IMPACT OF MACRO-ECONOMIC VARIABLES ON STOCK MARKET RETURNS AND SECTOR RETURNS USING MULTIVARIATE TIME SERIES APPROACH

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Degree of Master of Science in Business Statistics

Department of Mathematics

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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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ABSTRACT

This study investigates the effects of selected six macroeconomics variables: inflation rate, economic growth, exchange rate, interest rate, money supply and international crude oil prices on stock market and sector returns in the Colombo Stock Exchange using quarterly data from 1st quarter of 1996 to 4th quarter of 2018. All series were converted to logarithm form to reduce heteroscedasticity. Augmented Dickey Fuller and Phillip-Perron tests confirmed that all variables have unit root and integrated at first order. It was found that there is a long term relationship between macroeconomic variables and stock market and sector returns, separately and also have equilibrium long term relationship. Furthermore, short term dynamics between macroeconomic variables and stock market and sector returns were also identified using VECM. Economic growth and interest rate are significant and inflation, exchange rate, money supply and international crude oil price are not significant in explaining stock market returns in the long term. However, no macroeconomic variable is significant in explaining stock market returns in the short term. Laws and regulations governing the operations of the stock exchange should be strengthened to protect the interest of buyers and sellers on the stock market. This will increase the confidence of investors as well as boost domestic investor participation and enlarge stock ownership base in the economy.

Key words: *cointegration, macroeconomic variables, stock market return, sector returns, VECM*

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
ASPI	All Share Price Index
BFI	Bank Finance and Insurance
BFT	Beverage Food and Tobacco
C&E	Construction and Engineering
C&P	Chemicals and Pharmaceuticals
CBSL	Central Bank of Sri Lanka
CCPI	Colombo Consumer Price Index
CPI	Consumer Price Index
DCS	Department of Census and Statistics
DIV	Diversified Holdings
ECM	Error Correction Model
ECT	Error Correction Term
F&T	Footwear and Textile
GDP	Gross Domestic Product
H&T	Hotels and Travels
HLT	Health Care
IT	Information Technology
INV	Investment Trusts
L&P	Land and Property
LASPI	Log All Share Price Index
LCCPI	Log Consumer Price Index
LEXR	Log Exchange Rate
LGDP	Log of GDP
LIR	Log Interest Rate
LMS	Log of Money Supply
MFG	Manufacturing
MTR	Motors
OIL	Oil Palms
OLS	Ordinary Least Square
P&E	Power & Energy
PLT	Plantations
PP	Phillips-Perron
SRV	Services
S&S	Stores Supplies
TLE	Telecommunications
TRD	Trading
USD	United States Dollar
VAR	Vector Autoregression
VECM	Vector Error Correction Method

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The stock exchange of a country reflects the economic environment of the country, as it includes companies from all sectors of the economy and the economic agents; sectors with excess and shortage of funds. Therefore, stock market return is considered as an important economic indicator. In addition, different sector returns move differently to the changes in macroeconomic environment. Macroeconomic variables, such as interest rate, exchange rate, inflation, level of economic activities, money supply and oil price, among other factors, influence the behavior of the stock market returns.

Stock market functions as an intermediary in channeling funds from the sectors, which have excess funds for investments, to the firms, which need funds for investments. Therefore, the efficient functioning of a stock market is essential for the efficient allocation of resources in an economy. To perform these functions efficiently, the stock market functions as a primary market for issuing new shares (initial public offerings) and the secondary market for trading shares, which were already in issue.

In the Sri Lankan context, a formal stock market was established with the incorporation of the Colombo Stock Exchange (CSE) in 1985. Thereafter, CSE has been growing in terms of market capitalization and number of listed shares and corporate bonds. Overall stock market performance is measured through All Share Price index (ASPI), and performance of large market capitalization companies is measured through S&PSL20 Index. In addition, individual sector performances are measured using separate sector indices.

Several researches were performed on the impact of macroeconomic variables on stock market and sector returns in the developed economies (Paul & Mallik, 2003; Hess, 2003; Maysami, Howe, & Hamzah, 2004). However, research on this area in the developing world is less and was also performed in the recent past (Ali, Abdullah, & Azamn, 2011; Dincergok, 2016; Jambotkar & Raju, 2018; Kalyanaraman, 2015; Law & Ibrahim, 2014; Ozlen, 2014; Pyeman & Ahmad, 2017; Saeed, 2012; Sucherly, Wirasasmita, & Nidar, 2015), as these economies were

predominantly closed and under the government control until recent past. Nevertheless, the results in both developed and developing markets are diverse and have not reached any consensus related to the impact of macroeconomic variables on stock market and sector returns.

1.2 Stock Market Return

Stock market return is defined as change in *A*ll Share Price Index (ASPI). CSE has two main price indices namely ASPI and S&PSL20 that are calculated with the use of an on-going basis during the trading session, with the closing values published at the end of each session.

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. The ASPI indicates the price fluctuations of all the listed companies and covers all the traded companies during a market day.

$$ASPI = \frac{\text{Market Capitalization of All Listed Companies}}{\text{Base Market Capitalization}} * 100$$

Where;

$$\text{Market Capitalization} = \sum \text{Current No. of Listed Shares of Company}_i * \text{Market Price}_i$$

$$\text{Base Market Capitaliztion} = \sum \text{No. of Listed Shares of Company}_i * \text{Market Price}_i$$

Base values are established with average market value on year 1985. Hence the base year becomes 1985 (www.cse.lk).

$$\text{Opening Base Market Capitalization} = \frac{\text{Total Market Capitalization in 1985}}{\text{No. of Trading Days in 1985}}$$

1.3 Sector Returns

Sector returns are calculated on an on-going basis for separate twenty sectors. These twenty indices reflect the price movements of companies in the twenty sectors, which are listed on the CSE. It can be concluded that sector indices are an indication as to the trends of the market. Table 1.1 indicates the twenty price indices and codes.

Table 1.1: Sector Indices and Codes

BFI	Bank Finance and Insurance
BFT	Beverage Food and Tobacco
C&P	Chemicals and Pharmaceuticals
C&E	Construction And Engineering
DIV	Diversified Holdings
F&T	Footwear And Textile
HLT	Health Care
H&T	Hotels And Travels
IT	Information Technology
INV	Investment Trusts
L&P	Land And Property
MFG	Manufacturing
MTR	Motors
OIL	Oil Palms
PLT	Plantations
P&E	Power & Energy
SRV	Services
S&S	Stores Supplies
TLE	Telecommunications
TRD	Trading

1.4 Macroeconomic Variables

The selected six macroeconomic variables are interest rate, exchange rate, inflation, level of economic activities, money supply and international crude oil price.

1.5 Significance of the Dissertation

A research on "Impact of macroeconomic variables on stock market and sector returns" is important due to various reasons. The findings of a research of this nature are useful to the policy makers to identify how stock market and each sector of the economy react to the changes in the macroeconomic environment, and make policies accordingly. Furthermore, investors can also use the findings of this research to improve their investment decisions on the relationship between stock market and sector returns with macroeconomic variables. Literature review found only one published research on the relationship between stock market and sector returns with macroeconomic variables in Sri Lanka. The published researches have not considered all possible sectors of the economy. Moreover, most of the past studies have used annual data, which may result in aggregation bias problem. There are no research used the period after end of the internal armed conflict period to study the relationship between stock market and sector returns, and macroeconomic variables

in Sri Lanka. None of the previous studies in Sri Lanka included six macroeconomic variables to study the relationship between stock market and sector returns and macroeconomic variables. However, this dissertation uses six macroeconomic variables in determining stock market and sector returns in Sri Lanka.

1.6 Problem Statement

Decision makers around the globe seek new data and information for decision making. Similarly, investors, policy makers, and other individuals and institutions may seek what are the nature of short term and long term relationships between stock market and sector returns with macroeconomic variables in Sri Lanka. Hence, this research is an attempt to answer the question that "what are the nature of short term and long term relationships between stock market and sector returns with macroeconomic variables in Sri Lanka".

1.7 Objectives of the Dissertation

In view of the above explanation, objectives of this dissertation are:

(i) to examine the long term and short term relationships between stock market returns and macroeconomic variables in Sri Lanka, and

(ii) to examine the long term and short term relationships between sector returns and macroeconomic variables in Sri Lanka.

1.8 Outline of the Dissertation

The rest of the research is organized as follows. Chapter 2 reviews the previous works from developed and developing countries. Chapter 3 presents research methodology. Chapter 4 describes the data, data collection methods and nature of data. Chapter 5 provides the empirical results. Finally, Chapter 6 illustrates conclusions and recommendations of the research.

CHAPTER 2

LITERATURE REVIEW

2.1 The Impact of Macroeconomic Variables on Stock Market Returns and Sector Returns

The dynamic impact of macroeconomic variables on stock market returns and sector returns has produced diverse results in different stock markets of various countries in different periods. Therefore, this chapter critically evaluates the findings of previous researches on the impact of macroeconomic variables on stock market and sector returns.

2.2 Empirical Evidence from Developed Economies

Several researchers examined the impact of macroeconomic variables on stock market and sector returns for US and other developed stock markets specifically, and developing markets generally. The findings vary based on the development states of the economies, level of financial market development, period of researches, methods of analysis, frequencies of data, nature and number of macroeconomic variables, among other factors.

Paul and Mallik (2003) studied the relationship between macroeconomic factors and stock prices in the banking and finance sector using the cointegration test and error correction model with quarterly data for the period from Q1:1980 to Q1:1999 in Australia. Inflation, interest rate and real GDP growth are the selected macroeconomic variables. The study reveals that interest rate has a negative effect and GDP growth has a positive effect on stock prices, however, inflation has no significant effect on stock prices.

According to this study, the researcher used appropriate analysis methods such as unit root test, cointegration test and error correction model. Unit root test indicates that data series are stationary at first difference and cointegration test is used to examine whether there exists a long run equilibrium relationship between selected sector returns and macroeconomic factors. Cointegration test found that all selected variables are cointegrated with banking and finance stock prices and used error correction model for checking short term relationship. Moreover, selected time

period also support to take better results. Because of time period represents approximately twenty years. Furthermore, logarithms of data are used to adjust data into one flat form. If Paul and Mallik (2003) used some more macroeconomic variables, it would have improve the findings of the study.

Sector specific impact of macroeconomic fundamentals on the Swiss stock market is investigated using VECM technique period from M1:1975 to M12:2000. The real GDP, price level measured by CPI and monetary policy indicator are used as selected macroeconomic variables and eighteen sector indices are used. The results reveal that important divergences of sector index sensitivities to innovations in various macroeconomic variables (Hess, 2003). This research is important as it uses 18 sector indices for the research; however, only three macroeconomic variables are used.

The relationship between macroeconomic variables and the sector stock indices represented by the SES All-S Equities Finance, property and Hotel indexes as well as the Singapore`s composite stock index is investigated using Johansen`s cointegration test and VECM with the use of monthly data from M1:1989 to M12:2001 in Singapore.

The results indicate that the Singapore stock market and SES All-S Equities property index have significant relationship with all macroeconomic variables. Moreover, other two indexes namely as Finance index and Hotel index have significant relationship with only selected variables. Furthermore, the SES All-S Equities Finance index does not have relationship with real economic activities and money supply, while SES All-S Equities Hotel Index has no significant relationship with money supply, and short- and long-term interest rate (Maysami, Howe, & Hamzah, 2004). Though, this research uses little more than a decade data, the importance of this research is high, as it uses monthly data.

2.3 Empirical Evidence from Developing Countries in Asia - South Asian Countries

Jambotkar and Raju (2018) examined nine sector indices from the twelve sector indices at the National Stock Exchange of India (NSE) considering monthly data from M1:2007 to M12:2016 using unit root test, Ordinary Least Square model (OLS) and Correlation. The study claims that the combined effects of the macroeconomic

variables on each of the sector indices have significant influence, but the selected macroeconomic factors have less explanatory power (Jambotkar & Raju, 2018).

This research identified that data series are stationary at first difference. Even though researcher tests unit root and identify first difference stationary of data series, Cointegration test is not used. Correlation and OLS methods are used for identifying impact of macroeconomic variables on the selected sector indices. If the data series stationary at first difference, Cointegration test is most appropriate test than correlation and OLS method.

The relationship between share returns and macroeconomic variables among the sector specific indices of Indian stock market is examined with the use of regression analysis. Principal Component Analysis (PCA) is used to classify variables into specific sectors. The PCA is employed with pool of ten variables and they are highly correlated. The results of PCA identified five factors namely market economic factors, price economic factors, policy rate economic factors, industrial growth economic factors and money supply economic factors. Nifty and Sensex index value of five sectors as automobile, IT, FMCG, banking and metal are selected as dependent variables and multiple regression analysis is selected as analytical tool.

The results of Nifty index versus five factors indicate that the industry related factor has no statistically significant relationship with all five sector returns. Moreover, market economic factor has significant effect on all five sectors and price related factor has significant contrition in returns of IT, bank and metal industry. The results of regression analysis with Sensex values of five sectors illustrate that market driven factor has significant impact in all selected sectors. Further, policy related factor has statistically impact on bank sector and money supply factor has significant relationship with FMCG and metal sectors. Furthermore, remaining all factors is not statistically significant with any sector (Verma & Kumar, 2016). Compared to other studies, this research uses 10 variables and five indices, and PCA for the analysis, those are contributing aspects of this research.

Saeed (2012) used monthly data from M6:2000 to M6:2010 for examining the impact of macroeconomic variables on the returns of nine sectors, using OLS method in Pakistan. The results indicate that macroeconomic variables have significant impact on the returns of sectors, but their contribution to bring variation in their return is very small.

The researcher used OLS method as the result of diagnostic results which are obtained from correlation matrix. Augmented Dickey Fuller (ADF) test shows that data set is stationary at level and Multi-Colinearity has been checked using correlation matrix. Then, the researcher used OLS method to take conclusions. The data depend on time, therefore AutoRegressive Distributed Lags method is appropriate than OLS method (Saeed, 2012).

2.4 Empirical Evidence from Developed Countries in Asia – Southeast Asian Countries

By using monthly time series data, for the period of M1:2007 to M12:2011, Yogaswari, Nugroho and Astuti (2012) examined effect of macroeconomic variables on stock price volatility selecting Jakarta composite index, agriculture and basic industry sectors. Further, inflation, interest rate and exchange rate are used as macroeconomic factors. Methodology used in this research is multiple regression analysis and the results reveal that positive impact of inflation and negative impact of interest rate and exchange rate on stock price.

The abstract indicates that "inflation giving negative impact to the stock price". According to the output of regression analysis, it should be correct as exchange rate instead of inflation. Diagnostic tests are related with regression analysis to confirm goodness of best fitted model. Furthermore, if the researcher applied cointegration test, instead of multiple regression analysis, it would have generated better results than current results. If the researcher mention results of diagnostic test, it will be good approach for confirming conclusion of the research (Yogaswari, Nugroho, & Astuti, 2012).

Sucherly, Wirasasmita and Nidar (2015) studied the determinant factors of sector stock returns in Bullish and Bearish condition at Indonesian capital market using monthly data for the period from M1:1996 to M12:2013. Using Robust Least Square, the results indicate as two categories namely simultaneous and partially.

- Simultaneously, macroeconomic variables affected the sector stock return in bullish and bearish condition.
- Partially, even though exchange rate do not affect on the sector stock return, stock market return positively effect on sector stock return. More over stock market return is the main factor in determining sector stock return.

Using monthly data for the period of M1:2005 to M12:2014, Sutrisno (2017) examined the effect of macroeconomic variables on sectoral indices in the Indonesian Stock Exchange using OLS method. The results indicate that the interest rate has significant negative influence on all sectors except basic industry and chemical, finance, infrastructure, utilities and transportation, and miscellaneous industry sectors. The inflation rate has a significant negative impact on all industries, even though the inflation rate has no significant effect on all sectors. If the researcher used Cointegration test with unit root test, most appropriate results can be obtained.

Using monthly data for the period of M1:1995 to M12:2009 in Malaysia Ali, Abdullah and Azamn (2011) examined the relationship between the consumer and industrial product index with macroeconomic variables. Multiple regression analysis is used as methodology to evaluate conclusions. The results reveal that all macroeconomic variables have significant correlation with indices. Furthermore, its results show that interest rate and inflation rate have negative relationship and money supply has positive relationship with consumer product and industrial product index. Hence, it can be concluded that all macroeconomic variables have significant relationship with the stock market indices.

Even though the data depend on time, the researcher used multiple regression analysis to evaluate results. Therefore, stationary should be checked before selecting the method of analysis. After selecting stationary level appropriate methodology could have been selected according to the results of stationary. There are more methods which can reveal accurate results than Multiple Regression.

Pyeman and Ahmad (2017) examined the cointegration between macroeconomic variables and sectoral indices movement in Bursa Malaysia using monthly data from M1:1995 to M12:2014. The ten sector specific indices and three macroeconomic variables are investigated using Unit Root Test, Johansen Cointegration, Vector Error Correction Model (VECM) and Vector Auto Regression (VAR). The results reveal that technology sector has long run cointegration with macroeconomic variables. Moreover, in the long run, there are cointegration between macroeconomic variables and several sectoral indices (Pyeman & Ahmad, 2017).

Using monthly data for the period of M1:1988 to M12:2011, Law & Ibrahim (2014) examined the response of sectoral returns to macroeconomic shocks in the Malaysian stock market with selected five macroeconomic variables and five sectoral returns, namely; Industrial, Finance, Property, Tin and Plantation. VAR model and

generalized impulse response function were the main analytical tools and they indicate that monetary policy and exchange rate have significantly higher influence on finance sector. Moreover, exchange rate has significant relationship with property sector (Law & Ibrahim, 2014).

2.5 Empirical Evidence from Developed Countries in Asia - Middle East Countries

Using monthly observations from M1:2007 to M6:2013, Kalyanaraman (2015) examined long-run and short-run relationship between macroeconomic factors and returns on sectoral indices in Saudi Arabia. Fifteen sectors listed on Saudi stock market are selected as dependent variables and five macroeconomic variables, namely; inflation, industrial production, money supply, exchange rate and oil prices are selected as independent variables.

As the results of unit root test indicated that the variables are stationary at first difference, cointegration test, Vector Error Correction Model and causality test are selected as analytical techniques. Cointegration technique reveals that there exists at least one cointegration vector between the selected macroeconomic variables and the sector indices. The long-run and short-run relationship between selected macroeconomic variables and sector stock indices are examined using Error Correction Model and Wald test. The results indicate that the effect of the macroeconomic variables on the sector returns is varied (Kalyanaraman, 2015).

Ozlen (2014) investigated the effect of domestic macroeconomic determinants on stock returns using Auto Regressive Distributed Lags (ARDL) approach and eighty five monthly data during 2005-2012 period. Ozlen (2014) selected six macroeconomic factors to present independent variables and forty eight companies in eleven different sectors of Istanbul Stock Exchange to represent stock return as dependent variables. The results indicate that exchange rate is significantly influence on all sector returns except Communication and Textile sectors. The remaining factors, namely; interest rate, inflation rate, current account deficit and unemployment rate have influence on sector returns in various ways. Moreover, macroeconomic factors have significant influence on stock returns of all companies, except six companies (Ozlen, 2014).

The relationship between selected macroeconomic variables and world equity index on four main sector return indices, namely; Industry, Service, Financial and

Technology in Turkey is examined using OLS with monthly data from M8:2000 to M11: 2008. The results indicate that interest rate and exchange rate have negative influence on all sectors. Moreover, world equity return index has positive effect on all sector returns, except for the technology sector return. Furthermore, industrial production has negative relationship with BIST national service sector, and BIST national technology sector index and oil price is not significant on any return index (Dincergok, 2016).

2.6 Empirical Evidence from Sri Lanka

Literature reviews on the relationship between stock market returns and inflation are very few and also limited to shorter period. For example, (Menike, 2006) investigated the effect of macroeconomic variables on stock prices using monthly data from September 1991 to December 2002 using OLS in the Sri Lankan stock market. Multivariate regression was used for analyzing four macroeconomic variables namely exchange rate, inflation rate, money supply and interest rate for each individual stock. The results reveal that 27 stocks out of 34 have higher coefficient of determination which indicates that higher explanatory power of macroeconomic variables. Moreover, it suggests that lagged inflation rate and lagged money supply have less ability to explain variation which gets born from equity prices. Even though, money supply, inflation rate and interest rate have greater importance, Exchange rate is a most influential variable. If researcher used cointegration test, it would have improved the results.

2.7 Summary of Chapter 2

Stock market indices and various sector indices are selected as dependent variables. The results are examined for each sector indices separately. Money supply, inflation, interest rate, industrial production index, exchange rate, GDP, domestic oil price, CPI, gold price, silver price, oil price, exports, foreign reserves, trade balance, unemployment rate and fiscal deficit are the most used determinants for testing effect on stock market return. The researchers are used various analytical instruments to determine relationship between selected macroeconomic variables and stock market return. Many researchers have used cointegration, VECM, granger causality, impulse response function, variance decomposition, EGARCH, OLS, ARIMA and multiple regression analysis. All over the economies identified all considerable determinants

have influence on stock market return in the long run and short run. The results obtained are similar to work carried by every researcher in developed or developing economies. Accordingly to the review of previous research, there is no more research similar to impact of macroeconomics variables on stock market and sector returns in Sri Lanka. Furthermore, methodologies and findings of previous studies are useful to improve this research.

CHAPTER 3

MATERIALS AND METHODS

3.1 Secondary Data

The secondary data for the following variables (Table 3.1) during Q1:1996 to Q4:2018 were used.

Table 3.1 Description of Selected Variables

Variable	Symbol	Description
Stock market return	ASPI	All Share Price Index (Stock return is the market value weighted index of companies listed on the CSE)
Sector Returns	BFI	Bank Finance and Insurance
	BFT	Beverage Food and Tobacco
	C&P	Chemicals and Pharmaceuticals
	C&E	Construction And Engineering
	DIV	Diversified Holdings
	F&T	Footwear And Textile
	H&T	Hotels And Travels
	INV	Investment Trusts
	L&P	Land And Property
	MFG	Manufacturing
	MTR	Motors
	OIL	Oil Palms
	PLT	Plantations
	SRV	Services
	S&S	Stores Supplies
	TRD	Trading
Money supply	MS	Broad definition of money supply (MS) was selected as proxy for money supply
Gross Domestic Product	GDP	GDP represented sum of agriculture, industrial and service sector
Inflation	CCPI	Colombo Consumer Price Index (CCPI) is used as a proxy for inflation. As there is no other reliable price-index that represents the price level in Sri Lanka
Interest rate	IR	The money market rate was considered as a proxy for interest rate. Weighted average Yield rates on primary market operation of Treasury bill, 364 day was used for study
Exchange rate	EXR	Average exchange rates of major currencies represented by exchange rate, in this study represents Sri Lankan Rupees per unit of American dollar – United States Dollar(USD) as exchange rate
International Crude Oil Price	ICOP	ICOP is used to represent the international commodity prices

3.2 Sources of data

Data used for the research is secondary data and collected from various sources. Sources of data collection are shown in Table 3.2.

Table 3.2: Sources of Data

Data	Source
Stock return (ASPI)	CSE Database
Sector Returns	CSE Database
Inflation (CCPI)	DCS(www.statistics.gov.lk)
Interest rate (Treasury bill rate, 364 day)	Annual reports of CBSL
Exchange rate (US dollar)	Annual report of CBSL
GDP	Annual reports of CBSL
Money supply	Annual reports of CBSL
International Crude Oil Price	Reuters®

3.3 Log Transformation

Quarterly data have some fluctuations according to the time. Therefore, data represent high variance differences among selected variables. Log transformation is used for removing high variance differences. Table 3.3 indicates the notation of variables after applying logarithm.

Table 3.3: Arrangement of data

Variable	Definition of variable
LASPI	Logarithm of All Share Price Index
LBFI	Logarithm of Bank Finance and Insurance
LBFT	Logarithm of Beverage Food and Tobacco
LC&P	Logarithm of Chemicals and Pharmaceuticals
LC&E	Logarithm of Construction And Engineering
LDIV	Logarithm of Diversified Holdings
LF&T	Logarithm of Footwear And Textile
LH&T	Logarithm of Hotels And Travels
LINV	Logarithm of Investment Trusts
LL&P	Logarithm of Land And Property
LMFG	Logarithm of Manufacturing
LMTR	Logarithm of Motors
LOIL	Logarithm of Oil Palms
LPLT	Logarithm of Plantations
LSRV	Logarithm of Services
LS&S	Logarithm of Stores Supplies
LTRD	Logarithm of Trading
LCCPI	Logarithms of Colombo Consumer Price index
LIR	Logarithms of interest rate
LEXR	Logarithms of exchange rate
LGDP	Logarithms of gross domestic product
LMS	Logarithms of money supply
LICOP	Logarithms of international crude oil price

3.4 Model Specification

The following empirical model is estimated to explain research objectives on Stock market return.

$$\text{Stock market return}_t = \beta_0 + \beta_1 \text{Inflation}_t + \beta_2 \text{Interest rate}_t + \beta_3 \text{Exchange rate}_t + \beta_4 \text{Economic growth rate}_t + \beta_5 \text{Money supply}_t + \beta_6 \text{International crude oil price}_t + e_t \quad (3.1);$$

Following empirical model was estimated to explain research objectives on Sector returns.

$$\text{Sector return}_t = \beta_0 + \beta_1 \text{Inflation}_t + \beta_2 \text{Interest rate}_t + \beta_3 \text{Exchange rate}_t + \beta_4 \text{Economic growth rate}_t + \beta_5 \text{Money supply}_t + \beta_6 \text{International crude oil price}_t + e_t \quad (3.2);$$

3.5 Stationary

Before checking relationship between selected macroeconomic variables, and stock market and sector returns, time series data have to be checked for stationary. Therefore, unit root test is used to check stationary. As the result, Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) test are applied to check whether data follow stationary or not.

Unit root test is a statistical test that is used for studying stationary of time series. If any series depend on time, it is called non-stationary, which represents random walk ($y_t = y_{t-1} + \epsilon_t$), where ϵ is a stationary random disturbance term. The series y has a constant forecast value on t and variance increase with time. There is difference stationary series since first difference y is stationary is called random walk ($y_t - y_{t-1} = (1 - L)y_t = \in_t$).

When series is stationary with difference, is called integrated $I(d)$ where d is order of integration which describes number of unit roots contains in the series. If the variables are stationary in level, it can be denoted as $I(0)$ which explain integrated of order zero. Furthermore, if variables are stationary at first difference, it can be explained as integrated of order one that said to be I(*1*) variable.

The formal method that is used for testing stationary of a series is unit root test, which is the first step in empirical analysis. Unit root tests can be investigated as level, first difference or second difference with intercept or with trend &intercept. Two popular unit root tests are ADF (Dickey & Fuller, 1979) and PP nonparametric test (Phillips & Perron, 1988).

3.5.1 Augmented Dickey-Fuller Test

After subtracting $y_t = \rho y_{t-1} + x_t\delta + \epsilon_t$ formula from $t-1$ both sides, the standard Dickey-Fuller test can be generated.

$$\Delta y_t = \alpha y_{t-1} + x_t'\delta + \epsilon_t; \text{ where } \alpha = \rho - 1 \quad (3.3)$$

The null and alternative hypotheses are H_0: α = 0 vs. H_1: α <0 and the decision rule is evaluated by means of conventional t-ratio for α.

$t_\alpha = \frac{\hat{\alpha}}{se(\hat{\alpha})}$; where α̂ is estimate of α and $se(\hat{\alpha})$ is coefficient standard error.

If the series depend on AR (1) process, Dickey and Fuller (1979) identified that the test statistic does not follow the conventional student`s t distribution and derive asymptotic results and simulate critical values for various test and sample sizes. The assumption which is white noise disturbances ϵ_t is violated when the series is correlated at higher order lags.

The ADF test is only valid, if ϵ_t is white noise. The ADF test illustrated that a parametric correction for higher-order correlation, then it can be tested regression as the result of assumption. There are two assumptions namely the*y* series follows an AR(*P*) process and adding *p* lagged difference terms of the dependent variable *y*. There are two practical issues when using ADF test. First, must choose to include exogenous variables in the test regression. Second, have to specify lag length to include test regression.

3.5.2 Phillips-Perron Test

When testing unit root, a nonparametric method was introduced as alternative to control serial correlation by Phillips and Perron (1988). The test statistics of PP is shown below.

$$\hat{t_\alpha} = t_\alpha \left(\frac{\gamma_0}{f_0}\right)^{1/2} - \frac{T(f_0-\gamma_0)(se(\hat{\alpha}))}{2\, f_0{}^{1/2} s} \quad (3.4)$$

Where α̂ is an estimate of α, t ratio of α is denoted t_α, se(α̂) is coefficient standard error, s stand for standard error, γ_0 is a consistent estimate of the error variance (calculated as $\frac{(T-k)S^2}{T}$ where k is number of regressors) and remain f_0 is an estimator of the residual spectrum at frequency zero.

