expected inflation under alternative monetary policy regimes by using post-war data for the US, Canada, Germany and the UK,. He finds that existence of a negative relation between stock returns and changes in expected inflation in countries where there is no change in the policy regime.

Marshall (1992) investigated that negative effect of inflation on stock return is generated by real economic fluctuations, by monetary fluctuations or changes in both real and monetary variables. Engsted and Tanggaard (2002) found that a moderately positive relationship between expected stock returns and expected inflation for the US. Also he found that a strong positive relationship between expected stock returns and expected inflation for Denmark.

2.6 Studies on Relationship between on Stock Return and Money Supply

Studies on money supply and stock market relationship is focused on the question of whether money supply of a country is a leading indicator of stock prices. Study conducted by Homa and Jaffee (1971) supported the view that previous years of increase in money supply lead to increase in equity returns. Cooper (1974) found that the money market and stock market relationship using US data and found that the lead/ lag and cross spectra of stock returns and changes in money supply are consistent with the Efficient Market model and the Monetary Portfolio models.

Rogalski and Vinso (1977) and Hamburger and Kochin (1977) examined the reaction of stock prices to unanticipated changes in money and found that past money supply changes do not contain predictive information on stock prices, upholding the Efficient Markets view. Pearce and Roley (1985) found whether the response of common stock prices to weekly money announcements is consistent with the Efficient Market Hypothesis. Bulmash and Trivoli (1991) and Barrows and Naka (1994) find a positive relation between money supply and stock returns in hospitality industry. Campbell (1987) and Booth and Booth (1997) confirmed the theory that an expansionary monetary policy increases stock returns.

2.7 Studies on Relationship between Stock Return and Exchange Rates

Most of the empirical studies have focused on the simultaneous relation between stock returns and exchange rates. Aggarwal (1981) finds that US stock prices and the trade-weighted dollar are positively correlated. In contrast,Solnik (1987) used monthly and quarterly data for eight industrial countries from 1973-1983 to examine the relation between real stock returns, exchange rates and reports a negative relation among variables.

Soenen and Aggarwal (1989) re-assess this Solnik's model by using 1980-1987 data for the same industrial countries. He found a positive correlation between stock returns and exchange rates for three countries and negative correlation for five.

2.8 Studies on Relationship between Short run and long run Stock Return and Macroeconomic Variables

Panayotis et al. (1996) examined the impact of inflation uncertainty on stock prices in developed as well as in emerging capital markets for 20 countries and found a negative association between inflation uncertainty and stock prices. Hassan (2003) employed multivariate cointegration techniques to test for the existence of long-term relationships between share prices in the Persian Gulf region. Also he used a vector-error-correction model. He investigated the short-term dynamics of prices by testing for the existence and direction of intertemporal Granger-causality.

Hendry's (1986) approach allows making inferences to the short-run relationship between macroeconomic variables and the long-run adjustment to equilibrium. He analysed the power of interest rate, inflation, money supply, exchange rate and real activity, along with a dummy variable. Also it captures the way of macroeconomic variables impact on the Asian financial crisis in 1997. The results confirmed that the influence of macroeconomic variables on the stock market indices in each of the six countries under study. Moreover, the study found that the type and magnitude of the associations differed depending on the country's financial structure.

2.9 Studies on Relationship between Stock Market and Economic Growth

Several empirical papers such as Levine (1991) and Levine and Zevos (1995) have suggested that stock market development affect economic growth in developing countries. Several other studies examine the short run relationship between stock returns and with some macroeconomic and financial variables. Mohan (2006) found a relationship between domestic saving and economic growth for various economies with different income levels using Augmented Dickey Fuller (ADF) test and Granger causality test.

2.10 Chapter Summary

This chapter provided a background and describes the rationale for model development for macroeconomic variables, CSE indices and industry indices. A number of researchers in various countries have found significant long term and short term relationships between macroeconomic variables and stock prices in different countries. These studies were concerned various types of factor models which incorporate with macroeconomic variables and the variation in share market returns. The reviewer would be useful to decide what type of analysis to be carried out for this study.

CHAPTER THREE
MATERIALS AND METHODS

3.1 Introduction

This chapter describes the research methodology and secondary data used for this study. This section provides an overview of research sample and data and describes the key variables identified for the analysis. Furthermore, it justifies the use of quantitative method for this study, and presents the research design methods with the rationale for the study's descriptive approach.

3.2 Secondary Data Used

The following data and methodological approach is adopted in this study for establishing the relationship between macroeconomic variables and stock prices in the Emerging Sri Lankan Stock Market and sector index performance. The study uses stock prices which were collected from the CSE and macroeconomic variables collected from Central Bank of Sri Lanka. The sample period spans from January 1994 to December 2013 and the study was carried out by using 240 monthly observations.

3.3 Identification of Key Industrial Variables

The first highest industries which cover 78% of the market capitalization in ASPI show in the following industries in CSE. Moreover, the percentage contribution of each sector below represents more than 5% in ASPI.

1. Bank Finance and Insurance
2. Beverage Food and Tobacco
3. Diversified Holdings
4. Hotels and Travels
5. Telecommunications

3.4 Description of Selected Macroeconomic Variables

The study focuses on many macroeconomic variables such as the interest rates, inflation rate, exchange rates and money supply are influenced on sector wise indices. Also description on those variables is shown below.

3.4.1 Interest Rates

The study considers Average Weighted Prime Lending Rate (AWPR) and Average Weighted Deposit Rate (AWDR) as a measure for country's interest rates which supervise the behaviour of money market. The impact of interest rates on valuation of a share discuss in the simple dividend-discount valuation model in theory of finance. Assuming constant growth in dividends, dividend discount valuation model is shown in (3.1).

$$P=D_1/(k-g) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \ (3.1)$$

Where,

P= share price

D_1= dividends after first period

g= constant growth rate of the dividends

k= required rate of return on the stock

Mukherjee and Naka (1995) suggest that changes in both short-term and long-term government bond rates would affect the nominal risk-free rate and thus affect the discount rate or required rate of return on the stock. Many studies hypothesize a negative relationship between interest rates and stock prices for the following reasons: (i). Most companies finance their capital equipment and inventories through borrowings. As a result, Reduction in interest may result in decline in cost of borrowings in an organization. Thus, this serves as an incentive for expansion. This will have a positive effect on growth of the firm. (ii). Most of the investors purchased as substantial amount of stocks with the use of borrowed money, hence an increase in interest rates would make stock transactions more costly and discourage investors to invest in stock exchange.

3.4.1.1 Average Weighted Prime Lending Rate (AWPR)

The AWPR is the average rate of interest charged on loans by commercial banks to private individuals and companies. The AWPR is estimated weekly by the Central Bank of Sri Lanka.

3.4.1.2 Average Weighted Deposit Rate (AWDR)

The AWDR is the average rate of interest charged on deposits made by private individuals and companies in commercial banks. The AWDR is estimated weekly by the Central Bank of Sri Lanka.

3.4.2 Inflation (IN)

Colombo Consumer price index (as measure of inflation) is an indicator to measure the changes in the general level of consumer prices and used as one of the key indicators of inflation. Consumers' Price Index is also used for socio-economic analysis and policy purposes, mainly in the determination of monetary and income policies. It is used in the analysis of the trends in wages and other monetary incomes, for indexation of salaries and wages.

The results of studies by Fama and Schwert (1977) pointed out a negative relation between inflation and stock prices. Many studies hypothesize an increase in the rate of inflation is likely to lead to economic tightening policies, which in turn increases the nominal risk-free rate and hence raises the discount rate in the valuation model as shown in (3.1). On the other hand, Cash flows would probably decrease initially if the cost of inputs adjusts faster to rising inflation than output prices. Thus, cost push inflation may result a lower profit margins.

3.4.3 Broad Money Supply (M2)

Money supply is the total amount of monetary assets available in an economy at a specific time. In general, three definitions of monetary aggregates are used in analysing monetary developments in Sri Lanka. The first is 'reserve money' consisting of currency issued by the Central Bank and commercial banks' deposits with the Central Bank. This is also called base money or high-powered money, as commercial banks can create deposits based on reserve money which are components of a broader definition of money supply, through their process of creating credits and deposits. The second is narrow money, defined as the sum of currency held by the public and demand deposits held by the public with commercial banks. The third is broad money defined as the sum of currency held by the public and all deposits held by the public with commercial banks. Studies have shown that the most appropriate monetary variable to analyse the relationship between the money supply and the general price level is the broad money supply.

In economics, the money supply or money stock is the total amount of monetary assets available in an economy at a specific time of period. In the opinion of Mukherjee and Naka (1995), the effect of money supply on stock prices is an empirical question. An increase in money supply would lead to inflation, and may increase discount rate and reduce stock prices.

3.4.4 Exchange Rate

Exchange rate is the price of one country's currency expressed in another country's currency. Many studies hypothesize a positive relation between the exchange rate and share prices. A depreciation of the Sri Lankan Rupees will lead to an increase in demand for Sri Lankan exports due to comparative lower priced exports for foreign countries and thereby increasing cash flows to the country, assuming that the demand for exports is sufficiently elastic.

The impact of exchange rate changes on the economy will depend on a large or smaller extent on the level of international trade and the trade balance. Hence the impact will be determined by the relative dominance of import and export sectors of the economy. Moreover, Sri Lanka trades more with the countries of the United States of America (USA), United Kingdom (UK), India and Japan.

Therefore, the study focuses on the behaviour of ;

- USA Dollars,
- UK Pounds,
- Indian Rupees and
- Japanese Yen currency

3.4.4.1 Rate of Special Drawing Rights (SDR)

The study uses special drawing rights (SDR) rate which is a supplementary foreign exchange reserve assets defined and maintained by the International Monetary Fund (IMF).The value of the Sri Lankan Rupee in terms of the SDR is the reciprocal of the sum of the Rupee values, based on market exchange rates, of specified quantities of the Euro, Japanese Yen, Great Britain Pounds and US Dollars.

3.4.5 All Share Price Index (ASPI)

The All Share Price Index is one of the principal stock indices of the Colombo Stock Exchange in Sri Lanka. The All Share Price Index (ASPI) is a market capitalization weighted index where the weight of any company is taken as the number of ordinary shares listed in the market. This weighting system allows the price movements of larger companies to have a greater impact on the index. Such a weighting system was adopted on the assumption that the general economic situation has a greater influence on larger companies than on smaller ones.

$$\text{ASPI} = \frac{\text{Market Capitalization of All Listed Companies}}{\text{Base Market Capitalization}} * 100 \quad \ldots\ldots\ldots\ldots \quad (3.2)$$

Where,

Market Capitalization = Summation of current Number of listed shares * Market Price

Base Market Capitalization = Summation of Listed Shares * Market Price

Base values are established with average market value on year 1985. Hence the base year becomes 1985.

3.5 Procurement of Data

Following data was collected from various issues of "Economic and social statistics of Sri Lanka" published monthly by the Central Bank of Sri Lanka.

- Monthly Average Weighted Prime Lending Rate (AWPR)each year from 1994- 2013
- Monthly Average Weighted Deposit Rate (AWDR) each year from 1994- 2013
- Monthly y Inflation Rate each year from 1994- 2013
- Monthly money supply each year from 1994 – 2013
- Monthly exchange rate of SDR each year from 1994 – 2013
- Monthly exchange rate of USD each year from 1994 – 2013
- Monthly exchange rate of GBP each year from 1994 – 2013
- Monthly exchange rate of INR each year from 1994 – 2013
- Monthly exchange rate of JPY each year from 1994 – 2013
- Monthly indices performance from ASPI each year from 1994-2013
- Monthly indices performance from Banks, Diversified Holding, Beverage, Hotels, Telecommunication, manufacturing industry each year from 1994 – 2013

3.6 Conceptual Framework

The conceptual framework as brought out from the literature review in this study is illustrated in the Figure 3.1 below.

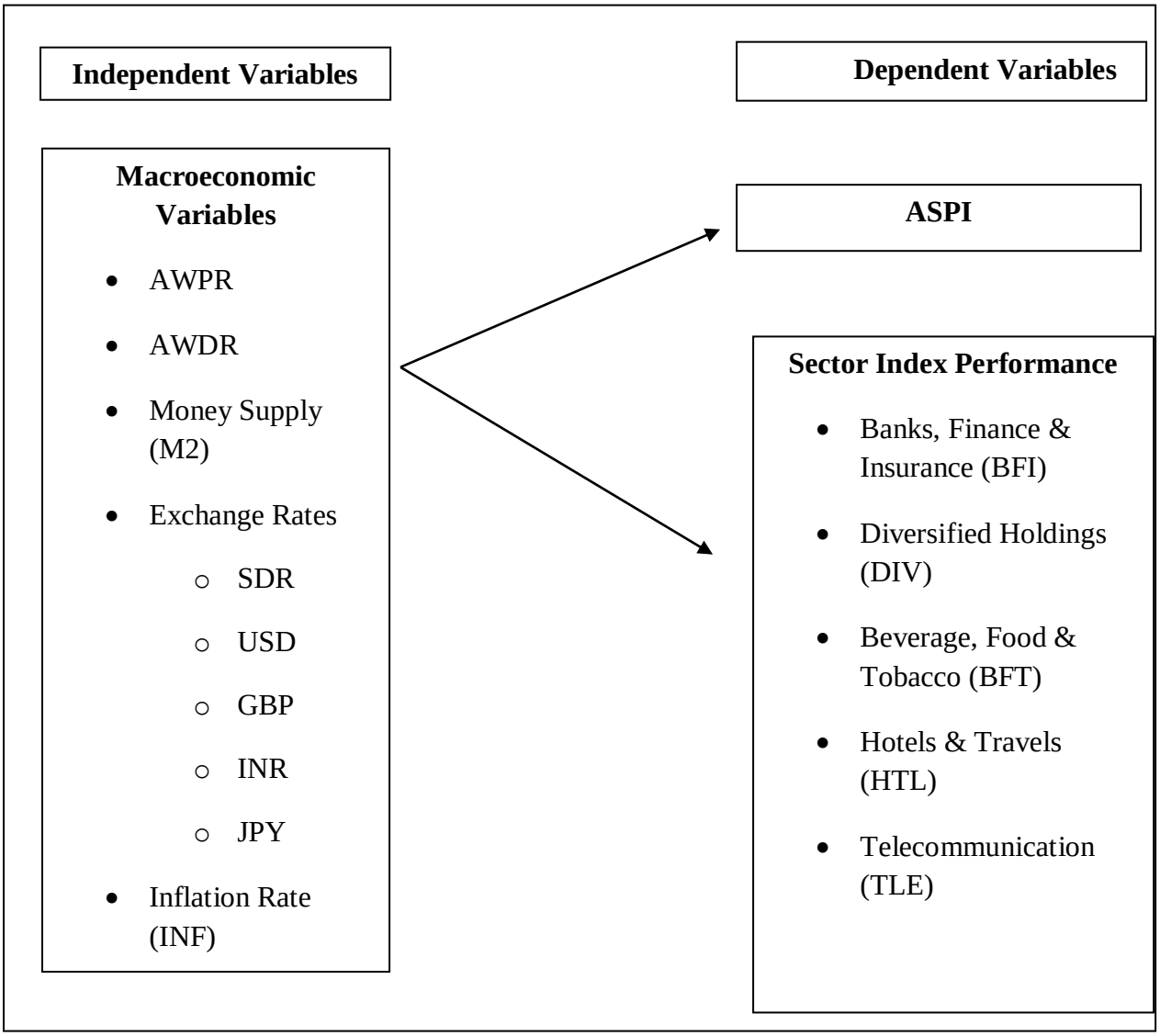

Figure 3.1 Conceptual Framework of the Study

3.7 Methodology of Data Analysis

3.7.1 Research Design

This study adopted a causal relationship research design to investigate the causal relationship between the ASPI and macroeconomic variables in Sri Lanka and the study investigates the causal relationship between the sector wise indices and macroeconomic variables. The causal research design enabled the researcher to understand how one variable under study affected, or was responsible for changes in another variable. Causal research design was chosen because in business research, the cause-effect relationship is less explicit. Use of a causal research design eases the understanding, explanation, prediction and control of any relationship between variables under study.

3.7.2 Preliminary Analysis Techniques

This section indentifies the techniques used to get a basic understanding of the time series variables used in this study.

Time Plot

The most important step in any time series is to plot the observation against the time. This plot shows the important features of the time series such as trend, seasonality, outliers and discontinuities. The plot is vital to describe the behaviour of variables.