Whether to include a constant, a constant and a linear time trend, or neither, in the regression and choose a method for estimating f_0 are the two choices to select when performing Phillips and Perron (PP) test.

3.6 Cointegration Technique

The regression of a non-stationary time series on another non-stationary time series may produce a spurious regression. When all variables integrated in first differences as *I*(1), that is called they contain a unit root. Regression equation can be derived as follows.

$$\text{Stock market return}_t = \beta_0 + \beta_1 \text{Inflation}_t + \beta_2 \text{Interest rate}_t + \beta_3 \text{Exchange rate}_t + \beta_4 \text{Economic growth rate}_t + \beta_5 \text{Money supply}_t + \beta_6 \text{International crude oil price}_t + e_t \quad (3.5)$$

Above equation can be rewritten as follow.

$$e_t = \text{Stock market return}_t - \beta_0 + \beta_1 \text{Inflation}_t - \beta_2 \text{Interest rate}_t - \beta_3 \text{Exchange rate}_t - \beta_4 \text{Economic growth rate}_t - \beta_5 \text{Money supply}_t - \beta_6 \text{International crude oil price}_t \quad (3.6)$$

Although selected variables are stationary at first differences individually, error term has unit root with level as I(*0*). In view of the above, it can be concluded that selected variables have stochastic trends where linear combination is I(*0*). That is called macroeconomic variables and stock market returns are cointegrated. If variables are cointegrated, it can be concluded that selected variables have long term equilibrium relationship.

Many macroeconomic time series have unit root. A linear combination of two or more non-stationary series may be stationary. The non-stationary time series can be cointegrated as a result of stationary linear combination exists which is called cointegration equation. That can be interpreted as those variables have long run equilibrium relationship (Engle & Granger, 1987).

Johansen cointegration test (Johanson & Juselius, 1990) is used to ensure long run equilibrium relationship between macroeconomic variables and each stock market index. The mathematical form of cointegration test describes bellow.

Consider a VAR of order P:

$$y_t = A_1 y_{t-1} + \ ... + \ A_p y_{t-p} + \ Bx_t + \in_t \ \ldots \ldots \text{(ii)} \quad (3.7)$$

Where:

y_t = k – vector of non stationary I(1) variables

x_t = d – vector of deterministic variables

$\in_t$ = vector of innovations

Above equation can be rewrite as follow

$$\Delta y_t = \prod y_{t-1} + \ ... + \sum_{i=1}^{p-1} \Gamma_i \, \Delta y_{t-i} + \ Bx_t + \in_t \ \ldots \ldots \text{(ii)} \quad (3.8)$$

Where;

$$\prod = \sum_{i=1}^{p} A_i \text{ - I,} \Gamma_i = \ -\sum_{j=i+1}^{p} A_j$$

According to the Granger`s representation theorem, If the coefficient matrix $\prod$ has reduced rank r < k, then there are k×r matrices as α and ß with rank r. Then $\prod = \alpha\beta'$ and $ß'y_t$ is I(0). Where r is the cointegrating rank and each column of ß is the cointegrating vector.

In equation (ii) the vector Δy_t and Δy_{t-i} are I(*1*) variables. Therefore, long run relationship among $y_t$can be determined with the use of the rank of $\prod$. The equation (ii) reduce to a VAR model of P^{th} order when r=0. It can be concluded that there are no any cointegration on vector macroeconomic variables in level. If the rank 0< r <n, there are possibility to have k×r matrices namely as α and ß. Then it can be written as $\prod = \alpha\beta'$.

The coefficient matrix is estimated from an unrestricted VAR in the Johansen cointegration test. Then restrictions can be rejected by the reduced rank using two methods namely trace statistic and maximum Eigenvalue statistics. The both statistics can be written as follow.

$$Trace(r,k) = -T\sum_{i=r+1}^{k} \ln(1-\lambda_i) \quad (3.9)$$

Where;

λ_i = i^{th} largest eigenvalue of matrix $\prod$

T = the number of observations

$$MaximumEigenValueTest = \lambda_{max} = -T\ln(1-\hat{\lambda}_{r+1}) \quad (3.10)$$

Where;

T = Number of observations

$\hat{\lambda}_j$ = estimated values of characteristic roots ranked from largest to small

r = 0, 1, 2,……..n-1

3.7 Error Correction Method

Lagged residual type cointegration regression has been employed to estimate ECM. It illustrates the short term dynamics and assists macroeconomic variables and stock markets indices to cointegrate in the long term. This research employs the following error correction model:

$$\Delta i_t = \delta + \chi\Delta\pi_t + \rho\{i_{t-1} - \alpha - \beta_1\pi_{t-1}\} + \varepsilon_t \quad (3.11)$$

$\Delta\pi_t$: equilibrium responses, and

$\{i_{t-1} - \alpha - \beta_1\pi_{t-1}\}$: disequilibrium responses.

$\{i_{t-1} - \alpha - \beta_1 \pi_{t-1}\}$, or the error correction term (ECT), captures the long term relationship in the model. As the coefficient of ECT spins out to be negative possibly due to large positive disturbances has been cancelled out. The OLS estimates are used to measure ECT. The adjustment factor, ρ, the coefficient of the ECT is taken as the speed of adjustment term. Accordingly, inverse of ρ, $(1/\rho)$, is the period taken by the market participants to learn and fully adjust the forecasting error. If ρ is close to one, the market participants correct the forecasting error instantly. In contrast, when ρ is close to zero, the market participants take a long time to learn and correct the errors. Therefore, the speed of adjustment of the forecasting error is measure through the adjustment term.

3.8 Stock Market Indices and Research Methodologies

Jambotkar and Raju (2018), Saeed (2012), Sutrisno (2017) and Dincergok (2016), among others, used OLS method to study impact of macroeconomic variables on stock market returns and sector returns. Jambotkar and Raju (2018), Saeed (2012), Sutrisno (2017), Dincergok (2016), among others, used Robust Least quare and Jambotkar and Raju (2018) used Correlation to examine determinants of stock market returns and sector returns. Multiple regression is used by Ali, Abdullah & Azamn (2011) and Verma & Kumar (2016) to identify the variables that affecting stock market returns and sector returns.

Principal Copmponent Analysis is applied by Verma & Kumar (2016) to identify the effect of macroeconomic factors on specific indices performance. Moreover, this research uses unit root test as Paul & Mallik (2003) and Pyeman & Ahmad (2017). Hess (2003) also used VECM to identify sector specific impacts of macroeconomic fundamentals on sector returns. Generalized impulse response function is used by Law & Ibrahim (2014), and VAR is used by Pyeman & Ahmad (2017) to examine cointegration between macroeconomic variables and sectoral indices. ARDL is usedby Ozlen (2014) to investigate the effect of domestic macroeconomic determinants on stock returns. Following Paul & Mallik (2003), Pyeman & Ahmad (2017), and Maysami and Howe and Hamzah (2004), among others, this research also uses Cointegration and VECM to study impact of macroeconomic variables on stock market returns and sector returns.

CHAPTER 4

EXPLORATORY DATA ANALYSIS

4.1 Introduction

This chapter reveals that exploratory data analysis of quarterly data for the period from Q1:1996 to Q4:2018. Graphical data presentations, temporal variability of data, arrangement of data and unit root properties of variables are discussed.

4.2 Temporal variability of Defined Variables

Figure 4.1 indicates the graphical movements of selected variables. It reveals that trend during the entire time period and Y axis represents high differences scalars. All selected variables are increasing since 1996Q1 according to the time. It can be concluded that data should be rearrange with log transformation.

More time series plots show upward trend, which describes long-term increase in data values and no any outliers. ASPI, BFI, C&E, C&P, DIV, F&T, H&T, INV, L&P, MFG, PLT and SRV have increased from 2008Q3 to 2010Q2 and subsequently decreased. MTR starts to increase in 2009Q2 and decreased from 2011Q1. Oil price index shows high increase from 2008Q3 to 2010Q4. BFT also started to increase in same point with oil index but it gradually decreased. S&S started to increase in 2009Q1 but in 2010Q4 started declining. TRD index increased rapidly since 2008Q3 up to 2011Q2. Even though, all indexes except BFT have rapidly increased after the war period, then the series follows decrease situation since 2011 and represents more fluctuations.

Trend is varying with mean overtime and seasonality is changing with variance over time, both can be called as non-stationary. Overall, the increasing pattern of all selected variables can be identified over the sample period. Therefore, it can be concluded that the observed data series are not stationary. Differencing is the most popular and widely used method for transforming data to stationary, which has stable mean and variance over time.

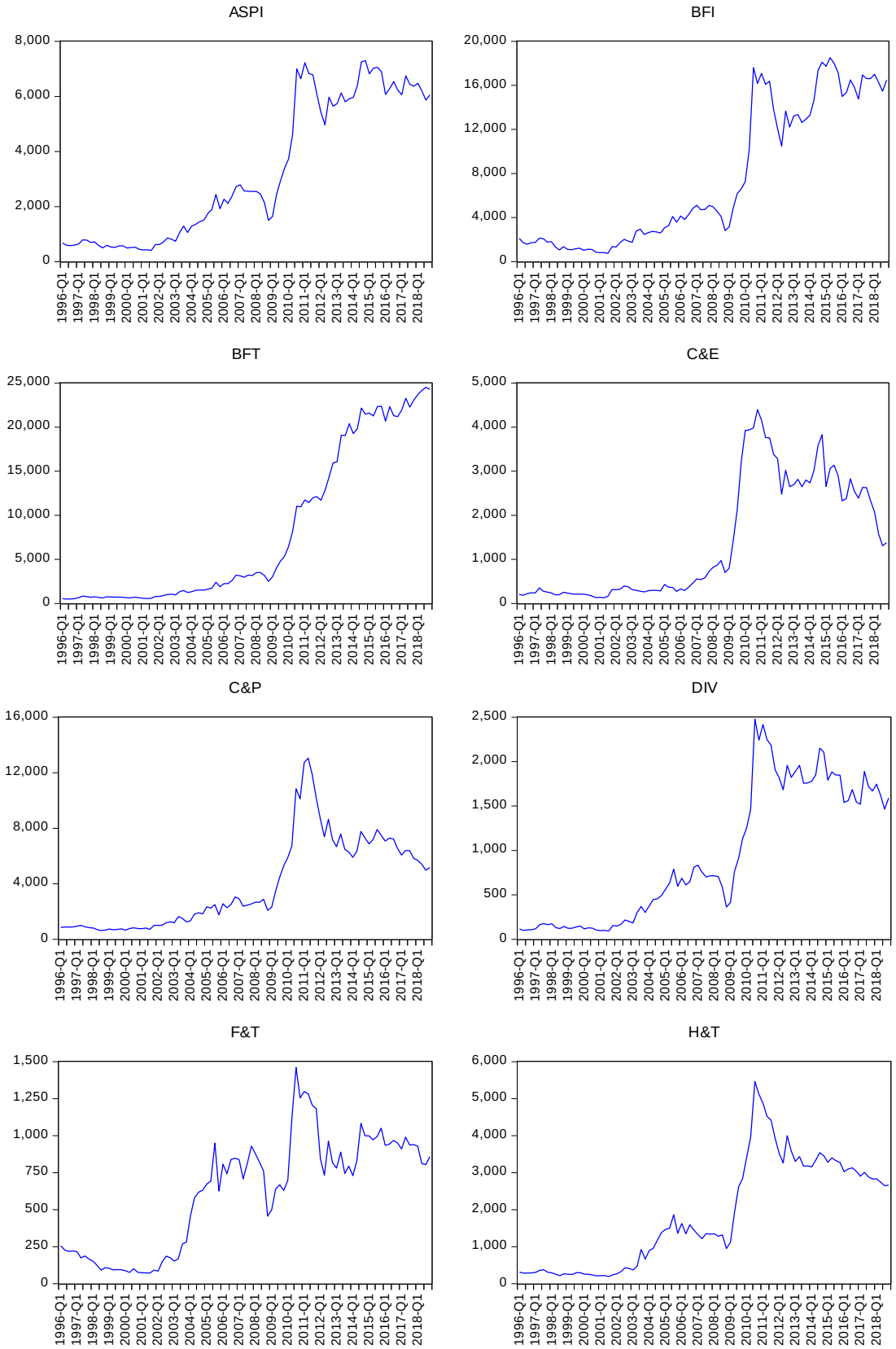

Figure 4.1: Plot of Time-Series data of Dependent Variables

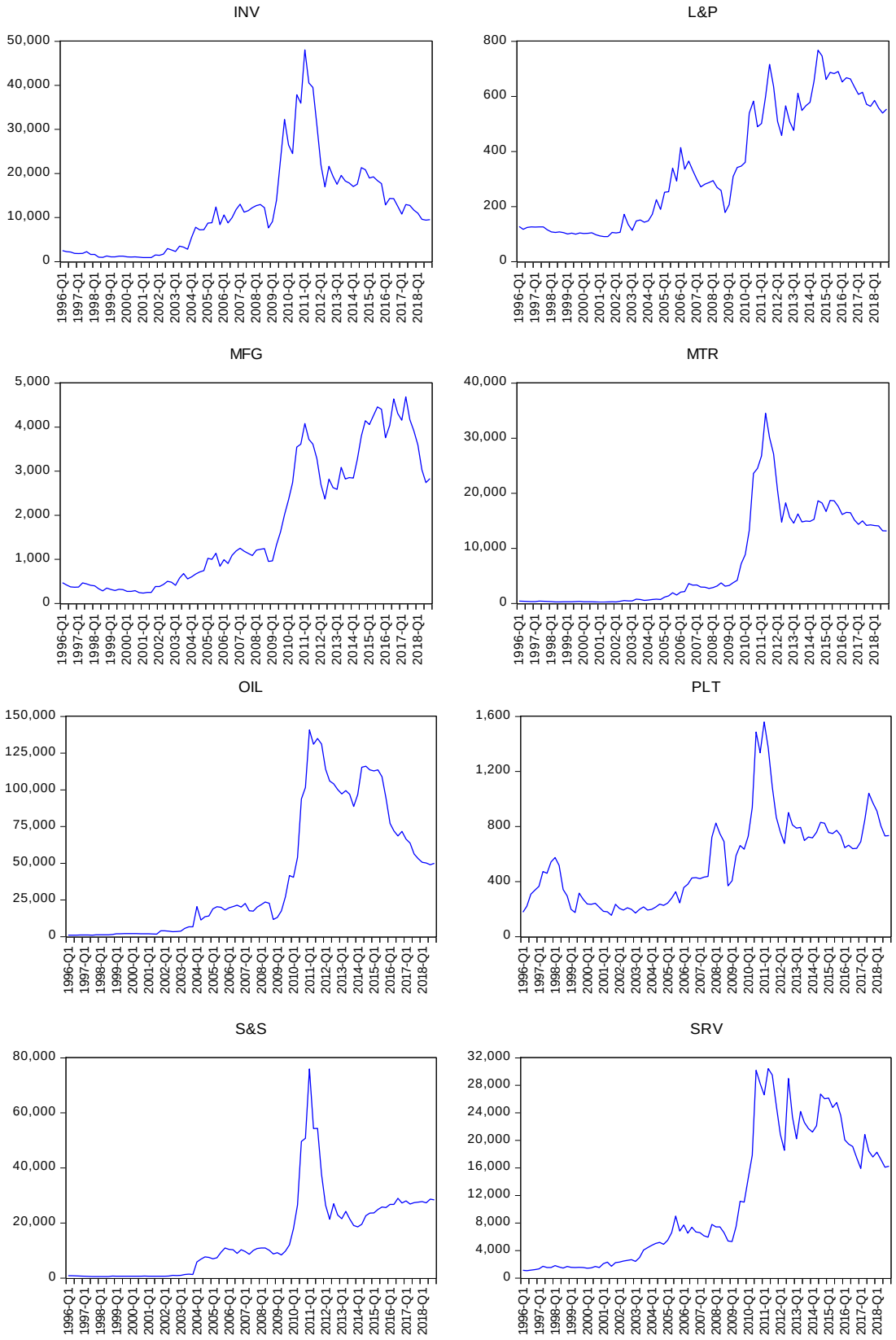

Figure 4.2: Plot of Time-Series data of Dependent Variables - continue

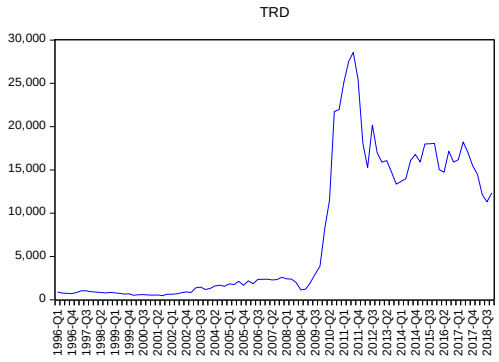

Figure 4.3: Plot of Time-Series data of Dependent Variables - continue

Inflation, exchange rate, economic growth, interest rate, money supply and oil price are the independent variables. All variables follow increasing line graph with fluctuations over time. The temporal variability of independent variables is shown in Figure 4.2.

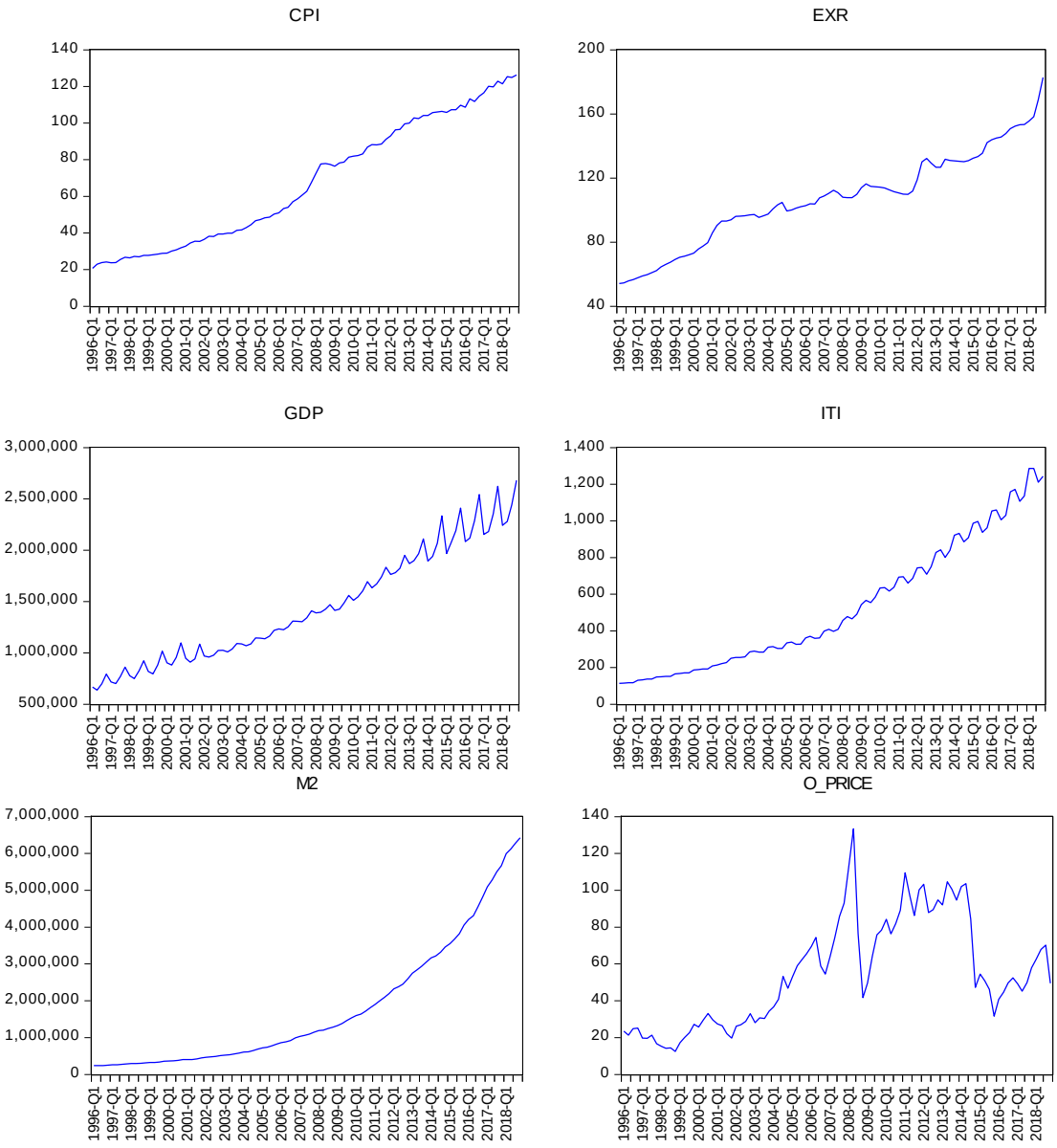

Figure 4.4: Plot of Time-Series data of the Independent Variables

4.3 Proportion of Percentage Variance

Table 4.1 indicates that the contribution from each variable to the total variance of 17-D system consists of one variable for stock market return and 16 other variables for sector return. This is useful to get some idea about the contribution of variation from each variable, irrespective of units.

Table 4.1 Proportion of variance in dependent variables

Variable	Proportion of variance (%)
ASPI	0.25
BFI	1.57
BFT	2.98
C&E	0.07
C&P	0.41
DIV	0.02
F&T	0.01
H&T	0.08
INV	4.13
L&P	0.00
MFG	0.08
MTR	2.90
OIL	72.92
PLT	0.00
S&S	8.54
SRV	3.48
TRD	2.56
Total of 17 variables	100.00

Results in Table 4.1 indicate that OIL index contributes the highest variance (72.92%) of the system. L&P and PLT represent lowest variance of the system. Contribution of variance from each of the six macroeconomic variables to the 6-D system is shown in table 4.2.

Table 4.2: Proportion of variance in independent variables

Variable	Proportion of variance (%)
CPI	0.00
EXR	0.00
GDP	9.11
IR	0.00
MS	90.89
OP	0.00

According to Table 4.2, money supply has captured the 90.89% of the total variance of the 6-D system. GDP contributes 9.11% and the remaining four variables

represent almost zero percentage of total variance. Accordingly, two variables (MS and GDP) explain all most all of the variance of the 6-D system. In order to reduce the variance hetroscedasacity, both dependent and independent variables were transformed to logarithm scale (Maysami, Howe, & Hamzah, 2004; Law & Ibrahim, 2014; Dincergok, 2016; Jambotkar & Raju, 2018; Paul & Mallik, 2003; Kalyanaraman, 2015; Sutrisno, 2017; Saeed, 2012). It should be noted that in macroeconomical studies all variables are generally transformed into logarithm, irrespective at the pattern of each variable.

4.4 Temporal Variability of Variables after adjusting Logarithm

The data series vary from cents to million in measurements. Therefore, data should follow stable measurement scale. Logarithm of data series is the most suitable method to remove effect of clustering of large variance on few variables.

4.4.1 Temporal variability of Dependent Variables after adjusting Logarithm

Figure 4.3 shows the temporal variability of all dependent variables after transforming to logarithm. Accordingly, all dependent variables follow increasing pattern over the entire time period. The peak points of data series are from Q3:2010 to Q2:2011. There are two breaking points, Q3:2001 and Q4:2008 – Q1:2009 periods. These two periods are the starting points of bullish market. Start of cease fire agreement and the end of the war are the prime reasons for these bullish periods.

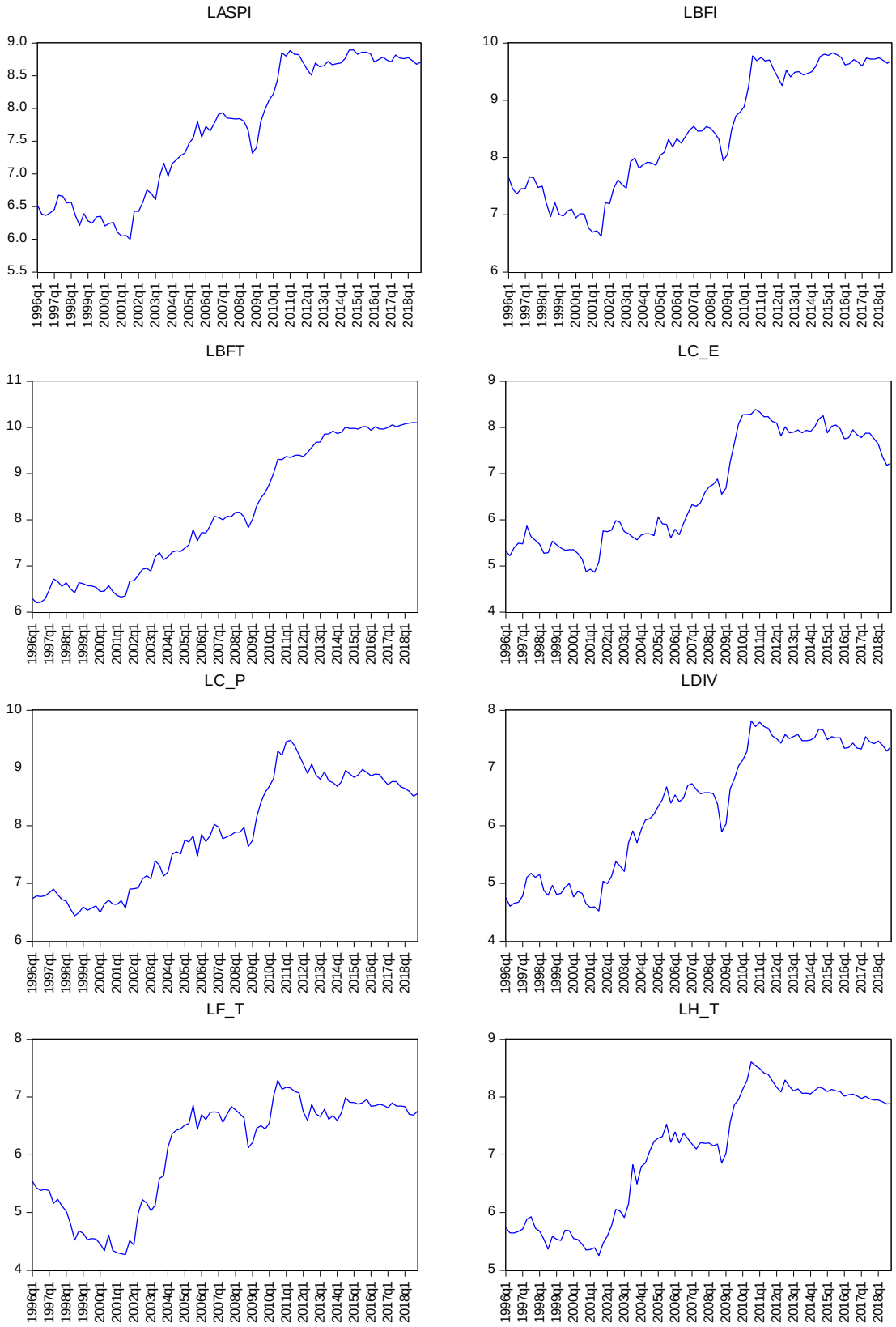

Figure 4.5: Plot of Time-Series data of the dependent variables after adjusting Logarithms

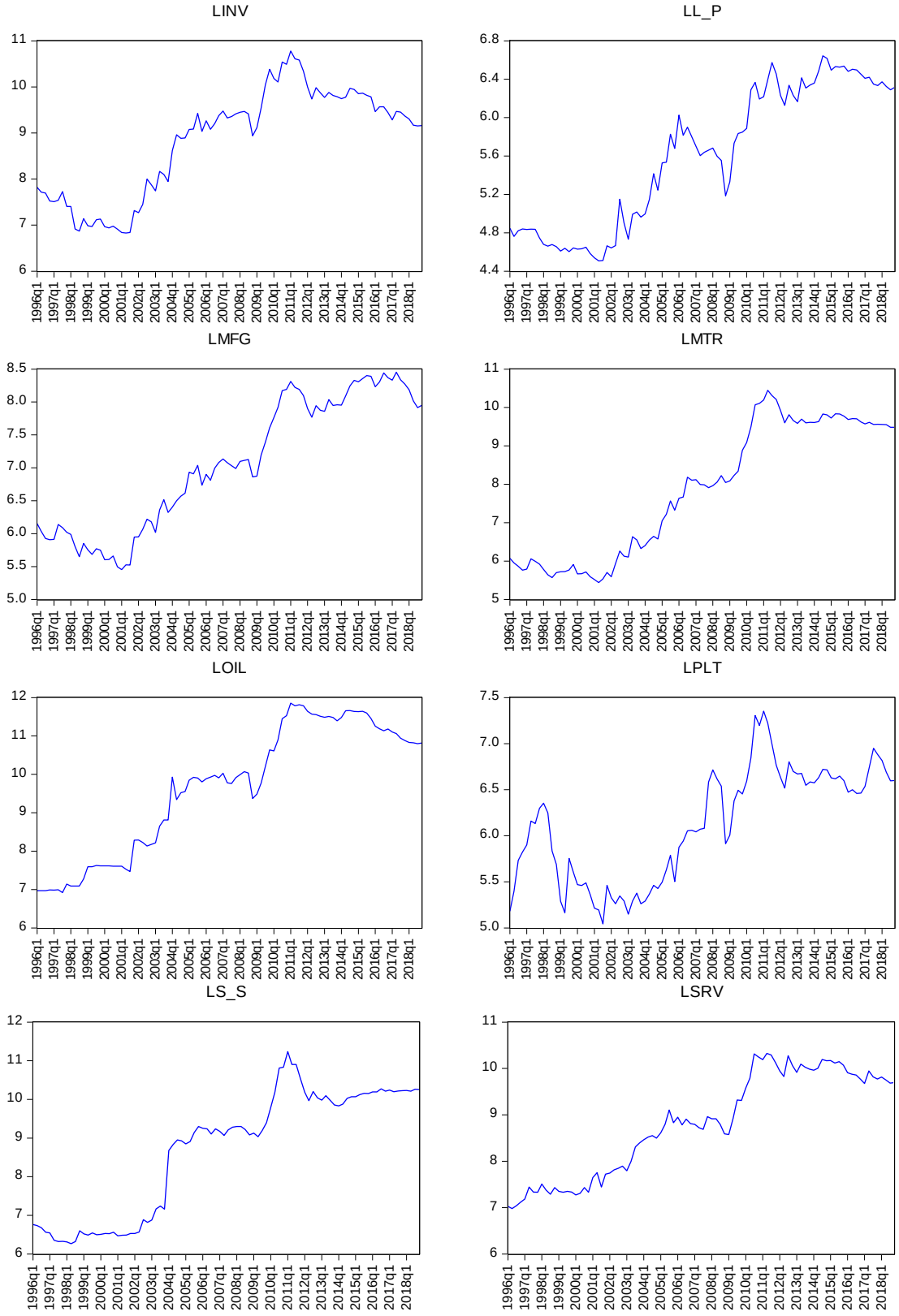

Figure 4.6: Plot of Time-Series data of the dependent variables after adjusting Logarithms – continue

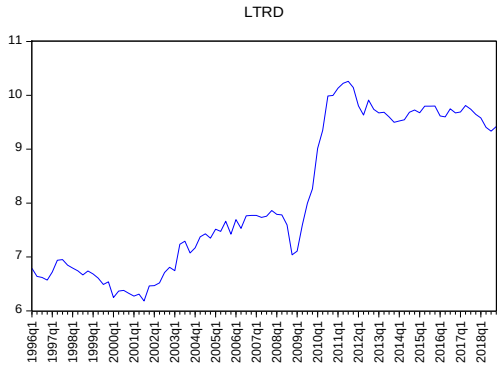

Figure 4.7: Plot of Time-Series data of the dependent variables after adjusting Logarithms - continue

4.4.2 Temporal Variability of Independent variables after adjusting Logarithms

Figure 4.4 shows the temporal variability of logarithm transformed independent variables. All macroeconomic variables follow increasing trend during the sample period. Though, Oil price was increasing during the sample period, it has higher volatility compared to other independent variables. Other variables have smooth increasing trend over time.

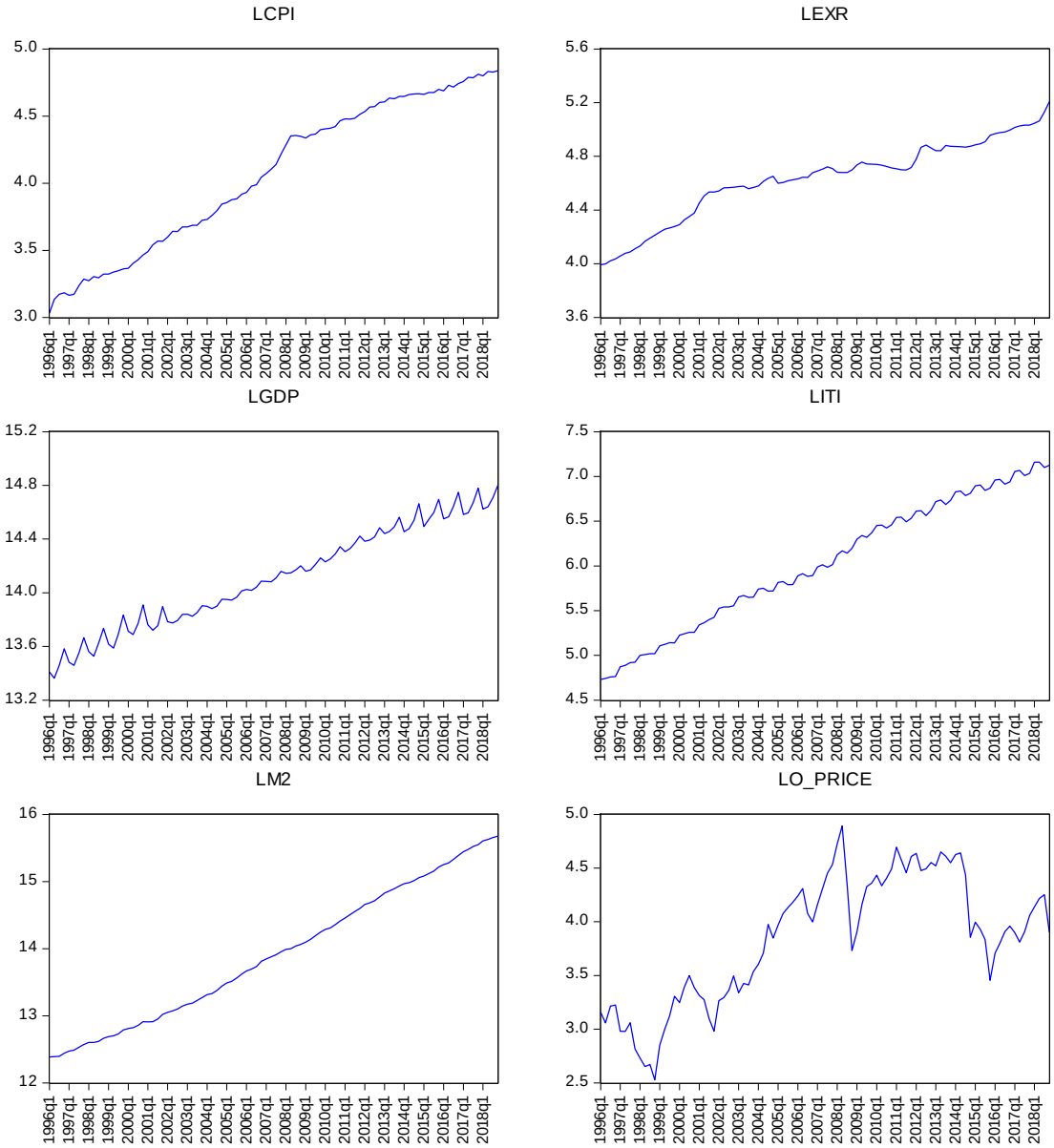

Figure 4.8: Plot of Time-Series data of independent variables after adjusting Logarithms

4.5 Descriptive Statistics of Log Transformed Data

The descriptive statistics of variables is provided in Table 4.3.

Table 4.3: Proportion of variance in dependent variables

Statistics	Mean	Median	Maximum	Minimum	Std. Dev.	Jarque-Bera	Probability
LASPI	7.66	7.80	8.90	6.00	1.01	9.42	0.01
LBFI	8.45	8.39	9.83	6.62	1.04	8.05	0.02
LBFT	8.17	8.03	10.11	6.20	1.41	9.67	0.01
LC&E	6.65	6.35	8.39	4.86	1.17	10.53	0.01
LC&P	7.88	7.83	9.48	6.44	0.95	8.15	0.02
LDIV	6.35	6.56	7.82	4.52	1.12	9.57	0.01
LF_T	6.09	6.58	7.29	4.27	0.94	12.29	0.00
LH_T	7.06	7.22	8.61	5.26	1.08	9.89	0.01
LINV	8.83	9.24	10.78	6.83	1.17	7.98	0.02
LL_P	5.60	5.68	6.64	4.51	0.73	9.64	0.01
LMFG	7.05	7.03	8.45	5.45	1.00	8.55	0.01
LMTR	7.86	8.02	10.45	5.44	1.72	10.26	0.01
LOIL	9.66	9.92	11.86	6.92	1.67	8.58	0.01
LPLT	6.13	6.20	7.35	5.04	0.62	5.96	0.05
LS&S	8.68	9.20	11.24	6.27	1.61	10.56	0.01
LSRV	8.81	8.82	10.32	6.98	1.10	8.44	0.01
LTRD	8.09	7.71	10.26	6.18	1.38	10.60	0.01

LOIL (9.66) represents the highest mean value and LL&P (5.60) represents the lowest mean. Standard deviation also has stable values in between 0.62 to 1.72. There is no high variance between maximum value and minimum value. All variables are negatively skewed except LBFT, LC&E and LTRD, which have positive skewness. LF&T is the only distribution that skewed moderately. Moreover, other all variables are distributed near to zero value; therefore, it is called approximately symmetric. All variables have less than three value (<3) for kurtosis measurement. Thus, it can be concluded that all variables are Platykurtic.

Jarque-Bera statistic test, which has the null hypothesis as data follow normal distribution is used to examine the normality of each selected variable. The results of Jarque-Bera tests rejected the null hypotheses that series are normally distributed, as the respective P-values are less than 0.05.Therefore, it can be concluded with 95% confidence that data do not follow normal distribution. Descriptive statistics of dependent variables are shown in Table 4.4.

Table 4.4: Descriptive statistics for the independent variables

Statistics	LCPI	LEXR	LGDP	LIR	LMS	LICOP
Mean	4.07	4.63	14.11	6.03	13.92	3.84
Median	4.12	4.68	14.10	6.00	13.89	3.91
Maximum	4.84	5.21	14.80	7.16	15.68	4.89
Minimum	3.03	3.99	13.36	4.73	12.38	2.53
Std. Dev.	0.56	0.29	0.38	0.73	1.01	0.60
Skewness	-0.22	-0.55	-0.01	-0.14	0.13	-0.30
Kurtosis	1.59	2.62	1.88	1.77	1.72	2.00
Jarque-Bera	8.37	5.11	4.84	6.07	6.51	5.23
Probability	0.02	0.08	0.09	0.05	0.04	0.07

LGDP has the highest mean value of 14.11 and Oil price has the minimum mean value of 3.84. Standard deviation is between on 0.29 to 1.01. All Kurtosis values on macroeconomic variables are less than 3. Hence, it can be concluded that all variables are Platykurtic. All macroeconomic variables, except LMS, have negative skewness. LMS has positive skewness and LEXR has the highest skewness. Jarque-Bera test found that LEXR, LGDP, LICOP follow normal distribution and others not at 5% significant value, as respective p-values are greater and less than 5% significant level, respectively.

4.6 Proportion of Variance after Applying Logarithm

As the result of high variance among the variables, log transformation is done and the proportions of variance on logarithms are shown in Table 4.5.

Table 4.5: Proportion of variance after applying Log transformation to dependent variables

Variable	**Percentage of variance (%)**
LASPI	4.18
LBFI	4.45
LBFT	8.17
LC&E	5.59
LC&P	3.66
LDIV	5.12
LF_T	3.63
LH_T	4.81
LINV	5.59
LL_P	2.19
LMFG	4.07
LMTR	12.15
LOIL	11.44
LPLT	1.56
LS&S	10.65
LSRV	4.97
LTRD	7.77

Table 4.5 indicates that LMTR has the highest percentage of variance of 12.15% and LPLT has the lowest variance of 1.56%. There is no much difference in variance of each variable. Therefore, it can be concluded that data set is stabled at unique platform after transforming to logarithm.

The proportions of variance after applying log transformation on independent variables are shown in Table 4.6.

Table 4.6: Proportion of variance after applying Log transformation to the independent variables

Variable	Percentage of variance (%)
LCPI	12.77
LEXR	3.45
LGDP	6.01
LIR	21.57
LMS	41.73
LOP	14.48

LMS has the highest percentage of variance and LEXR has the lowest variance of 41.73% and 3.45%, respectively. There is no high difference in variance between variables. Therefore, it can be concluded that data set is stabled at unique platform after transforming to logarithm.

4.7 Test for Stationary

The two methods are used to test stationary. They are correlograms and unit root tests. Correlograms are graphical presentation, which describe stationary of variables. Unit root test is performed using both ADF and PP tests.

4.7.1 Correlograms

Appendices from 1 to 17 display autocorrelation and partial autocorrelation functions up to 12^{th} order of lags of level and first difference of variables. Correlograms mostly used to check randomness of variables.

All lag level correlograms are shown in from 1 to 17 appendices and categorize as (a) and shown on left side. All selected variables indicate that the sample autocorrelation are decreasing when the lag increases and autocorrelations are significantly different from zero. In view of that it can be concluded that original series are not stationary at level. The Ljung-Box Q-statistics and their p-values are reported in last two columns. According to the results of correlogram level`s Q-statistics up to lag 12, it is found that series have autocorrelation.

Correlograms of first differences are shown in Appendices 1 to 17 and categorize as (b) and shown on right size. All selected macroeconomics variables have homogeneous characteristics in each correlogram. Autocorrelation values indicate approximately near value to zero. Therefore, it can be concluded that the original series are stationary at first difference.

4.7.2 Results of Unit Root Tests

The unit root test examines stationary of a time series. It is the first step in performing empirical analysis. Though, there are several methods to check unit root of a series, since ADF test and PP test most popular methods, those two are selected. The null hypothesis of both tests is that the 'Series contains a unit root'. The results of unit root tests on level and first difference of logarithm data with intercept, and with trend & intercept using ADF and PP tests are shown in Table 4.7 and 4.8, respectively.

Table 4.7: The Results of Unit Root Tests using Augmented Dickey-Fuller Test

Variable	Level		1st difference		Order of Integration
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	
LASPI	-0.71	-1.81	-8.96*	-8.91*	I(1)
LBFI	-0.46	-2.61	-8.93*	-8.88*	I(1)
LBFT	-0.31	-1.85	-9.06*	-9.01*	I(1)
LC&E	-1.26	-1.25	-8.05*	-8.07*	I(1)
LC&P	-1.06	-1.29	-9.98*	-9.96*	I(1)
LDIV	-1.15	-1.58	-9.11*	-9.12*	I(1)
LF_T	-0.86	-1.67	-9.36*	-9.30*	I(1)
LH_T	-1.03	-1.18	-9.43*	-9.43*	I(1)
LINV	-1.06	-1.03	-9.39*	-9.39*	I(1)
LL_P	-0.98	-2.56	-3.94*	-3.92*	I(1)
LMFG	-0.66	-2.01	-8.96*	-8.92*	I(1)
LMTR	-0.59	-2	-1.82	-1.92	I(2)
LOIL	-1.52	-1.54	-7.39*	-7.39*	I(1)
LPLT	-1.78	-2.17	-8.60*	-8.56*	I(1)
LS&S	-0.82	-1.98	-5.12*	-5.11*	I(1)
LSRV	-1.42	-1.28	-9.91*	-10.01*	I(1)
LTRD	-1.12	-3.01	-4.78*	-4.76*	I(1)
LCPI	-1.37	-0.21	-2.70*	-3.51*	I(1)
LGDP	-1.27	-1.99	-4.79*	-4.93*	I(1)
LMS	1.53	-3.53*	-3.00*	-3.39*	I(1)
LIR	-2.02	-1.92	-2.87*	-3.81*	I(1)
LEXR	-0.8	-2.12	-5.34*	-5.26*	I(1)
LOP	-1.48	-0.79	-9.96*	-10.11*	I(1)

* indicates significant at 1% level

Table 4.8: The Results of Unit Root Tests using Phillips-Perron Test

Variable	Level		1st difference		Order of integration
	Intercept	Trend &Intercept	Intercept	Trend & Intercept	
LASPI	-0.75	-2.09	-8.96*	-8.92*	I(1)
LBFI	-0.52	-2.77	-8.93*	-8.88*	I(1)
LBFT	-0.31	-1.92	-9.06*	-9.01*	I(1)
LC&E	-1.17	-1.29	-8.07*	-8.09*	I(1)
LC&P	-1.08	-1.49	-9.97*	-9.95*	I(1)
LDIV	-1.15	-1.77	-9.11*	-9.12*	I(1)
LF_T	-0.92	-1.85	-9.37*	-9.32*	I(1)
LH_T	-1.05	-1.47	-9.45*	-9.45*	I(1)
LINV	-1.05	-1.07	-9.39*	-9.39*	I(1)
LL_P	-0.87	-2.49	-10.94*	-10.88*	I(1)
LMFG	-0.71	-2.33	-8.98*	-8.93*	I(1)
LMTR	-0.72	-1.71	-8.63*	-8.59*	I(1)
LOIL	-1.63	-1.75	-7.95*	-7.98*	I(1)
LPLT	-1.84	-2.36	-8.58*	-8.54*	I(1)
LS&S	-0.94	-1.82	-8.42*	-8.38*	I(1)
LSRV	-1.43	-1.28	-9.91*	-10.03*	I(1)
LTRD	-0.91	-2.21	-7.67*	-7.63*	I(1)
LCPI	-2.13	-0.71	-9.33*	-9.49*	I(1)
LGDP	-0.46	-8.15*	-18.28*	-18.31*	I(1)
LMS	2.30	-3.29*	-7.93*	-8.07*	I(1)
LIR	-1.83	-3.36*	-12.09*	-13.85*	I(1)
LEXR	-1.05	-1.85	-4.60*	-4.53*	I(1)
LOP	-1.49	-0.77	-9.95*	-10.11*	I(1)

* indicates significant at 1% level

The results of both ADF and PP tests reveal that all variables are non-stationary at level. PP test found that first differences of all variables are stationary at 1% significant level. Similarly, ADF test also found that first differences of all variables are stationary, except for LMTR, at 1% significant level. Though, according to ADF test, LMTR is not stationary, since, it is stationary at first difference using PP test; it is assumed that LMTR is stationary at first difference. Therefore, it can be concluded that all variables have unit root properties, are stationary at first difference I(*1*) variables.

As all variables have unit root ad integrated at same level, first order of integration, cointegration test is the most appropriate test to find the long term relationship between macroeconomic variables and stock market indices.

4.8 Summary of Chapter 4

ASPI and most of the sector indices; BFI, BFT, H_T, INV, L_P, MTR, OIL, S&S, SRV, and TRD shown downward trend from 1996 to 2000, from 2001 to 2007 those indices shown upward trend and, again during 2008 – 2009 period those indices were dropping. After end of the war (Q2:2009) all indices, including above explained indices were increased till Q2:2011. Most of the indices remained flat after 2011 till the end of the sample period. All macroeconomic variables show upward trend during the sample period, except for ICOP, which shows high volatility with a marginal upward trend. All the series significantly deviated from normal distribution. All series have unit root at level and are stationary at the first difference; hence, they are integrated at first order. Therefore, cointegration test is selected as method of empirical analysis.

CHAPTER 5

IMPACT OF MACROECONOMIC VARIABLES ON STOCK MARKET RETURNS AND SECTOR RETURNS

This chapter describes the empirical results on the long term impact of macroeconomic variables on stock market returns and sector returns using the results of Johansen cointegration tests. Further, VECM is also applied to find the short term dynamics of macroeconomic variables on stock market and sector returns, when those are cointegrated.

5.1 The Relationship between Macroeconomic Variables and ASPI

Six information criteria are used to find the most appropriate lag length to perform cointegration tests. The results of the maximum lag length criteria are reported in Table 5.1.

Table 5.1: The Maximum Lag Length of Macroeconomic Variables and ASPI

Lag	LogL	LR	FPE	AIC	SC	HQ
0	319.832	NA	0.000	-7.110	-6.913	-7.030
1	1159.135	1526.007	0.000	-25.071	-23.495*	-24.436
2	1240.616	135.184	0.000	-25.809	-22.854	-24.619
3	1323.818	124.804	0.000	-26.587	-22.251	-24.840
4	1487.535	219.529*	0.000*	-29.194*	-23.479	-26.892*

Based on the results in Table 5.1, the results of LR, FPE, AIC and HQ indicate maximum lag length as four. While SC selected lag one. More criteria selected lag four as maximum lag length and it used to perform the Johansen cointegration test.

5.1.1 Cointegration between Macroeconomic Variables and ASPI

Cointegration test is performed with ASPI and macroeconomics variables, and is reported in Table 5.2.

Table 5.2: The Results Johansen Cointegration Test on Macroeconomic Variables and ASPI

H_0:	H_1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	177.050	125.615	Reject H_0
r <= 1	r > 1	125.957	95.754	Reject H_0
r <= 2	r > 2	88.909	69.819	Reject H_0
r <= 3	r > 3	54.798	47.856	Reject H_0
r <= 4	r > 4	33.072	29.797	Reject H_0
r <= 5	r > 5	14.680	15.495	Do not Reject H_0
λ-max Test				
r = 0	r = 1	51.093	46.231	Reject H_0
r = 1	r = 2	37.048	40.078	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration.

The Cointegration test uses Trace statistic and maximum Eigen value to find the number of cointegration equations. According to trace statistic, null hypotheses of that there is no, at most one, two, three and four cointegration equation/s are rejected at 5% significance level (P<0.05). However, trace statistic accept the null hypothesis there are five cointegration equations at 5% significant level (P>0.05). Therefore, it can be concluded with 95% confidence under trace statistic that there are five cointegration equations.

Maximum Eigen value rejected the null hypothesis that there is no cointegration equation at 5% significant level (P<0.05). In contrast, maximum Eigen value accepted the null hypothesis that there is one cointegration equation at 5% significant level (P>0.05). Therefore, it can be concluded with 95% confidence that there is one cointegration equation under maximum Eigen value.

Trace statistic found at most five cointegration equations, meanwhile, maximum Eigen value found one cointegration equations. Therefore, it can be concluded that macroeconomic variables and ASPI are co-integrated in the long term and has one cointegration equation.

5.1.2 Long Term Relationship between Macroeconomic variables and ASPI

The results of cointegration equation are shown in Table 5.3.

Table 5.3: Cointegration Equation on Macroeconomic Variables and ASPI

Variables	β′	Standard error	t-stat	Decision
Inflation	-2.493	2.959	0.842	Do not Reject H_0
Exchange rate	1.946	1.804	-1.079	Do not Reject H_0
Economic growth	-8.079	4.020	2.009	Reject H_0
Interest rate	8.277	3.684	-2.247	Reject H_0
Money supply	-0.792	1.194	0.663	Do not Reject H_0
Oil Price	-0.535	0.400	1.337	Do not Reject H_0

The results indicate that economic growth and interest rate are significantly different from zero. The results confirmed that, in the long term, interest rate has significant positive relationship, while economic growth has significant negative relationship, with ASPI. Inflation, exchange rate, money supply and international crude oil price have no significant relationship with ASPI in the long term. Based on the results in Table 5.3, the fitted model can be written as:

$$\text{ASPI}_{t-1} = 85.886 - (2.493 * \text{Inflation}_{t-1}) + (1.946 * \text{exchange rate}_{t-1}) - (8.079 * \text{economic growth rate}_{t-1}) + (8.277 * \text{interest rate}_{t-1}) - (0.792 * \text{money supply}_{t-1}) - (0.535 * \text{oil price}_{t}) + e_{t-1} \quad (5.1)$$

5.1.3 The Results of VECM on Macroeconomic Variables and ASPI

VECM was performed; as macroeconomic variables and stock market return are cointegrated. The results of VECM and Error correction term (ECT) (C1) are shown in Table 5.4.

Table 5.4: The Results of VECM on Macroeconomic Variables and ASPI

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.088	0.032	-2.761	0.008
D(LASPI) lag 1	C(2)	0.107	0.135	0.79	0.433
D(LASPI) lag 2	C(3)	-0.077	0.146	-0.527	0.6
D(LASPI) lag 3	C(4)	0.236	0.14	1.686	0.097
D(LASPI) lag 4	C(5)	0.008	0.139	0.056	0.955
D(LCPI) lag 1	C(6)	0.383	1.019	0.376	0.709
D(LCPI) lag 2	C(7)	-0.957	1.049	-0.912	0.366
D(LCPI) lag 3	C(8)	-1.235	1.059	-1.166	0.248
D(LCPI) lag 4	C(9)	1.277	0.874	1.461	0.15
D(LEXR) lag 1	C(10)	0.517	0.97	0.533	0.596

D(LEXR) lag 2	C(11)	-1.118	1.12	-0.999	0.322
D(LEXR) lag 3	C(12)	3.204	1.118	2.866	0.006
D(LEXR) lag 4	C(13)	-1.518	0.911	-1.666	0.101
D(LGDP) lag 1	C(14)	1.467	0.97	1.512	0.136
D(LGDP) lag 2	C(15)	1.143	0.961	1.189	0.239
D(LGDP) lag 3	C(16)	0.631	0.899	0.702	0.486
D(LGDP) lag 4	C(17)	0.73	0.865	0.843	0.403
D(LIR) lag 1	C(18)	0.847	0.731	1.159	0.251
D(LIR) lag 2	C(19)	0.926	0.711	1.302	0.198
D(LIR) lag 3	C(20)	0.322	0.752	0.428	0.67
D(LIR) lag 4	C(21)	0.372	0.686	0.543	0.59
D(LMS) lag 1	C(22)	-1.431	1.392	-1.028	0.308
D(LMS) lag 2	C(23)	2.306	1.404	1.643	0.106
D(LMS) lag 3	C(24)	-0.561	1.433	-0.391	0.697
D(LMS) lag 4	C(25)	1.954	1.36	1.437	0.156
D(LICOP) lag 1	C(26)	-0.041	0.112	-0.368	0.714
D(LICOP) lag 2	C(27)	-0.052	0.113	-0.465	0.644
D(LICOP) lag 3	C(28)	0.006	0.106	0.056	0.956
D(LICOP) lag 4	C(29)	-0.078	0.099	-0.788	0.434
C	C(30)	-0.19	0.135	-1.41	0.164
R-squared		0.444	Mean dependent var		0.026
Adjusted R-squared		0.161	S.D. dependent var		0.138
S.E. of regression		0.127	Akaike info criterion		-1.026
Sum squared resid		0.916	Schwarz criterion		-0.176
Log likelihood		74.623	Hannan-Quinn criter.		-0.683
F-statistic		1.569	Durbin-Watson stat		2.097
Prob(F-statistic)		0.073			

According to the results of VECM, ECT(-0.088) has the expected negative sign and is significant. Inverse value of absolute ECT is close to 12 (1/0.088=11.36). Accordingly, market participants take 12 quarters to learn and fully adjust the forecasting error.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are represented minimum value. Durbin Watson statistic is 2.097.

F-statistic of the model in not significant (P(F-Stat)>0.05) at 5% level. Insignificant F-statistic provides no sufficient evidence to support that the regression model is better in explaining ASPI than a model with no independent variable. As a result, individual variables in the regression may not also be significant. However, F-statistic is significant at 10% level.

5.1.4 Short Term Relationship between Macroeconomic Variables and ASPI

The results of Wald test are shown in Table 5.5.

Table 5.5: The Results of Wald Test on Macroeconomic Variables and ASPI

Variable	Chi-square value	df	Probability	Decision
Inflation	4.05	4	0.3987	Not Significant
Exchange rate	8.64***	4	0.0708	Not Significant
Economic growth	4.09	4	0.3942	Not Significant
Interest rate	2.56	4	0.6334	Not Significant
Money supply	5.02	4	0.2855	Not Significant
Oil Price	0.97	4	0.9148	Not Significant

Notes: *** denotes significance at 10% level of significance, respectively.

The results of Wald test show that no variable is significant in explaining ASPI in the short term. This finding is similar to the results of F-statistic.

5.2 The Relationship between Macroeconomic Variables and BFI

Maximum lag length of macroeconomic variables and BFI under different information criteria are reported in Table 5.6.