Transformation

Plotting the data may suggest that it is sensible to consider transforming them by taking logarithms or square roots. The three main reasons for making a transformation are as follows.

a) To Stabilize the Variance

   If there is a trend in the series and the variance appears to increase with the mean, then it may be advisable to transform the data. In particular, if the standard deviation is directly proportional to mean, a logarithmic transformation is most suitable.

b) To Make Seasonal Effect Additive

If there is a trend in the series and the size of the seasonal effect appears to increase with the mean, then it may be advisable to transform the data in order to make the seasonal effect constant from year to year. In particular, if the size of the seasonal effect is directly proportional to the mean, then the seasonal effect is to be multiplicative and a logarithm transformation is most suitable.

c) To make data normally distributed

Model building and forecasting are usually carried out on the assumption that the errors are normally distributed. Therefore, an appropriate transformation can be applied to make the errors normally distributed.

3.7.3 Test for Stationary

In order to avoid the possibility of biased results stemming from a likely existence of unit roots in the variables under study, the researcher is planning to test stationary of data using the Augmented Dickey Fuller test (ADF) procedure and Phillip Perron Test (PP).

a) The ADF Approach

The ADF approach controls for higher-order correlation by adding lagged difference terms of the dependent variable to the right-hand side of the regression. The ADF test is specified here as follows (3.3):

$$\Delta Yt = \alpha + \theta Y_{t-1} + \beta_1 \Delta Y_{t-1} + \beta_2 \Delta Y_{t-2} + \ldots\ldots\ldots \beta_p \Delta Y_{t-p} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.3)$$

Where,

Yt = time series to be tested for stationary

α= the intercept term,

θ = the coefficient of interest in the unit root test,

ε_t= the white noise error term.

The null hypothesis of the ADF T- test is:

H_0: $\hat{\theta}$=0 (The series need to be differenced to make it stationary)

H_1: $\hat{\theta}$<0 (The series is stationary)

The test statistic,

$$T_{df} = \frac{\hat{\theta}}{SE(\hat{\theta})} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3.4)$$

The ADF t-statistic does not follow a standard t- distribution, however special tables have been developed to find critical values at given significance level. If the test statistic is less than the critical value then H_0 is rejected confirming the series is stationary at a given significance level.

b) The Phillips – Perron (PP) Test

Phillips and Perron (1988) proposed an alternative method of controlling for serial correlation when testing for an unit root. The PP method estimates the non augmented Dickey Fuller test equation and modifies the estimate of the variance. Therefore that serial correlation does not affect the asymptotic distribution of the test statistic. Accordingly, the hypotheses, rejection rule and distribution are the same as in ADF test.

3.7.4 Testing for Co-integration

Once a unit root has been confirmed for a data series as stationary, there arises a question whether there is any possibility for the existence of a long-run equilibrium relationship among a given set of variables. In order to test for the co-integrating relationship between the variables under study, the general to specific approach was taken to search for a suitable optimal lag length. Johansen's co-integration tests are very sensitive to the choice of optimal lag length. Therefore, Johansen-Juselius test procedure was used to test for the possibility of a long-run equilibrium relationship between macroeconomic variables, sector wise price indices and ASPI. This way, the researcher was able to analyze whether the time series under study share a common stochastic drift or not.

Thereafter, The Hannan-Quinn information criterion (HQ) and the Schwartz information criteria (SIC) are used to select the number of lags required in the co-integration test. The AIC statistics are given by (3.5):

$$\text{HQ}= -2\left(\frac{LL}{T}\right) + \frac{2ln\{\ln(T)\}}{T} t_p \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.5)}$$

LL= Log Likelihood

t_p= total number of parameters in the model

The SIC statistics are given by (3.6):

$$\text{SIC} = -2L_m + m\ln n \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3.6)}$$

n= Sample size

L_m= maximized log-likelihood of the model

m= number of parameters in the model

The SIC considers both the statistical goodness of fit and the number of parameters that have to be estimated to achieve this particular degree of fit, by imposing a penalty for increasing the number of parameters.

3.7.5 Testing for the Causality

The researcher's selected the granger procedure because it consists the more powerful and simpler way of testing causal relationship (Granger, 1986). The Granger-causality test use to investigate direction of causation between stock market performance and macroeconomic variables. The outcome from the Granger-causality test was used to determine whether the variables under study can be used to predict each other or not. At the same time, the variables used in the granger-causality test were all assumed to be stationary i.e. I (0) process. Finally, the causality test helps to ascertain whether a uni-directional or bi-directional (feedback) relationship exists between macroeconomic variables and stock market performance

3.8 Model Specification

VECM is including the error correction term used to investigate the dynamic behaviour of the model. Since the variables included in the VAR model are found to be co-integrated and all series are stationary in the same order, the study specified and estimates a VECM. Moreover, the size of the error correction term indicates the speed of adjustment of any disequilibrium towards a long-run equilibrium state. (Engle, 1987)

3.9 Chapter Summary

This chapter described the research framework and statistical methodology used in this study. The rationale to use time series analysis and importance of conceptual framework for model development were discussed. The next part discussed and compared data collection technique and sample size of the data set. The final section discussed several research analysis techniques including pre-estimation diagnostic such as test for stationary, testing for co-integration, testing for causality and also model specification used for data analysis. Furthermore, choice of macroeconomic variables for this study was justified.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter describes the way in which data from 240 valid observations of macroeconomic variables and price indices were analyzed, and presents the results. Data was analysed using the software of E Views in order to examine the influences of variables. The data analysis is divided into the following sections: Section 4.2 shows the descriptive statistics of the collected data series. The next section describes the causal relationship between stock market sector performance and macroeconomic variables. It allows us to capture the unique characteristics and point out specific leading and lagging macroeconomic indicators in Sri Lanka that impact strongly on stock exchange performance and sector wise performance, thereby boosting economic policy. The final section brings the results of the tool used to determine the causal relationship between stock market performance and macroeconomic variables, the unit root Augmented Dickey Fuller (ADF) test proposed by Dickey and Fuller; Johansen's co-integration test and Granger-causality test proposed by Granger Engle. In order to produce dynamic results for co-integrated series, the Vector Error Correction Model (VECM) was carried out which in predicting the short-run as well as the long-run dynamics between stock market performance and macroeconomic variables.

4.2 Descriptive Statistics

The descriptive statistics for the sixteen variables have been obtained for empirical investigation and are presented in the Table 4.1.The variables are ASPI, AWDR, AWPR, money supply of M2, SDR, USD, GBP, INF, MFG, BFI, FBI, DIV, HTL, and TLE.

Table 4.1 Descriptive Statistics of Variables

		Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	CV (%)	Jarque-Bera	Probability
SECTORWISE INDICES	**ASPI**	3397.54	2539.68	7798.00	739.00	2003.83	0.61	1.92	59	14.43	0.00
	BFI	7234.17	4833.54	17826.3	1734.20	4897.25	0.80	2.14	68	18.08	0.00
	BFT	6331.09	3297.77	20385.1	980.20	5639.35	1.00	2.70	89	22.39	0.00
	DIV	1066.60	725.13	2554.00	181.50	682.49	0.66	1.98	64	15.17	0.00
	HTL	2272.46	1549.18	5459.40	370.70	1387.67	0.65	2.16	61	13.20	0.00
	MFG	1740.27	1218.20	4244.20	411.30	1062.90	0.73	2.24	61	14.96	0.00
	TLE	174.46	161.23	332.15	80.00	56.27	0.67	2.89	32	9.92	0.01
MACROECONOMIC VARIABLES	**AWDR**	7.85	7.20	11.74	4.84	2.12	0.34	1.69	27	11.94	0.00
	AWPR	12.77	11.84	20.79	8.94	3.32	0.79	2.41	26	15.68	0.00
	GBP	188.71	185.74	230.97	152.75	18.75	0.22	2.34	10	3.44	**0.18**
	INF	9.62	8.01	28.20	0.70	5.69	1.25	4.46	59	46.22	0.00
	SDR	167.54	170.77	202.59	132.14	18.99	0.01	2.22	11	3.37	**0.19**
	USD	110.58	109.81	132.87	94.51	10.28	0.67	2.67	9	10.34	0.01
	JPY	0.8873	0.8649	1.6862	0.4450	0.33002	0.536	2.303	37.1	16.372	0.00027
	INR	2.053	2.1054	2.8755	1.4861	0.37982	0.042	1.692	18.5	17.159	0.0001
	M2	14030	1211302	3058793	512993	725894.7	0.69	2.34	52	12.76	0.00

The values of skewness and kurtosis indicate the lack of symmetry in the distribution. Further, if skewness and kurtosis have values zero and 3 respectively, it is observed that the given data series is normally distributed which is represent in the some variables in given data set. The Jarque-Bera statistic is an indication of distributions deviation where all variables except exchange rate of SDR and GBP indicates that null hypothesis of the normal distribution is rejected (P<0.05). The higher values of CV (>50%) indicate that BFI, BFT, HTL, MFG AND ASPI have a larger variability.

4.3 Temporal Variability of ASPI

The simplest method for determining the time series is stationary or not with the use of graphical representation which observes the evidence of mean, variance, autocorrelation and seasonality. Figure 4.1 highlights the graphical representation of ASPI from 1994-2013 due to economical and market changes.

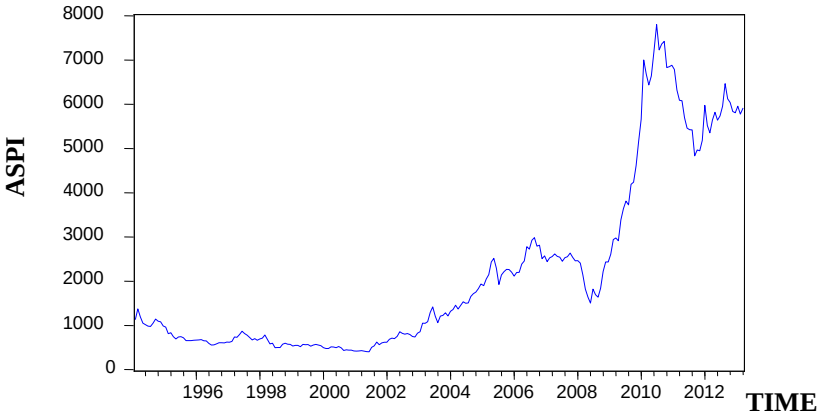

Figure 4.1: Pattern of ASPI

The ASPI has no significant gradual movements till year 2004. Thereafter, upward trend can be identified and a steep upward slope is notable after year 2009 due to the end of Sri Lankan civil war. However, a sudden drop has been reported in 2011 and now ASPI in a recovery phase. The economic variables contribute more on dynamic changes in ASPI. The highest ASPI reported as 7798 in mid of 2010 and lowest ASPI reported as 739 in mid of 2001.

4.4 Temporal Variability of Macroeconomic Variables

The variability of AWDR, AWPR, M2 money supply, INF and SDR rate has been discussed under this section. Figure 4.2 illustrates the pattern of an economic indicator of AWDR.

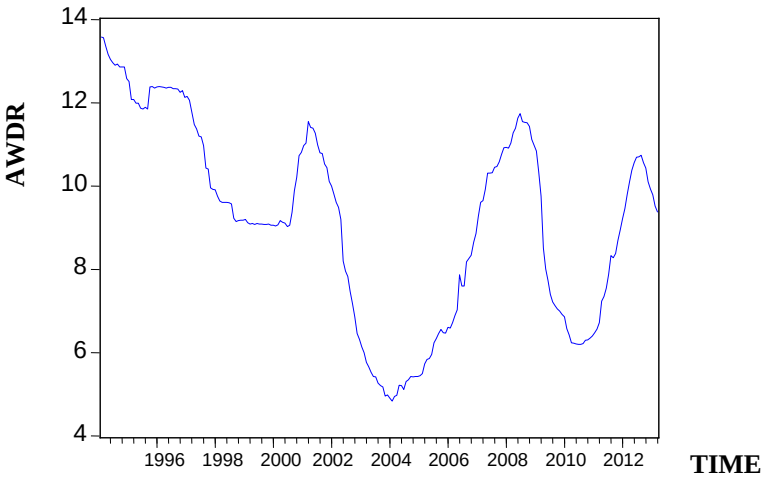

Figure 4.2: Pattern of AWDR

AWDR has a decreasing trend. The cyclical pattern of average weighted deposit rate has been reported. Peak has been reported in year 2001, 2008 and 2012. However, there is a decreasing trend in average weighted deposit rate in current period in order to stimulate business investments. Average weighted prime lending rate (AWPR) pattern may in line with the AWDR as shown in Figure 4.3.

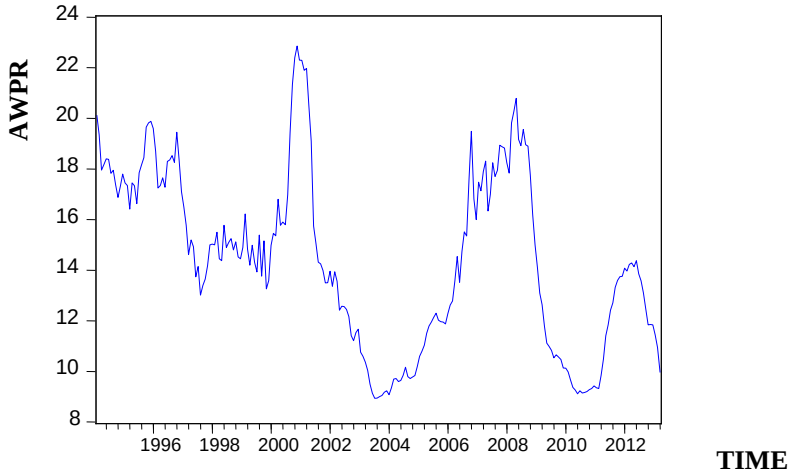

Figure 4.3: Pattern of AWPR

AWPR has a decreasing trend. The cyclical pattern of average weighted prime lending rate has been reported. Peak has been reported in year 2001, 2008 and 2012 where same peak levels have been reported in AWDR. However, volatility of AWPR is very much higher compared to AWDR. Changes in AWPR are determined by the money supply. Figure 4.4 presents the pattern of broad money in Sri Lanka.

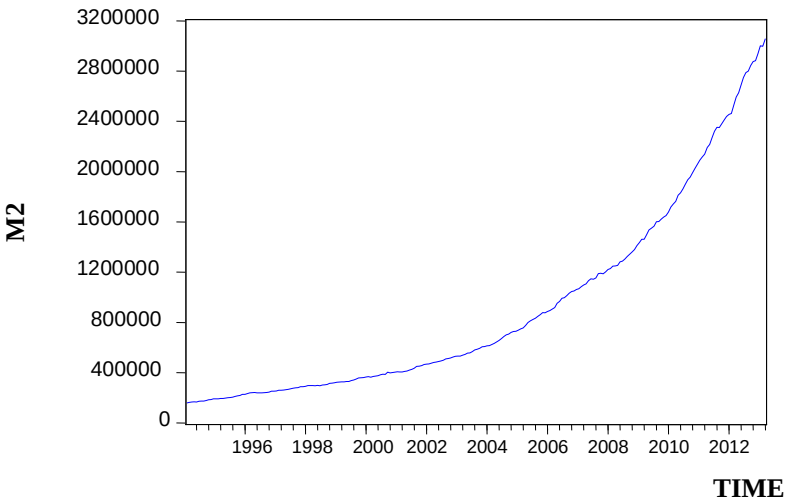

Figure 4.4: Pattern of Average M2

Figure 4.4 presents a smoothing curve of increase in M2 and no presence of high volatility. The sum of currency held by the public and all deposits held by the public with commercial banks is gradually increasing and as a result this monetary variable influence on general price levels in a country. Changes in price levels represent in Figure 4.5.

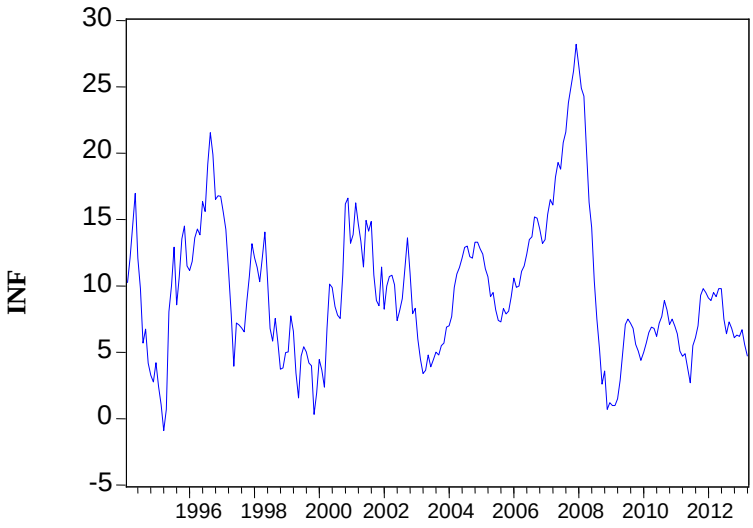

Figure 4.5: Pattern of INF

Inflation rate shows a cyclical pattern where highest rise in prices where highest inflation rate of 28.02 percent as shown in table 4.1 reported in year 2008 and disinflation has been reported after 2008. The behaviour of inflation rate is more volatile and currently drop in inflation rate is reported. Inflation rate is influenced on exchange rates of a country. Pattern of exchange rate of SDR is presented in Figure 4.6.

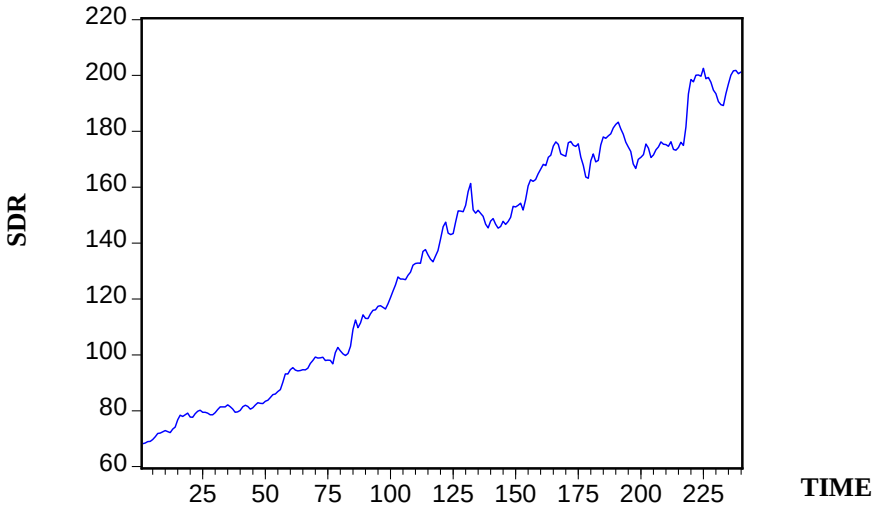

Figure 4.6: Pattern of Exchange Rate of SDR

Exchange rate of SDR shows an upward trend where volatility is very much high. Variation of imports and exports leads to the volatility of SDR. US dollar, UK pounds, Euros and Japanese Yen behavior represents by exchange rate of SDR.

4.5 Tests for Stationary for Original Series

ADF Test and PP test of the all variables of the original series is shown in Table 4.2.

Table 4.2 Results of the Unit Root Test for Original Series

	Variable	ADF Test Statistics	P Value	Philiphs Perron Test Statistics	P Value
SECTORWISE INDICES	ASPI	0.320260	0.9790	-0.23143	0.9311
	BFI	-0.08146	0.94886	-0.5723	0.8729
	BFT	2.18678	0.999	4.90383	1.0000
	DIV	-0.26952	0.9258	-0.5803	0.8710
	HTL	-0.90563	0.7853	-0.77263	0.8245
	MFG	-0.0457	0.9525	-0.52010	0.8836
	TLE	-1.94956	0.3089	-2.1592	0.2223
MACROECONOMIC VARIABLES	AWDR	-2.56218	0.1024	-2.17346	0.2166
	AWPR	-2.4349	0.1332	-2.3747	0.15003
	GBP	-1.17103	0.6873	-1.10969	0.7124
	INF	-2.97903	**0.0384****	-3.34568	**0.0140****
	SDR	-0.34684	0.9144	-0.3051	0.9207
	USD	-0.74394	0.8322	-0.64149	0.8575
	JPY	-0.97764	0.7615	-0.93392	0.776
	INR	-1.45286	0.5559	-1.3507	0.6060
	M2	8.322078	1.000	20.60220	1.0000

** Significant at 5% level

Since the P values of the corresponding variables except INF test statistic in both tests are greater than the significance levels (0.05), null hypothesis could not to be rejected for variables in original data series. Therefore, all the variables in original series are non-stationary according to the ADF test and PP test.

4.6 Tests for Stationary for Log Transformation Data Series

As all the variables showed that variability increase with time and non-stationary at original series, log transformations for all series were considered. This will reduce the heteroskedasticity of the sample. The log transformed for below variables as shown in Table 4.3.

Table 4.3 Log Transformation of the Variables

	Original Series	Log Series
SECTORWISE INDICES	ASPI	LNASPI
	BFI	LNBFI
	BFT	LNBFT
	DIV	LNDIV
	HTL	LNHTL
	MFG	LNMFG
MACROECONOMIC VARIABLES	TLE	LNTLE
	AWDR	LNAWDR
	AWPR	LNAWPR
	GBP	LNGBP
	INF	LNINF
	SDR	LNSDR
	USD	LNUSD
	JPY	LNJPY
	INR	LNINR
	M2	LNM2

Thereafter, log transformation data was tested for unit root at first difference and second difference as shown in Table 4.4 and 4.5 respectively

Table 4.4 Results of Unit Root Test for First Difference of Log Series

	Variable	ADF Test Statistics	P Value	Philiphs Perron Test Statistics	P Value
SECTORWISE INDICES	LNASPI	-13.628	0.0000**	-14.06217	0.0000**
	LNBFI	-14.1116	0.0000**	-14.47341	0.0000**
	LNBFT	-13.9162	0.0000**	-14.02126	0.0000**
	LNDIV	-13.3629	0.0000**	-13.45426	0.0000**
	LNHTL	-11.4365	0.0000**	-13.24994	0.0000**
	LNMFG	-14.1360	0.0000**	-14.27691	0.0000**
	LNTLE	-9.82288	0.0000**	-9.869672	0.0000**
MACROECONOMIC VARIABLES	LNAWDR	-3.95267	0.0020**	-9.713462	0.0000**
	LNAWPR	-6.47768	0.0000**	-14.11301	0.0000**
	LNGBP	-11.1222	0.0000**	-11.53355	0.0000**
	LNINF	-17.7531	0.0000**	-18.08487	0.0000**
	LNSDR	-11.2845	0.0000**	-10.83133	0.0000**
	LNUSD	-10.3199	0.0000**	-10.34056	0.0000**
	LNJPY	-10.6088	0.0000**	-11.45518	0.0000**
	LNINR	-11.8983	0.0000**	-12.07185	0.0000**
	LNM2	-2.80684	0.0589	-15.73939	0.0000**

** Significant at 5% level

Since the P value for LNM2 is greater than the significance levels (0.05), null hypothesis could not to be rejected. Therefore, LNM2 series is non-stationary according to the ADF test.

However, Phillips Perron test statistics are significant for all variables. As ADF statistics, LNM2 series showed non stationary in first difference, second difference transformation is applied for the series as variance stabilization measure as shown in Table 4.5.

Table 4.5 Results of Unit Root Test for Second Difference of Log Series

	Variable	ADF Test Statistics	P Value	Philiphs Perron Test Statistics	P Value
SECTORWISE INDICES	LNASPI	-10.7386	0.0000**	-9.947674	0.0000**
	LNBFI	-13.7746	0.0000**	-77.17332	0.0001**
	LNBFT	-10.1044	0.0000**	-67.63441	0.0001**
	LNDIV	-13.8429	0.0000**	-73.57379	0.0001**
	LNHTL	-11.2854	0.0000**	-14.04176	0.0000**
	LNMFG	-10.6875	0.0000**	-9.973287	0.0000**
	LNTLE	-13.9371	0.0000**	-38.67045	0.0001**
MACROECONOMIC VARIABLES	LNAWDR	-18.5120	0.0000**	-39.21955	0.0001**
	LNAWPR	-12.7982	0.0000**	-88.71652	0.0001**
	LNGBP	-14.4477	0.0000**	-73.03322	0.0001**
	LNINF	-8.62503	0.0000**	-42.64832	0.0001**
	LNSDR	-11.3262	0.0000**	-120.8227	0.0001**
	LNUSD	-18.7310	0.0000**	-39.20025	0.0001**
	LNJPY	-9.95955	0.0000**	-53.10342	0.0001**
	LNINR	-14.7154	0.0000**	-65.97604	0.0001**
	LNM2	-10.3434	0.0000**	-41.43229	0.0001**

** Significant at 5% level

As can be seen in the Table 4.5, null hypothesis can be rejected at 5% significance level for all the variables. Thus, it can be concluded that all series are stationary at its 2nd difference based on ADF test and Phillips Perron test. Since the all variables are integrated of the same order for all series, long-run equilibrium relationship between these series is investigated. The simple regression of macroeconomic variables and ASPI is carried out at second difference level to check the stationary of error series of the above model and summary result of the model and residuals are shown in Table 4.6 below.

Table 4.6 Augmented Dickey-Fuller Test (Unit root test) for Residuals

Null Hypothesis: D(RESID) has a unit root

Exogenous: Constant

Lag Length: 6 (Automatic based on SIC, MAXLAG=14)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.286434	**0.0000**
Test critical values:	1% level	-3.465977	
	5% level	-2.877099	
	10% level	-2.575143	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESID,2)

Method: Least Squares

Date: 05/29/14 Time: 13:26

Sample (adjusted): 57 240

Included observations: 184 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RESID(-1))	-4.465138	0.480824	-9.286434	0.0000
D(RESID(-1),2)	2.632935	0.441728	5.960529	0.0000
D(RESID(-2),2)	1.954333	0.383128	5.100988	0.0000
D(RESID(-3),2)	1.406368	0.312496	4.500431	0.0000
D(RESID(-4),2)	0.945575	0.234089	4.039388	0.0001
D(RESID(-5),2)	0.551224	0.153108	3.600228	0.0004
D(RESID(-6),2)	0.185830	0.075955	2.446590	0.0154
C	2.874742	23.27326	0.123521	0.9018

R-squared	0.805505	Mean dependent var	2.708276
Adjusted R-squared	0.797769	S.D. dependent var	701.9300
S.E. of regression	315.6587	Akaike info criterion	14.38970
Sum squared resid	17536711	Schwarz criterion	14.52948
Log likelihood	-1315.853	F-statistic	104.1293
Durbin-Watson stat	2.049486	Prob(F-statistic)	0.000000

According to the result in Table 4.6, null hypothesis can be not accepted at 1%,5% and 10% significance level, because, P-values for residuals are less than the corresponding significance levels. Thus, it can be concluded that residual series is stationary at its 2nd difference. Once a unit root has been confirmed for a data series, it is recommended to check whether there is any possibility for the existence of a long-run equilibrium relationship among a given set of variables. In order to test for the co-integrating relationship between the variables under study, the general rule is to search for a suitable lag length with the use of Johansen co-integration method (Yoo, 2006).

4.7 Selection of Optimal Lag Length of the Model

The important step in the Johansen cointegration method is the selection of appropriate lag length of the model by applying maximum likelihood estimation procedure. In concerning the choice of the lag length of selecting the optimal lag length is shown in Table 4.7. The results of the analysis of optimal lag length for VECM model is based on SIC and HQ.

Table 4.7 Results of Lag Order Selection

Lag	SIC	HQ
0	-20.15506	-20.25816
1	-51.51123*	-52.74846*
2	-49.54753	-51.91890
3	-47.30050	-50.80600

Results indicates that the minimum values of SIC and HQ statistic were obtained at lag 1. Therefore, it can be concluded that the optimal lag length of this model is one. Thus granger causality test was carried out for the corresponding variables for lag 1.

4.8 Testing for the Causality

Granger (1986) proposed that if causal relationship exists between variables, these variables can be used to predict each other. The causality test helps to ascertain whether a uni-directional or bi-directional (feedback) relationship exists between economic growth and stock market performance. To achieve this, we employed the granger-causality test was carried out to check the statistical causality between the stock market performance and economic growth as well as to determine the predictive content of one variable beyond that inherent in the explanatory variable itself.

Granger causality test of the study is conducted under three main sections as follows.

- Granger causality between macro economic variables and price indices in stock exchange
- Granger causality between exchange rates and macroeconomic variables
- Granger causality among macroeconomic variables

4.8.1 Granger Causality between Macroeconomic Variables and Price Indices in Stock Exchange

Macroeconomic variables are critical indicators that affect stock market of a country. Consequently, the following analysis was carried out to find the causality.

- Causality between AWDR and price indices in CSE (Table 4.8)
- Causality between AWPR and price indices in CSE (Table 4.9)
- Causality between INF and price indices in CSE (Table 4.10)
- Causality between Broad M2 and Price indices in CSE (Table 4.11)
- Causality between exchange rate of GBP and price indices in CSE (Table 4.12)
- Causality between exchange rate of USD and price indices in CSE (Table 4.13)
- Causality between exchange rate of SDR and price indices in CSE (Table 4.14)
- Causality between ASPI and price indices in CSE (Table 4.15)

Table 4.8 Results of Granger Causality between AWDR and Price Indices in CSE

Null Hypothesis	F-Statistic	Causal Inference
LNASPI does not Granger Cause LNAWDR	4.41336 (0.03672)	Causality
LNAWDR does not Granger Cause LNASPI	4.26853 (0.03992)	Causality
LNBFI does not Granger Cause LNAWDR	2.11181 (0.14749)	No Causality
LNAWDR does not Granger Cause LNBFI	1.74983 (0.18718)	No Causality
LNBFT does not Granger Cause LNAWDR	2.72399 (0.10018)	No Causality
LNAWDR does not Granger Cause LNBFT	1.19318 (0.27580)	No Causality
LNDIV does not Granger Cause LNAWDR	4.40394 (0.03705)	Causality
LNAWDR does not Granger Cause LNDIV	1.31519 (0.25276)	No Causality
LNHTL does not Granger Cause LNAWDR	3.04153 (0.08246)	No Causality
LNAWDR does not Granger Cause LNHTL	4.09057 (0.04425)	Causality
LNMFG does not Granger Cause LNAWDR	2.27172 (0.13309)	No Causality
LNAWDR does not Granger Cause LNMFG	2.57294 (0.11004)	No Causality
LNTLE does not Granger Cause LNAWDR	22.2369 (6.2E-06)	Causality
LNAWDR does not Granger Cause LNTLE	1.70269 (0.19428)	No Causality

The values of F statistic in table 4.8 suggest that LNAWDR Granger-causes LNASPI and LNHTL (P= 0.03992). Thus, it can be argued that past values of LNAWDR contribute to the prediction of the present value of ASPI and HTL index. The study suggests that LNASPI granger causes LNAWDR (P = 0.0036) and therefore, bi directional granger causality found between LNASPI and LNAWDR. However, the values of F statistic imply that LNAWDR does not cause BFI, BFT, DIV, MFG, and TLE. Thus, it can be claimed that past values of LNAWDR does not contribute to the prediction of the present value of BFI, BFT, DIV, MFG and TLE.