Table 5.6: The Maximum Lag Length of Macroeconomic Variables and BFI

Lag	LogL	LR	FPE	AIC	SC	HQ
0	310.538	NA	0.000	-6.899	-6.702	-6.819
1	1140.962	1509.863	0.000	-24.658	-23.082*	-24.023
2	1223.434	136.828	0.000	-25.419	-22.463	-24.228
3	1304.099	120.998	0.000	-26.139	-21.803	-24.392
4	1444.838	188.718*	0.000*	-28.224*	-22.509	-25.921*

According to SC maximum lag length is one and remaining criteria confirmed that lag four as maximum lag length. Therefore, lag four is selected to perform the cointegration test between macroeconomic variables and BFI.

5.2.1 Cointegration between Macroeconomic Variables and BFI

The results of cointegration test between macroeconomics variables and BFI are reported in Table 5.7.

Table 5.7: The Results of Johansen Cointegration Test on Macroeconomic Variables and BFI

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	174.188	125.615	Reject H_0
r <= 1	r >1	121.004	95.754	Reject H_0
r <= 2	r >2	82.577	69.819	Reject H_0
r <= 3	r >3	49.570	47.856	Reject H_0
r <= 4	r >4	27.767	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	53.184	46.231	Reject H_0
r = 1	r = 2	38.427	40.078	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. R is the order of cointegration

Trace statistics rejected null hypotheses of that there is no, at most one, two and three cointegration equation/s at 5% significance level (P<0.05). Although, first three hypothesis are rejected, Trace statistic accepted the null hypothesis of that there are four cointegration equations at 5% significant level (P>0.05). Therefore, it can be concluded with 95% confidence under Trace statistic that there are four cointegration equations.

Maximum Eigen value rejected the null hypothesis that there is no cointegration equation at 5% significant level (P<0.05) and accepted the null hypothesis that there is one cointegration equation at 5% significant level (P > 0.05). Therefore, it can be concluded with 95% confidence that there is one cointegration equation under maximum Eigen value.

Maximum Eigen value confirmed one cointegration equation, while trace statistic selected four cointegration equations. Therefore, it can be concluded that there is equilibrium long term relationship and one cointegration equation between macroeconomic variables and BFI.

5.2.2 Long term Relationship between Macroeconomic Variables and BFI

As found above, macroeconomic variables have long term cointegration relationship with BFI. The results are reported in Table 5.8.

Table 5.8: Cointegration Equation on Macroeconomic Variables and BFI

Variables	β'	Standard error	t-stat	Decision
Inflation	-6.046	2.493	2.425	Reject H_0
Exchange rate	-2.719	1.545	1.759	Do not Reject H_0
Economic growth	-9.377	3.195	2.935	Reject H_0
Interest rate	13.099	2.970	-4.410	Reject H_0
Money supply	-0.559	1.028	0.544	Do not Reject H_0
Oil Price	-0.419	0.344	1.217	Do not Reject H_0

The results of Table 5.8 indicate that inflation, economic growth and interest rate are significantly different from zero in the long term. Further, inflation and economic growth have significant negative relationship with BFI, while interest rate has significant positive relationship with BFI, in the long term. However exchange rate, money supply and international crude oil price have no significant relationship with BFI in the long term. Based on the results in Table 5.8, the fitted model can be written as:

$$\text{BFI}_{t-1} = 108.328 - (6.046 * \text{Inflation}_{t-1}) - (2.719 * \text{exchange rate}_{t-1}) - (9.377 * \text{economic growth rate}_{t-1}) + (13.099 * \text{interest rate}_{t-1}) - (0.559 * \text{money supply}_{t-1}) + (0.419 * \text{oil price}_{t}) + e_{t-1} \quad (5.2)$$

5.2.3 The Results of VECM on Macroeconomic Variables and BFI

VECM was performed as macroeconomic variables and BFI are cointegrated. The results of VECM and ECT (C1) are shown in Table 5.9.

Table 5.9: The results of VECM on Macroeconomic Variables and BFI

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.089	0.045	-1.979	0.053
D(LASPI) lag 1	C(2)	0.145	0.137	1.056	0.296
D(LASPI) lag 2	C(3)	-0.071	0.154	-0.462	0.646
D(LASPI) lag 3	C(4)	0.186	0.147	1.265	0.211
D(LASPI) lag 4	C(5)	0.042	0.147	0.29	0.773
D(LCPI) lag 1	C(6)	0.714	1.365	0.523	0.603
D(LCPI) lag 2	C(7)	-0.693	1.336	-0.519	0.606
D(LCPI) lag 3	C(8)	-1.454	1.366	-1.064	0.292
D(LCPI) lag 4	C(9)	2.046	1.137	1.8	0.077
D(LEXR) lag 1	C(10)	0.979	1.221	0.802	0.426

D(LEXR) lag 2	C(11)	-1.052	1.426	-0.738	0.464
D(LEXR) lag 3	C(12)	3.47	1.435	2.418	0.019
D(LEXR) lag 4	C(13)	-1.299	1.134	-1.146	0.257
D(LGDP) lag 1	C(14)	0.915	1.196	0.765	0.448
D(LGDP) lag 2	C(15)	0.385	1.17	0.329	0.743
D(LGDP) lag 3	C(16)	-0.105	1.07	-0.098	0.922
D(LGDP) lag 4	C(17)	-0.165	1.017	-0.163	0.871
D(LIR) lag 1	C(18)	1.374	0.944	1.455	0.151
D(LIR) lag 2	C(19)	0.828	0.897	0.924	0.359
D(LIR) lag 3	C(20)	0.881	0.949	0.929	0.357
D(LIR) lag 4	C(21)	0.415	0.876	0.474	0.637
D(LMS) lag 1	C(22)	-1.849	1.693	-1.092	0.28
D(LMS) lag 2	C(23)	3.125	1.712	1.826	0.073
D(LMS) lag 3	C(24)	-0.506	1.78	-0.284	0.777
D(LMS) lag 4	C(25)	3.158	1.672	1.889	0.064
D(LICOP) lag 1	C(26)	-0.096	0.139	-0.688	0.494
D(LICOP) lag 2	C(27)	-0.033	0.14	-0.235	0.815
D(LICOP) lag 3	C(28)	-0.001	0.133	-0.009	0.993
D(LICOP) lag 4	C(29)	-0.062	0.124	-0.5	0.619
C	C(30)	-0.272	0.177	-1.54	0.129
R-squared		0.407	Mean dependent var		0.026
Adjusted R-squared		0.106	S.D. dependent var		0.166
S.E. of regression		0.157	Akaike info criterion		-0.599
Sum squared resid		1.405	Schwarz criterion		0.252
Log likelihood		56.04	Hannan-Quinn criter.		-0.256
F-statistic		1.35	Durbin-Watson stat		2.129
Prob(F-statistic)		0.165			

ECT has the expected negative sign; however, it is not significant at conventional level. As a result, the time taken by the market participants to correct the forecasting error cannot be estimated.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are found to be minimum. Durbin Watson statistic is 2.129.

F-statistic is not significant at 5% level (P(F-stat)>0.05). Therefore, the model does not provide enough evidence to conclude that the regression model is good in explaining BFI. This may lead to insignificant individual variables in the regression.

5.2.4 Short Term Relationship between Macroeconomic Variables and BFI

The results of Wald test are shown in Table 5.10.

Table 5.10: The Results of Wald Test on Macroeconomic Variables and BFI

Variable	Chi-square value	df	Probability	Decision
Inflation	4.25	4	0.3725	Not Significant
Exchange rate	6.49	4	0.1652	Not Significant
Economic growth	3.71	4	0.4456	Not Significant
Interest rate	2.39	4	0.6645	Not Significant
Money supply	7.25	4	0.1231	Not Significant
Oil Price	0.84	4	0.9330	Not Significant

According to the results of Wald test, no variable is significant in explaining BFI in the short term. This is further supported by insignificant F-statistic.

5.3 The Relationship between Macroeconomic Variables and BFT

Lag length criteria is tested on macroeconomic variables and BFT, and are reported in Table 5.11.

Table 5.11: The Maximum Lag Length of Macroeconomic Variables and BFT

Lag	LogL	LR	FPE	AIC	SC	HQ
0	342.740	NA	0.000	-7.630	-7.433	-7.551
1	1164.832	1494.714	0.000	-25.201	-23.624*	-24.566
2	1244.980	132.972	0.000	-25.909	-22.953	-24.718
3	1319.347	111.550	0.000	-26.485	-22.150	-24.739
4	1450.130	175.369*	0.000*	-28.344*	-22.629	-26.042*

SC selected maximum lag length as one and remaining criteria selected lag four as maximum lag length. Accordingly, it can be concluded that lag four is the maximum lag length.

5.3.1 Cointegration between Macroeconomic Variables and BFT

The Johansen cointegration test performed with four lags and the results of cointegration test are reported in Table 5.12.

Table 5.12: The Results of Johansen Cointegration Test on Macroeconomic Variables and BFT

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	175.515	125.615	Reject H_0
r <= 1	r >1	114.985	95.754	Reject H_0
r <= 2	r >2	75.572	69.819	Reject H_0
r <= 3	r >3	48.887	47.856	Reject H_0
r <= 4	r >4	27.330	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	60.529	46.231	Reject H_0
r = 1	r = 2	39.414	40.078	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Trace statistics rejected null hypotheses that there are no, at most one, two and three cointegration equation/s and accepted the null hypothesis that there are four cointegration equations at 5% significant level. Maximum Eigen value rejected null hypothesis that there is no cointegration equation and accepted the null hypothesis that there is one cointegration equation at 5% significance level. Therefore, it can be concluded that there is long term equilibrium relationship and one cointegration equation between macroeconomics variables and BFT.

5.3.2 Long Term Relationship between Macroeconomic Variables and BFT

Johansen cointegration test found that there is long term relationship between macroeconomic variables and BFT and the results are shown in Table 5.13.

Table 5.13: Cointegration Equation on Macroeconomic Variables and BFT

Variables	β′	Standard error	t-statistic	Decision
Inflation	13.096	5.861	-2.235	Reject H_0
Exchange rate	-3.443	3.834	0.898	Do not Reject H_0
Economic growth	16.659	8.934	-1.865	Do not Reject H_0
Interest rate	-26.858	7.113	3.776	Reject H_0
Money supply	6.784	2.613	-2.596	Reject H_0
Oil Price	2.068	0.869	-2.378	Reject H_0

Inflation, money supply and international crude oil price have significant positive relationship, and interest rate has significant negative relationship, with BFT, in the long run. However, exchange rate and economic growth are not significant in explaining relationship between macroeconomic variables and BFT in the long term.

Based on the results in Table 5.13, the fitted model can be written as:

$$\mathrm{BFT}_{t-1} = -204.523 + (13.096 * \mathrm{Inflation}_{t-1}) - (3.443 * \text{exchange rate}_{t-1}) + (16.659 * \text{economic growth rate}_{t-1}) - (26.858 * \text{interest rate}_{t-1}) + (6.784 * \text{money supply}_{t-1}) + (2.068 * \text{oil price}_{t}) + e_{t-1} \quad (5.3)$$

5.3.3 The results of VECM on Macroeconomic Variables and BFT

VECM is used to find the short term relationship between macroeconomic variables and BFT. The results of VECM and ECT (C1) are shown in Table 5.14.

Table 5.14: The results of VECM on Macroeconomic Variables and BFT

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	0.021	0.012	1.795	0.078
D(LASPI) lag 1	C(2)	0.05	0.134	0.37	0.713
D(LASPI) lag 2	C(3)	-0.075	0.149	-0.505	0.615
D(LASPI) lag 3	C(4)	-0.038	0.141	-0.268	0.79
D(LASPI) lag 4	C(5)	-0.036	0.137	-0.261	0.795
D(LCPI) lag 1	C(6)	-0.45	0.927	-0.486	0.629
D(LCPI) lag 2	C(7)	0.167	0.942	0.178	0.86
D(LCPI) lag 3	C(8)	-1.01	0.941	-1.073	0.288
D(LCPI) lag 4	C(9)	1.18	0.805	1.465	0.149
D(LEXR) lag 1	C(10)	0.563	0.812	0.693	0.491
D(LEXR) lag 2	C(11)	-1.179	0.974	-1.21	0.231
D(LEXR) lag 3	C(12)	2.587	0.981	2.638	0.011
D(LEXR) lag 4	C(13)	-0.971	0.815	-1.19	0.239
D(LGDP) lag 1	C(14)	1.082	0.813	1.33	0.189
D(LGDP) lag 2	C(15)	0.521	0.793	0.657	0.514
D(LGDP) lag 3	C(16)	0.33	0.751	0.439	0.663
D(LGDP) lag 4	C(17)	0.467	0.731	0.639	0.526
D(LIR) lag 1	C(18)	1.31	0.649	2.016	0.049
D(LIR) lag 2	C(19)	1.226	0.647	1.895	0.063
D(LIR) lag 3	C(20)	0.399	0.685	0.582	0.563
D(LIR) lag 4	C(21)	1.217	0.651	1.871	0.067
D(LMS) lag 1	C(22)	-1.152	1.281	-0.899	0.372
D(LMS) lag 2	C(23)	2.408	1.291	1.865	0.067
D(LMS) lag 3	C(24)	0.832	1.305	0.638	0.526
D(LMS) lag 4	C(25)	1.999	1.214	1.646	0.105
D(LICOP) lag 1	C(26)	-0.068	0.101	-0.671	0.505
D(LICOP) lag 2	C(27)	0.002	0.1	0.016	0.987
D(LICOP) lag 3	C(28)	0.016	0.095	0.164	0.87
D(LICOP) lag 4	C(29)	-0.042	0.089	-0.469	0.641
C	C(30)	-0.261	0.135	-1.94	0.057
R-squared		0.354	Mean dependent var		0.042
Adjusted R-squared		0.026	S.D. dependent var		0.115
S.E. of regression		0.114	Akaike info criterion		-1.243
Sum squared resid		0.737	Schwarz criterion		-0.393

Log likelihood	84.08	Hannan-Quinn criter.	-0.901
F-statistic	1.078	Durbin-Watson stat	2.17
Prob(F-statistic)	0.395		

ECT does not have the expected negative sign and is not significant at 5% level. Therefore, the time taken by the market participants to correct the forecasting error cannot be estimated.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are represented minimum value. Durbin Watson statistic is 2.1698.

Since F-statistic is not significant (P(F-stat)>0.05), the regression model is no better model than a model with only constant. This may lead to not significant individual variables in the fitted model.

5.3.4 Short Term Relationship between Macroeconomic Variables and BFT

The results of Wald test are shown in Table 5.15.

Table 5.15: The Results of Wald Test on Macroeconomic Variables and BFT

Variable	Chi-square value	df	Probability	Decision
Inflation	3.92	4	0.4172	Not Significant
Exchange rate	7.10	4	0.1306	Not Significant
Economic growth	3.73	4	0.4431	Not Significant
Interest rate	7.84	4	0.0976***	Not Significant
Money supply	8.50	4	0.0748***	Not Significant
Oil Price	0.72	4	0.9489	Not Significant

Notes: *** denotes significance at10% level of significance.

The results of Wald Test found that interest rate and money supply are significant in explaining BFT at 10% significant level. Inflation, exchange rate, economic growth and international crude oil price have no significant relationship with BFT in the short term. Similar to the findings of F-statistic, no variable is significant at 5% in explaining BFT in the short term.

5.4 The Relationship between Macroeconomic Variables and C&E

The findings of maximum lag length criteria between macroeconomic variables and C&E are shown in Table 5.16.

Table 5.16: The Maximum Lag Length of Macroeconomic Variables and C&E

Lag	LogL	LR	FPE	AIC	SC	HQ
0	300.989	NA	0.000	-6.682	-6.485	-6.602
1	1127.840	1503.366	0.000	-24.360	-22.784*	-23.725
2	1205.188	128.327	0.000	-25.004	-22.048	-23.813
3	1279.129	110.912	0.000	-25.571	-21.236	-23.825
4	1404.024	167.473*	0.000*	-27.296*	-21.581	-24.994*

SC selected one maximum lag length and other criteria selected lag four as maximum lag length. Lag four is taken as most appropriate maximum lag length.

5.4.1 Cointegration between Macroeconomic Variables and C&E

The results of cointegration test between Macroeconomic Variables and C&E are reported in Table 5.17.

Table 5.17: The Results of Johansen Cointegration Test on Macroeconomic Variables and C&E

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	185.628	125.615	Reject H_0
r <= 1	r >1	119.151	95.754	Reject H_0
r <= 2	r >2	74.710	69.819	Reject H_0
r <= 3	r >3	48.534	47.856	Reject H_0
r <= 4	r >4	25.232	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	66.477	46.231	Reject H_0
r = 1	r = 2	44.441	40.078	Reject H_0
r = 2	r = 3	26.176	33.877	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Johansen cointegration test is performed using four lags, accordingly, null hypotheses that there is/are no, at most one, two and three cointegration equations are rejected while confirming the null hypothesis that there are four cointegration equations at 5% significance level with trace statistics.

Maximum Eigen value confirmed two cointegration equations while rejecting the null hypothesis that there is no and one cointegration equation at 5% significance

level. Therefore, it can be concluded that there is equilibrium long term relationship and two cointegration equations between macroeconomic variables and C&E.

5.4.2 Long Term Relationship between Macroeconomic Variables and C&E

Long term cointegration equation on macroeconomic variables and C&E is given in Table 5.18.

Table 5.18: Cointegration Equation on Macroeconomic Variables and C&E

Variables	β′	Standard error	t-statistic	Decision
Inflation	-10.415	2.857	3.645	Reject H_0
Exchange rate	-11.119	1.842	6.038	Reject H_0
Economic growth	-6.556	3.774	1.737	Do not Reject H_0
Interest rate	24.619	3.251	-7.573	Reject H_0
Money supply	-4.899	1.244	3.937	Reject H_0
Oil Price	-0.730	0.417	1.753	Do not Reject H_0

Table 5.18 deduced that inflation, exchange rate and money supply have significant negative relationship while interest rate has significant positive relationship with C&E in the long term. In contrast, economic growth and international crude oil price are not significant in explaining C&E in the long term. Based on the results in Table 5.18, the fitted model can be written as:

$$\text{C\&E}_{t-1} = -115.541 - (10.415 * \text{Inflation}_{t-1}) - (11.119 * \text{exchange rate}_{t-1}) - (6.556 * \text{economic growth rate}_{t-1}) + (24.619 * \text{interest rate}_{t-1}) - (4.899 * \text{money supply}_{t-1}) + (0.730 * \text{oil price}_{t}) + e_{t-1} \quad (5.4)$$

5.4.3 The Results of VECM on Macroeconomic Variables and C&E

VECM is used to find the short term relationship between macroeconomic variables and C&E. The Results of VECM and ECT (C1) are shown in Table 5.19.

Table 5.19: The Results of on Macroeconomic Variables and C&E

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	0.000	0.036	0.003	0.998
D(LASPI) lag 1	C(2)	0.154	0.14	1.097	0.277
D(LASPI) lag 2	C(3)	-0.083	0.139	-0.598	0.552
D(LASPI) lag 3	C(4)	0.152	0.138	1.102	0.275
D(LASPI) lag 4	C(5)	-0.064	0.135	-0.477	0.635
D(LCPI) lag 1	C(6)	1.623	1.563	1.038	0.304
D(LCPI) lag 2	C(7)	-0.227	1.524	-0.149	0.882
D(LCPI) lag 3	C(8)	-0.422	1.572	-0.268	0.789

D(LCPI) lag 4	C(9)	1.602	1.33	1.205	0.233
D(LEXR) lag 1	C(10)	1.361	1.329	1.025	0.31
D(LEXR) lag 2	C(11)	-1.623	1.566	-1.036	0.304
D(LEXR) lag 3	C(12)	3.928	1.558	2.521	0.015
D(LEXR) lag 4	C(13)	-2.962	1.324	-2.236	0.029
D(LGDP) lag 1	C(14)	-0.946	1.107	-0.855	0.396
D(LGDP) lag 2	C(15)	-1.071	1.093	-0.98	0.331
D(LGDP) lag 3	C(16)	-0.739	1.049	-0.705	0.484
D(LGDP) lag 4	C(17)	-0.628	1.034	-0.608	0.546
D(LIR) lag 1	C(18)	1.344	1.128	1.191	0.238
D(LIR) lag 2	C(19)	1.149	1.061	1.082	0.284
D(LIR) lag 3	C(20)	1.388	1.109	1.252	0.216
D(LIR) lag 4	C(21)	0.844	1.106	0.763	0.449
D(LMS) lag 1	C(22)	0.676	1.894	0.357	0.723
D(LMS) lag 2	C(23)	1.502	1.871	0.803	0.426
D(LMS) lag 3	C(24)	-1.889	1.939	-0.974	0.334
D(LMS) lag 4	C(25)	1.396	1.97	0.709	0.482
D(LICOP) lag 1	C(26)	0.125	0.157	0.794	0.43
D(LICOP) lag 2	C(27)	-0.114	0.157	-0.722	0.473
D(LICOP) lag 3	C(28)	-0.035	0.149	-0.237	0.813
D(LICOP) lag 4	C(29)	-0.222	0.141	-1.578	0.12
C	C(30)	-0.184	0.229	-0.806	0.423
R-squared		0.39	Mean dependent var		0.02
Adjusted R-squared		0.08	S.D. dependent var		0.187
S.E. of regression		0.179	Akaike info criterion		-0.335
Sum squared resid		1.829	Schwarz criterion		0.516
Log likelihood		44.557	Hannan-Quinn criter.		0.008
F-statistic		1.258	Durbin-Watson stat		2.04
Prob(F-statistic)		0.226			

According to the VECM, ECT has no expected negative sign. Thus, the time taken by the market participants to correct the forecasting error cannot be reliably estimated. Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are illustrated minimum value. Durbin Watson statistic is 2.04.Fitted model is no better model than a model with no independent variable, as F-statistic is not significant (P(F-stat)>0.05). This shows that the fitted model is not significant in the short term, and the regression variables may not be significant in explaining C&E.

5.4.4 Short Term Relationship between Macroeconomic Variables and C&E

The results of Wald test are shown in Table 5.20.

Table 5.20: The Results of Wald Test on Macroeconomic Variables and C&E

Variable	Chi-square value	df	Probability	Decision
Inflation	1.99	4	0.7359	Not Significant
Exchange rate	8.39	4	0.0781***	Not Significant
Economic growth	1.11	4	0.8920	Not Significant
Interest rate	2.04	4	0.7291	Not Significant
Money supply	1.97	4	0.7405	Not Significant
Oil Price	3.54	4	0.4719	Not Significant

Notes: *** denotes significance at 10% level of significance.

No variable has significant relationship with C&E at 5% level in the short term. Findings of F-statistic support the results of Walt test. Nevertheless, exchange rate has short term relationship with C&E at 10% significance level.

5.5 The Relationship between Macroeconomic Variables and C&P

The results of maximum lag length criteria of macroeconomic variables and C&P are shown in Table 5.21.

Table 5.21: The Maximum Lag Length of Macroeconomic Variables and C&P

Lag	LogL	LR	FPE	AIC	SC	HQ
0	315.783	NA	0.000	-7.018	-6.821	-6.938
1	1148.286	1513.642	0.000	-24.825	-23.248*	-24.190
2	1223.876	125.410	0.000	-25.429	-22.473	-24.238
3	1297.418	110.314	0.000	-25.987	-21.651	-24.240
4	1423.698	169.330*	0.000*	-27.743*	-22.028	-25.441*

SC recommended lag one and remaining criteria confirmed lag four as maximum lag length. Therefore, it can be concluded that lag four as maximum lag length.

5.5.1 Cointegration between Macroeconomic Variables and C&P

The results of Johansen cointegration test on macroeconomic variables and C&P is reported in Table 5.22.

Table 5.22: The Results of Johansen cointegration Test on Macroeconomic Variables and C&P

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	173.341	125.615	Reject H_0
r <= 1	r >1	122.226	95.754	Reject H_0
r <= 2	r >2	75.648	69.819	Reject H_0
r <= 3	r >3	46.905	47.856	Do not Reject H_0
λ-max Test				
r = 0	r = 1	51.115	46.231	Reject H_0
r = 1	r = 2	46.577	40.078	Reject H_0
r = 2	r = 3	28.744	33.877	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Trace statistics rejected null hypotheses that there is/are no, at most one and two cointegration equation/s and the null hypothesis that there are three cointegration equations is accepted at 5% significance level. The maximum Eigen value accepted the null hypothesis that there are two cointegration equations while rejected null hypotheses that there is no and one cointegration equation at 5% significance level.
As the result, it can be concluded that there is equilibrium long term relationship and two cointegration equations between macroeconomic variables and C&P.

5.5.2 Long Term Relationship between Macroeconomic Variables and C&P

Cointegration test found long term relationship between macroeconomic variables and C&P. The test results are shown in Table 5.23.

Table 5.23: Cointegration Equation on Macroeconomic Variables and C&P

Variables	β′	Standard error	t-statistic	Decision
Inflation	-4.877	1.192	4.092	Reject H_0
Exchange rate	-5.802	0.793	7.321	Reject H_0
Economic growth	-4.214	1.581	2.666	Reject H_0
Interest rate	11.525	1.511	-7.627	Reject H_0
Money supply	-1.589	0.568	2.796	Reject H_0
Oil Price	0.157	0.174	-0.904	Do not Reject H_0

Inflation, exchange rate, economic growth and money supply have significant negative relationship, while interest rate has significant positive relationship in explaining C&P in the long term. Moreover, international crude oil price has no

significant relationship with C&P. Based on the results in Table 5.23, the fitted model can be written as:

$$C\&P_{t-1} = 66.077 - (4.877 * \text{Inflation}_{t-1}) - (5.802 * \text{exchange rate}_{t-1}) - (4.214 * \text{economic growth rate}_{t-1}) + (11.525 * \text{interest rate}_{t-1}) - (1.589 * \text{money supply}_{t-1}) + (0.157 * \text{oil price}_{t}) + e_{t-1} \quad (5.5)$$

5.5.3 The Results of VECM on Macroeconomic Variables and C&P

VECM is used to find the short term relationship between macroeconomic variables and C&P, as the selected variables are cointegrated. The Results of VECM and ECT (C1) are shown in Table 5.24.

Table 5.24: VECM results on Macroeconomic Variables and C&P

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.028	0.086	-0.32	0.75
D(LASPI) lag 1	C(2)	-0.033	0.142	-0.23	0.819
D(LASPI) lag 2	C(3)	0.017	0.136	0.123	0.902
D(LASPI) lag 3	C(4)	0.243	0.133	1.825	0.073
D(LASPI) lag 4	C(5)	0.153	0.136	1.129	0.264
D(LCPI) lag 1	C(6)	0.158	1.424	0.111	0.912
D(LCPI) lag 2	C(7)	0.116	1.313	0.088	0.93
D(LCPI) lag 3	C(8)	-1.522	1.414	-1.076	0.286
D(LCPI) lag 4	C(9)	-0.286	1.186	-0.241	0.811
D(LEXR) lag 1	C(10)	0.722	1.116	0.647	0.52
D(LEXR) lag 2	C(11)	-1.019	1.346	-0.757	0.452
D(LEXR) lag 3	C(12)	2.323	1.31	1.773	0.082
D(LEXR) lag 4	C(13)	-1.704	1.087	-1.568	0.123
D(LGDP) lag 1	C(14)	-0.558	1.016	-0.549	0.585
D(LGDP) lag 2	C(15)	-0.794	0.963	-0.824	0.413
D(LGDP) lag 3	C(16)	-0.875	0.918	-0.953	0.345
D(LGDP) lag 4	C(17)	-0.831	0.893	-0.931	0.356
D(LIR) lag 1	C(18)	1.26	1.027	1.227	0.225
D(LIR) lag 2	C(19)	1.034	0.882	1.172	0.246
D(LIR) lag 3	C(20)	0.679	0.855	0.794	0.431
D(LIR) lag 4	C(21)	0.549	0.81	0.678	0.501
D(LMS) lag 1	C(22)	-1.863	1.745	-1.068	0.29
D(LMS) lag 2	C(23)	1.661	1.629	1.02	0.312
D(LMS) lag 3	C(24)	-1.931	1.669	-1.157	0.252
D(LMS) lag 4	C(25)	1.11	1.631	0.68	0.499
D(LICOP) lag 1	C(26)	-0.056	0.132	-0.424	0.673
D(LICOP) lag 2	C(27)	0.083	0.137	0.607	0.547
D(LICOP) lag 3	C(28)	-0.058	0.13	-0.449	0.655
D(LICOP) lag 4	C(29)	-0.016	0.123	-0.127	0.9
C	C(30)	0.023	0.2	0.117	0.907
R-squared		0.327	Mean dependent var		0.02
Adjusted R-squared		-0.016	S.D. dependent var		0.15
S.E. of regression		0.151	Akaike info criterion		-0.676

Sum squared resid	1.3	Schwarz criterion	0.174
Log likelihood	59.406	Hannan-Quinn criter.	-0.334
F-statistic	0.955	Durbin-Watson stat	2.03
Prob(F-statistic)	0.543		

ECT has expected negative sign; however, it is not significant. Therefore, the time taken by the market participants to correct the forecasting error cannot reliably be estimated.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are illustrated minimum value. Durbin Watson is 2.03.bThe short term regression model is not a better model than a model with no exogenous variable, as F-statistic is not significant (P(F-stat)>0.05). As a result, t-statistic on each independent variable may not also be significant.