Table 4.9 Results of Granger Causality between AWPR and Price Indices in CSE

Null Hypothesis	F-Statistic	Causal Inference
LNASPI does not Granger Cause LNAWPR	0.03419 (0.85346)	No Causality
LNAWPR does not Granger Cause LNASPI	6.05080 (0.01462)	Causality
LNBFT does not Granger Cause LNAWPR	0.52930 (0.46762)	No Causality
LNAWPR does not Granger Cause LNBFT	1.58649 (0.20907)	No Causality
LNDIV does not Granger Cause LNAWPR	0.00068 (0.97920)	No Causality
LNAWPR does not Granger Cause LNDIV	3.82484 (0.05182)	No Causality
LNBFI does not Granger Cause LNAWPR	0.18618 (0.66651)	No Causality
LNAWPR does not Granger Cause LNBFI	3.12662 (0.07832)	No Causality
LNHTL does not Granger Cause LNAWPR	0.12024 (0.72908)	No Causality
LNAWPR does not Granger Cause LNHTL	5.38430 (0.02117)	Causality
LNMFG does not Granger Cause LNAWPR	0.20106 (0.65428)	No Causality
LNAWPR does not Granger Cause LNMFG	3.30603 (0.07029)	No Causality
LNTLE does not Granger Cause LNAWPR	8.03468 (0.00533)	Causality
LNAWPR does not Granger Cause LNTLE	0.32686 (0.56852)	No Causality

The values of F statistic in table 4.8 suggest that AWPR Granger-causes ASPI and HTL (P=0.0146, 0.0211). Thus, it can be argued that past values of AWPR contribute to the prediction of the present value of ASPI and HTL. The study suggests that ASPI does not granger causes AWPR (P=0.853) and therefore no bi directional granger causality found between ASPI and AWPR. Moreover, TLE granger causes AWPR where causal influence is running from TLE and AWPR (P= 0.005). Furthermore, results in Table 4.9 reject the null hypothesis that, there is an uni-directional causal link between TLE and AWPR (P=0.0053)

Table 4.10Results of Granger Causality between INF and Price Indices in CSE

Null Hypothesis	F-Statistic	Causal Inference
LNINF does not Granger Cause LNASPI	1.00391 (0.31740)	No Causality
LNASPI does not Granger Cause LNINF	0.13992 (0.70870)	No Causality
LNINF does not Granger Cause LNBFI	0.91730 (0.33917)	No Causality
LNBFI does not Granger Cause LNINF	0.21432 (0.64383)	No Causality
LNINF does not Granger Cause LNBFT	0.02049 (0.88629)	No Causality
LNBFT does not Granger Cause LNINF	0.64932 (0.42117)	No Causality
LNINF does not Granger Cause LNDIV	2.89941 (0.09008)	No Causality
LNDIV does not Granger Cause LNINF	0.02836 (0.86643)	No Causality
LNINF does not Granger Cause LNHTL	2.41470 (0.12155)	No Causality
LNHTL does not Granger Cause LNINF	0.20570 (0.65058)	No Causality
LNMFG does not Granger Cause LNINF	0.39883 (0.39883)	No Causality
LNINF does not Granger Cause LNMFG	0.16150 (0.68815)	No Causality
LNTLE does not Granger Cause LNINFL	7.39445 (0.00745)	Causality
LNINFL does not Granger Cause LNTLE	0.77769 (0.37950)	No Causality

The values of F statistic in Table 4.10 suggest that INF does not Granger-causes with ASPI and any industry index. Thus, it can be claimed that past values of inflation rate does not contribute to the prediction of the present value of ASPI and any other industry index. However, TLE granger causes inflation rate where causal influence is running from TLE to inflation rate (P= 0.00745).

Table 4.11 Results of Granger Causality between M2 and Price Indices in CSE

Null Hypothesis	F-Statistic	Causal Inference
LNM2 does not Granger Cause LNASPI	7.77550 (0.00573)	Causality
LNASPI does not Granger Cause LNM2	7.93459 (0.00526)	Causality
LNM2 does not Granger Cause LNBFI	7.33313 (0.00726)	Causality
LNBFI does not Granger Cause LNM2	6.14888 (0.01385)	Causality
LNM2 does not Granger Cause LNBFT	11.7098 (0.00073)	Causality
LNBFT does not Granger Cause LNM2	4.78869 (0.02963)	Causality
LNM2 does not Granger Cause LNDIV	2.18691 (0.14068)	No Causality
LNDIV does not Granger Cause LNM2	3.73289 (0.05469)	No Causality
LNM2 does not Granger Cause LNHTL	6.50179 (0.01141)	Causality
LNHTL does not Granger Cause LNM2	10.7945 (0.00117)	Causality
LNMFG does not Granger Cause LNM2	8.00704 (0.00506)	Causality
LNM2 does not Granger Cause LNMFG	8.58864 (0.00371)	Causality
LNTLE does not Granger Cause LNM2	0.65685 (0.41918)	No Causality
LNM2 does not Granger Cause LNTLE	0.48697 (0.48655)	No Causality

The values of F statistic in Table 4.11 suggest that M2Granger-causes ASPI, BFI, BFT, HTL, and MFG ($P< 0.05$). Thus, it can be argued that past values of M2 contribute to the prediction of the present value of ASPI, BFI, BFT, HTL and MGF index. The study suggests that ASPI granger causes M2 and therefore bi directional granger causality found between ASPI and M2 money supply. Moreover , BFI, BFT, HTL, MFG granger causes M2 money supply where causal influence is running from the stated indextoM2 money supply ($P= 0.005$).In contrast, DIV and TLE index does not contribute to the prediction of M2 supply and M2 money supply does not granger causes DIV and TLE.

Table 4.12Results of Granger Causality between Exchange Rate of GBP and Price Indices in CSE

Null Hypothesis	F-Statistic	Causal Inference
LNGBP does not Granger Cause LNASPI	7.06658 (0.00839)	Causality
LNASPI does not Granger Cause LNGBP	0.05910 (0.80814)	No Causality
LNGBP does not Granger Cause LNBFT	4.36716 (0.03771)	Causality
LNBFT does not Granger Cause LNGBP	0.01021 (0.91959)	No Causality
LNGBP does not Granger Cause LNDIV	1.61097 (0.20575)	No Causality
LNDIV does not Granger Cause LNGBP	0.17183 (0.58582)	No Causality
LNGBP does not Granger Cause LNHTL	9.16467 (0.00274)	Causality
LNHTL does not Granger Cause LNGBP	0.16024 (0.68930)	No Causality
LNGBP does not Granger Cause LNMFG		
LNMFG does not Granger Cause LNGBP	0.34600 (0.81249)	No Causality
LNGBP does not Granger Cause LNTLE	0.51866 (0.47273)	No Causality
LNTLE does not Granger Cause LNGBP	2.57960 (0.11071)	No Causality
LNGBP does not Granger Cause LNBFI	4.56283(0.01138)	Causality
LNBFI does not Granger Cause LNGBP	0.19668(0.82159)	No Causality

The values of F statistic in Table 4.12 are not exhibited Granger causality from exchange rate of GBP to DIV and TLE index (P> 0.05). The bi directional granger causality does not found between ASPI and exchange rate of GBP. However, past values of GBP contribute to the prediction of the present value of ASPI (P= 0.008) and other industry indices in CSE. DIV, BFT, HTL, MFG, BFI and TLE indices do not granger cause GBP where causal influence is not running from the stated index to GBP (P>0.05).

Table 4.13Results of Granger Causality between Exchange Rate of USD and Price Indices in CSE

Null Hypothesis	F-Statistic	Causal Inference
LNUSD does not Granger Cause LNASPI	11.1105 (0.00100)	Causality
LNASPI does not Granger Cause LNUSD	4.76172 (0.03009)	Causality
LNUSD does not Granger Cause LNBFI	9.02038 (0.00296)	Causality
LNBFI does not Granger Cause LNUSD	5.02971 (0.02585)	Causality
LNUSD does not Granger Cause LNBFT	8.35443 (0.00421)	Causality
LNBFT does not Granger Cause LNUSD	1.51972 (0.21889)	No Causality
LNUSD does not Granger Cause LNHTL	12.9235 (0.00040)	Causality
LNHTL does not Granger Cause LNUSD	6.74728 (0.00998)	Causality
LNUSD does not Granger Cause LNMFG	11.9596 (0.00064)	Causality
LNMFG does not Granger Cause LNUSD	5.01473 (0.02606)	Causality
LNUSD does not Granger Cause LNTLE	0.23709 (0.62715)	No Causality
LNTLE does not Granger Cause LNUSD	0.04705 (0.82862)	No Causality
LNUSD does not Granger Cause LNDIV	4.74055 (0.03057)	Causality
LNDIV does not Granger Cause LNUSD	1.38007 (0.24141)	No Causality

Exchange rate of USD can be estimated from ASPI, BFI, BFT, HTL, MFG and DIV index ($P<0.05$). This implies that bank and finance industry, hotel and travel industry, manufacturing industry and food and beverage industry influence on behaviour of USD according to the results in Table 4.13. In contrast, ASPI can be estimated from exchange rate of USD ($P=0.03009$). Therefore, bi directional granger causality found between ASPI and exchange rate of USD. Moreover, past values of BFT, TLE, and DIV indices do not contribute to the prediction of the present value of exchange rate of USD.

Table 4.14 Results of Granger Causality between Exchange Rate of SDR and Price Indices in CSE

Null Hypothesis	F-Statistic	Causal Inference
LNSDR does not Granger Cause LNASPI	11.4905 (0.00082)	Causality
LNASPI does not Granger Cause LNSDR	0.76636 (0.38224)	No Causality
LNSDR does not Granger Cause LNBFI	9.02029 (0.00296)	Causality
LNBFI does not Granger Cause LNSDR	0.80722 (0.36986)	No Causality
LNSDR does not Granger Cause LNBFT	8.32134 (0.00428)	Causality
LNBFT does not Granger Cause LNSDR	0.07959 (0.77810)	No Causality
LNSDR does not Granger Cause LNDIV	5.67782 (0.01807)	Causality
LNDIV does not Granger Cause LNSDR	0.94444 (0.33225)	No Causality
LNSDR does not Granger Cause LNHTL	13.5258 (0.00029)	Causality
LNHTL does not Granger Cause LNSDR	1.22459 (0.26959)	No Causality
LNSDR does not Granger Cause LNTLE	1.23621 (0.26829)	No Causality
LNTLE does not Granger Cause LNSDR	0.36063 (0.54922)	No Causality
LNSDR does not Granger Cause LNMFG	12.9321 (0.00039)	Causality
LNMFG does not Granger Cause LNSDR	1.06246 (0.30371)	No Causality

The values of F statistic in Table 4.14are not exhibited Granger causality from exchange rate of SDR to TLE index only (P> 0.05). Furthermore, bi directional granger causality does not found between ASPI and exchange rate of SDR. The past values of SDR contribute to the prediction of the present value of ASPI and all other industry indices in CSE except TLE. All industry indices including ASPI does not granger cause SDR where causal influence is not running from the stated all indices to SDR (P> 0.05).

Table 4.15Results of Granger Causality between ASPI and Industry Price Indices in CSE

Null Hypothesis	F-Statistic	Causal Inference
LNBFI does not Granger Cause LNASPI	4.32272 (0.03869)	Causality
LNASPI does not Granger Cause LNBFI	5.91063 (0.01580)	Causality
LNBFT does not Granger Cause LNASPI	3.31126 (0.07007)	Causality
LNASPI does not Granger Cause LNBFT	2.58742 (0.10905)	No Causality
LNDIV does not Granger Cause LNASPI	3.30444 (0.07051)	Causality
LNASPI does not Granger Cause LNDIV	0.29060 (0.59041)	No Causality
LNHTL does not Granger Cause LNASPI	6.10792 (0.01416)	Causality
LNASPI does not Granger Cause LNHTL	0.98183 (0.32276)	No Causality
LNMFG does not Granger Cause LNASPI	0.24729 (0.61945)	No Causality
LNASPI does not Granger Cause LNMFG	2.38265 (0.12403)	No Causality
LNTLE does not Granger Cause LNASPI	6.56664 (0.01155)	Causality
LNASPI does not Granger Cause LNTLE	0.03190 (0.85853)	No Causality

ASPI can be estimated from indices of BFI index only (P=0.015). This implies that bank and finance industry influence on behaviour of ASPI in CSE. In contrast, all the industry indices considered in the study can be predicted with the use of past behavior of ASPI except DIV and MFG indices. However, past values of all indices except BFI do not contribute to the prediction of the present value of ASPI.

4.8.2 Results of Granger Causality between Exchange Rates and Macroeconomic Variables

In order to find the relationship between exchange rates and macroeconomic variables in Sri Lanka, bivariate Granger causality test was considered for the following series described below. This brings insight on association among predictor variables of macroeconomic indicators. This covers below stated causality between major exchange rates and macroeconomic variables.

- Causality between exchange rate of GBP and Macroeconomic Variables (Table 4.16)
- Causality between exchange rate of SDR and Macroeconomic Variables (Table 4.17)
- Causality between exchange rate of USD and Macroeconomic Variables (Table 4.18)

Table 4.16 Granger Causality between Exchange Rate of GBP and Macroeconomic Variables

Null Hypothesis	F-Statistic	Causal Inference
LNGBP does not Granger Cause LNAWDR	3.86562 (0.05006)	Causality
LNAWDR does not Granger Cause LNGBP	2.59656 (0.10843)	No Causality
LNGBP does not Granger Cause LNAWPR	0.05286 (0.81837)	No Causality
LNAWPR does not Granger Cause LNGBP	1.85108 (0.17496)	No Causality
LNGBP does not Granger Cause LNINF	0.08073 (0.77656)	No Causality
LNINF does not Granger Cause LNGBP	3.05518 (0.08179)	No Causality
LNGBP does not Granger Cause LNM2	0.07930 (0.77850)	No Causality
LNM2 does not Granger Cause LNGBP	0.20476 (0.65132)	No Causality
LNGBP does not Granger Cause LNSDR	0.04195 (0.83789)	No Causality
LNSDR does not Granger Cause LNGBP	0.35751 (0.55046)	No Causality
LNGBP does not Granger Cause LNUSD	4.87135 (0.02827)	Causality
LNUSD does not Granger Cause LNGBP	5.89496 (0.01593)	Causality

Exchange rate of GBP can be estimated from AWDR and exchange rate of USD only (P<0.05). This implies that exchange rate of USD and country's AWDR influence on appreciation or depreciation of exchange rate of GBP in Sri Lanka. In contrast, AWPR, INF, M2 and exchange rate of SDR are not caused on the behaviour of exchange rate of GBP (P>0.05). However, exchange rate of USD can be predicted with the use of GBP exchange rate (P = 0.028).

Table 4.17 Results of Granger Causality between Exchange Rate of SDR and Macroeconomic Variables

Null Hypothesis	F-Statistic	Causal Inference
LNSDR does not Granger Cause LNAWDR	1.93214 (0.16583)	No Causality
LNAWDR does not Granger Cause LNSDR	0.22749 (0.63383)	No Causality
LNSDR does not Granger Cause LNAWPR	0.69119 (0.40660)	No Causality
LNAWPR does not Granger Cause LNSDR	0.09983 (0.75232)	No Causality
LNSDR does not Granger Cause LNINF	0.02850 (0.86609)	No Causality
LNINF does not Granger Cause LNSDR	1.91984 (0.16719)	No Causality
LNSDR does not Granger Cause LNM2	0.10668 (0.74424)	No Causality
LNM2 does not Granger Cause LNSDR	0.29106 (0.59005)	No Causality
LNUSD does not Granger Cause LNSDR	8.92522 (0.00311)	Causality
LNSDR does not Granger Cause LNUSD	6.60909 (0.01076)	Causality

The values of F statistic in Table 4.17 are not exhibited Granger causality from exchange rate of SDR to macroeconomic variables (P > 0.05). Further, bi directional granger causality found between exchange rate of USD and exchange rate of SDR. Therefore, past exchange rates of SDR contribute to the prediction of the present value of USD and past exchange rate of USD contribute to the prediction of SDR (P < 0.05). This implies that no macroeconomic variables influence on the appreciation or depreciation of exchange rate of SDR except exchange rate of USD. Also, behaviour of exchange rates does not influence on the prediction of M2, INF, AWPR, and AWDR in Sri Lanka.

Table 4.18 Results of Granger Causality between Exchange Rate of USD and Macroeconomic Variables

Null Hypothesis	F-Statistic	Causal Inference
LNUSD does not Granger Cause LNAWDR	1.01790 (0.31405)	No Causality
LNAWDR does not Granger Cause LNUSD	0.04128 (0.83918)	No Causality
LNUSD does not Granger Cause LNAWPR	1.14406 (0.28589)	No Causality
LNAWPR does not Granger Cause LNUSD	2.48827 (0.11604)	No Causality
LNUSD does not Granger Cause LNINF	0.12498 (0.72401)	No Causality
LNINF does not Granger Cause LNUSD	0.25507 (0.61400)	No Causality
LNUSD does not Granger Cause LNM2	0.40866 (0.52327)	No Causality
LNM2 does not Granger Cause LNUSD	0.02638 (0.87111)	No Causality

As shown in Table 4.18, there is no Granger causality is exhibited from exchange rate of USD to macroeconomic variables ($P > 0.05$). Therefore, a past exchange rate of USD does not contribute to the prediction of the present value of macroeconomic variables and past behaviour of exchange rate does not contribute to the prediction of USD ($P > 0.05$).

This implies that no macroeconomic variables significantly influence on the appreciation or depreciation of exchange rate of USD. Also, behaviour of exchange rates does not influence on the prediction of M2, INF, AWPR, AWDR and exchange rate of GBP in Sri Lanka. In conclusion, there will be non macroeconomic variables which influence on the prediction of USD such as demand and supply of USD in the Sri Lankan Foreign exchange market.

4.8.3 Granger Causality among Macroeconomic Variables

Results of bivariate Granger causality between macroeconomic variables of M2, AWPR, AWDR, and INF represent the relationship among country's monetary policy changes and fiscal policy changes as shown in Table 4.19.

Table 4.19 Results of Granger Causality among Macroeconomic Variables

Null Hypothesis	F-Statistic	Causal Inference
LNINFL does not Granger Cause LNAWDR	20.2946 (1.0E-05)	Causality
LNAWDR does not Granger Cause LNINFL	0.02886 (0.86525)	No Causality
LNM2 does not Granger Cause LNAWDR	3.32237 (0.06961)	No Causality
LNAWDR does not Granger Cause LNM2	0.79124 (0.37463)	No Causality
LNINFL does not Granger Cause LNAWPR	4.46181 (0.03572)	Causality
LNAWPR does not Granger Cause LNINFL	0.39718 (0.52916)	No Causality
LNM2 does not Granger Cause LNAWPR	0.45501 (0.50063)	No Causality
LNAWPR does not Granger Cause LNM2	1.94211(0.16475)	No Causality
LNM2 does not Granger Cause LNINFL	0.29349 (0.58851)	No Causality
LNINFL does not Granger Cause LNM2	1.29660 (0.25600)	No Causality

There is no Granger causality is exhibited from AWDR and AWPR to macroeconomic variables as the corresponding P value is greater than 5%. Therefore, past interest AWDR and AWPR does not contribute to the prediction of the present value of macroeconomic variables and past behaviour of money supply does not contribute to the prediction of AWDR and AWPR. This implies that money supply variable does not significantly influence on the change of AWDR. However, behaviour of inflation rates influence on the prediction of interest rates AWDR and AWPR in Sri Lanka. In conclusion, inflation rates influence on the prediction of interest rates in the Sri Lankan Money Market.

4.9 Estimation of Johansen Cointegration Model for ASPI

The Co-integration relationship between ASPI and other macro economic variables is tested using Johansen approach at the predetermined lag 1. In these tests, maximum Eigen value statistic is known as trace statistic which is compared to the corresponding critical value as shown in Table 4.20.

Table 4.20 Results of Johansen Cointegration Test for ASPI

Sample (1994-2013)

Series Included : Ln_AWPR,LNAWDR, LNGBP,

LNINFLATION, LNM2, LNSDR, LNUSD, LNASPI

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob.**	Significance at 5% level
None *	0.315475	344.7219	285.1425	0.0000	Yes
At most 1 *	0.261927	263.6093	239.2354	0.0024	Yes
At most 2 *	0.217829	198.6148	197.3709	0.0433	Yes
At most 9	0.042256	10.45371	15.49471	0.2474	-
At most 10	0.005658	1.214232	3.841466	0.2705	-

The Trace Test in Table 4.18 indicates the existence of three cointegrating equation at the 5%significance level. This cointegrating equation means that three linear combination exists between the variables that force these indices to have a relationship over the entire 19 years time period, despite potential deviation from equilibrium levels in the short-term. In order to confirm the results of the Johansen's Trace test, the Cointegration Rank Test carried out and shown in Table 4.21 below.

Table 4.21 Unrestricted Cointegration Rank Test (Maximum Eigen Value)

Hypothesized No. of CE(s)	Trace Statistics Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.31547	81.112594	70.53513438	0.003987
At most 1 *	0.26192	64.994453	64.5047170	0.0448

The results of the Johansen's cointegration test in the Table indicate that maximum Eigen value statistic values are greater than the critical value at 5% significant level in two occasions only ($P < 0.05$). Therefore, two cointegration equations can be found. It implied that there exists a long run relationship between ASPI and macroeconomic variables.

Similarly, the maximum Eigen value rejects the null hypothesis of $r = 0$ co-integrating vector at 5 percent significant level and accepts the alternate hypothesis of one co-integrating vector. Therefore, both test statistics suggest the presence of one co-integrating vector. It can be concluded that the variables are co integrated and follow long-run equilibrium relationship. Engle and Granger (1987) stated that the evidence of cointegration rules out spurious correlation and suggests the presence of at least one direction(s) of Granger causality.

Table 4.22 Normalized Cointegrating Coefficient: ASPI

Variable	LNASPI	LN AWDR	LN AWPR	LNINF	LN M2	LN SDR	LN USD	LN GBP	LNINR	LNJPY
Coefficient Value	1	9.17	-12.12	-3.53	-1.13	1.381	3.797	-29.93	17.59	-25.83
Standard Error		-3.20	-3.369	-0.54	-2.83	-1.03	-0.67	-7.157	-5.10	-4.85
t statistics		[-2.86]	[3.59]	[6.53]	[0.399]	[-1.34]	[-5.66]	[4.18]	[-3.44]	[5.32]

Results in Table 4.22 indicate that there is one integrating equation, with normalized cointegrating coefficient. Hence, an error correction model should be applied. The ASPI and macroeconomic variables have the expected signs and are statistically significant according to the t values shown. The study can interpret the coefficients as follows:

- A 1% increase in AWDR leads to a 9.17 per cent increase in LNASPI in the long run.
- A 1% increase in AWPR leads to a 12.12 per cent decrease in LNASPI in the long run.
- A 1% increase in inflation rate leads to a 3.53 per cent decrease in LNASPI in the long run.
- A 1% increase in USD leads to a 3.797 per cent increase in LNASPI in the long run.
- A 1% increase in GBP leads to a 29.93 per cent decrease in LNASPI in the long run.
- A 1% increase in INR leads to a 17.59 per cent increase in LNASPI in the long run.
- A 1% increase in JPY leads to a 25.83 per cent decrease in LNASPI in the long run.

In contrast to the sample results, the Money supply of M2B, M2 and exchange rate of SDR are not statistically significant according to the t values shown. The ECM for ASPI was fitted to determine the short run relationship between macro economic variables and ASPI results are shown below in Table 4.23.

Table 4.23 Adjustment Coefficients and the Corresponding Standard Error : ASPI

	D(LNASPI)	D(LNAWDR)	D(LNAWPR)	D(LNINF)	D(LNM2)	D(LNSDR)	D(LNUSD)	D(LNGBP)	LNINR	LNJPY
Coefficient Value	-0.058	-0.01	-0.02	0.472	0.0069	0.012	-0.0116	0.025	-9.70E-05	-0.001305
Standard Error	-0.039	-0.01	-0.02	-0.18	-0.004	-0.007	-0.0053	-0.01	0.00026	0.00034

According to the above table, 5% of disequilibrium “corrected” each month by changes in ASPI, and about 1% of disequilibrium “corrected” each month by changes in AWDR, SDR and USD.

Table 4.24 Results of the ECM Estimates for ASPI

Cointegrating Eq:	CointEq1
LNASPI(-1)	1
LNAWDR(-1)	9.17595[2.86238]
LNAWPR(-1)	-12.1264[-3.59842]
LNGBP(-1)	-29.9347[-4.18201]
LNINF(-1)	-3.53236[-6.48823]
LNINR(-1)	17.59502[3.44539]
LNJPY(-1)	-25.8333[-5.31560]
LNM2(-1)	58.28394[2.19249]
LNSDR(-1)	50.65345[3.78546]
LNUSD(-1)	29.94538[4.29780]
C	-36.906

The figures in the parentheses indicate the test statistics of the coefficients. The significant relationship between every macroeconomic variable considered in the study and ASPI exists and one cointegration equation developed for the study as shown in Table 4.25.

Table 4.25 Cointegration Results for Error Correction Model for ASPI

Error Correction:	D(LNASPI)
CointEq1	0.002768[1.12231]
D(LNASPI(-1))	0.02415[0.32546]
D(LNASPI(-2))	-0.06375[-0.86326]
D(LNAWDR(-1))	-0.10092[-0.38852]
D(LNAWDR(-2))	-0.00719[-0.02858]
D(LNAWPR(-1))	-0.2083[-1.79737]
D(LNAWPR(-2))	0.050115[0.42689]
D(LNGBP(-1))	0.422542[0.99775]
D(LNGBP(-2))	-0.13166[-0.31360]
D(LNINF(-1))	0.000845[0.05161]
D(LNINF(-2))	-0.00527[-0.33859]
D(LNINR(-1))	0.750014[2.34735]
D(LNINR(-2))	-0.15403[-0.48282]
D(LNJPY(-1))	0.373125[1.32415]
D(LNJPY(-2))	-0.05028[-0.17529]
D(LNM2(-1))	1.346114[1.26689]
D(LNM2(-2))	-0.95639[-0.88865]
D(LNSDR(-1))	-0.26535[-0.27770]
D(LNSDR(-2))	-0.31755[-0.32730]
D(LNUSD(-1))	-0.93529[-1.32897]
D(LNUSD(-2))	0.2819[0.10221]
C	0.005035[0.42623]

The figures in the parentheses indicate the test statistics of the coefficients. The model has been displayed below equation (4.1) to explain the relationship between macroeconomic variables and ASPI.

D(LNASPI) = 0.0027*(LNASPI(-1) + 9.175950424*LNAWDR(-1) -12.12637154*LNAWPR(-1) - 29.93472646*LNGBP(-1) -3.532354838*LNINFLATION_RATE(-1) + 17.59502453*LNINR(-1) - 25.8333284*LNJPY(-1) + 58.28393786*LNM2(-1) - 72.20451871*LNM2B(-1) + 50.65345037*LNSDR(-1) + 29.94538159*LNUSD(-1) - 36.90599275) + 0.02415*D(LNASPI(-1)) + -0.063*D(LNASPI(-2)) -0.10*D(LNAWDR(-1)) + -0.00719*D(LNAWDR(-2)) - 1.797*D(LNAWPR(-1)) + 0.05*D(LNAWPR(-2)) + 0.422*D(LNGBP(-1)) + -0.131*D(LNGBP(-2)) + 0.0008*D(LNINFLATION_RATE(-1)) + -0.052*D(LNINFLATION_RATE(-2)) + 0.75*D(LNINR(-1)) + -0.154*D(LNINR(-2)) + 0.373*D(LNJPY(-1)) + -0.050*D(LNJPY(-2)) +1.346*D(LNM2(-1)) + -0.956*D(LNM2(-2)) -0.265*D(LNSDR(-1)) + -0.3175*D(LNSDR(-2))+ - 0.935*D(LNUSD(-1)) + 0.2819*D(LNUSD(-2)) + 0.0050**…….. (4.1)**

4.10 Diagnostic Test for Error Correction Model for ASPI

The result of the ECM is given in Table 4.24.In order to provide the final equation acceptable, the study carried out various diagnostic tests. The LM model seems to be fit in the sense that it satisfies the diagnostic test explain below in Table 4.26.

Table 4.26 VEC Residual Serial Correlation LM Tests for ASPI

Lags	LM-Stat	Prob
1	78.36247	0.5624
2	83.74107	0.3954
3	67.3623	0.8611
4	83.61568	0.3991
5	85.86069	0.3348
6	119.8893	0.0033
7	72.88954	0.7281
8	103.8389	0.0445
9	76.69164	0.6149
10	85.89344	0.3339
11	91.36126	0.2023
12	140.7213	0

The result of the diagnostic tests shows that there is no serious problem of either serial correlation. VEC Residual Serial Correlation LM Tests confirm that there is no serial correlation in the residuals of the ECM regression at lag 1 and lag 2 (P >0.05).This shows that there are no lagged forecast variances in the conditional variance equation. Moreover, the errors are conditionally normally distributed, and can be used for inference.

Table 4.27 VEC Residual Heteroskedasticity Tests for ASPI

Chi-sq	df	Prob.
3363.769	3036	0.0000

It is evident from the table 4.27 that the specification of VECM of ASI function is accepting that the null hypothesis of Heteroskedasticity does not exist in the VECM model (P<0.05). Normality test for residuals explain in Table 4.28.

Table 4.28 VEC Residual Normality Tests for ASPI

Component	Jarque-Bera	df	Prob.
1	2.754384	2	0.2523

The Error-Correction Model yielded residuals that are normally distributed. This conclusion is arrived at given that the Jarque-Bera statistic is not significant (P=0.253).The coefficient of the error correction term with two period lag is significant suggesting that the above long run relationship is stable and unique and any disequilibrium created in the short run will be temporary and will get corrected over a period of time.

4.11 Estimation of Johansen Cointegration Model for BFI

The Co-integration relationship between BFI and other macro economic variables is tested using Johansen approach at the predetermined lag 1.In these tests, maximum Eigen value statistic is known as trace statistic which is compared to the corresponding critical value as shown in Table 4.29.

Table 4.29 Results of Johansen Cointegration Test for BFI

Sample (1994-2013)

Series Included : LNAWPR,LNAWDR, LNGBP, LNINFLATION, LNM2, LNSDR, LNUSD, LNJPY, LNINR, LNBFI

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob.**	Significance at 5% level
None *	0.321449	344.4697	285.1425	0.0000	Yes
At most 1 *	0.229610	261.4815	239.2354	0.0033	Yes
At most 2 *	0.220449	205.6578	197.3709	0.0182	Yes
At most 9	0.039416	10.75528	15.49471	0.2270	-
At most 10	0.009994	2.149434	3.841466	0.1426	-

The Trace Test in Table 4.29 indicates the existence of three cointegrating equation at the 5% significance level. This cointegrating equation means that three linear combination exists between the variables that force these indices to have a relationship over the entire 19 years time period, despite potential deviation from equilibrium levels in the short-term. In order to confirm the results of the Johansen's Trace test, In order to confirm the results of the Johansen's Trace test, the Cointegration Rank Test carried out and shown in Table 4.30 below.

Table 4.30 Unrestricted Cointegration Rank Test (Maximum Eigen Value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.3214	82.988	70.53	0.0024
At most 1	0.2296	55.823	64.50	0.2614

The results in the Table 4.30 indicate that the trace statistic and maximum Eigen value statistic values are greater than the critical value at 5% significant level ($P < 0.05$). Therefore three cointegration equations are found. It implied that there exists a long run relationship between BFI and macroeconomic variables.

Table 4.31 Normalized Cointegrating Coefficient: BFI

Variable	LNBFI	LN AWDR	LN AWPR	LNINF RATE	LN M2	LN SDR	LN USD	LN GBP	LNINR	LNJPY
Coefficient Value	1	5.002	-5.973	-1.9639	24.3	26.18	17.76	-16.35	8.7002	-13.94
Standard Error		1.7368	1.82497	-0.294	-14.35	-7.22	-3.78	-3.873	-2.776	-2.627
t statistics		[-2.88]	[3.28]	[6.67]	[1.69]	[-3.62]	[-4.69]	[4.22]	[-3.13]	[5.30]

Results in Table 4.31 indicate that there is one integrating equation, with normalized cointegrating coefficient. Hence, an error correction model should be applied. The BFI and macroeconomic variables have the expected signs and are statistically significant according to the t values shown. The study can interpret the coefficients as follows:

- A 1% change in AWDR leads to a 5 per cent increase in LNBFI in the long run
- A 1% change in AWPR leads to a 5.97 per cent decrease in LNBFI in the long run
- A 1% change in inflation rate leads to a 1.96 per cent decrease in LNBFI in the long run
- A 1% increase in GBP leads to a 16.35 per cent decrease in LNBFI in the long run
- A 1% increase in INR leads to a 8.7 per cent increase in LNBFI in the long run
- A 1% increase in JPY leads to a 13.94 per cent decrease in LNBFI in the long run

Table 4.32 Adjustment Coefficients and the Corresponding Standard Error : BFI

	D(LNBFI)	D(LNAWDR)	D(LNAWPR)	D(LNGBP)	D(LNINF)	D(LNM2)	D(LNSDR)	D(LNUSD)	D(LNINR)	D(LNJPY)
Coefficient Value	0.0037	-0.007	-0.001	0.004	0.044	0.0001	0.00317	-0.00017	0.0010	0.005
Standard Error	-0.005	-0.001	-0.003	-0.001	-0.021	-0.0005	-0.0008	-0.0006	-0.001	-0.0015

According to the above table, 0.3% of disequilibrium "corrected" each month by changes in BFI, and about 0.07% of disequilibrium "corrected" each month by changes in AWDR

Table 4.33Results of the ECM Estimates for BFI

Cointegrating Eq:	CointEq1
LNBFI(-1)	1
LNAWDR(-1)	5.002457 [2.88013]
LNAWPR(-1)	-5.973812 [-3.27338]
LNGBP(-1)	-16.3537[-4.2223]
LNINF(-1)	-1.9639[-6.6747]
LNM2(-1)	24.3032[1.6929]
LNSDR(-1)	26.1867[3.62250]
LNUSD(-1)	17.7658[4.699]
LNINR(-1)	8.70021 [3.1334]
LNJPY(-1)	-13.946[-5.3075]
C	-24.9717

The figures in the parentheses indicate the test statistics of the coefficients. The significant relationship between every macroeconomic variable considered in the study and BFI exists and one cointegration equation developed for the study as shown in table 4.34.