5.5.4 Short Term Relationship between Macroeconomic Variables and C&P

The results of Wald test are shown in Table 5.25.

Table 5.25: Wald Test results on Macroeconomic Variables and C&P

Variable	Chi-square value	df	Probability	Decision
Inflation	1.31	4	0.8598	Not Significant
Exchange rate	4.15	4	0.3861	Not Significant
Economic growth	1.46	4	0.8338	Not Significant
Interest rate	2.04	4	0.7277	Not Significant
Money supply	2.87	4	0.5802	Not Significant
Oil Price	0.67	4	0.9551	Not Significant

Wald test results indicate that no variable is significant in explaining C&P in the short term. Therefore, it is concluded that there is no short term relationship between any macroeconomic variables and C&P. The findings of Wald test are similar to the finding of F-statistic.

5.6 The Relationship between Macroeconomic Variables and DIV

The results of the maximum lag length of macroeconomic variables and DIV are reported in Table 5.26.

Table 5.26: The Maximum Lag Length of Macroeconomic Variables and DIV

Lag	LogL	LR	FPE	AIC	SC	HQ
0	301.858	NA	0.000	-6.701	-6.504	-6.622
1	1137.814	1519.921	0.000	-24.587	-23.010	-23.952
2	1220.495	137.175	0.000	-25.352	-22.396	-24.161
3	1305.526	127.547	0.000	-26.171	-21.836	-24.424
4	1481.044	235.353*	0.000*	-29.046*	-23.332*	-26.744*

All criteria selected lag four as maximum lag length. As a result, Lag four considered as the most appropriate lag length and selected to perform Johansen Cointegration test.

5.6.1 Cointegration between Macroeconomic Variables and DIV

Cointegration test is performed between macroeconomics variables and DIV, and is reported in Table 5.27.

Table 5.27: The Results of Johansen Cointegration Test on Macroeconomic Variables and DIV

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	177.364	125.615	Reject H_0
r <= 1	r >1	125.409	95.754	Reject H_0
r <= 2	r >2	82.186	69.819	Reject H_0
r <= 3	r >3	48.989	47.856	Reject H_0
r <= 4	r >4	26.873	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	51.955	46.231	Reject H_0
r = 1	r = 2	43.223	40.078	Reject H_0
r = 2	r = 3	33.197	33.877	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

According to trace statistics, null hypotheses of that there is/are no, at most one, two and three cointegration equation/s are rejected at 5% significance level (P<0.05). However, trace statistic accept the null hypothesis there are four cointegration equations at 5% significant level (P>0.05). Therefore, it can be concluded with 95% confidence that there are four cointegration equations under trace statistic.

Maximum Eigen value rejected null hypotheses that there is no and one cointegration equation while accepted null hypothesis that there are two cointegration equations at 5% significant level. Therefore, it can be concluded with 95% confidence that there are two cointegration equations based on maximum Eigen value. Trace statistic found at most four cointegration equations, meanwhile, maximum Eigen value found two cointegration equations. Therefore, it can be concluded that there is equilibrium long term relationship and two cointegration equations between macroeconomic variables and DIV.

5.6.2 Long Term Relationship between Macroeconomic Variables and DIV

Cointegration test found long term relationship between macroeconomic variables and DIV and the results are presented in Table 5.28.

Table 5.28: Cointegration Equation on Macroeconomic Variables and DIV

Variables	β'	Standard error	t-statistic	Decision
Inflation	36.628	17.182	-2.132	Reject H_0
Exchange rate	-12.206	10.592	1.152	Do not Reject H_0
Economic growth	46.362	26.230	-1.767	Do not Reject H_0
Interest rate	-69.792	22.927	3.044	Reject H_0
Money supply	13.253	6.855	-1.933	Do not Reject H_0
Oil Price	5.324	2.256	-2.359	Reject H_0

According to cointegration test, inflation and international crude oil price have significant positive relationship with DIV, and interest rate has significant negative relationship with DIV, in the long term. Remaining variables, namely; exchange rate, economic growth and money supply have no significant relationship with DIV.Based on the results in Table 5.28, the fitted model can be written as:

$$\begin{aligned}\mathrm{DIV}_{t-1} = {} & -523.975 + (36.628 * \mathrm{Inflation}_{t-1}) - (12.206 * \text{exchange rate}_{t-1}) + \\ & (46.362 * \text{economic growth rate}_{t-1}) - (69.792 * \text{interest rate}_{t-1}) + \\ & (13.253 * \text{money supply}_{t-1}) + (5.324 * \text{oil price}_{t}) + e_{t-1}\end{aligned} \quad (5.6)$$

5.6.3 The Results of VECM on Macroeconomic Variables and DIV

VECM is used to find the short term dynamics between macroeconomic variables and DIV, as the selected variables are cointegrated. The Results of VECM results and ECT are shown in Table 5.29.

Table 5.29: The Results of VECM on Macroeconomic Variables and DIV

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	0.018	0.007	2.623	0.011
D(LASPI) lag 1	C(2)	-0.008	0.135	-0.06	0.952
D(LASPI) lag 2	C(3)	-0.307	0.146	-2.098	0.04
D(LASPI) lag 3	C(4)	0.184	0.14	1.311	0.195
D(LASPI) lag 4	C(5)	-0.09	0.14	-0.644	0.522
D(LCPI) lag 1	C(6)	1.147	1.288	0.89	0.377
D(LCPI) lag 2	C(7)	-1.282	1.309	-0.979	0.332
D(LCPI) lag 3	C(8)	-1.8	1.337	-1.346	0.184
D(LCPI) lag 4	C(9)	2.011	1.077	1.866	0.067
D(LEXR) lag 1	C(10)	0.111	1.15	0.097	0.923
D(LEXR) lag 2	C(11)	-0.686	1.357	-0.506	0.615
D(LEXR) lag 3	C(12)	3.387	1.362	2.486	0.016
D(LEXR) lag 4	C(13)	-1.703	1.116	-1.526	0.133
D(LGDP) lag 1	C(14)	1.505	1.217	1.237	0.221
D(LGDP) lag 2	C(15)	1.231	1.202	1.025	0.31
D(LGDP) lag 3	C(16)	0.594	1.122	0.53	0.598
D(LGDP) lag 4	C(17)	0.87	1.105	0.787	0.434
D(LIR) lag 1	C(18)	1.893	0.877	2.158	0.035
D(LIR) lag 2	C(19)	1.824	0.902	2.022	0.048
D(LIR) lag 3	C(20)	1.624	0.98	1.658	0.103
D(LIR) lag 4	C(21)	1.593	0.925	1.721	0.091
D(LMS) lag 1	C(22)	-1.675	1.718	-0.975	0.334
D(LMS) lag 2	C(23)	3.079	1.726	1.783	0.08
D(LMS) lag 3	C(24)	-1.168	1.75	-0.667	0.507
D(LMS) lag 4	C(25)	1.851	1.69	1.095	0.278
D(LICOP) lag 1	C(26)	0.01	0.139	0.071	0.944
D(LICOP) lag 2	C(27)	0.004	0.138	0.029	0.977
D(LICOP) lag 3	C(28)	0.005	0.13	0.041	0.968
D(LICOP) lag 4	C(29)	-0.046	0.123	-0.378	0.707
C	C(30)	-0.305	0.184	-1.651	0.104
R-squared		0.476	Mean dependent var		0.03
Adjusted R-squared		0.209	S.D. dependent var		0.176
S.E. of regression		0.156	Akaike info criterion		-0.605
Sum squared resid		1.395	Schwarz criterion		0.245
Log likelihood		56.338	Hannan-Quinn criter.		-0.263
F-statistic		1.786	Durbin-Watson stat		2.16
Prob(F-statistic)		0.031			

ECT has no expected negative sign and significant at 5% level. Since, ECT is positive and less than one, market participants never correct the forecasting error.

The test results indicate that the Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion have minimum values. Durbin Watson statistic is 2.160.

F-statistic is significant (P(F-stat)<0.05). As a result, it can be concluded that the fitted model is better than a model with no independent variable.

5.6.4 Short Term Relationship between Macroeconomic Variables and DIV

The results of Wald test are shown in Table 5.30.

Table 5.30: Wald Test results on Macroeconomic Variables and DIV

Variable	Chi-square value	df	Probability	Decision
Inflation	5.67	4	0.2250	Not Significant
Exchange rate	7.06	4	0.1329	Not Significant
Economic growth	2.99	4	0.5588	Not Significant
Interest rate	6.92	4	0.1401	Not Significant
Money supply	1.11	4	0.3489	Not Significant
Oil Price	0.16	4	0.9971	Not Significant

Since no variable is significant in explaining DIV, it has no short term dynamics with macroeconomic variables in the short term.

5.7 The Relationship between Macroeconomic Variables and F&T

The maximum lag length of macroeconomic variables and F&T is illustrated in Table 5.31.

Table 5.31: The Maximum Lag Length of Macroeconomic Variables and F&T

Lag	LogL	LR	FPE	AIC	SC	HQ
0	272.601	NA	0.000	-6.036	-5.839	-5.957
1	1129.262	1557.565	0.000	-24.392	-22.816*	-23.757
2	1207.315	129.497	0.000	-25.053	-22.097	-23.862
3	1296.155	133.259	0.000	-25.958	-21.623	-24.211
4	1458.079	217.123*	0.000*	-28.525*	-22.810	-26.222*

All criteria selected lag four as maximum lag length. Therefore, it can be concluded that the lag four is appropriate for further analysis.

5.7.1 Cointegration between Macroeconomic Variables and F&T

The results of Johansen cointegration test on macroeconomic variables and F&T is reported in Table 5.32.

Table 5.32: The Results of Johansen Cointegration Test on Macroeconomic Variables and F&T

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	210.518	125.615	Reject H_0
r <= 1	r >1	144.949	95.754	Reject H_0
r <= 2	r >2	93.024	69.819	Reject H_0
r <= 3	r >3	51.982	47.856	Reject H_0
r <= 4	r >4	28.627	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	65.569	46.231	Reject H_0
r = 1	r = 2	51.924	40.078	Reject H_0
r = 2	r = 3	41.043	33.877	Reject H_0
r = 3	r = 4	23.354	27.584	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Trace statistic rejected null hypotheses that there is/are no, at most one, two and three cointegration equation/s and accepted null hypothesis that there are four cointegration equations at 5% significance level.

The maximum Eigen statistics accepted the null hypothesis that there are three cointegration equations while rejecting null hypotheses that there is/are no, one and two cointegration equation/s at 5% significance level. Based on the results of both test statistics, it can be concluded that there is equilibrium long term relationship and three cointegration equations between macroeconomic variables and F&T.

5.7.2 Long Term Relationship between Macroeconomic Variables and F&T

The long term relationship between macroeconomic and F&T are shown in Table 5.33.

Table 5.33: Cointegration Equation on Macroeconomic Variables and F&T

Variables	β′	Standard error	t-statistic	Decision
Inflation	21.539	4.557	-4.727	Reject H_0
Exchange rate	-2.128	2.674	0.796	Do not Reject H_0
Economic growth	3.166	5.727	-0.553	Do not Reject H_0
Interest rate	-31.165	5.885	5.296	Reject H_0
Money supply	9.459	1.863	-5.078	Reject H_0
Oil Price	1.106	0.591	-1.872	Do not Reject H_0

Inflation and money supply have significant positive long term relationship with F&T, while interest rate has significant negative relationship with F&T. The remaining variables, namely; exchange rate, economic growth rate and international crude oil price have no significant long term relationship with F&T. Based on the results in Table 5.33, the fitted model can be written as:

$$\text{F\&}T_{t-1} = -64.174 + (21.539 * \text{Inflation}_{t-1}) - (2.128 * \text{exchange rate}_{t-1}) + (3.166 * \text{economic growth rate}_{t-1}) - (31.165 * \text{interest rate}_{t-1}) + (9.459 * \text{money supply}_{t-1}) + (1.106 * \text{inoil price}_{t}) + e_{t-1} \quad (5.7)$$

5.7.3 The Results of VECM on Macroeconomic Variables and F&T

VECM is used to find the short term relationship between macroeconomic variables and F&T, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.34.

Table 5.34: The Results of VECM on Macroeconomic Variables and F&T

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	0.112	0.022	5.226	0.000
D(LASPI) lag 1	C(2)	-0.294	0.136	-2.165	0.035
D(LASPI) lag 2	C(3)	-0.299	0.141	-2.117	0.039
D(LASPI) lag 3	C(4)	-0.198	0.134	-1.475	0.146
D(LASPI) lag 4	C(5)	-0.294	0.13	-2.272	0.027
D(LCPI) lag 1	C(6)	3.728	1.354	2.753	0.008
D(LCPI) lag 2	C(7)	0.067	1.281	0.052	0.959
D(LCPI) lag 3	C(8)	0.33	1.287	0.256	0.799
D(LCPI) lag 4	C(9)	1.076	1.043	1.032	0.307
D(LEXR) lag 1	C(10)	0.75	1.127	0.665	0.509
D(LEXR) lag 2	C(11)	-2.085	1.362	-1.53	0.132
D(LEXR) lag 3	C(12)	2.396	1.403	1.707	0.093
D(LEXR) lag 4	C(13)	-0.106	1.134	-0.093	0.926
D(LGDP) lag 1	C(14)	2.526	0.99	2.55	0.014
D(LGDP) lag 2	C(15)	2.247	1.002	2.243	0.029
D(LGDP) lag 3	C(16)	1.464	0.974	1.503	0.138
D(LGDP) lag 4	C(17)	2.116	0.967	2.187	0.033
D(LIR) lag 1	C(18)	0.683	0.853	0.801	0.426
D(LIR) lag 2	C(19)	1.946	0.864	2.251	0.028
D(LIR) lag 3	C(20)	0.997	0.896	1.113	0.271
D(LIR) lag 4	C(21)	2.785	0.853	3.266	0.002
D(LMS) lag 1	C(22)	-2.076	1.544	-1.345	0.184
D(LMS) lag 2	C(23)	0.107	1.634	0.066	0.948
D(LMS) lag 3	C(24)	1.088	1.68	0.647	0.52
D(LMS) lag 4	C(25)	-0.298	1.654	-0.18	0.858
D(LICOP) lag 1	C(26)	0.092	0.136	0.675	0.502
D(LICOP) lag 2	C(27)	-0.096	0.134	-0.713	0.479

D(LICOP) lag 3	C(28)	0.154	0.129	1.194	0.237
D(LICOP) lag 4	C(29)	-0.064	0.12	-0.531	0.597
C	C(30)	-0.329	0.164	-2.005	0.05
R-squared		0.541	Mean dependent var		0.016
Adjusted R-squared		0.307	S.D. dependent var		0.184
S.E. of regression		0.153	Akaike info criterion		-0.65
Sum squared resid		1.334	Schwarz criterion		0.2
Log likelihood		58.282	Hannan-Quinn criter.		-0.308
F-statistic		2.316	Durbin-Watson stat		2.017
Prob(F-statistic)		0.003			

Since, ECT is significant (P<0.05), positive and less than one, it can be concluded that market participants does not correct the forecasting error.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are illustrated minimum value. Durbin Watson statistic is 2.017.

F-statistic is significant (P(F-stat)<0.05). As a result, it can be concluded that the fitted model is better than a model with no independent variable. Therefore, the fitted model is better in explaining F&T in the short term.

5.7.4 Short Term Relationship between Macroeconomic Variables and F&T

The results of Wald test are shown in Table 5.35.

Table 5.35: Wald Test results on Macroeconomic Variables and F&T

Variable	Chi-square value	df	Probability	Decision
Inflation	7.96	4	0.0931***	Not Significant
Exchange rate	4.23	4	0.3763	Not Significant
Economic growth	8.03	4	0.0905***	Not Significant
Interest rate	11.38	4	0.0226**	Significant
Money supply	2.31	4	0.6787	Not Significant
Oil Price	1.96	4	0.7434	Not Significant

Notes: ** and *** denote significance at 5% and 10% level of significance, respectively.

Interest rate is significant and positive and other variables are not significant in explaining F&T, in the short term. Other variables are not significant at 5% level in explaining F&T in the short term. However, inflation and economic growth are significant in explaining F&T in the short term at 10% significant level.

5.8 The Relationship between Macroeconomic Variables and H&T

Maximum lag length of macroeconomic variables with H&T under different information criteria are reported in Table 5.36.

Table 5.36: The Maximum Lag Length of Macroeconomic Variables and H&T

Lag	LogL	LR	FPE	AIC	SC	HQ
0	292.530	NA	0.000	-6.489	-6.292	-6.410
1	1148.349	1556.036	0.000	-24.826	-23.250	-24.191
2	1238.696	149.893	0.000	-25.766	-22.810	-24.575
3	1330.044	137.022	0.000	-26.728	-22.393	-24.982
4	1505.182	234.845*	0.000*	-29.595*	-23.880*	-27.293*

Lag four is selected as maximum lag length by all criteria. Therefore, lag four is selected to perform the cointegration test between macroeconomic variables and H&T.

5.8.1 Cointegration between Macroeconomic Variables and H&T

The results of cointegration test using macroeconomic variables and H&T are reported in Table 5.37.

Table 5.37: The Results of Johansen Cointegration Test on Macroeconomic Variables and H&T

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	201.991	125.615	Reject H_0
r <= 1	r >1	142.784	95.754	Reject H_0
r <= 2	r >2	94.626	69.819	Reject H_0
r <= 3	r >3	52.794	47.856	Reject H_0
r <= 4	r >4	30.615	29.797	Reject H_0
r <= 5	r >5	11.214	15.495	Do not Reject H_0
λ-max Test				
r = 0	r = 1	59.207	46.231	Reject H_0
r = 1	r = 2	48.158	40.078	Reject H_0
r = 2	r = 3	41.831	33.877	Reject H_0
r = 3	r = 4	22.180	27.584	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Trace statistics show that null hypotheses of that there is/are no, at most one, two, three and four cointegration equation/s are rejected at 5% significance level ($P<0.05$). Although, first five hypotheses are rejected, the null hypothesis of there are five

cointegration equations is accepted at 5% significant level (P>0.05).Therefore, it can be concluded with 95% confidence under trace statistic that there are five cointegration equations.

Maximum Eigen value rejected null hypotheses that there is/are no, one and two cointegration equation at 5% significant level. Null hypothesis that there are three cointegration equations is accepted at 5% significant level. Therefore, it can be concluded with 95% confidence that there are three cointegration equations under maximum Eigen value.

Maximum Eigen value confirmed three cointegration equations, while trace statistic selected five cointegration equations. Therefore, it can be concluded that there is equilibrium long term relationship and three cointegration equations between macroeconomic variables and H&T.

5.8.2 Long Term Relationship between Macroeconomic Variables and H&T

The results of Johansen Cointegration test are shown in Table 5.38.

Table 5.38: Cointegration Equation on Macroeconomic Variables and H&T

Variables	β′	Standard error	t-statistic	Decision
Inflation	2.832	0.872	-3.248	Reject H_0
Exchange rate	-3.201	0.584	5.485	Reject H_0
Economic growth	0.092	1.489	-0.062	Do not Reject H_0
Interest rate	-3.047	1.226	2.485	Reject H_0
Money supply	1.804	0.385	-4.687	Reject H_0
Oil Price	0.833	0.128	-6.499	Reject H_0

All macroeconomic variables, except economic growth, are significant in explaining H&T, in the long term. Inflation, money supply and international crude oil price have significant positive relationship with H&T while exchange rate and interest rate have significant negative relationship with H&T in the long term. Based on the results in Table 5.38, the fitted model can be written as:

$$H\&T_{t-1} = -0.807 + (2.832 * Inflation_{t-1}) - (3.201 * exchange\ rate_{t-1}) + (0.092 * economic\ growth\ rate_{t-1}) - (3.047 * interest\ rate_{t-1}) + (1.804 * money\ supply_{t-1}) + (0.833 * oil\ price_t) + e_{t-1} \quad (5.8)$$

5.8.3 The Results of VECM on Macroeconomic Variables and H&T

VECM is used to find the short term relationship between macroeconomic variables and H&T, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.39.

Table 5.39: The Results of VECM on Macroeconomic Variables and H&T

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	0.448	0.088	5.064	0.000
D(LASPI) lag 1	C(2)	-0.629	0.172	-3.67	0.001
D(LASPI) lag 2	C(3)	-0.394	0.176	-2.24	0.029
D(LASPI) lag 3	C(4)	-0.122	0.153	-0.793	0.431
D(LASPI) lag 4	C(5)	-0.294	0.136	-2.162	0.035
D(LCPI) lag 1	C(6)	0.802	1.024	0.783	0.437
D(LCPI) lag 2	C(7)	-1.617	1.046	-1.545	0.128
D(LCPI) lag 3	C(8)	1.036	1.083	0.956	0.343
D(LCPI) lag 4	C(9)	0.845	0.857	0.985	0.329
D(LEXR) lag 1	C(10)	1.172	0.949	1.235	0.222
D(LEXR) lag 2	C(11)	-0.646	1.133	-0.57	0.571
D(LEXR) lag 3	C(12)	1.856	1.106	1.677	0.099
D(LEXR) lag 4	C(13)	-1.554	0.9	-1.726	0.090
D(LGDP) lag 1	C(14)	2.144	0.81	2.645	0.011
D(LGDP) lag 2	C(15)	2.148	0.832	2.581	0.012
D(LGDP) lag 3	C(16)	1.056	0.807	1.308	0.196
D(LGDP) lag 4	C(17)	1.425	0.836	1.705	0.094
D(LIR) lag 1	C(18)	4.876	0.971	5.021	0.000
D(LIR) lag 2	C(19)	5.744	0.981	5.858	0.000
D(LIR) lag 3	C(20)	4.082	1.103	3.702	0.001
D(LIR) lag 4	C(21)	4.478	1.071	4.182	0.000
D(LMS) lag 1	C(22)	-3.878	1.333	-2.909	0.005
D(LMS) lag 2	C(23)	-2.333	1.45	-1.609	0.113
D(LMS) lag 3	C(24)	-1.806	1.497	-1.206	0.233
D(LMS) lag 4	C(25)	-1.607	1.435	-1.12	0.267
D(LICOP) lag 1	C(26)	0.369	0.125	2.962	0.004
D(LICOP) lag 2	C(27)	0.14	0.124	1.13	0.263
D(LICOP) lag 3	C(28)	0.228	0.11	2.081	0.042
D(LICOP) lag 4	C(29)	-0.072	0.102	-0.708	0.482
C	C(30)	-0.239	0.128	-1.864	0.068
R-squared		0.611	Mean dependent var		0.025
Adjusted R-squared		0.413	S.D. dependent var		0.163
S.E. of regression		0.125	Akaike info criterion		-1.058
Sum squared resid		0.887	Schwarz criterion		-0.208
Log likelihood		76.023	Hannan-Quinn criter.		-0.716
F-statistic		3.086	Durbin-Watson stat		2.203
Prob(F-statistic)		0.000			

Since, ECT is significant ($P<0.05$), positive and less than one, it can be concluded that market participants does not correct the forecasting error.

According to the results of VECM, Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are illustrated minimum value. Durbin Watson statistic is 2.203.

Since, F-statistic is significant (P(F-stat)<0.05), it can be concluded that the fitted model is better than a model with no independent variable. Thus, the fitted model is significant in explaining H&T in the short term.

5.8.4 Short Term Relationship between Macroeconomic Variables and H&T

The results of Wald test are shown in Table 5.40.

Table 5.40: Wald Test results on Macroeconomic Variables and H&T

Variable	Chi-square value	df	Probability	Decision
Inflation	3.91	4	0.4179	Not Significant
Exchange rate	5.76	4	0.2177	Not Significant
Economic growth	11.37	4	0.0227**	Significant
Interest rate	39.68	4	0.0000*	Significant
Money supply	14.61	4	0.0056*	Significant
Oil Price	12.79	4	0.0123**	Significant

Notes: *and ** denote significance at 1% and 5% level of significance, respectively.

Economic growth, interest rate, money supply and international crude oil price have significant positive relationship with H&T in the short term. Inflation and exchange rate are not significant in explaining H&T in the short term. This finding supports the results of F-statistic.

5.9 The Relationship between Macroeconomic Variables and INV

The results of lag length criteria are shown in Table 5.41.

Table 5.41: The Maximum Lag Length of Macroeconomic Variables and INV

Lag	LogL	LR	FPE	AIC	SC	HQ
0	275.315	NA	0.000	-6.098	-5.901	-6.019
1	1118.827	1533.659	0.000	-24.155	-22.579	-23.520
2	1194.478	125.512	0.000	-24.761	-21.805	-23.570
3	1275.967	122.233	0.000	-25.499	-21.164	-23.753
4	1449.934	233.273*	0.000*	-28.339*	-22.625*	-26.037*

All lag length criteria selected lag four as the maximum lag length. Thus, it can be concluded that lag four is appropriated for Cointegration test.

5.9.1 Cointegration between Macroeconomic Variables and INV

The results of Johansen cointegration test on macroeconomic variables and INV are reported in Table 5.42.

Table 5.42: The Results of Johansen Cointegration Test on Macroeconomic Variables and INV

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	201.960	125.615	Reject H_0
r <= 1	r >1	138.013	95.754	Reject H_0
r <= 2	r >2	93.353	69.819	Reject H_0
r <= 3	r >3	57.059	47.856	Reject H_0
r <= 4	r >4	35.465	29.797	Reject H_0
r <= 5	r >5	14.281	15.495	Reject H_0
r <= 6	r >6	201.960	125.615	Do not Reject H_0
λ-max Test				
r = 0	r = 1	63.948	46.231	Reject H_0
r = 1	r = 2	44.660	40.078	Reject H_0
r = 2	r = 3	36.294	33.877	Reject H_0
r = 3	r = 4	21.594	27.584	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Trace statistics accept the null hypothesis that there are five cointegration equations and rejected null hypotheses that there is/are no, at most one, two, three and four cointegration equation/s at 5% significant level.

Maximum Eigen statistics, accepted null hypothesis that there are three cointegration equations; while rejected null hypotheses that there is/are no, one and two cointegration equation/s at 5% significance level. Therefore, it can be concluded that there is long term equilibrium relationship and three cointegration equations between macroeconomics variables and INV with 95% confidence.

5.9.2 Long Term Relationship between Macroeconomic Variables and INV

The results of cointegration test between macroeconomic variables and INV are represented in Table 5.43.

Table 5.43: Cointegration Equation on Macroeconomic Variables and INV

Variables	β′	Standard error	t-statistic	Decision
Inflation	4.658	0.575	-8.108	Reject H_0
Exchange rate	-1.549	0.369	4.198	Reject H_0
Economic growth	-6.699	0.779	8.602	Reject H_0
Interest rate	1.098	0.709	-1.547	Do not Reject H_0
Money supply	0.300	0.257	-1.171	Do not Reject H_0
Oil Price	0.257	0.082	-3.127	Reject H_0

The fitted model shows that inflation and international crude oil price have significant positive relationship with INV, while exchange rate and economic growth have significant negative relationship with INV; however, interest rate and money supply are not significant in explaining INV, in the long term. Based on the results in Table 5.43, the fitted model can be written as:

$$\text{INV}_{t-1} = 79.793 + (4.658 * \text{Inflation}_{t-1}) - (1.549 * \text{exchange rate}_{t-1}) - (6.699 * \text{economic growth rate}_{t-1}) + (1.098 * \text{interest rate}_{t-1}) + (3.000 * \text{money supply}_{t-1}) + (0.257 * \text{oil price}_{t}) + e_{t-1} \quad (5.9)$$

5.9.3 The Results of VECM Results on Macroeconomic Variables and INV

VECM is used to find the short term relationship between macroeconomic variables and INV, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.44.