Table 4.34 Cointegration Results for Error Correction Model for BFI

Error Correction:	**D(LNBFI)**
CointEq1	0.00373[0.67971]
D(LNBFI(-1))	0.013208 [0.17855]
D(LNBFI(-2))	-0.056281 [-0.77397]
D(LNAWDR(-1))	-0.04665[-0.14754]
D(LNAWDR(-2))	0.054516 [0.17839]
D(LNAWPR(-1))	-0.328527[-2.32892]
D(LNAWPR(-2))	0.00594[0.04132]
D(LNGBP(-1))	0.240988 [0.46883]
D(LNGBP(-2))	-0.099273 [-0.19411]
D(LNINF(-1))	-0.020641 [-1.03005]
D(LNINF(-2))	0.000581 [0.03034]
D(LNM2(-1))	1.709549 [1.31491]
D(LNM2(-2))	-1.204113 [-0.91494]
D(LNSDR(-1))	0.22925[0.1966]
D(LNSDR(-2))	-0.12101[-0.1021]
D(LNUSD(-1))	-1.21148[-1.4063]
D(LNUSD(-2))	-0.456812 [-0.5233]
D(LNINR(-1))	0.88160[2.2649]
D(LNINR(-2))	-0.229733 [-0.5908]
D(LNJPY(-1))	0.408671[1.1864]
D(LNJPY(-2))	-0.120107 [-0.3434]
C	0.002765 [0.1914]

The figures in the parentheses indicate the test statistics of the coefficients. The model has been displayed below equation (4.2) to explain the relationship between macroeconomic variables and BFI.

D(LNBFI) = 0.00373*(LNBFI(-1) + 5.002457036*LNAWDR(-1) - 5.973812485*LNAWPR(-1) - 16.35375046*LNGBP(-1) - 1.963999101*LNINFLATION_RATE(-1) + 24.3032669*LNM2(-1) - 31.95225447*LNM2B(-1) + 26.18672622*LNSDR(-1) + 17.76580541*LNUSD(-1) + 8.700210281*LNINR(-1) - 13.94673688*LNJPY(-1) - 24.9717565) + 0.0132*D(LNBFI(-1)) + - 0.056281*D(LNBFI(-2)) -0.04665*D(LNAWDR(-1)) + 0.0545*D(LNAWDR(-2)) – 0.328*D(LNAWPR(-1)) + 0.00594*D(LNAWPR(-2)) + 0.240*D(LNGBP(-1)) -0.0998*D(LNGBP(-2)) – 0.02 *D(LNINFLATION_RATE(-1)) + 0.0005*D(LNINFLATION_RATE(-2)) + 1.7*D(LNM2(-1)) – 1.204*D(LNM2(-2)) + 0.229*D(LNSDR(-1)) – 0.121*D(LNSDR(-2)) -1.211*D(LNUSD(-1)) - 0.456*D(LNUSD(-2)) +0.88160*D(LNINR(-1)) + 0.229*D(LNINR(-2)) + 0.408*D(LNJPY(-1)) - 0.1201*D(LNJPY(-2)) + 0.002765**…….(4.2)**

4.12 Diagnostic Test for Error Correction Model for BFI

The result of the ECM is given in Table 4.34.In order to provide the final equation acceptable, the study carried out various diagnostic tests. The LM model seems to be fit in the sense that it satisfies the diagnostic test explain below in Table 4.35.

Table 4.35 VEC Residual Serial Correlation LM Tests for BFI

Lags	LM-Stat	Prob
1	118.6110	0.5444
2	132.9372	0.2159
3	116.5759	0.5967
4	112.1045	0.7065
5	140.0504	0.1135
6	180.0288	0.0004
7	105.8613	0.8349
8	130.9760	0.2524
9	114.3078	0.6537
10	133.0160	0.2145
11	146.9301	0.0545
12	172.3302	0.0015

The result of the diagnostic tests shows that there is no serious problem of either serial correlation. VEC Residual Serial Correlation LM Tests confirm that there is no serial correlation in the residuals of the ECM regression at lag 1 and lag 2 (P >0.05).However, serial correlation exist on lag 6 and 12.This shows that there are no lagged forecast variances in the conditional variance equation. Moreover, the errors are conditionally normally distributed, and can be used for inference.

Table 4.36 VEC Residual Heteroskedasticity Tests for BFI

Chi-sq	df	Prob.
3414.776	3036	0.0000

It is evident from the table 4.36 that the specification of VECM of BFI function is accepting that the null hypothesis of Heteroskedasticity does not exist in the VECM model (P<0.05). Normality test for residuals explain in Table 4.37.

Table 4.37 VEC Residual Normality Tests for BFI

Component	Jarque-Bera	df	Prob.
1	5.710771	2	0.0575
2	102.5073	2	0.0000

The Error-Correction Model yielded residuals that are normally distributed. This conclusion is arrived at given that the Jarque-Bera statistic is not significant (P =0.0575). The coefficient of the error correction term with one period lag is significant suggesting that the above long run relationship is stable and unique and any disequilibrium created in the short run will be temporary and will get corrected over a period of time.

4.13 Estimation of Johansen Cointegration Model for DIV

The Co-integration relationship between DIV and other macroeconomic variables is tested using Johansen approach at the predetermined lag 1. In these tests, maximum Eigen value statistic is known as trace statistic which is compared to the corresponding critical value as shown in Table 4.38.

Table 4.38 Results of Johansen Cointegration Test for DIV

Sample (1994-2013)

Series Included : LNAWPR,LNAWDR, LNGBP, LNINFLATION, LNM2, LNSDR, LNUSD, LNJPY, LNINR, LNDIV

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob.**	Significance at 5% level
None *	0.312896	335.507	285.1425	0.0001	YES
At most 1 *	0.267696	255.9498	239.2354	0.007	YES
At most 2	0.206271	189.8992	197.3709	0.1102	-
At most 9	0.042786	10.28264	15.49471	0.2596	-
At most 10	0.004763	1.012254	3.841466	0.3144	-

The Trace Test in Table 4.38 indicates the existence of two cointegrating equation at the 5% significance level. This cointegrating equation means that two linear combination exists between the variables that force these indices to have a relationship over the entire 10years time period, despite potential deviation from equilibrium levels in the short-term. In order to confirm the results of the Johansen's Trace test, the results cointegration rank test is carried out and shown in Table 4.39 below.

Table 4.39 Unrestricted Cointegration Rank Test (Maximum Eigen Value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.312896	79.55722	70.53513	0.006
At most 1 *	0.267696	66.05058	64.50472	0.0353

The results of the Johansen's cointegration test in the tables indicate that the trace statistic and maximum Eigen value statistic values are greater than the critical value at 5% significant level (p-value < 0.05). Therefore, two cointegration equations are found. It implied that there exists a long run relationship between DIV and macroeconomic variables.

Similarly, the maximum Eigen value rejects the null hypothesis of r = 0 co-integrating vector at 5 percent significant level and accepts the alternate hypothesis of one co-integrating vector. Therefore, since both test statistics suggest the presence of one co-integrating vector, it can be concluded that the variables are co integrated and follow long-run equilibrium relationship.

Table 4.40 Normalized Cointegrating Coefficient: DIV

Variable	LNDIV	LN AWDR	LN AWPR	LNGBP	LN INF	LN M2	LN SDR	LN USD	LNINR	LNJPY
Coefficient Value	1	7.968	-10.11	-25.64	-3.209	59.36	46.157	25.967	15.84	-22.05
Standard Error		-2.871	-3.022	-6.479	-0.486	-23.79	-12.30	-6.300	-4.577	-4.341
t statistics		[-2.77]	[3.34]	[3.95]	[6.602]	[-2.495]	[-3.75]	[4.12]	[-3.46]	[5.07]

Results in Table 4.40 indicate that there is one integrating equation, with normalized cointegrating coefficient. Hence, an error correction model should be applied. DIV and macroeconomic variables have the expected signs and are statistically significant according to the t values shown. The study can interpret the coefficients as follows:

- A 1% increase in AWDR leads to a 7.968 per cent increase in LNDIV in the long run
- A 1% increase in AWPR leads to a 10..11 per cent decrease in LNDIV in the long run
- A 1% increase in INF leads to a 3.209 per cent decrease in LNDIV in the long run
- A 1% increase in GBP leads to a 25.64 per cent decrease in LNDIV in the long run
- A 1% increase in INR leads to a 15.84 per cent increase in LNDIV in the long run
- A 1% increase in JPY leads to a 22.05 per cent decrease in LNDIV in the long run

All the variables are statistically significant according to the t values shown in Table 4.39. The ECM for DIV was fitted to determine the short run relationship between macroeconomic variables and DIV results are shown in Table 4.41.

Table 4.41 Adjustment Coefficients and the Corresponding Standard Error: DIV

	D(LNDIV)	D(LNAWDR)	D(LNAWPR)	D(LNGBP)	D(LNINF)	D(LNM2)	D(LNSDR)	D(LNUSD)	D(LNINR)	D(LNJPY)
Coefficient Value	0.0048	-0.004	-0.0005	0.0024	0.0299	0.00012	0.0017	-0.00016	0.0006	0.0033
Standard Error	-0.003	-0.0007	-0.0019	-0.0008	-0.0134	-0.0003	-0.0005	-0.0003	-0.0007	-0.0009

According to the above table, 0.4% of disequilibrium "corrected" each month by changes in DIV, and about 2% of disequilibrium "corrected" each month by changes in INF.

Table 4.42 Results of the ECM Estimates for DIV

Cointegrating Eq:	CointEq1
LNDIV(-1)	1
LNAWDR(-1)	7.96806[2.77519]
LNAWPR(-1)	-10.1197[-3.34800]
LNGBP(-1)	-25.6435 [-3.9575]
LNINF(-1)	-3.20995 [-6.6041]
LNM2(-1)	59.3695[2.49556]
LNSDR(-1)	46.15748 [3.7517]
LNUSD(-1)	25.9675[4.1216]
LNINR(-1)	15.8400[3.4601]
LNJPY(-1)	-22.0582[-5.0807]
C	-20.62314

The figures in the parentheses indicate the test statistics of the coefficients. The significant relationship between every macroeconomic variable considered in the study and DIV exists and one cointegration equation developed for the study as shown in Table 4.43.

Table 4.43 Cointegration Results for Error Correction Model for DIV

Error Correction:	D(LNDIV)
CointEq1	0.00489[1.41022]
D(LNDIV(-1))	-0.00866[-0.11642]
D(LNDIV(-2))	-0.035876 [-0.4832]
D(LNAWDR(-1))	-0.14224[-0.44209]
D(LNAWDR(-2))	0.139197[0.4466]
D(LNAWPR(-1))	-0.328527[0.4466]
D(LNAWPR(-2))	0.073493 [0.50609]
D(LNGBP(-1))	0.64354[1.2203]
D(LNGBP(-2))	-0.305674 [-0.5846]
D(LNINF(-1))	0.00853[0.42044]
D(LNINFL(-2))	0.00214 [0.1109]
D(LNM2(-1))	1.3253[0.99345]
D(LNM2(-2))	-1.460899[-1.08156]
D(LNSDR(-1))	-0.494292 [-0.41678]
D(LNSDR(-2))	0.150249[0.12485]
D(LNUSD(-1))	-1.400746 [-1.61239]
D(LNUSD(-2))	0.156878[-0.88681]
D(LNINR(-1))	1.130869 [2.84174]
D(LNINR(-2))	-0.278808 [-0.69654]
D(LNJPY(-1))	0.539243 [1.54632]
D(LNJPY(-2))	-0.330563 [-0.92988]
C	0.015201 [1.03577]

The figures in the parentheses indicate the test statistics of the coefficients. The model has been displayed below equation (4.3) to explain the relationship between macroeconomic variables and DIV.

D(LNDIV) = 0.00489*(LNDIV(-1) + 7.9680618*LNAWDR(-1) - 10.11977567*LNAWPR(-1) - 25.64351139*LNGBP(-1) - 3.209956342*LNINFLATION_RATE(-1) + 59.36951137*LNM2(-1) - 73.13315361*LNM2B(-1) + 46.1574847*LNSDR(-1) + 25.96755957*LNUSD(-1) + 15.84008003*LNINR(-1) - 22.05828206*LNJPY(-1) - 20.62314447) – 0.00866 *D(LNDIV(-1)) - 0.035876*D(LNDIV(-2)) - 0.14224 *D(LNAWDR(-1)) + 0.139197 *D(LNAWDR(-2)) – 0.328527 *D(LNAWPR(-1)) + 0.073493 *D(LNAWPR(-2)) + 0.64354 *D(LNGBP(-1)) – 0.30567 *D(LNGBP(-2)) + 0.00853 *D(LNINFLATION_RATE(-1)) + 0.00214 *D(LNINFLATION_RATE(-2)) + 1.3253*D(LNM2(-1)) -1.4608*D(LNM2(-2)) -0.79204 – 0.4942*D(LNSDR(-1)) + 0.15024*D(LNSDR(-2)) -1.400746 *D(LNUSD(-1)) + 0.156878 *D(LNUSD(-2)) + 1.130869*D(LNINR(-1))-0.278808 *D(LNINR(-2)) + 0.539243 *D(LNJPY(-1)) -0.330563 *D(LNJPY(-2)) + 0.015201**…(4.3)**

4.14 Diagnostic Test for Error Correction Model for DIV

The result of the ECM is given in Table 4.43.In order to provide the final equation acceptable, the study carried out various diagnostic tests. The LM model seems to be fit in the sense that it satisfies the diagnostic test explain below in Table 4.44.

Table 4.44 VEC Residual Serial Correlation LM Tests for DIV

Lags	LM-Stat	Prob
1	111.031	0.7311
2	134.299	0.1927
3	112.5124	0.697
4	113.1761	0.6812
5	148.2035	0.047
6	165.5347	0.0045
7	104.2246	0.862
8	131.324	0.2457
9	110.7578	0.7372
10	138.9062	0.1269
11	153.2805	0.0252
12	181.8137	0.0003

The result of the diagnostic tests shows that there is no serious problem of either serial correlation. VEC Residual Serial Correlation LM tests confirm that there is no serial correlation in the residuals of the ECM regression at lag 1 and lag 2 ($P>0.05$).This shows that there are no lagged forecast variances in the conditional variance equation. Moreover, the errors are conditionally normally distributed, and can be used for inference.

Table 4.45 VEC Residual Heteroskedasticity Tests for DIV

]

Chi-sq	df	Prob.
5242.079	4914	0.0006

It is evident from the Table 4.45that the specification of VECM of DIV function is accepting that the null hypothesis of Heteroskedasticity does not exist in the VECM model (P<0.05).Normality test for residuals explain in Table 4.46.

Table 4.46 VEC Residual Normality Tests for DIV

Component	Jarque-Bera	df	Prob.
1	1.011531	2	0.603
2	110.6731	2	0

The Error-Correction Model yielded residuals that are normally distributed. This conclusion is arrived at given that the Jarque-Bera statistic is not significant (P=0.603).The coefficient of the error correction term with two period lag is significant suggesting that the above long run relationship is stable and unique and any disequilibrium created in the short run will be temporary and will get corrected over a period of time.

4.15 Estimation of Johansen Cointegration Model for BFT

The Co-integration relationship between BFT and other macroeconomic variables is tested using Johansen approach at the predetermined lag 1. In these tests, maximum Eigen value statistic is known as trace statistic which is compared to the corresponding critical value as shown in Table 4.47.

Table 4.47 Results of Johansen Cointegration Test for BFT

Sample (1994-2013)

Series Included : LNAWPR,LNAWDR, LNGBP, LNINFLATION, LNM2, LNSDR, LNUSD, LNJPY, LNINR, LNBFT

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Significance at 5% level
None *	0.312896	335.507	285.1425	0.0001	YES
At most 1 *	0.267696	255.9498	239.2354	0.007	YES
At most 2	0.206271	189.8992	197.3709	0.1102	-
At most 9	0.042786	10.28264	15.49471	0.2596	-
At most 10	0.004763	1.012254	3.841466	0.3144	-

The Trace Test in Table 4.47 indicates the existence of three cointegrating equation at the 5% significance level. This cointegrating equation means that two linear combination exists between the variables that force these indices to have a relationship over the entire 10years time period, despite potential deviation from equilibrium levels in the short-term. In order to confirm the results of the Johansen's Trace test, cointegration rank test was carried out and shown in Table 4.48below.