Table 5.44: The Results of VECM results on Macroeconomic Variables and INV

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.401	0.213	-1.881	0.065
D(LASPI) lag 1	C(2)	0.366	0.221	1.657	0.103
D(LASPI) lag 2	C(3)	0.141	0.189	0.747	0.458
D(LASPI) lag 3	C(4)	0.339	0.154	2.198	0.032
D(LASPI) lag 4	C(5)	0.216	0.135	1.601	0.115
D(LCPI) lag 1	C(6)	1.123	1.611	0.697	0.489
D(LCPI) lag 2	C(7)	-0.71	1.717	-0.414	0.681
D(LCPI) lag 3	C(8)	-3.741	1.662	-2.251	0.028
D(LCPI) lag 4	C(9)	2.872	1.468	1.956	0.055
D(LEXR) lag 1	C(10)	0.22	1.501	0.147	0.884
D(LEXR) lag 2	C(11)	-1.561	1.773	-0.88	0.382
D(LEXR) lag 3	C(12)	3.688	1.828	2.017	0.048
D(LEXR) lag 4	C(13)	-2.399	1.502	-1.598	0.116
D(LGDP) lag 1	C(14)	2.548	2.139	1.191	0.239
D(LGDP) lag 2	C(15)	1.377	1.876	0.734	0.466
D(LGDP) lag 3	C(16)	1.087	1.579	0.688	0.494

D(LGDP) lag 4	C(17)	0.554	1.327	0.418	0.678
D(LIR) lag 1	C(18)	-3.156	2.156	-1.464	0.149
D(LIR) lag 2	C(19)	-1.243	1.978	-0.628	0.532
D(LIR) lag 3	C(20)	-2.952	1.998	-1.478	0.145
D(LIR) lag 4	C(21)	-1.586	2.038	-0.778	0.44
D(LMS) lag 1	C(22)	-0.552	2.475	-0.223	0.825
D(LMS) lag 2	C(23)	5.853	2.406	2.432	0.018
D(LMS) lag 3	C(24)	-1.277	2.536	-0.504	0.617
D(LMS) lag 4	C(25)	1.991	2.355	0.845	0.402
D(LICOP) lag 1	C(26)	-0.09	0.201	-0.449	0.655
D(LICOP) lag 2	C(27)	-0.19	0.214	-0.89	0.377
D(LICOP) lag 3	C(28)	-0.151	0.179	-0.841	0.404
D(LICOP) lag 4	C(29)	-0.311	0.169	-1.841	0.071
C	C(30)	-0.042	0.208	-0.201	0.841
R-squared		0.407	Mean dependent var		0.019
Adjusted R-squared		0.105	S.D. dependent var		0.219
S.E. of regression		0.207	Akaike info criterion		-0.042
Sum squared resid		2.452	Schwarz criterion		0.809
Log likelihood		31.811	Hannan-Quinn criter.		0.301
F-statistic		1.348	Durbin-Watson stat		2.085
Prob(F-statistic)		0.166			

ECT has expected negative sign and is not significant at 5% significance level. Therefore, it can be concluded that the speed of adjustment of forecasting error cannot reliably be compiled.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are illustrated minimum value. Durbin Watson statistic is 2.085.

F-statistic is not significant (P(F-stat)>0.05). Therefore, it can be concluded that the fitted model is not significant in explaining INV in the short term and the individual variables in the fitted model may not also be significant in explaining INV.

5.9.4 Short Term Relationship between Macroeconomic Variables and INV

The results of Wald test are shown in Table 5.45.

Table 5.45: Wald Test results on Macroeconomic Variables and INV

Variable	Chi-square value	df	Probability	Decision
Inflation	7.73	4	0.1021	Not Significant
Exchange rate	4.62	4	0.3285	Not Significant
Economic growth	2.76	4	0.5985	Not Significant
Interest rate	3.45	4	0.4859	Not Significant
Money supply	6.24	4	0.1819	Not Significant
Oil Price	4.67	4	0.3234	Not Significant

Supporting the results of F-statistic, Wald test also found that the macroeconomic variables are not significant in explaining INV in the short term.

5.10 The Relationship between Macroeconomic Variables and L&P

The results of maximum lag length criteria between macroeconomic variables and L&P are shown in Table 5.46.

Table 5.46: The Maximum Lag Length of Macroeconomic Variables and L&P

Lag	LogL	LR	FPE	AIC	SC	HQ
0	334.599	NA	0.000	-7.445	-7.248	-7.366
1	1153.946	1489.722	0.000	-24.953	-23.377*	-24.318
2	1231.523	128.707	0.000	-25.603	-22.647	-24.412
3	1308.181	114.987	0.000	-26.231	-21.896	-24.485
4	1457.938	200.810*	0.000*	-28.521*	-22.807	-26.219*

SC selected lag one while remaining criteria selected lag four as maximum lag length. Accordingly, lag four is selected to carry out Cointegration test.

5.10.1 Cointegration between Macroeconomic Variables and L&P

The results of Johansen cointegration test on macroeconomic variables and L&P are reported in Table 5.47.

Table 5.47: The Results of Johansen Cointegration Test on Macroeconomic Variables and L&P

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	212.211	125.615	Reject H_0
r <= 1	r >1	149.742	95.754	Reject H_0
r <= 2	r >2	94.024	69.819	Reject H_0
r <= 3	r >3	61.299	47.856	Reject H_0
r <= 4	r >4	29.627	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	62.469	46.231	Reject H_0
r = 1	r = 2	55.718	40.078	Reject H_0
r = 2	r = 3	32.726	33.877	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Null hypotheses as there is no, at most one, two and three cointegration equation/s are rejected and the null hypothesis that there are four cointegration equations is confirmed at 5% significance level with Trace statistics. Maximum Eigen statistics confirmed that there are two cointegration equations while rejecting the null hypotheses that there is no and one cointegration equation at 5% significance level.

Therefore, it can be concluded that there is equilibrium long term relationship and two cointegration equations between macroeconomic variables and L&P.

5.10.2 Long Term Relationship between Macroeconomic Variables and L&P

Long term cointegration equation on macroeconomic variables and L&P is shown in Table 5.48.

Table 5.48: Cointegration Equation on Macroeconomic Variables and L&P

Variables	β′	Standard error	t-statistic	Decision
Inflation	3.036	0.615	-4.934	Reject H_0
Exchange rate	-0.003	0.400	0.008	Do not Reject H_0
Economic growth	1.450	0.822	-1.765	Do not Reject H_0
Interest rate	-4.779	0.735	6.501	Reject H_0
Money supply	1.577	0.269	-5.861	Reject H_0
Oil Price	0.333	0.091	-3.674	Reject H_0

The results indicate that inflation, money supply and international crude oil price have significant positive relationship with L&P, while interest rate has significant negative relationship with L&P, in the long term. However, exchange rate and economic growth have no significant relationship with L&P in the long term. Based on the results in Table 5.48, the fitted model can be written as:

$$\begin{aligned} \text{L\&}P_{t-1} = {} & -21.601 + (3.036 * \text{Inflation}_{t-1}) - (0.003 * \text{exchange rate}_{t-1}) + \\ & (1.450 * \text{economic growth rate}_{t-1}) - (4.778 * \text{interest rate}_{t-1}) + (1.577 * \\ & \text{money supply}_{t-1}) + (0.333 * \text{oil price}_{t}) + e_{t-1} \end{aligned} \quad (5.10)$$

5.10.3 The Results of VECM on Macroeconomic Variables and L&P

VECM is used to find the short term relationship between macroeconomic variables and L&P, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.49.

Table 5.49: The Results of VECM on Macroeconomic Variables and L&P

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	0.023	0.142	0.161	0.873
D(LASPI) lag 1	C(2)	-0.154	0.189	-0.813	0.42
D(LASPI) lag 2	C(3)	-0.133	0.188	-0.706	0.483
D(LASPI) lag 3	C(4)	-0.018	0.178	-0.099	0.922
D(LASPI) lag 4	C(5)	0.272	0.17	1.598	0.116
D(LCPI) lag 1	C(6)	-0.944	1.219	-0.774	0.442

D(LCPI) lag 2	C(7)	-0.568	1.244	-0.457	0.65
D(LCPI) lag 3	C(8)	-1.663	1.34	-1.241	0.22
D(LCPI) lag 4	C(9)	1.235	1.047	1.18	0.243
D(LEXR) lag 1	C(10)	0.461	1.153	0.4	0.69
D(LEXR) lag 2	C(11)	-0.601	1.297	-0.463	0.645
D(LEXR) lag 3	C(12)	1.052	1.281	0.821	0.415
D(LEXR) lag 4	C(13)	-0.13	1.067	-0.122	0.903
D(LGDP) lag 1	C(14)	-0.273	0.973	-0.281	0.78
D(LGDP) lag 2	C(15)	-0.653	0.905	-0.722	0.473
D(LGDP) lag 3	C(16)	-0.519	0.865	-0.601	0.551
D(LGDP) lag 4	C(17)	-0.493	0.888	-0.555	0.581
D(LIR) lag 1	C(18)	0.67	0.924	0.725	0.471
D(LIR) lag 2	C(19)	1.567	0.937	1.673	0.1
D(LIR) lag 3	C(20)	0.052	0.988	0.053	0.958
D(LIR) lag 4	C(21)	1.56	1.099	1.419	0.161
D(LMS) lag 1	C(22)	-1.392	1.496	-0.93	0.356
D(LMS) lag 2	C(23)	2.5	1.578	1.584	0.119
D(LMS) lag 3	C(24)	-0.555	1.608	-0.345	0.731
D(LMS) lag 4	C(25)	1.425	1.556	0.916	0.364
D(LICOP) lag 1	C(26)	0.035	0.144	0.242	0.81
D(LICOP) lag 2	C(27)	0.138	0.135	1.024	0.31
D(LICOP) lag 3	C(28)	-0.008	0.127	-0.067	0.947
D(LICOP) lag 4	C(29)	-0.043	0.116	-0.366	0.716
C	C(30)	-0.108	0.165	-0.65	0.518
R-squared		0.336	Mean dependent var		0.017
Adjusted R-squared		-0.001	S.D. dependent var		0.146
S.E. of regression		0.146	Akaike info criterion		-0.746
Sum squared resid		1.213	Schwarz criterion		0.105
Log likelihood		62.434	Hannan-Quinn criter.		-0.403
F-statistic		0.997	Durbin-Watson stat		2.078
Prob(F-statistic)		0.490			

ECT does not have the expected negative sign and it is not significant. Hence, it can be concluded that the speed of adjustment of forecasting error cannot be estimated reliably.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are represented minimum value. Durbin Watson statistic is 2.078.

F-statistic is not significant (P(F-stat)>0.05).Therefore, it can be concluded that the fitted model is not significant in explaining L&P in the short term, and individual variables in the model may not be significant in the short term.

5.10.4 Short Term Relationship between Macroeconomic Variables and L&P

Wald test results are shown in Table 5.50.

Table 5.50: Wald Test results on Macroeconomic Variables and L&P

Variable	Chi-square value	df	Probability	Decision
Inflation	4.49	4	0.3429	Not Significant
Exchange rate	0.81	4	0.9368	Not Significant
Economic growth	1.00	4	0.9095	Not Significant
Interest rate	4.59	4	0.3323	Not Significant
Money supply	3.44	4	0.4868	Not Significant
Oil Price	1.48	4	0.8299	Not Significant

Wald test found that the selected macroeconomic variables are not significant in explaining INV in the short term. The results of Wald test also similar to the results of F-statistic.

5.11 The Relationship between Macroeconomic Variables and MFG

The results of maximum lag length criteria of macroeconomic variables and MFG are given in Table 5.51.

Table 5.51: The maximum Lag Length of Macroeconomic Variables and MFG

Lag	LogL	LR	FPE	AIC	SC	HQ
0	322.190	NA	0.000	-7.163	-6.966	-7.084
1	1161.992	1526.912	0.000	-25.136	-23.559*	-24.501
2	1234.811	120.814	0.000	-25.678	-22.722	-24.487
3	1321.101	129.435	0.000	-26.525	-22.190	-24.778
4	1472.611	203.160*	0.000*	-28.855*	-23.140	-26.552*

Even though, SC selected lag one as maximum lag length, remaining four criteria selected lag four as the maximum lag length. Therefore, it can be concluded that lag four is appropriate for cointegration analysis.

5.11.1 Cointegration between Macroeconomic Variables and MFG

The results of Johansen cointegration test on macroeconomic variables and MFG are reported in Table 5.52.

Table 5.52: The results of Johansen Cointegration Test on Macroeconomic Variables and MFG

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	195.007	125.615	Reject H_0
r <= 1	r >1	135.442	95.754	Reject H_0
r <= 2	r >2	89.824	69.819	Reject H_0
r <= 3	r >3	58.952	47.856	Reject H_0
r <= 4	r >4	34.228	29.797	Reject H_0
r <= 5	r >5	15.646	15.495	Reject H_0
r <= 6	r >6	3.481	3.841	Do not Reject H_0
λ-max Test				
r = 0	r = 1	59.565	46.231	Reject H_0
r = 1	r = 2	45.618	40.078	Reject H_0
r = 2	r = 3	30.872	33.877	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Trace statistics rejected null hypotheses that there are no, at most one, two, three, four and five cointegration equation/s and accepted the null hypothesis that there are six cointegration equations at 5% significant level.

The maximum Eigen statistics is accepted the null hypothesis that there are two cointegration equations while rejecting null hypotheses that there are no and one cointegration equations at 5% significance level. Based on the results of both test statistics, it can be concluded that there is equilibrium long term relationship and two cointegration equations between selected six macroeconomic variables and MFG.

5.11.2 Long Term Relationship between Macroeconomic Variables and MFG

As found above, macroeconomic variables have long term cointegration relationship with MFG. The cointegration test results are reported in Table 5.53.

Table 5.53: Cointegration Equation on Macroeconomic Variables and MFG

Variables	β′	Standard error	t-statistic	Decision
Inflation	-0.225	0.455	0.494	Do not Reject H_0
Exchange rate	-3.452	0.295	11.695	Reject H_0
Economic growth	-3.066	0.603	5.082	Reject H_0
Interest rate	3.313	0.555	-5.974	Reject H_0
Money supply	0.728	0.213	-3.417	Reject H_0
Oil Price	-0.079	0.067	1.195	Do not Reject H_0

Exchange rate and economic growth have significant negative relationship with MFG in the long term. Moreover, interest rate and money supply have significant positive relationship with MFG. In contrast, inflation and international crude oil price are not significant in explaining MFG in the long term. Based on the results in Table 5.53the fitted model can be written as:

$$\text{MFG}_{t-1} = 37.439 - (0.225 * \text{Inflation}_{t-1}) - (3.452 * \text{exchange rate}_{t-1}) - (3.066 * \text{economic growth rate}_{t-1}) + (3.313 * \text{interest rate}_{t-1}) + (0.728 * \text{money supply}_{t-1}) - (0.079 * \text{oil price}_{t}) + e_{t-1} \quad (5.11)$$

5.11.3 The Results of VECM on Macroeconomic Variables and MFG

VECM is used to find the short term relationship between macroeconomic variables and MFG, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.54.

Table 5.54: The Results of VECM on Macroeconomic Variables and MFG

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	0.17	0.185	0.919	0.362
D(LASPI) lag 1	C(2)	-0.01	0.21	-0.047	0.963
D(LASPI) lag 2	C(3)	0.013	0.167	0.077	0.939
D(LASPI) lag 3	C(4)	0.221	0.153	1.44	0.155
D(LASPI) lag 4	C(5)	0.098	0.142	0.687	0.495
D(LCPI) lag 1	C(6)	0.195	1.251	0.156	0.877
D(LCPI) lag 2	C(7)	-1.176	1.16	-1.013	0.315
D(LCPI) lag 3	C(8)	-2.03	1.165	-1.743	0.087
D(LCPI) lag 4	C(9)	0.438	1.082	0.405	0.687
D(LEXR) lag 1	C(10)	0.8	1.077	0.743	0.461
D(LEXR) lag 2	C(11)	-0.819	1.231	-0.666	0.508
D(LEXR) lag 3	C(12)	2.986	1.248	2.393	0.02
D(LEXR) lag 4	C(13)	-1.13	1.042	-1.084	0.283
D(LGDP) lag 1	C(14)	-0.874	0.851	-1.027	0.309
D(LGDP) lag 2	C(15)	-0.824	0.798	-1.032	0.306
D(LGDP) lag 3	C(16)	-1.052	0.754	-1.395	0.169
D(LGDP) lag 4	C(17)	-0.248	0.736	-0.337	0.738
D(LIR) lag 1	C(18)	1.794	1.293	1.387	0.171
D(LIR) lag 2	C(19)	1.596	1.136	1.405	0.166
D(LIR) lag 3	C(20)	0.624	1.078	0.579	0.565
D(LIR) lag 4	C(21)	0.724	0.939	0.771	0.444
D(LMS) lag 1	C(22)	-2.43	1.585	-1.533	0.131
D(LMS) lag 2	C(23)	1.225	1.589	0.771	0.444
D(LMS) lag 3	C(24)	-1.923	1.72	-1.118	0.268
D(LMS) lag 4	C(25)	-0.664	1.607	-0.413	0.681
D(LICOP) lag 1	C(26)	-0.114	0.121	-0.943	0.35

D(LICOP) lag 2	C(27)	0.109	0.127	0.858	0.394
D(LICOP) lag 3	C(28)	0.04	0.119	0.332	0.741
D(LICOP) lag 4	C(29)	-0.009	0.114	-0.083	0.934
C	C(30)	0.093	0.151	0.618	0.539
R-squared		0.357	Mean dependent var		0.023
Adjusted R-squared		0.031	S.D. dependent var		0.139
S.E. of regression		0.137	Akaike info criterion		-0.868
Sum squared resid		1.073	Schwarz criterion		-0.018
Log likelihood		67.774	Hannan-Quinn criter.		-0.526
F-statistic		1.093	Durbin-Watson stat		2.013
Prob(F-statistic)		0.378			

ECT does not have the expected negative sign and is not significant. Accordingly, it can be concluded that the speed of adjustment of forecasting error cannot be estimated reliably.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are represented minimum value. Durbin Watson statistic is 2.013.

F-statistic is not significant (P(F-stat)>0.05). Therefore, it can be concluded that the fitted model is not significant in explaining MFG in the short term.

5.11.4 Short Term Relationship between Macroeconomic Variables and MFG

The results of Wald test are shown in Table 5.55.

Table 5.55: Wald Test results on Macroeconomic Variables and MFG

Variable	Chi-square value	df	Probability	Decision
Inflation	4.56	4	0.3354	Not Significant
Exchange rate	6.20	4	0.1845	Not Significant
Economic growth	2.84	4	0.5833	Not Significant
Interest rate	3.39	4	0.4948	Not Significant
Money supply	3.73	4	0.4438	Not Significant
Oil Price	1.76	4	0.7798	Not Significant

Wald test also found that the selected macroeconomic variables are not significant in explaining MFG in the short term.

5.12 The Relationship between Macroeconomic Variables and MTR

Six lag length criteria are used to find the appropriate lag length for cointegration test. The results are shown in Table 5.56.

Table 5.56: The Maximum Lag Length of Macroeconomic Variables and MTR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	291.306	NA	0.000	-6.461	-6.264	-6.382
1	1133.187	1530.694	0.000	-24.482	-22.905*	-23.846
2	1205.943	120.708	0.000	-25.021	-22.066	-23.831
3	1281.097	112.731	0.000	-25.616	-21.281	-23.869
4	1409.640	172.3642*	0.000*	-27.423*	-21.709	-25.121*

Majority criteria selected lag four as maximum lag length. Therefore, it can be concluded that lag four is appropriate for cointegration test.

5.12.1 Cointegration between Macroeconomic Variables and MTR

Johansen cointegration test is used to find the long term relationship between macroeconomic variables and MTR, and the results of the test are reported in Table 5.57.

Table 5.57: The Results of Johansen Cointegration Test on Macroeconomic Variables and MTR

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	183.425	125.615	Reject H_0
r <= 1	r >1	118.224	95.754	Reject H_0
r <= 2	r >2	79.474	69.819	Reject H_0
r <= 3	r >3	46.356	47.856	Do not Reject H_0
λ-max Test				
r = 0	r = 1	65.200	46.231	Reject H_0
r = 1	r = 2	38.750	40.078	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Trace statistics rejected null hypotheses that there is/are no, at most one and two cointegration equations while confirmed the null hypothesis that there are three cointegration equations at 5% significance level. Thus, Trace statistics indicates that there are three cointegration equations.

Maximum Eigen statistics confirmed that there is one cointegration equation while rejecting the null hypothesis that there is no cointegration equation at 5% significance level. Therefore, it can be concluded that there is equilibrium long term relationship and one cointegration equation between selected six macroeconomic variables and MTR.

5.12.2 Long Term Relationship between Macroeconomic Variables and MTR

The macroeconomic variables and MTR are cointegrated and its long term equation is shown in the Table 5.58.

Table 5.58: Cointegration Equation on Macroeconomic Variables and MTR

Variables	β′	Standard error	t-statistic	Decision
Inflation	-4.032	2.215	1.820	Do not Reject H_0
Exchange rate	-5.768	1.454	3.966	Reject H_0
Economic growth	-6.210	3.042	2.041	Reject H_0
Interest rate	14.322	2.581	-5.548	Reject H_0
Money supply	-2.239	0.995	2.250	Reject H_0
Oil Price	-0.258	0.326	0.791	Do not Reject H_0

The results indicate that interest rate has significant positive relationship with MTR, while exchange rate, economic growth and money supply have significant negative relationship with MTR, in the long term. However, inflation and international crude oil price have no significant relationship with MTR in the long term. Based on the results in Table 5.58, the fitted model can be written as:

$$\mathrm{MTR}_{t-1} = 84.363 - (4.032 * \mathrm{Inflation}_{t-1}) - (5.768 * \mathrm{exchangerate}_{t-1}) - (6.210 * \mathrm{economicgrowthrate}_{t-1}) + (14.322 * \mathrm{interestrate}_{t-1}) - (2.239 * \mathrm{moneysupply}_{t-1}) - (0.258 * \mathrm{oilprice}_{t}) + e_{t-1} \quad (5.12)$$

5.12.3 The Results of VECM on Macroeconomic Variables and MTR

VECM is used to find the short term relationship between macroeconomic variables and MTR, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.59.

Table 5.59: The Results of VECM on Macroeconomic Variables and MTR

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.102	0.044	-2.3	0.025
D(LASPI) lag 1	C(2)	0.05	0.136	0.364	0.717
D(LASPI) lag 2	C(3)	0.27	0.141	1.919	0.06
D(LASPI) lag 3	C(4)	0.248	0.134	1.855	0.069
D(LASPI) lag 4	C(5)	0.119	0.139	0.859	0.394
D(LCPI) lag 1	C(6)	2.282	1.425	1.602	0.115
D(LCPI) lag 2	C(7)	-0.909	1.428	-0.636	0.527
D(LCPI) lag 3	C(8)	-0.204	1.487	-0.137	0.892
D(LCPI) lag 4	C(9)	2.488	1.252	1.987	0.052
D(LEXR) lag 1	C(10)	0.038	1.326	0.029	0.977
D(LEXR) lag 2	C(11)	0.743	1.541	0.482	0.632

D(LEXR) lag 3	C(12)	3.113	1.552	2.006	0.05
D(LEXR) lag 4	C(13)	-0.607	1.327	-0.457	0.649
D(LGDP) lag 1	C(14)	1.531	1.287	1.19	0.239
D(LGDP) lag 2	C(15)	1.102	1.26	0.875	0.385
D(LGDP) lag 3	C(16)	0.38	1.18	0.322	0.748
D(LGDP) lag 4	C(17)	0.739	1.141	0.647	0.52
D(LIR) lag 1	C(18)	0.865	1.03	0.84	0.405
D(LIR) lag 2	C(19)	0.713	0.982	0.726	0.471
D(LIR) lag 3	C(20)	-0.068	0.985	-0.069	0.945
D(LIR) lag 4	C(21)	0.551	0.902	0.61	0.544
D(LMS) lag 1	C(22)	-2.327	1.899	-1.225	0.226
D(LMS) lag 2	C(23)	2.105	1.883	1.118	0.268
D(LMS) lag 3	C(24)	2.287	1.951	1.172	0.246
D(LMS) lag 4	C(25)	-0.423	1.874	-0.226	0.822
D(LICOP) lag 1	C(26)	-0.124	0.151	-0.819	0.416
D(LICOP) lag 2	C(27)	0.149	0.152	0.978	0.332
D(LICOP) lag 3	C(28)	0.198	0.147	1.34	0.186
D(LICOP) lag 4	C(29)	-0.241	0.142	-1.698	0.095
C	C(30)	-0.268	0.2	-1.341	0.185
R-squared		0.424	Mean dependent var		0.042
Adjusted R-squared		0.131	S.D. dependent var		0.187
S.E. of regression		0.174	Akaike info criterion		-0.392
Sum squared resid		1.727	Schwarz criterion		0.459
Log likelihood		47.042	Hannan-Quinn criter.		-0.049
F-statistic		1.449	Durbin-Watson stat		2.036
Prob(F-statistic)		0.115			

ECT has the expected negative sign and is significant. Inverse of absolute ECT is little less than 10 (1/0.102=9.8). As a result it can reliably be concluded that market participants take about 10 quarters to learn and correct the forecasting error.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion have minimum value. Durbin Watson statistic is 2.036.

Since F-statistic is not significant (P(F-stat)>0.05), it can be concluded that the fitted model is not significant in explaining MTR than a model with only intercept in the short term.

5.12.4 Short Term Relationship between Macroeconomic Variables and MTR

The results of Wald test are shown in Table 5.60.

Table 5.60: Wald Test results on Macroeconomic Variables and MTR

Variable	Chi-square value	df	Probability	Decision
Inflation	5.24	4	0.2635	Not Significant
Exchange rate	6.17	4	0.1871	Not Significant
Economic growth	3.46	4	0.4838	Not Significant
Interest rate	1.60	4	0.8086	Not Significant
Money supply	4.66	4	0.3238	Not Significant
Oil Price	6.88	4	0.1422	Not Significant

The results Wald test indicate that no variable is significant in explaining MTR in the short term.

5.13 The Relationship between Macroeconomic Variables and OIL

The results of the maximum lag length of macroeconomic variables and OIL are reported in Table 5.61.

Table 5.61: The Maximum Lag Length of Macroeconomic Variables and OIL

Lag	LogL	LR	FPE	AIC	SC	HQ
0	277.386	NA	0.000	-6.145	-5.948	-6.066
1	1108.083	1510.358	0.000	-23.911	-22.334*	-23.276
2	1184.335	126.509	0.000	-24.530	-21.574	-23.339
3	1262.368	117.049	0.000	-25.190	-20.855	-23.444
4	1418.733	209.671*	0.000*	-27.630*	-21.916	-25.328*

All criteria, except SC, confirmed lag four as maximum lag length. Therefore, lag four is considered as most appropriate and selected to perform the cointegration test.

5.13.1 Cointegration between Macroeconomic Variables and OIL

Cointegration test is performed between macroeconomics variables and OIL, and the results are reported in Table 5.62.

Table 5.62: The Results of Johansen Cointegration Test on Macroeconomic Variables and OIL

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	194.140	125.615	Reject H_0
r <= 1	r >1	133.629	95.754	Reject H_0
r <= 2	r >2	84.033	69.819	Reject H_0
r <= 3	r >3	51.003	47.856	Reject H_0
r <= 4	r >4	30.326	29.797	Reject H_0
r <= 5	r >5	9.819	15.495	Do not Reject H_0
λ-max Test				
r = 0	r = 1	60.510	46.231	Reject H_0
r = 1	r = 2	49.597	40.078	Reject H_0
r = 2	r = 3	33.029	33.877	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Based on Trace statistic, null hypotheses of that there is/are no, at most one, two, three and four cointegration equation/s are rejected at 5% significance level (P<0.05). However, Trace statistic accepted the null hypothesis there are five cointegration equations at 5% significant level (P>0.05). Therefore, it can be concluded with 95% confidence that there are five cointegration equations using Trace statistic.

Maximum Eigen value rejected the null hypothesis that there is no and one cointegration equation/s, however; null hypothesis that there are two cointegration equations is accepted, at 5% significant level (P>0.05). Therefore, it can be concluded with 95% confidence that there are two cointegration equations based on maximum Eigen value.

Trace statistic found at most five cointegration equations, meanwhile, maximum Eigen value found two cointegration equations. Therefore, it can be concluded that there is equilibrium long term relationship and two cointegration equations between selected six macroeconomic variables and OIL.

5.13.2 Long Term Relationship between Macroeconomic Variables and OIL

The long term relationship between macroeconomic variables and OIL is shown in Table 5.63.

Table 5.63: Cointegration Equation on Macroeconomic Variables and OIL

Variables	β′	Standard error	t-statistic	Decision
Inflation	-1.236	1.059	1.167	Do not Reject H_0
Exchange rate	-2.356	0.7737	3.197	Reject H_0
Economic growth	-2.262	1.457	1.553	Do not Reject H_0
Interest rate	6.546	1.468	-4.459	Reject H_0
Money supply	-1.588	0.528	3.007	Reject H_0
Oil Price	0.939	0.156	-6.009	Reject H_0

According to the results of cointegration test, exchange rate and money supply have significant negative relationship with OIL, while interest rate and international crude oil price are significant and positive in explaining OIL, in the long term. Nevertheless, inflation and economic growth are not significant in explaining OIL in the long term. Based on the results in Table 5.63, the fitted model can be written as:

$$\mathrm{OIL}_{t-1} = 36.568 - (1.236 * \mathrm{Inflation}_{t-1}) - (2.356 * \mathrm{exchangerate}_{t-1}) - (2.262 * \mathrm{economicgrowthrate}_{t-1}) + (6.546 * \mathrm{interestrate}_{t-1}) - (1.588 * \mathrm{moneysupply}_{t-1}) + (0.939 * \mathrm{oilprice}_{t}) + e_{t-1} \quad (5.13)$$

5.13.3 The Results of VECM on Macroeconomic Variables and OIL

VECM is used to find the short term relationship between macroeconomic variables and OIL, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.64.

Table 5.64: The results of VECM on Macroeconomic Variables and OIL

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.531	0.106	-4.99	0.000
D(LASPI) lag 1	C(2)	0.06	0.12	0.495	0.622
D(LASPI) lag 2	C(3)	0.15	0.109	1.372	0.176
D(LASPI) lag 3	C(4)	0.2	0.103	1.941	0.057
D(LASPI) lag 4	C(5)	0.052	0.106	0.489	0.627
D(LCPI) lag 1	C(6)	1.522	1.456	1.045	0.3
D(LCPI) lag 2	C(7)	-0.76	1.487	-0.511	0.611
D(LCPI) lag 3	C(8)	-0.657	1.493	-0.44	0.662
D(LCPI) lag 4	C(9)	-0.753	1.241	-0.606	0.547
D(LEXR) lag 1	C(10)	-0.228	1.346	-0.169	0.866
D(LEXR) lag 2	C(11)	-1.044	1.57	-0.665	0.509
D(LEXR) lag 3	C(12)	3.53	1.558	2.266	0.027
D(LEXR) lag 4	C(13)	0.247	1.383	0.179	0.859
D(LGDP) lag 1	C(14)	0.908	0.999	0.909	0.367
D(LGDP) lag 2	C(15)	0.548	0.998	0.549	0.585
D(LGDP) lag 3	C(16)	0.248	1.005	0.247	0.806
D(LGDP) lag 4	C(17)	0.313	1.017	0.308	0.76

D(LIR) lag 1	C(18)	-5.453	1.713	-3.184	0.002
D(LIR) lag 2	C(19)	-4.545	1.557	-2.919	0.005
D(LIR) lag 3	C(20)	-4.016	1.4	-2.868	0.006
D(LIR) lag 4	C(21)	-3.084	1.258	-2.452	0.017
D(LMS) lag 1	C(22)	2.626	1.968	1.334	0.188
D(LMS) lag 2	C(23)	3.1	1.987	1.56	0.124
D(LMS) lag 3	C(24)	-2.491	2.071	-1.203	0.234
D(LMS) lag 4	C(25)	2.563	2.085	1.229	0.224
D(LICOP) lag 1	C(26)	-0.257	0.187	-1.38	0.173
D(LICOP) lag 2	C(27)	-0.464	0.177	-2.614	0.011
D(LICOP) lag 3	C(28)	-0.208	0.166	-1.255	0.215
D(LICOP) lag 4	C(29)	-0.374	0.156	-2.4	0.02
C	C(30)	0.246	0.184	1.338	0.186
R-squared		0.556	Mean dependent var		0.044
Adjusted R-squared		0.330	S.D. dependent var		0.226
S.E. of regression		0.185	Akaike info criterion		-0.274
Sum squared resid		1.944	Schwarz criterion		0.577
Log likelihood		41.909	Hannan-Quinn criter.		0.069
F-statistic		2.462	Durbin-Watson stat		1.975
Prob(F-statistic)		0.002			

ECT has expected negative sign and it is significant. Inverse value of absolute ECT is close to two (1/0.531=1.9). Therefore, it can be concluded that market participants correct the forecasting error within two quarters.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are illustrated minimum value. Durbin Watson statistic is 1.975.

Significant F-statistic (P(F-stat)<0.05) show that the fitted model is significant in explaining OIL than a model with no independent variable in the short term. Therefore, it can be concluded that the fitted model in good in explaining the short term dynamics of OIL.

5.13.4 Short Term Relationship between Macroeconomic Variables and OIL

The results Wald test are shown in Table 5.65.

Table 5.65: Wald Test results on Macroeconomic Variables and OIL

Variable	Chi-square value	df	Probability	Decision
Inflation	2.03	4	0.7303	Not Significant
Exchange rate	7.41	4	0.1159	Not Significant
Economic growth	1.51	4	0.8254	Not Significant
Interest rate	10.88**	4	0.0280	Significant
Money supply	7.29	4	0.1212	Not Significant
Oil Price	12.95**	4	0.0115	Significant

Notes:** denotes significance at 5% level of significance.

Interest rate and International crude oil price is significant determinant of OIL in the short term. Inflation, exchange rate, economic growth and money supply are not significant in explaining OIL in the short term.

5.14 The Relationship between Macroeconomic Variables and PLT

Results of maximum lag length criteria are shown in Table 5.66.

Table 5.66: The Maximum Lag Length of Macroeconomic Variables and PLT

Lag	LogL	LR	FPE	AIC	SC	HQ
0	331.559	NA	0.000	-7.376	-7.179	-7.297
1	1121.695	1436.610	0.000	-24.220	-22.644*	-23.585
2	1203.042	134.963	0.000	-24.956	-22.000	-23.765
3	1280.693	116.476	0.000	-25.607	-21.271	-23.860
4	1404.011	165.359*	0.000*	-27.296*	-21.581	-24.993*

All criteria except SC selected lag four as maximum lag length. As a result, lag four is considered as most appropriate and selected to perform the Johansen cointegration test.

5.14.1 Cointegration between Macroeconomic Variables and PLT

The results of cointegration test are reported in Table 5.67

Table 5.67: The Results of Johansen cointegration test on macroeconomic variables and PLT

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	202.516	125.615	Reject H_0
r <= 1	r >1	137.040	95.754	Reject H_0
r <= 2	r >2	92.647	69.819	Reject H_0
r <= 3	r >3	58.433	47.856	Reject H_0
r <= 4	r >4	27.618	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	65.477	46.231	Reject H_0
r = 1	r = 2	44.392	40.078	Reject H_0
r = 2	r = 3	34.214	33.877	Reject H_0
r = 3	r = 4	30.815	27.584	Reject H_0
r = 4	r = 5	15.988	21.132	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Both Trace and Maximum Eigen statistics rejected hypotheses that there is/are no, at most one, two and three cointegration equation/s and accepted the null hypothesis

that there are four cointegration equations though at 5% significant level as P<0.05. Therefore, it can be concluded that there is long term equilibrium relationship and four cointegration equations between macroeconomics variables and PLT.

5.14.2 Long Term Relationship between Macroeconomic Variables and PLT

Long term cointegration equation on macroeconomic variables and PLT is reported in Table 5.68 and Equation 5.14.

Table 5.68: Cointegration Equation on Macroeconomic Variables and PLT

Variables	β′	Standard error	t-statistic	Decision
Inflation	-50.945	19.259	2.645	Reject H_0
Exchange rate	-11.278	11.509	0.979	Do not Reject H_0
Economic growth	-45.307	24.584	1.843	Do not Reject H_0
Interest rate	94.839	21.555	-4.399	Reject H_0
Money supply	-15.688	8.026	1.955	Reject H_0
Oil Price	-5.876	2.547	2.307	Reject H_0

Inflation, money supply and international crude oil price have significant negative relationship, while interest rate has significant positive relationship, with PLT in the long term. Moreover, exchange rate and economic growth are not significant in explaining PLT in the long term. Based on the results in Table 5.68, the fitted model can be written as:

$$\mathrm{PLT}_{t-1} = 573.669 - (50.945 * \mathrm{Inflation}_{t-1}) - (11.278 * \mathrm{exchangerate}_{t-1}) - (45.307 * \mathrm{economicgrowthrate}_{t-1}) + (94.839 * \mathrm{interestrate}_{t-1}) - (15.688 * \mathrm{moneysupply}_{t-1}) - (5.876 * \mathrm{oilprice}_{t}) + e_{t-1} \quad (5.14)$$

5.14.3 The Results of VECM Results on Macroeconomic Variables and PLT

VECM is used to find the short term relationship between macroeconomic variables and PLT, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.69.

Table 5.69: The Results of VECM on Macroeconomic Variables and PLT

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.002	0.007	-0.347	0.73
D(LASPI) lag 1	C(2)	0.153	0.135	1.139	0.259
D(LASPI) lag 2	C(3)	-0.079	0.15	-0.522	0.603
D(LASPI) lag 3	C(4)	0.029	0.148	0.196	0.845
D(LASPI) lag 4	C(5)	-0.21	0.143	-1.465	0.148
D(LCPI) lag 1	C(6)	-0.307	1.743	-0.176	0.861
D(LCPI) lag 2	C(7)	0.228	1.66	0.137	0.891
D(LCPI) lag 3	C(8)	-1.062	1.681	-0.632	0.53
D(LCPI) lag 4	C(9)	-0.489	1.401	-0.349	0.728
D(LEXR) lag 1	C(10)	1.512	1.507	1.003	0.32
D(LEXR) lag 2	C(11)	-1.75	1.748	-1.001	0.321
D(LEXR) lag 3	C(12)	2.573	1.727	1.49	0.142
D(LEXR) lag 4	C(13)	-1.684	1.417	-1.189	0.24
D(LGDP) lag 1	C(14)	0.191	1.377	0.139	0.89
D(LGDP) lag 2	C(15)	-0.568	1.359	-0.418	0.677
D(LGDP) lag 3	C(16)	0.139	1.308	0.107	0.916
D(LGDP) lag 4	C(17)	0.465	1.26	0.369	0.714
D(LIR) lag 1	C(18)	2.201	1.094	2.013	0.049
D(LIR) lag 2	C(19)	0.631	1.065	0.593	0.556
D(LIR) lag 3	C(20)	1.124	1.098	1.024	0.31
D(LIR) lag 4	C(21)	1.115	1.031	1.081	0.284
D(LMS) lag 1	C(22)	-1.183	2.054	-0.576	0.567
D(LMS) lag 2	C(23)	4.437	2.088	2.126	0.038
D(LMS) lag 3	C(24)	-1.102	2.182	-0.505	0.615
D(LMS) lag 4	C(25)	2.967	2.116	1.402	0.166
D(LICOP) lag 1	C(26)	0.057	0.176	0.323	0.748
D(LICOP) lag 2	C(27)	-0.03	0.175	-0.169	0.867
D(LICOP) lag 3	C(28)	0.043	0.165	0.261	0.795
D(LICOP) lag 4	C(29)	0.098	0.154	0.641	0.524
C	C(30)	-0.298	0.231	-1.288	0.203
R-squared		0.283	Mean dependent var		0.008
Adjusted R-squared		-0.081	S.D. dependent var		0.19
S.E. of regression		0.197	Akaike info criterion		-0.143
Sum squared resid		2.215	Schwarz criterion		0.707
Log likelihood		36.226	Hannan-Quinn criter.		0.199
F-statistic		0.777	Durbin-Watson stat		2.026
Prob(F-statistic)		0.768			

ETC has the expected negative sign, and is not significant. As a result, it can be concluded that the speed of adjustment of forecasting error cannot be estimated reliably.

According to the results of Cointegration test, Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion have minimum value. Durbin Watson statistic is 2.026.

Since F-statistic is not significant (P(F-stat)>0.05), there is no satisfactory evidence to conclude that the fitted model is better than a model with no independent variable

to explain the short term dynamics of PLT. Further, individual variables may also not be individually significant in explaining the short term dynamics of PLT.

5.14.4 Short Term Relationship between Macroeconomic Variables and PLT

The results of Wald test are shown in Table 5.70.

Table 5.70: Wald Test results on Macroeconomic Variables and PLT

Variable	Chi-square value	df	Probability	Decision
Inflation	0.55	4	0.9687	Not Significant
Exchange rate	3.21	4	0.5238	Not Significant
Economic growth	2.11	4	0.7154	Not Significant
Interest rate	4.51	4	0.3417	Not Significant
Money supply	6.20	4	0.1845	Not Significant
Oil Price	0.69	4	0.9525	Not Significant

As in the case of F-statistics, based on the results of Wald test, no variable is significant in explaining PLT in the short term.

5.15 The Relationship between Macroeconomic Variables and S&S

The results of lag length criteria are shown in Table 5.71.

Table 5.71: The Maximum Lag Length of Macroeconomic Variables and S&S

Lag	LogL	LR	FPE	AIC	SC	HQ
0	261.042	NA	0.000	-5.774	-5.577	-5.694
1	1104.843	1534.184	0.000	-23.837	-22.261*	-23.202
2	1181.641	127.414	0.000	-24.469	-21.513	-23.278
3	1260.308	118.001	0.000	-25.143	-20.808	-23.397
4	1411.325	202.501*	0.000*	-27.462*	-21.747	-25.159*

All criteria selected lag four as maximum lag length, except SC. Thus, it can be concluded that lag four is appropriate for Cointegration analysis.

5.15.1 Cointegration between Macroeconomic Variables and S&S

The cointegration test is performed between macroeconomic variables and S&S using trace statistics and maximum Eigen value. The results are shown in Table 5.72.

Table 5.72: The Results Johansen Cointegration Test on Macroeconomic Variables and S&S

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	200.464	125.615	Reject H_0
r <= 1	r >1	144.880	95.754	Reject H_0
r <= 2	r >2	92.515	69.819	Reject H_0
r <= 3	r >3	50.860	47.856	Reject H_0
r <= 4	r >4	26.777	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	55.584	46.231	Reject H_0
r = 1	r = 2	52.365	40.078	Reject H_0
r = 2	r = 3	41.655	33.877	Reject H_0
r = 3	r = 4	24.084	27.584	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

According to the trace statistic, the null hypothesis that there is/are no, at most one, two and three cointegration equation/s are rejected, and the null hypothesis that there are four cointegration equations is accepted at 5% significance level.

The maximum Eigen statistics accepted the null hypothesis that there are three cointegration equations while rejecting null hypothesis that there is/are no, at most one and two cointegration equation/s at 5% significance level. According to both test statistics, it can be concluded that there is equilibrium long term relationship and three cointegration equations between macroeconomic variables and S&S.

5.15.2 Long Term Relationship between Macroeconomic Variables and S&S

Long term cointegration equation is provided in Table 5.73.

Table 5.73: Cointegration Equation on Macroeconomic Variables and S&S

Variables	β′	Standard error	t-statistic	Decision
Inflation	4.135	0.838	-4.937	Reject H_0
Exchange rate	-1.714	0.553	3.101	Reject H_0
Economic growth	-3.824	1.175	3.253	Reject H_0
Interest rate	-2.089	1.069	1.954	Reject H_0
Money supply	1.999	0.397	-5.037	Reject H_0
Oil Price	0.846	0.130	-6.488	Reject H_0

All variables are significant in explaining S&S in the long term at 5% significant level. Inflation, money supply and international crude oil price have significant

positive relationship with S&S while exchange rate, economic growth and interest rate have significant negative relationship with S&S in the long term. Based on the results in Table 5.73, the fitted model can be written as:

$$S\&S_{t-1} = 35.285 + (4.135 * \text{Inflation}_{t-1}) - (1.714 * \text{exchangerate}_{t-1}) - (3.825 * \text{economicgrowthrate}_{t-1}) - (2.089 * \text{interestrate}_{t-1}) + (1.999 * \text{moneysupply}_{t-1}) + (0.846 * \text{internationalcrudeoilprice}_{t}) + e_{t-1} \quad (5.15)$$

5.15.3 The Results of VECM on Macroeconomic Variables and S&S

VECM is used to find the short term relationship between macroeconomic variables and S&S, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.74.

Table 5.74: The Results of VECM on Macroeconomic Variables and S&S

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.23	0.177	-1.302	0.198
D(LASPI) lag 1	C(2)	0.281	0.181	1.547	0.127
D(LASPI) lag 2	C(3)	0.326	0.183	1.775	0.081
D(LASPI) lag 3	C(4)	0.261	0.161	1.620	0.111
D(LASPI) lag 4	C(5)	0.032	0.160	0.198	0.844
D(LCPI) lag 1	C(6)	-0.63	1.866	-0.338	0.737
D(LCPI) lag 2	C(7)	-1.208	1.887	-0.64	0.525
D(LCPI) lag 3	C(8)	-1.057	1.818	-0.581	0.563
D(LCPI) lag 4	C(9)	-1.008	1.589	-0.634	0.528
D(LEXR) lag 1	C(10)	1.375	1.684	0.817	0.418
D(LEXR) lag 2	C(11)	-2.212	2.001	-1.105	0.274
D(LEXR) lag 3	C(12)	0.049	2.025	0.024	0.981
D(LEXR) lag 4	C(13)	1.616	1.709	0.946	0.348
D(LGDP) lag 1	C(14)	-0.077	1.287	-0.06	0.952
D(LGDP) lag 2	C(15)	-1.215	1.231	-0.987	0.328
D(LGDP) lag 3	C(16)	-0.659	1.245	-0.529	0.599
D(LGDP) lag 4	C(17)	-0.506	1.259	-0.402	0.689
D(LIR) lag 1	C(18)	-0.599	1.77	-0.338	0.736
D(LIR) lag 2	C(19)	-1.451	1.792	-0.81	0.421
D(LIR) lag 3	C(20)	-1.35	1.833	-0.737	0.464
D(LIR) lag 4	C(21)	-0.268	1.932	-0.139	0.89
D(LMS) lag 1	C(22)	-1.478	2.968	-0.498	0.62
D(LMS) lag 2	C(23)	4.341	2.778	1.562	0.124
D(LMS) lag 3	C(24)	0.532	2.96	0.18	0.858
D(LMS) lag 4	C(25)	2.028	2.603	0.779	0.439
D(LICOP) lag 1	C(26)	-0.175	0.221	-0.792	0.432
D(LICOP) lag 2	C(27)	-0.058	0.229	-0.252	0.802
D(LICOP) lag 3	C(28)	-0.012	0.198	-0.058	0.954
D(LICOP) lag 4	C(29)	-0.238	0.188	-1.266	0.211
C	C(30)	0.012	0.254	0.046	0.963

R-squared	0.265	Mean dependent var	0.043
Adjusted R-squared	-0.109	S.D. dependent var	0.223
S.E. of regression	0.235	Akaike info criterion	0.205
Sum squared resid	3.137	Schwarz criterion	1.055
Log likelihood	21.091	Hannan-Quinn criter.	0.547
F-statistic	0.707	Durbin-Watson stat	1.931
Prob(F-statistic)	0.844		

ETC has expected negative sign, and is not significant. Accordingly, it can be concluded that the speed of adjustment of forecasting error cannot reliably be estimated.

According to the cointegration test results, Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are illustrated minimum value. Durbin Watson statistic is 1.931.

F-statistic is not significant (P(F-stat)>0.05). Therefore, there are no adequate facts to prove that the fitted model is superior to a model with no independent variables in explaining S&S in the short term.

5.15.4 Short Term Relationship between Macroeconomic Variables and S&S

Wald test results are shown in Table 5.75.

Table 5.75: The Results of Wald Test on Macroeconomic Variables and S&S

Variable	Chi-square value	df	Probability	Decision
Inflation	2.22	4	0.6949	Not Significant
Exchange rate	2.79	4	0.5919	Not Significant
Economic growth	2.20	4	0.6986	Not Significant
Interest rate	2.00	4	0.7352	Not Significant
Money supply	3.28	4	0.5117	Not Significant
Oil Price	2.15	4	0.7073	Not Significant

Since the results of Wald test are not significant, it can be concluded that macroeconomic variables have no significant short term relationship with S&S.

5.16 The Relationship between Macroeconomic Variables and SRV

The findings of maximum lag length criteria between macroeconomic variables and SRV are shown in Table 5.76.

Table 5.76: The Maximum Lag Length of Macroeconomic Variables and SRV

Lag	LogL	LR	FPE	AIC	SC	HQ
0	308.871	NA	0.000	-6.861	-6.664	-6.781
1	1139.529	1510.287	0.000	-24.626	-23.049*	-23.991
2	1219.833	133.231	0.000	-25.337	-22.381	-24.146
3	1300.143	120.466	0.000	-26.049	-21.713	-24.302
4	1440.723	188.505*	0.000*	-28.130*	-22.415	-25.828*

SC selected lag one, and remaining criteria selected lag four as maximum lag length. Thus, lag four is selected as maximum lag to perform cointegration test.

5.16.1 Cointegration between Macroeconomic Variables and SRV

The results Johansen cointegration test on macroeconomic variables and SRV are reported in Table 5.77.

Table 5.77: The Results Johansen Cointegration Test on Macroeconomic Variables and SRV

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	191.525	125.615	Reject H_0
r <= 1	r >1	130.509	95.754	Reject H_0
r <= 2	r >2	85.270	69.819	Reject H_0
r <= 3	r >3	48.972	47.856	Reject H_0
r <= 4	r >4	25.662	29.797	Do not Reject H_0
λ-max Test				
r = 0	r = 1	61.016	46.231	Reject H_0
r = 1	r = 2	45.239	40.078	Reject H_0
r = 2	r = 3	36.298	33.877	Reject H_0
r = 3	r = 4	23.310	27.584	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Null hypotheses that there is no, at most one, two, three and four cointegration equation/s are rejected, while confirming the null hypothesis that there are five cointegration equations at 5% significance level with trace statistics. Maximum Eigen statistics confirmed one cointegration equation while rejecting the null hypothesis that there is no cointegration equation at 5% significance level. Therefore, it can be concluded that there is equilibrium long term relationship and one cointegration equation between macroeconomic variables and SRV.

5.16.2 Long Term Relationship between Macroeconomic Variables and SRV

The results of cointegration test are shown in Table 5.78.

Table 5.78: Cointegration Equation on Macroeconomic Variables and SRV

Variables	β′	Standard error	t-statistic	Decision
Inflation	11.518	4.085	-2.819	Reject H_0
Exchange rate	-0.441	2.753	0.160	Do not Reject H_0
Economic growth	10.376	5.584	-1.858	Do not Reject H_0
Interest rate	-20.112	5.288	3.803	Reject H_0
Money supply	4.148	1.738	-2.387	Reject H_0
Oil Price	1.797	0.572	-3.143	Reject H_0

Inflation, money supply and international crude oil price have significant positive relationship with SRV, while interest rate has significant negative relationship with SRV, in the long term. However, exchange rate and economic growth have no significant relationship with SRV in the long term. Based on the results in Table 5.78, the fitted model can be written as:

$$\text{SRV}_{t-1} = -125.672 + (11.518 * \text{Inflation}_{t-1}) - (0.441 * \text{exchangerate}_{t-1}) + (10.378 * \text{economicgrowthrate}_{t-1}) - (20.112 * \text{interestrate}_{t-1}) + (4.148 * \text{moneysupply}_{t-1}) + (1.797 * \text{oilprice}_{t}) + e_{t-1} \quad (5.16)$$

5.16.3 The Results of VECM on Macroeconomic Variables and SRV

VECM is used to find the short term relationship between macroeconomic variables and SRV, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.79.

Table 5.79: The Results of VECM on Macroeconomic Variables and SRV

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	0.038	0.025	1.559	0.124
D(LASPI) lag 1	C(2)	-0.069	0.143	-0.486	0.629
D(LASPI) lag 2	C(3)	-0.035	0.152	-0.231	0.819
D(LASPI) lag 3	C(4)	0.132	0.14	0.942	0.35
D(LASPI) lag 4	C(5)	-0.037	0.146	-0.256	0.799
D(LCPI) lag 1	C(6)	0.353	1.355	0.261	0.795
D(LCPI) lag 2	C(7)	-0.698	1.347	-0.518	0.606
D(LCPI) lag 3	C(8)	-0.829	1.398	-0.593	0.556
D(LCPI) lag 4	C(9)	1.071	1.125	0.952	0.345
D(LEXR) lag 1	C(10)	1.179	1.184	0.996	0.324
D(LEXR) lag 2	C(11)	-0.812	1.411	-0.576	0.567
D(LEXR) lag 3	C(12)	2.457	1.407	1.746	0.086

D(LEXR) lag 4	C(13)	-1.353	1.155	-1.171	0.246
D(LGDP) lag 1	C(14)	1.512	1.14	1.326	0.19
D(LGDP) lag 2	C(15)	1.488	1.119	1.329	0.189
D(LGDP) lag 3	C(16)	0.564	1.075	0.525	0.602
D(LGDP) lag 4	C(17)	0.326	1.051	0.31	0.757
D(LIR) lag 1	C(18)	2.09	0.889	2.35	0.022
D(LIR) lag 2	C(19)	2.824	0.885	3.19	0.002
D(LIR) lag 3	C(20)	1.636	0.973	1.681	0.098
D(LIR) lag 4	C(21)	0.816	0.93	0.877	0.384
D(LMS) lag 1	C(22)	-0.948	1.713	-0.554	0.582
D(LMS) lag 2	C(23)	1.918	1.725	1.112	0.271
D(LMS) lag 3	C(24)	-1.104	1.713	-0.644	0.522
D(LMS) lag 4	C(25)	2.223	1.691	1.314	0.194
D(LICOP) lag 1	C(26)	-0.007	0.142	-0.047	0.963
D(LICOP) lag 2	C(27)	0.051	0.139	0.364	0.717
D(LICOP) lag 3	C(28)	0.079	0.133	0.595	0.554
D(LICOP) lag 4	C(29)	-0.028	0.125	-0.227	0.821
C	C(30)	-0.321	0.179	-1.795	0.078
R-squared		0.36	Mean dependent var		0.029
Adjusted R-squared		0.035	S.D. dependent var		0.163
S.E. of regression		0.16	Akaike info criterion		-0.561
Sum squared resid		1.458	Schwarz criterion		0.289
Log likelihood		54.422	Hannan-Quinn criter.		-0.219
F-statistic		1.107	Durbin-Watson stat		2.08
Prob(F-statistic)		0.363			

The results of VECM show that ECT does not have the expected negative sign and is not significant. Consequently, it can be concluded that the speed of adjustment of forecasting error cannot reliably be estimated.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion have their respective minimum value. Durbin Watson statistic is 2.079.

As F-statistic is not significant (P(F-stat)>0.05), there are no enough evidence to support that the fitted model is better than a model with no independent variables in explaining S&S in the short term.

5.16.4 Short Term Relationship between Macroeconomic Variables and SRV

Wald test results are shown in Table 5.80.

Table 5.80: Wald Test results on Macroeconomic Variables and SRV

Variable	Chi-square value	df	Probability	Decision
Inflation	1.46	4	0.8334	Not Significant
Exchange rate	4.31	4	0.3653	Not Significant
Economic growth	5.88	4	0.2082	Not Significant
Interest rate	13.58	4	0.0088*	Significant
Money supply	2.67	4	0.6140	Not Significant
Oil Price	0.66	4	0.9565	Not Significant

Notes: * denotes significance at 1% level.

According to the results of Wald test interest rate is significant and no other macroeconomic variable is significant in explaining SRV in the short term.

5.17 The Relationship between Macroeconomic Variables and TRD

The results of lag length criteria are shown in Table 5.81.

Table 5.81: The Maximum Lag Length of Macroeconomic Variables and TRD

Lag	LogL	LR	FPE	AIC	SC	HQ
0	274.546	NA	0.000	-6.081	-5.884	-6.001
1	1120.636	1538.346	0.000	-24.196	-22.619*	-23.561
2	1203.531	137.531	0.000	-24.967	-22.011	-23.776
3	1286.005	123.711	0.000	-25.727	-21.392	-23.981
4	1406.684	161.819*	0.000*	-27.356*	-21.642	-25.054*

Majority criteria selected lag four as maximum lag length. Therefore lag four is selected as appropriate lag to continue further analysis.

5.17.1 Cointegration between Macroeconomic Variables and TRD

Johansen cointegration test is used to identify long term relationship between macroeconomic variables and TRD. The results of cointegration test are shown in Table 5.82.