Table 4.48 Unrestricted Cointegration Rank Test (Maximum Eigen Value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.312896	79.55722	70.53513	0.006
At most 1 *	0.267696	66.05058	64.50472	0.0353

The results of the Johansen's cointegration test in the table indicate that the trace statistic and maximum Eigen value statistic values are greater than the critical value at 5% significant level ($P < 0.05$). Therefore two cointegration equations are found. It implied that there exists a long run relationship between BFT and macroeconomic variables.

Similarly, the maximum Eigen value rejects the null hypothesis of $r = 0$ co-integrating vector at 5 percent significant level and accepts the alternate hypothesis of one co-integrating vector. Therefore, since both test statistics suggest the presence of one co-integrating vector, it can be concluded that the variables are co integrated and follow long-run equilibrium relationship.

Table 4.49 Normalized Cointegrating Coefficient: BFT

Variable	LNBFT	LN AWDR	LN AWPR	LNGBP	LN INF	LN M2	LN SDR	LN USD	LNINR	LNJPY
Coefficient Value	1	1.897	-2.162	-6.7923	-0.66	4.038	12.00	5.320	3.323	-5.065
Standard Error		-0.627	-0.659	-1.401	-0.106	-5.213	-2.621	-1.35	-0.999	-0.952
t statistics		[-3.02]	[3.28]	[4.84]	[6.22]	[0.77]	[4.57]	[3.94]	[-3.32]	[5.32]

Results in Table 4.49 indicate that there is one integrating equation, with normalized cointegrating coefficient. Hence, an error correction model should be applied. The BFT and macroeconomic variables have the expected signs and are statistically significant according to the t values shown. The study can interpret the coefficients as follows:

- A 1% increase in AWDR leads to a 1.897 per cent increase in LNBFT in the long run
- A 1% increase in AWPR leads to a 2.162 per cent decrease in LNBFT in the long run
- A 1% increase in INF leads to a 0.66 per cent decrease in LNBFT in the long run
- A 1% increase in GBP leads to a 6.792 per cent decrease in LNBFT in the long run
- A 1% increase in INR leads to a 3.32 per cent increase in LNBFT in the long run
- A 1% increase in JPY leads to a 5.06 per cent decrease in LNBFT in the long run

Table 4.50 Adjustment Coefficients and Corresponding Standard Error : BFT

	D(LNBFT)	D(LNAWDR)	D(LNAWPR)	D(LNGBP)	D(LNINF)	D(LNM2)	D(LNSDR)	D(LNUSD)	D(LNINR)	D(LNJPY)
Coefficient Value	-0.0095	-0.019	-0.0063	0.011	0.1078	0.00037	0.00724	-0.0019	0.00231	0.0146
Standard Error	-0.012	-0.003	-0.008	-0.0037	-0.060	-0.0015	-0.0023	-0.0017	-0.0032	-0.004

According to the above table, 0.9% of disequilibrium "corrected" each month by changes in BFT, and about 1% of disequilibrium "corrected" each month by changes in GBP.

Table 4.51Results of the ECM Estimates for BFT

Cointegrating Eq:	CointEq1
LNBFT(-1)	1
LNAWDR(-1)	1.897[3.02348]
LNAWPR(-1)	-2.162[-3.278]
LNGBP(-1)	-6.792313 [-4.846]
LNINF(-1)	-0.662[-6.219]
LNM2(-1)	4.0389[0.774]
LNSDR(-1)	12.005[4.580]
LNUSD(-1)	5.3201[3.914]
LNINR(-1)	3.323[3.3248]
LNJPY(-1)	-5.065[-5.317]
C	1.00147

The figures in the parentheses indicate the test statistics of the coefficients. The significant relationship between every macroeconomic variable considered in the study and BFT exists and one cointegration equation developed for the study as shown in Table 4.52.

Table 4.52 Cointegration Results for Error Correction Model for BFT

Error Correction:	D(LNBFT)
CointEq1	-0.00959[-0.797]
D(LNBFT(-1))	0.04282[0.575]
D(LNBFT(-2))	0.028106 [0.387]
D(LNAWDR(-1))	-0.1868 [-0.75570]
D(LNAWDR(-2))	-0.16065[-0.6680]
D(LNAWPR(-1))	-0.262337 [-2.3710]
D(LNAWPR(-2))	0.05313 [0.4713]
D(LNINF(-1))	-0.00087[-0.0560]
D(LNINF(-2))	-0.016426 [-1.1069]
D(LNINR(-1))	0.6107[2.0255]
D(LNINR(-2))	-0.06214[-0.2047]
D(LNJPY(-1))	0.27279 [1.01877]
D(LNJPY(-2))	-0.0750[-0.2748]
D(LNM2(-1))	1.15741[1.1377]
D(LNM2(-2))	-0.57380[-0.5535]
D(LNSDR(-1))	0.176558 [0.19419]
D(LNSDR(-2))	-0.133878 [-0.14504]
D(LNUSD(-1))	-0.339486 [-0.50651]
D(LNUSD(-2))	-0.191574 [-0.28276]
D(LNGBP(-1))	0.135638 [0.33830]
D(LNGBP(-2))	-0.132269 [-0.33155]
C	0.007571 [0.67333]

The figures in the parentheses indicate the test statistics of the coefficients. The model has been displayed below equation (4.4) to explain the relationship between macroeconomic variables and BFT.

D(LNBFT) = -0.00959*(LNBFT(-1) + 1.897500697*LNAWDR(-1) - 2.162432126*LNAWPR(-1) - 0.6626361587*LNINFLATION_RATE(-1) + 3.323188446*LNINR(-1) - 5.06586741*LNJPY(-1) + 4.038935767*LNM2(-1) - 8.191858078*LNM2B(-1) + 12.00568169*LNSDR(-1) + 5.320184085*LNUSD(-1) - 6.792313067*LNGBP(-1) + 1.001478609) + 0.04282*D(LNBFT(-1)) + 0.0281*D(LNBFT(-2)) -0.1868 *D(LNAWDR(-1)) -0.16065*D(LNAWDR(-2)) – 0.2623 *D(LNAWPR(-1)) + 0.05313*D(LNAWPR(-2)) – 0.00087*D(LNINFLATION_RATE(-1)) -0.01642 *D(LNINFLATION_RATE(-2)) + 0.6107*D(LNINR(-1)) – 0.0621*D(LNINR(-2)) + 0.2727*D(LNJPY(-1)) – 0.0750*D(LNJPY(-2)) + 1.1574*D(LNM2(-1)) – 0.5738*D(LNM2(-2)) + 0.17655*D(LNSDR(-1)) - 0.1338*D(LNSDR(-2)) - 0.3394*D(LNUSD(-1)) - 0.1915 *D(LNUSD(-2)) + 0.1356 *D(LNGBP(-1)) - 0.13226*D(LNGBP(-2)) + 0.00757 **…….(4.4)**

4.16 Diagnostic Test for Error Correction Model for BFT

The result of the ECM is given in Table 4.52.In order to provide the final equation acceptable, the study carried out various diagnostic tests. The LM model seems to be fit in the sense that it satisfies the diagnostic test explain below in Table 4.53.

Table 4.53 VEC Residual Serial Correlation LM Tests for BFT

Lags	LM-Stat	Prob
1	119.8929	0.5114
2	141.251	0.1007
3	124.5672	0.3936
4	111.5979	0.7182
5	138.9394	0.1265
6	166.2668	0.004
7	103.9197	0.8667
8	135.3029	0.1767
9	110.0058	0.7537
10	127.2058	0.3318
11	139.8445	0.1159
12	173.7907	0.0012

The result of the diagnostic tests shows that there is no serious problem of either serial correlation. VEC Residual Serial Correlation LM Tests confirm that there is no serial correlation in the residuals of the ECM regression at lag 1 and lag 2 (P >0.05).This shows that there are no lagged forecast variances in the conditional variance equation. Moreover, the errors are conditionally normally distributed, and can be used for inference.

Table 4.54 VEC Residual Heteroskedasticity Tests for BFT

Chi-sq	df	Prob.
3383.701	3036	0.0000

It is evident from the Table 4.54 that the specification of VECM of BFT function is accepting that the null hypothesis of Heteroskedasticity does not exist in the VECM model (P<0.05). Normality test for residuals explain in Table 4.55.

Table 4.55 VEC Residual Normality Tests for BFT

Component	Jarque-Bera	df	Prob.
1	2.514728	2	0.2844
2	110.6731	2	0.000

The Error-Correction Model yielded residuals that are normally distributed. This conclusion is arrived at given that the Jarque-Bera statistic is not significant (P=0.2844). The coefficient of the error correction term with two period lag is significant suggesting that the above long run relationship is stable and unique and any disequilibrium created in the short run will be temporary and will get corrected over a period of time.

4.17 Estimation of Johansen Cointegration Model for HTL

The Co-integration relationship between HTL and other macroeconomic variables is tested using Johansen approach at the predetermined lag 1. In these tests, maximum Eigen value statistic is known as trace statistic which is compared to the corresponding critical value as shown in Table 4.56.

Table 4.56 Results of Johansen Cointegration Test for HTL

Sample (1994-2013)

Series Included : LNAWPR,LNAWDR, LNGBP, LNINFLATION, LNM2, LNSDR, LNUSD, LNJPY, LNINR, LNHTL

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	0.05 Critical Value	Prob.**	Significance at 5% level
None *	0.329361	340.8256	285.1425	0.000	YES
At most 1 *	0.24338	255.3274	239.2354	0.0076	YES
At most 2	0.197209	195.6441	197.3709	0.0607	-
At most 9	0.037808	8.900246	15.49471	0.3747	-
At most 10	0.003044	0.652391	3.841466	0.4193	-

The Trace Test in Table 4.56 indicates the existence of two cointegrating equation at the 5% significance level. This cointegrating equation means that two linear combination exists between the variables that force these indices to have a relationship over the entire 10 years time period, despite potential deviation from equilibrium levels in the short-term. In order to confirm the results of the Johansen's Trace test, the Cointegration Rank Test was carried out and shown in Table 4.57 below.

Table 4.57 Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.329361	85.49812	70.53513	0.0012
At most 1	0.24338	59.68337	64.50472	0.134

The results of the Johansen's cointegration test in the Table 4.57indicate that the trace statistic and maximum Eigen value statistic values are greater than the critical value at 5% significant level ($P < 0.05$). Therefore, one cointegration equation is found. It implied that there exists a long run relationship between HTL and macroeconomic variables.

Similarly, the maximum Eigen value rejects the null hypothesis of $r = 0$ co-integrating vector at 5 percent significant level and accepts the alternate hypothesis of one co-integrating vector. Therefore, since both test statistics suggest the presence of one co-integrating vector, it can be concluded that the variables are co integrated and follow long-run equilibrium relationship.

Table 4.58 Normalized Cointegrating Coefficient: HTL

Variable	LNHTL	LN AWDR	LN AWPR	LNGBP	LN INF	LN M2	LN SDR	LN USD	LNINR	LNJPY
Coefficient Value	1	6.604	-6.9911	-14.359	-1.825	28.53	28.886	16.019	6.66	-11.91
Standard Error		-1.627	-1.710	-3.650	-0.279	-13.50	-6.883	-3.526	-2.578	-2.47
t statistics		[-4.05]	[4.08]	[3.93]	[6.54]	[-2.113]	[-4.19]	[-4.53]	[-2.58]	[4.82]

Results in Table 4.58 indicate that there is one integrating equation, with normalized cointegrating coefficient. Hence, an error correction model should be applied. The HTL and macroeconomic variables have the expected signs and are statistically significant according to the t values shown. The study can interpret the coefficients as follows:

- A 1% increase in AWDR leads to a 6.604 per cent increase in LNHTL in the long run
- A 1% increase in AWPR leads to a 6.9911 per cent decrease in LNHTL in the long run
- A 1% increase in INF leads to a 1.825 per cent decrease in LNHTL in the long run
- A 1% increase in GBP leads to a 14.359 per cent decrease in LNHTL in the long run
- A 1% increase in INR leads to a 6.66 per cent increase in LNHTL in the long run
- A 1% increase in JPY leads to a 11.91 per cent decrease in LNHTL in the long run

Table 4.59 Adjustment Coefficients and the Corresponding Standard Error: HTL

	D(LNHTL)	D(LNAWDR)	D(LNAWPR)	D(LNGBP)	D(LNINF)	D(LNM2)	D(LNSDR)	D(LNUSD)	D(LNINR)	D(LNJPY)
Coefficient Value	0.0147	-0.0079	-0.002	0.0035	0.0520	0.00058	0.00239	-0.0005	0.00112	0.00400
Standard Error	-0.0055	-0.0012	-0.003	-0.0013	-0.022	-0.0005	-0.0009	-0.00065	-0.0012	-0.00166

According to the above table, 1% of disequilibrium "corrected" each month by changes in HTL, and about 5 % of disequilibrium "corrected" each month by changes in INF.

Table 4.60 Results of the ECM Estimates for HTL

CointegratingEq:	CointEq1
LNHTL(-1)	1
LNAWDR(-1)	6.604[4.0571]
LNAWPR(-1)	-6.991 [-4.0864]
LNGBP(-1)	-14.359[-3.933]
LNINFL(-1)	-1.825[-6.538]
LNM2(-1)	28.534 [0.774]
LNSDR(-1)	28.886 [4.196]
LNUSD(-1)	16.019 [4.543]
LNINR(-1)	6.6609[2.58350]
LNJPY(-1)	-11.917[-4.808]
C	-13.81225

The figures in the parentheses indicate the test statistics of the coefficients. The significant relationship between some of macroeconomic variable considered in the study and HTL exists and one cointegration equation developed for the study as shown in Table 4.61.

Table 4.61 Cointegration results for Error Correction Model for HTL

Error Correction:	D(LNHTL)
CointEq1	0.0147 [2.644]
D(LNHTL(-1))	0.0529 [0.750]
D(LNHTL(-2))	-0.2859 [-4.029]
D(LNAWDR(-1))	0.29684 [0.9780]
D(LNAWDR(-2))	-0.24340[-0.8220]
D(LNAWPR(-1))	-0.13795[-0.9911]
D(LNAWPR(-2))	0.0505 [0.3633]
D(LNINF(-1))	-0.00223[-0.1164]
D(LNINF(-2))	-0.0077[-0.42350]
D(LNINR(-1))	0.99206[2.63624]
D(LNINR(-2))	0.058726[0.1555]
D(LNJPY(-1))	0.66941 [1.9829]
D(LNJPY(-2))	0.03924[0.1155]
D(LNM2(-1))	1.01976 [0.8143]
D(LNM2(-2))	-0.72213[-0.5712]
D(LNSDR(-1))	-1.07363[-0.9453]
D(LNSDR(-2))	-0.72622[-0.6356]
D(LNUSD(-1))	-0.99749[-1.1985]
D(LNUSD(-2))	0.74787[0.8891]
D(LNGBP(-1))	0.32795 [0.65590]
D(LNGBP(-2))	0.01347[0.02733]
C	0.01541[1.0925]

The figures in the parentheses indicate the test statistics of the coefficients. The model has been displayed below equation (4.5) to explain the relationship between macroeconomic variables and HTL.

D(LNHTL) = 0.0147*(LNHTL(-1) + 6.604554487*LNAWDR(-1) - 6.991181716*LNAWPR(-1) - 1.825676388*LNINFLATION_RATE(-1) + 6.660952403*LNINR(-1) - 11.91777912*LNJPY(-1) + 28.53417778*LNM2(-1) - 37.91929787*LNM2B(-1) + 28.88693414*LNSDR(-1) + 16.01998264*LNUSD(-1) - 14.35903713*LNGBP(-1) - 13.81225332) + 0.0529*D(LNHTL(-1)) + - 0.2859*D(LNHTL(-2)) + 0.29684*D(LNAWDR(-1)) – 0.2434*D(LNAWDR(-2)) -0.13795*D(LNAWPR(-1)) + 0.0505*D(LNAWPR(-2)) -0.00223*D(LNINFLATION_RATE(-1)) – 0.0077*D(LNINFLATION_RATE(-2)) + 0.99206*D(LNINR(-1)) + 0.05876*D(LNINR(-2)) + 0.66941*D(LNJPY(-1)) + 0.03924*D(LNJPY(-2)) + 1.01976*D(LNM2(-1)) -0.7221*D(LNM2(-2)) - 1.07363*D(LNSDR(-1)) -0.72622*D(LNSDR(-2)) -0.997*D(LNUSD(-1)) + 0.747*D(LNUSD(-2)) + 0.3279*D(LNGBP(-1)) + 0.01347*D(LNGBP(-2)) + 0.01541**…….(4.5)**

4.18 Diagnostic Test for Error Correction Model for HTL

The result of the ECM is given in Table 4.61.In order to provide the final equation acceptable, the study carried out various diagnostic tests. The LM model seems to be fit in the sense that it satisfies the diagnostic test explain below in Table 4.62.

Table 4.62 VEC Residual Serial Correlation LM Tests for HTL

Lags	LM-Stat	Prob
1	130.4149	0.2634
2	133.8394	0.2004
3	115.7459	0.6178
4	116.6834	0.594
5	130.1397	0.269
6	164.6066	0.0052
7	106.1849	0.8292
8	121.5	0.4701
9	102.9952	0.8804
10	123.8521	0.4111
11	152.5704	0.0276
12	186.7064	0.0001

The result of the diagnostic tests shows that there is no serious problem of either serial correlation. VEC Residual Serial Correlation LM Tests confirm that there is no serial correlation in the residuals of the ECM regression at lag 1 and lag 2 ($P > 0.05$).This shows that there are no lagged forecast variances in the conditional variance equation. Moreover, the errors are conditionally normally distributed, and can be used for inference.

Table 4.63 VEC Residual Heteroskedasticity Tests for HTL

Chi-sq	df	Prob.
3316.449	3036	0.0002

It is evident from the Table 4.63 that the specification of VECM of HTL function is accepting that the null hypothesis of Heteroskedasticity does not exist in the VECM model (P<0.05). Normality test for residuals explain in Table 4.64.

Table 4.64 VEC Residual Normality Tests

Component	Jarque-Bera	df	Prob.
1	125.077	2	0.000
2	84.8769	2	0.000

The Error-Correction Model yielded residuals that are normally distributed. This conclusion is arrived at given that the Jarque-Bera statistic is significant (P=0.000).The coefficient of the error correction term with two period lag is significant suggesting that the above long run relationship is stable and unique and any disequilibrium created in the short run will be temporary and will get corrected over a period of time according to the residual tests.

4.19 Estimation of Johansen Cointegration Model for TLE

The Co-integration relationship between TLE and other macroeconomic variables is tested using Johansen approach at the predetermined lag 1. In these tests, maximum Eigen value statistic is known as trace statistic which is compared to the corresponding critical value as shown in Table 4.65.

Table 4.65 Results of Johansen Cointegration Test for TLE

Sample (1994-2013)

Series Included : LNAWPR,LNAWDR, LNGBP, LNINFLATION, LNM2, LNSDR, LNUSD, LNJPY, LNINR, LNTLE

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**	Significance at 5% level
None *	0.562243	401.3401	285.1425	0.000	YES
At most 1 *	0.391254	294.7743	239.2354	0.000	YES
At most 2 *	0.381755	230.7446	197.3709	0.0004	YES
At most 3 *	0.304742	168.7123	159.5297	0.0143	YES
At most 10	0.004865	0.629159	3.841466	0.4277	-

The Trace Test in Table 4.65 indicates the existence of three cointegrating equation at the 5% significance level. This cointegrating equation means that three linear combination exists between the variables that force these indices to have a relationship over the entire 10 years time period, despite potential deviation from equilibrium levels in the short-term. In order to confirm the results of the Johansen's Trace test, cointegration rank test was carried out and shown in Table 4.66 below.

Table 4.66 Unrestricted Cointegration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.562243	106.5657	70.53513	0
At most 1	0.391254	64.02969	64.50472	0.0555
At most 2 *	0.381755	62.0323	58.43354	0.0213
At most 3	0.304742	46.88802	52.36261	0.1633

The results of the Johansen's cointegration test in the table indicate that the trace statistic and maximum Eigen value statistic values are greater than the critical value at 5% significant level ($P < 0.05$). Therefore, two cointegration equations are found. It implied that there exists a long run relationship between TLE and macroeconomic variables.

Similarly, the maximum Eigen value rejects the null hypothesis of $r = 0$ co-integrating vector at 5 percent significant level and accepts the alternate hypothesis of two co-integrating vector. Therefore, since both test statistics suggest the presence of two co-integrating vector, it can be concluded that the variables are co integrated and follow long-run equilibrium relationship.

Table 4.67 Normalized Cointegrating Coefficient: TLE

Variable	LNTLE	LN AWDR	LN AWPR	LNGBP	LN INF	LN M2	LN SDR	LN USD	LNINR	LNJPY
Coefficient Value	1	-4.533	4.825	30.419	0.868	-3.937	-53.06	6.3206	-2.549	18.81
Standard Error		-2.354	-2.175	-4.118	-0.252	-11.61	-9.991	-4.40	-2.14	-2.678
t statistics		[1.925]	[2.21]	[7.38]	[3.44]	[0.33]	[-5.31]	[-1.43]	[1.19]	[7.02]

Results in Table 4.67 indicate that there is one integrating equation, with normalized cointegrating coefficient. Hence, an error correction model should be applied. The TLE and macroeconomic variables have the expected signs and are statistically significant according to the t values shown. The study can interpret the coefficients as follows:

- A 1% increase in AWPR leads to a 4.825 per cent increase in LNTLE in the long run
- A 1% increase in INF leads to a 0.868 per cent increase in LNTLE in the long run
- A 1% increase in GBP leads to a 30.419 per cent increase in LNTLE in the long run
- A 1% increase in JPY leads to a 18.81 per cent increase in LNTLE in the long run

In contrast to the sample results, the AWPR, M2 and M2b money supply, exchange rate of USD and INR are not statistically significant according to the t value shown. The ECM for TLE index was fitted to determine the short run relationship between macroeconomic variables and TLE index results are shown below in Table 4.68

Table 4.68 Adjustment Coefficients and Corresponding Standard Error: TLE

	D(LNTLE)	D(LNAWDR)	D(LNAWPR)	D(LNGBP)	D(LNINF)	D(LNM2)	D(LNSDR)	D(LNUSD)	D(LNINR)	D(LNJPY)
Coefficient Value	-0.0025	0.0115	0.0125	-0.0016	0.067	-0.0012	-0.0018	-0.00075	-0.0005	-0.0065
Standard Error	-0.0089	-0.0018	-0.003	-0.002	-0.021	-0.0007	-0.0014	-0.0010	-0.001	-0.0023

According to the above table, 0.2% of disequilibrium "corrected" each month by changes in TLE, and about 1 % of disequilibrium "corrected" each month by changes in AWDR

Table 4.69 Results of the ECM Estimates for TLE

Cointegrating Eq:	CointEq1
LNTLE(-1)	1
LNAWDR(-1)	-4.5333[-1.925]
LNAWPR(-1)	4.825[2.218]
LNGBP(-1)	30.41[7.3864]
LNINF(-1)	0.868 [3.443]
LNM2(-1)	-3.9374[-0.338]
LNSDR(-1)	-53.062[-5.310]
LNUSD(-1)	6.32064[1.436]
LNINR(-1)	-2.5497[-1.188]
LNJPY(-1)	18.819[7.025]
C	38.28038

The figures in the parentheses indicate the test statistics of the coefficients. The significant relationship between some of macroeconomic variable considered in the study and TLE exists and one cointegration equation developed for the study as shown in Table 4.70.

Table 4.70 Cointegration Results for Error Correction Model for TLE

Error Correction:	D(LNHTL)
CointEq1	-0.0025[-0.278]
D(LNTLE(-1))	0.1060[1.132]
D(LNTLE(-2))	-0.0357[-0.370]
D(LNAWDR(-1))	-0.4942[-1.091]
D(LNAWDR(-2))	0.0438[0.096]
D(LNAWPR(-1))	0.1564[0.624]
D(LNAWPR(-2))	0.0505 [0.3633]
D(LNGBP(-1))	1.2398[1.725]
D(LNGBP(-2))	-0.6560[-0.977]
D(LNINF(-1))	0.0053 [0.12512]
D(LNINF(-2))	-0.0185[-0.453]
D(LNINR(-1))	0.4650[0.90978]
D(LNINR(-2))	0.2467[0.485]
D(LNJPY(-1))	-0.15838[-0.342]
D(LNJPY(-2))	-0.057804[-0.121]
D(LNM2(-1))	-0.91632[-0.508]
D(LNM2(-2))	-3.935159[-2.099]
D(LNSDR(-1))	-1.6495[-1.070]
D(LNSDR(-2))	-1.1695[-0.780]
D(LNUSD(-1))	-0.8282[-0.732]
D(LNUSD(-2))	1.62792[1.398]
C	0.02789[1.1407]

The figures in the parentheses indicate the test statistics of the coefficients. The model has been displayed below equation (4.6) to explain the relationship between macroeconomic variables and TLE.

$$D(LNTLE) = -0.0025*(LNTLE(-1) - 4.533307495*LNAWDR(-1) + 4.825884352*LNAWPR(-1) + 30.41990686*LNGBP(-1) + 0.8680235197*LNINFLATION\_RATE(-1) - 2.549739909*LNINR(-1) + 18.81953524*LNJPY(-1) - 3.937406982*LNM2(-1) + 6.323528635*LNM2B(-1) - 53.06214096*LNSDR(-1) + 6.320645534*LNUSD(-1) + 38.28037873) + 0.1060*D(LNTLE(-1)) + -0.0357*D(LNTLE(-2)) -0.4942*D(LNAWDR(-1)) + 0.0438*D(LNAWDR(-2)) + 0.1564*D(LNAWPR(-1)) + 0.0505*D(LNAWPR(-2)) + 1.239*D(LNGBP(-1)) -0.656*D(LNGBP(-2)) + 0.0053*D(LNINFLATION\_RATE(-1)) -0.0185*D(LNINFLATION\_RATE(-2)) + 0.465*D(LNINR(-1)) + 0.2467*D(LNINR(-2)) -0.1583*D(LNJPY(-1)) – 0.15838 *D(LNJPY(-2)) -0.916*D(LNM2(-1)) – 3.9351*D(LNM2(-2)) – 1.6495 *D(LNSDR(-1)) -1.1695*D(LNSDR(-2)) -0.8282*D(LNUSD(-1)) + 1.627*D(LNUSD(-2)) + 0.02789 \quad \textbf{(4.6)}$$

4.20 Diagnostic Test for Error Correction Model for TLE

The result of the ECM is given in Table 4.70. In order to provide the final equation acceptable, the study carried out various diagnostic tests. The LM model seems to be fit in the sense that it satisfies the diagnostic test explain below in Table 4.71.

Table 4.71 VEC Residual Serial Correlation LM Tests for TLE

Lags	LM-Stat	Prob
1	113.0175	0.685
2	120.7493	0.4893
3	103.3713	0.8749
4	104.7014	0.8544
5	134.8544	0.1837
6	161.4653	0.0082
7	113.2792	0.6787
8	113.2709	0.6789
9	105.6911	0.8378
10	134.442	0.1904
11	111.3232	0.7245
12	156.3088	0.0169

The result of the diagnostic tests shows that there is no serious problem of either serial correlation. VEC Residual Serial Correlation LM Tests confirm that there is no serial correlation in the residuals of the ECM regression at lag 1 and lag 2 ($P > 0.05$).This shows that there are no lagged forecast variances in the conditional variance equation. Moreover, the errors are conditionally normally distributed, and can be used for inference.

Table 4.72 VEC Residual Heteroskedasticity Tests for TLE

Chi-sq	df	Prob.
3135.146	3036	0.1025

It is evident from the table 4.72 that the specification of VECM of TLE function is not accepting that the null hypothesis of Heteroskedasticity does not exist in the VECM model (P>0.05). Normality test for residuals explain in Table 4.73.

Table 4.73 VEC Residual Normality Tests for TLE

Component	Jarque-Bera	df	Prob.
1	11.89314	2	0.0026
2	1.002235	2	0.6059

The Error-Correction Model yielded residuals that are normally distributed. This conclusion is arrived at given that the Jarque-Bera statistic is significant at component 1 (P=0.000).
The coefficient of the error correction term with one period lag is significant suggesting that the above long run relationship is stable and unique and any disequilibrium created in the short run will be temporary and will get corrected over a period of time according to the residual tests.

4.21 Chapter Summary

Data analysis in this study consisted of main parts, namely granger causality between macroeconomic variables and industry indices, cointegration test between macroeconomic variables and selected industry indices including ASPI, examination of the validity and reliability of data surveyed, and computation of the residual check for VECM.

The implications of the findings and other results elaborated above, and the contributions, limitation of the study as well as suggestions for further studies are discussed in chapter five.

CHAPTER FIVE
CONCLUSION AND IMPLICATIONS

5.1 Conclusion

The results indicate that overall macroeconomic variables are perceived to have an influence on the ASPI and other industry indices. This study examined the perceived influence of macroeconomic behaviour on five major industries namely BFI sector, DIV sector, BFI sector, HTL sector, and TLE sector along with ASPI. The macroeconomic profile reveals that the behaviour of AWDR, AWPR, M2, SDR, USD, GBP, and INF. The variation in the past ten years shows that ASPI and other industry indices represent highest volatility more than 50 percent of coefficient of variation and in addition macroeconomic variables of inflation rate and money supply (M2) of the country represent highest volatile in macroeconomic environment. The below results reveal that the responsiveness of ASPI and industrial indices towards changes in AWDR, AWPR, INF, M2 and exchange rates of USD, GBP,SDR, INR and JPY.

Table 5.1: Summary of Findings and Results

MACROECONOMIC VARIABLES		INDUSTRY INDICES				
	ASPI CHANGES	BFI CHANGES	DIV CHANGES	BFT CHANGES	HTL CHANGES	TLE CHANGES
1% INCREASE IN AWDR	+9.17%**	+5.00%**	+7.96%**	+1.89%**	+6.60%**	-4.53%
1% INCREASE IN AWPR	-12.12%**	-5.97%**	-10.11%**	-2.162%**	-6.99%**	+4.82%**
1% INCREASE IN INF	-3.53%**	-1.96%**	-3.20%**	-0.66%**	-1.82%**	+0.86%**
1% INCREASE IN M2	-1.13%	+24.3%	+59.36%**	+4.03%	+28.5%**	-3.93%
1% INCREASE IN SDR	+1.381%	+26.18%	46.15%**	+12.00%**	+28.88%**	-53.00%**
1% INCREASE IN USD	-3.79%**	+17.76%**	25.96%**	+5.32%**	+16.01%**	+6.32%
1% INCREASE IN GBP	-29.93%**	-16.35%**	-25.64%**	-6.79%**	-14.35%**	-30.41%**
1% INCREASE IN INR	+17.59%**	+8.700%**	15.84%**	+3.32%**	+6.60%**	-2.54%
1% INCREASE IN JPY	-25.83%**	-13.94%**	-22.05%**	-5.065%**	-11.91%**	+18.81%**

** Significant at 5% Level

Table 5.1 explains the summary of findings and results drawn from VECM to test the objective of investigating relationship between macroeconomic variables and major industrial indices.

Furthermore, the responsiveness of BFI industry, DIV, FBI, HTL, and TLE industry towards macroeconomic variables. AWPR, INF, exchange rate of GBP and JPY affect all the five major industries while exchange rate of USD does not influence on TLE industry. Moreover, all the macroeconomic variables have significant influence on DIV industry and HTL industry. Therefore, best fitted VECM can be identified in DIV holdings and HTL industry indices. A discussion of the theoretical contributions and practical implications for both academic and managerial professionals is followed by limitations of the study and suggestions for further related research.

5.2 Further Research

The findings of the study provide opportunities for further research in the following areas. This research focused only on monetary policy variables, consumer price index changes, and exchange rate changes as macroeconomic variables. However, Future studies may desire to consider fiscal policy variables, country's production and supply growth policy variables to formulate better cointegration.

It is possible that other industries indices can be considered to perform a more in depth industry analysis as manufacturing, health care, Information technology indices where they show higher industrial growth in the economy. Further, future studies can focus on the pre and post war macroeconomic effects towards the industry indices and ASPI.

5.3 Implications

This study has some practical implications for policy makers, managers and academics in the field of study. Investors of the major industries would be able to make future finance and investment decisions by sighted at the causality and VECM among macroeconomic behaviour and industry behaviour. Policy makers may make their macroeconomic policy decisions in favour to the stock exchange investments and industrial developments. The

mangers can predict the industrial performance with the change of monetary policy instruments and exchange rates.

This study presents support for the hypothesized linkage between macro economy and CSE price indices. In contrast, this study has raised a number of issues and challenges as limited conceptual framework. In addition, researchers and management professionals can further investigate, validate or criticize the model by altering the macroeconomic elements to determine the drivers and impediments toward industrial indices and ASPI.As a final point macroeconomic variables play a major role for changes in CSE behavoiur.

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