Table 5.82: The Results of Johansen Cointegration Test on Macroeconomic Variables and TRD

H0:	H1:	Statistics	CV 95%	Results
λ-trace				
r = 0	r > 0	184.617	125.615	Reject H_0
r <= 1	r >1	126.706	95.754	Reject H_0
r <= 2	r >2	81.523	69.819	Reject H_0
r <= 3	r >3	43.879	47.856	Do not Reject H_0
λ-max Test				
r = 0	r = 1	57.911	46.231	Reject H_0
r = 1	r = 2	45.182	40.078	Reject H_0
r = 2	r = 3	37.645	33.877	Reject H_0
r = 3	r = 4	21.380	27.584	Do not Reject H_0

Notes: H_0 and H_1 are the null and alternative hypotheses, respectively. CV is the critical values of the λ_{trace} and λ_{max} at 5% significance level. r is the order of cointegration

Both Trace and maximum Eigen statistics rejected null hypotheses as there is/are no, at most one and two cointegration equation/s and accepted the null hypothesis that there are three cointegration equations at 5% significance level. Therefore, it can be concluded that there is equilibrium long term relationship and three cointegration equations between macroeconomic variables and TRD.

5.17.2 Long Term Relationship between Macroeconomic Variables and TRD

The cointegration results are reported in Table 5.83.

Table 5.83: Cointegration Equation on Macroeconomic Variables and TRD

Variables	β′	Standard error	t-statistic	Decision
Inflation	-49.038	23.448	2.091	Reject H_0
Exchange rate	0.394	16.956	-0.023	Do not Reject H_0
Economic growth	-52.703	33.184	1.588	Do not Reject H_0
Interest rate	110.425	31.672	-3.487	Reject H_0
Money supply	-25.625	10.778	2.377	Reject H_0
Oil Price	-9.251	3.482	2.657	Reject H_0

Inflation, money supply and international crude oil price have significant negative relationship, while interest rate has significant positive relationship, with TRD in the long term. Based on the results in Table 5.83, the fitted model can be written as:

$$TRD_{t-1} = 675.258 - (49.038 * Inflation_{t-1}) + (0.394 * exchangerate_{t-1}) - (52.704 * economicgrowthrate_{t-1}) + (110.425 * interestrate_{t-1}) - (25.625 * moneysupply_{t-1}) - (9.251 * oilprice_t) + e_{t-1} \quad (5.17)$$

5.17.3 The Results of VECM on Macroeconomic Variables and TRD

VECM is used to find the short term relationship between macroeconomic variables and TRD, as the selected variables are cointegrated. The Results of VECM and ECT are shown in Table 5.84.

Table 5.84: The Results of VECM on Macroeconomic Variables and TRD

Variable		Coefficient	Std. Error	t-Statistic	Prob.
Cointegration equation	C(1)	-0.005	0.005	-1.05	0.298
D(LASPI) lag 1	C(2)	0.222	0.135	1.637	0.107
D(LASPI) lag 2	C(3)	0.179	0.143	1.249	0.217
D(LASPI) lag 3	C(4)	0.129	0.134	0.961	0.341
D(LASPI) lag 4	C(5)	0.061	0.134	0.457	0.649
D(LCPI) lag 1	C(6)	-0.585	1.469	-0.398	0.692
D(LCPI) lag 2	C(7)	-1.873	1.474	-1.271	0.209
D(LCPI) lag 3	C(8)	-0.447	1.512	-0.295	0.769
D(LCPI) lag 4	C(9)	0.209	1.243	0.168	0.867
D(LEXR) lag 1	C(10)	2.365	1.329	1.78	0.08
D(LEXR) lag 2	C(11)	-0.981	1.572	-0.624	0.535
D(LEXR) lag 3	C(12)	2.536	1.561	1.625	0.11
D(LEXR) lag 4	C(13)	-1.279	1.251	-1.023	0.311
D(LGDP) lag 1	C(14)	0.38	1.252	0.303	0.763
D(LGDP) lag 2	C(15)	-0.438	1.252	-0.35	0.728
D(LGDP) lag 3	C(16)	-0.764	1.191	-0.641	0.524
D(LGDP) lag 4	C(17)	-0.041	1.166	-0.035	0.972
D(LIR) lag 1	C(18)	3.144	0.965	3.258	0.002
D(LIR) lag 2	C(19)	1.243	1.015	1.225	0.226
D(LIR) lag 3	C(20)	1.409	1.037	1.359	0.179
D(LIR) lag 4	C(21)	1.339	0.937	1.43	0.158
D(LMS) lag 1	C(22)	-2.686	1.817	-1.478	0.145
D(LMS) lag 2	C(23)	4.336	1.855	2.337	0.023
D(LMS) lag 3	C(24)	0.051	1.924	0.027	0.979
D(LMS) lag 4	C(25)	1.792	1.866	0.96	0.341
D(LICOP) lag 1	C(26)	-0.064	0.154	-0.418	0.678
D(LICOP) lag 2	C(27)	0.084	0.153	0.549	0.585
D(LICOP) lag 3	C(28)	0.071	0.149	0.477	0.636
D(LICOP) lag 4	C(29)	-0.131	0.139	-0.943	0.349
C	C(30)	-0.28	0.196	-1.425	0.16
R-squared		0.467	Mean dependent var		0.031
Adjusted R-squared		0.195	S.D. dependent var		0.196
S.E. of regression		0.176	Akaike info criterion		-0.369
Sum squared resid		1.766	Schwarz criterion		0.481
Log likelihood		46.069	Hannan-Quinn criter.		-0.027
F-statistic		1.72	Durbin-Watson stat		2.05
Prob(F-statistic)		0.04			

ECT has expected negative sign, and is not significant. Hence, it can be concluded that the time taken to adjust the forecasting error cannot be estimated reliably.

Akaike information criterion, Schwarz criterion and Hannan-Quinn criterion are at their minimum values. Durbin Watson statistic is 2.050.

Since F-statistic is significant (P(F-stat)<0.05), there is sufficient evidence to show that the fitted model is better than a model with no independent variables in explaining TRD in the short term.

5.17.4 Short Term Relationship between Macroeconomic Variables and TRD

The results of Wald test are shown in Table 5.85.

Table 5.85: The Results of Wald Test on Macroeconomic Variables and TRD

Variable	Chi-square value	df	Probability	Decision
Inflation	2.36	4	0.6701	Not Significant
Exchange rate	6.34	4	0.1753	Not Significant
Economic growth	3.69	4	0.4494	Not Significant
Interest rate	11.34**	4	0.0230	Significant
Money supply	7.83***	4	0.0980	Not Significant
Oil Price	1.76	4	0.7796	Not Significant

Notes: ** and *** denote significance at 5% and 10% levels, respectively.

Based on Wald test, it is found that interest rate is significant; however, other five macroeconomic variables are not significant in explaining TRD in the short term.

5.18 Summary Results of the Cointegration Tests and the Results of VECM

Summary of Results are shown in Table 5.86.

Table 5.86: Summary of Results

	Cointegration relationship	Inflation	Exchange rate	Economic Growth	Interest rate	Money Supply	Oil price	Expected ECT Value	Model Fitness	Significant Variables
ASPI	Yes	N	N	S(-)	S+	N	N	Yes	No	-
BFI	Yes	S(-)	N	S(-)	S+	N	N	No	No	-
BFT	Yes	S+	N	N	S(-)	S+	S+	No	No	-
C&E	Yes	S(-)	S(-)	N	S+	S(-)	N	No	No	-
C&P	Yes	S(-)	S(-)	S(-)	S+	S(-)	N	No	No	-
DIV	Yes	S+	N	N	S(-)	N	S+	No	Yes	-
F&T	Yes	S+	N	N	S(-)	S+	N	No	Yes	Interest rate
H&T	Yes	S+	S(-)	N	S(-)	S+	S+	No	Yes	Economic growth Interest rate Money supply Oil price
INV	Yes	S+	S(-)	S(-)	N	N	S+	No	No	-
L&P	Yes	S+	N	N	S(-)	S+	S+	No	No	-
MFG	Yes	N	S(-)	S(-)	S+	S+	N	No	No	-
MTR	Yes	N	S(-)	S(-)	S+	S(-)	N	Yes	No	-
OIL	Yes	N	S(-)	N	S+	S(-)	S+	Yes	Yes	Interest rate Oil price
PLT	Yes	S(-)	N	N	S+	S(-)	S(-)	No	No	-
S&S	Yes	S+	S(-)	S(-)	S(-)	S+	S+	No	No	-
SRV	Yes	S+	N	N	S(-)	S+	S+	No	No	Interest rate
TRD	Yes	S(-)	N	N	S+	S(-)	S(-)	No	Yes	Interest rate

S = Significant
N = Not Significant

Macroeconomic variables and stock market return are cointegrated and have long term equilibrium relationship. Macroeconomic variables and each sector return are cointegrated and have long term equilibrium relationships. Interest rate has positive and economic growth has negative impact on ASPI, in the long term. Other macroeconomic variables are not significant in explaining ASPI, in the long term.

Interest rate has positive relationship, and inflation and economic growth have negative relationships with BFI, in the long term. Other variables have no significant

relationship with BFI in the long term. Inflation, money supply and international crude oil price have significant positive influence, and interest rate has significant negative influence on BFT, L&P and SRV, in the long term. Other variables have no significant impact on these three sectors.

BFT, L&P and SRV have similar long term impact of macroeconomic variables in terms of significance of variables. Inflation, exchange rate and money supply have long term significant negative relationship, and interest rate has long term significant positive relationship with C&E. In contrast, economic growth and international crude oil price have no long term significant relationship with C&E. Inflation, exchange rate, economic growth and money supply have significant negative impact, and interest rate has significant positive impact on C&P, in the long term. However, crude oil price is not significant in the long term in explaining C&P.

Inflation and international crude oil price have significant positive relationship, and interest rate has significant negative relationship with DIV, in the long term. Nonetheless, in the long term, exchange rate, economic growth and money supply have no significant long term relationship with DIV. Inflation and money supply have significant positive impact on F&T, and interest rate has significant impact on F&T, in the long term. Other variables have no significant long term relationship with F&T. Inflation, money supply and international crude oil price have long term significant positive influence on H&T. Further, exchange rate and interest rate have long term significant negative influence on H&T. Moreover, there is no significant long term impact of economic growth on H&T.

Inflation and international crude oil price have significant positive relationship, and exchange rate and economic growth have significant negative relationship with INV, in the long term. Other variables have no significant long term impact on INV. Interest rate and money supply have significant positive relationship, and exchange rate and economic growth have significant negative relationship, with MFG, in the long term. Remaining variables; inflation and international crude oil price, have no long term significant impact on MFG.

Interest rate has significant long term positive relationship, and exchange rate, economic growth and money supply have significant long term negative relationship, with MTR. However, inflation and international crude oil price have no significant long term relationship with MTR. Interest rate and oil price have significant positive long term relationship with OIL. Moreover, exchange rate and money supply have

significant negative relationship with OIL in the long term. Other variables are not significant in explaining OIL in the long term.

Interest rate has positive long term impact on both PLT and TRD. Inflation, money supply and crude oil price have long term significant negative impact on PLT and TRD. Nevertheless, exchange rate and economic growth are not significant in explaining PLT and TRD in the long term. Macroeconomic variables have similar impact on PLT and TRD in terms of significance of variables.

In the long term, all macroeconomic variables are significant in explaining S&S. Accordingly, inflation, money supply and international crude oil price have significant positive long term relationship with S&S. Further, in the long term, exchange rate, economic growth and interest rate and have significant negative relationship with S&S. Very few variables are significant in explaining sector returns in the short term. Macroeconomic variables have no significant short term relationship with most of the sectors. Majority of sectors does not have significant negative ECT and most of the fitted models are not significant in explaining short term dynamics of macroeconomic variables on each sector return.

In terms of significance of individual variables in the cointegration equations between macroeconomic variables and each sector return, the following derivations can be arrived. Inflation has positive impact on eight sectors, negative impact on five sectors and no impact on three sectors. Exchange rate has no positive impact on any sector, negative impact on eight sectors and no impact on eight sectors. Similarly, economic growth has no positive impact on any sector, negative impact on seven sectors and no impact on nine sectors. Interest rate has positive impact on eight sectors, negative impact on seven sectors and no impact on one sector. Money supply has positive impact on seven sectors, negative impact on six sectors and no impact on three sectors. Crude oil price has positive impact on eight sectors, negative impact on two sectors and no impact on six sectors.

CHAPTER 6

CONCLUSIONS AND RECCOMENDATIONS

Based on the results of data analyses in Chapter 4 and Chapter 5, the following conclusions and recommendations are given.

6.1 Conclusions

- Macroeconomic variables and stock market return are cointegrated and have long term equilibrium relationship.
- Interest rate has significant positive and economic growth has significant negative relationship with ASPI, in the long term.
- Macroeconomic variables and each sector return are cointegrated and have long term equilibrium relationships.
- Exchange rate and economic growth have significant negative relationship with eight and seven sectors, respectively, and no significant positive relationship with any sector return, in the long term
- Inflation has significant positive and negative long term relationship with eight and five sectors, respectively.
- Interest rate and money supply have significant long term positive and negative relationship with nearly half of the sector returns each.
- Oil price is significant and positive in explaining half of the sector returns, significant and negative in explaining two sector returns, in the long term.
- Majority of macroeconomic variables; economic growth, interest rate, money supply and oil price, are significant in explaining only H&T in the short term.
- No macroeconomic variable is significant in explaining ASPI, BFI, BFT, C&E, C&P, DIV, INV, L&P, MFG, MTR, PLT, and S&S, in the short term.
- Interest rate and international crude oil price have significant short term relationship with OIL.
- Interest rate has short term significant relationship with five sector returns; F&T, H&T,F&T,SRV, and TRD, separately.
- Inflation and exchange rate have no significant short term relationship with any sector return.

6.2 Recommendations

- The results of this research are useful for the investors, using both technical and fundamental analysis, to improve the value of equity investment decisions,
- The results of this research could be used as input to the policy making when deciding investment promotions locally and internationally, and
- A research of this nature is useful to the policy makers to identify how stock market and each sector of the economy react to the changes in the macroeconomic environment, and make policies accordingly, and
- This research is useful to economists to get an understanding as to how macroeconomic variables have impact on stock market and sector returns.

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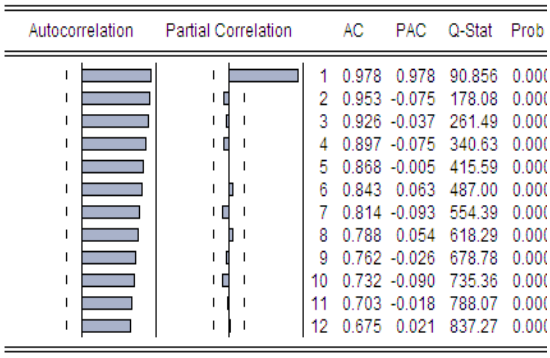
Appendix I: Correlogram of Variables

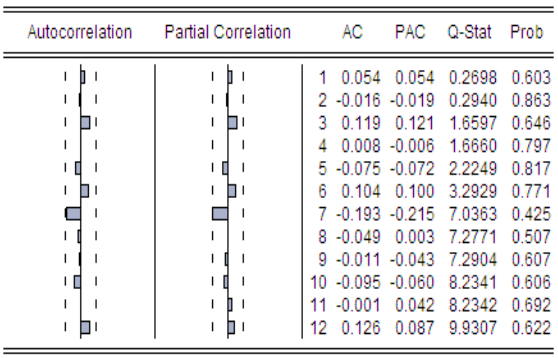
1) Correlogram of LASPI

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.978	0.978	90.856	0.000
		2	0.953	-0.075	178.08	0.000
		3	0.926	-0.037	261.49	0.000
		4	0.897	-0.075	340.63	0.000
		5	0.868	-0.005	415.59	0.000
		6	0.843	0.063	487.00	0.000
		7	0.814	-0.093	554.39	0.000
		8	0.788	0.054	618.29	0.000
		9	0.762	-0.026	678.78	0.000
		10	0.732	-0.090	735.36	0.000
		11	0.703	-0.018	788.07	0.000
		12	0.675	0.021	837.27	0.000

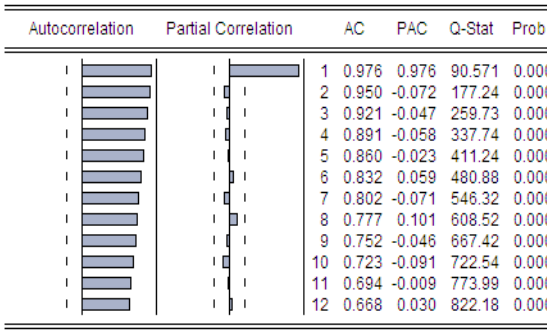
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.054	0.054	0.2698	0.603
		2	-0.016	-0.019	0.2940	0.863
		3	0.119	0.121	1.6597	0.646
		4	0.008	-0.006	1.6660	0.797
		5	-0.075	-0.072	2.2249	0.817
		6	0.104	0.100	3.2929	0.771
		7	-0.193	-0.215	7.0363	0.425
		8	-0.049	0.003	7.2771	0.507
		9	-0.011	-0.043	7.2904	0.607
		10	-0.095	-0.060	8.2341	0.606
		11	-0.001	0.042	8.2342	0.692
		12	0.126	0.087	9.9307	0.622

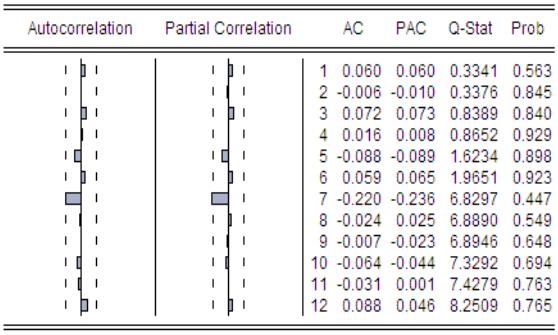
2) Correlogram of LBFI

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.976	0.976	90.571	0.000
		2	0.950	-0.072	177.24	0.000
		3	0.921	-0.047	259.73	0.000
		4	0.891	-0.058	337.74	0.000
		5	0.860	-0.023	411.24	0.000
		6	0.832	0.059	480.88	0.000
		7	0.802	-0.071	546.32	0.000
		8	0.777	0.101	608.52	0.000
		9	0.752	-0.046	667.42	0.000
		10	0.723	-0.091	722.54	0.000
		11	0.694	-0.009	773.99	0.000
		12	0.668	0.030	822.18	0.000

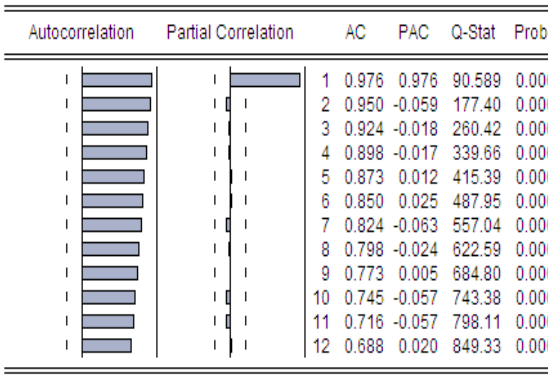
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.060	0.060	0.3341	0.563
		2	-0.006	-0.010	0.3376	0.845
		3	0.072	0.073	0.8389	0.840
		4	0.016	0.008	0.8652	0.929
		5	-0.088	-0.089	1.6234	0.898
		6	0.059	0.065	1.9651	0.923
		7	-0.220	-0.236	6.8297	0.447
		8	-0.024	0.025	6.8890	0.549
		9	-0.007	-0.023	6.8946	0.648
		10	-0.064	-0.044	7.3292	0.694
		11	-0.031	0.001	7.4279	0.763
		12	0.088	0.046	8.2509	0.765

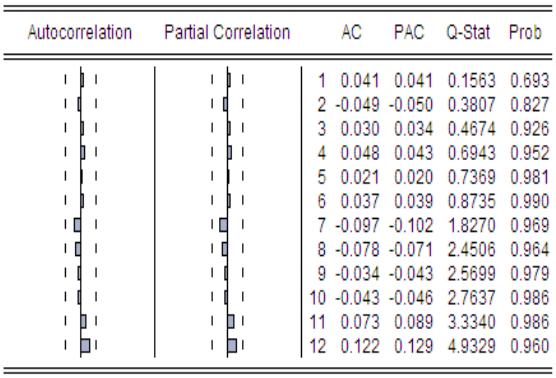
3) Correlogram of LBFT

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.976	0.976	90.589	0.000
		2	0.950	-0.059	177.40	0.000
		3	0.924	-0.018	260.42	0.000
		4	0.898	-0.017	339.66	0.000
		5	0.873	0.012	415.39	0.000
		6	0.850	0.025	487.95	0.000
		7	0.824	-0.063	557.04	0.000
		8	0.798	-0.024	622.59	0.000
		9	0.773	0.005	684.80	0.000
		10	0.745	-0.057	743.38	0.000
		11	0.716	-0.057	798.11	0.000
		12	0.688	0.020	849.33	0.000

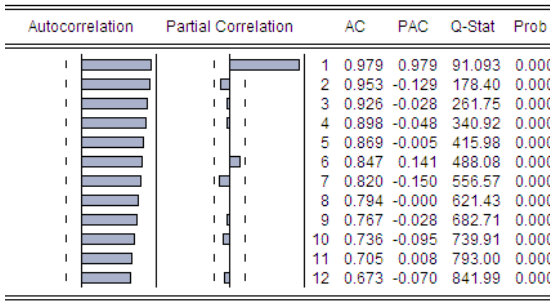
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.041	0.041	0.1563	0.693
		2	-0.049	-0.050	0.3807	0.827
		3	0.030	0.034	0.4674	0.926
		4	0.048	0.043	0.6943	0.952
		5	0.021	0.020	0.7369	0.981
		6	0.037	0.039	0.8735	0.990
		7	-0.097	-0.102	1.8270	0.969
		8	-0.078	-0.071	2.4506	0.964
		9	-0.034	-0.043	2.5699	0.979
		10	-0.043	-0.046	2.7637	0.986
		11	0.073	0.089	3.3340	0.986
		12	0.122	0.129	4.9329	0.960

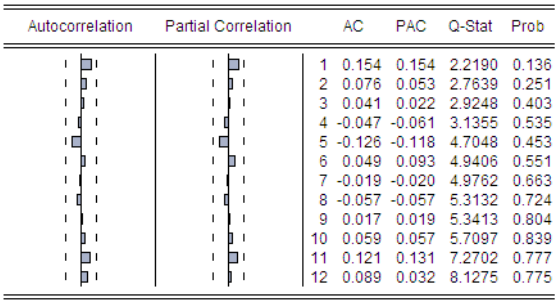
4) Correlogram of LC&E

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.979	0.979	91.093	0.000
		2	0.953	-0.129	178.40	0.000
		3	0.926	-0.028	261.75	0.000
		4	0.898	-0.048	340.92	0.000
		5	0.869	-0.005	415.98	0.000
		6	0.847	0.141	488.08	0.000
		7	0.820	-0.150	556.57	0.000
		8	0.794	-0.000	621.43	0.000
		9	0.767	-0.028	682.71	0.000
		10	0.736	-0.095	739.91	0.000
		11	0.705	0.008	793.00	0.000
		12	0.673	-0.070	841.99	0.000

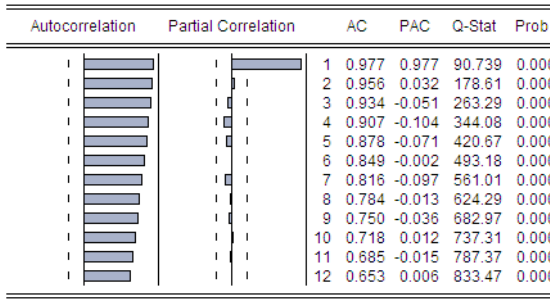
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.154	0.154	2.2190	0.136
		2	0.076	0.053	2.7639	0.251
		3	0.041	0.022	2.9248	0.403
		4	-0.047	-0.061	3.1355	0.535
		5	-0.126	-0.118	4.7048	0.453
		6	0.049	0.093	4.9406	0.551
		7	-0.019	-0.020	4.9762	0.663
		8	-0.057	-0.057	5.3132	0.724
		9	0.017	0.019	5.3413	0.804
		10	0.059	0.057	5.7097	0.839
		11	0.121	0.131	7.2702	0.777
		12	0.089	0.032	8.1275	0.775

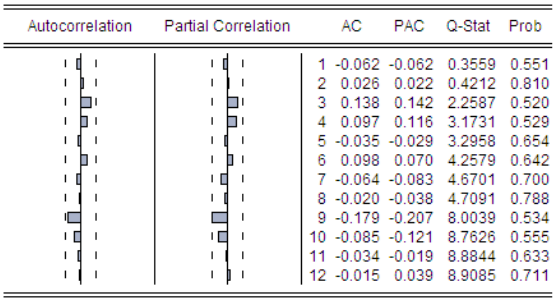
5) Correlogram of LC&P

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.977	0.977	90.739	0.000
		2	0.956	0.032	178.61	0.000
		3	0.934	-0.051	263.29	0.000
		4	0.907	-0.104	344.08	0.000
		5	0.878	-0.071	420.67	0.000
		6	0.849	-0.002	493.18	0.000
		7	0.816	-0.097	561.01	0.000
		8	0.784	-0.013	624.29	0.000
		9	0.750	-0.036	682.97	0.000
		10	0.718	0.012	737.31	0.000
		11	0.685	-0.015	787.37	0.000
		12	0.653	0.006	833.47	0.000

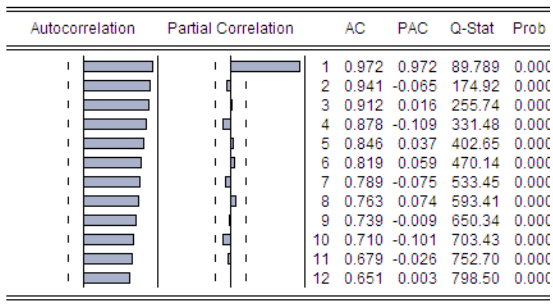
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.062	-0.062	0.3559	0.551
		2	0.026	0.022	0.4212	0.810
		3	0.138	0.142	2.2587	0.520
		4	0.097	0.116	3.1731	0.529
		5	-0.035	-0.029	3.2958	0.654
		6	0.098	0.070	4.2579	0.642
		7	-0.064	-0.083	4.6701	0.700
		8	-0.020	-0.038	4.7091	0.788
		9	-0.179	-0.207	8.0039	0.534
		10	-0.085	-0.121	8.7626	0.555
		11	-0.034	-0.019	8.8844	0.633
		12	-0.015	0.039	8.9085	0.711

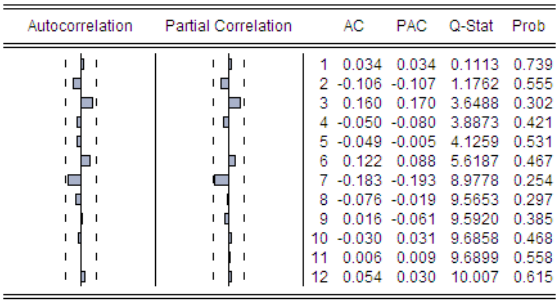
6) Correlogram of LDIV

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.972	0.972	89.789	0.000
		2	0.941	-0.065	174.92	0.000
		3	0.912	0.016	255.74	0.000
		4	0.878	-0.109	331.48	0.000
		5	0.846	0.037	402.65	0.000
		6	0.819	0.059	470.14	0.000
		7	0.789	-0.075	533.45	0.000
		8	0.763	0.074	593.41	0.000
		9	0.739	-0.009	650.34	0.000
		10	0.710	-0.101	703.43	0.000
		11	0.679	-0.026	752.70	0.000
		12	0.651	0.003	798.50	0.000

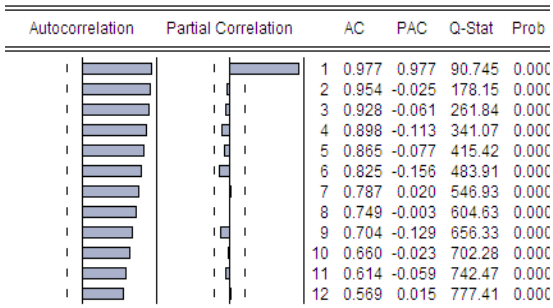
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.034	0.034	0.1113	0.739
		2	-0.106	-0.107	1.1762	0.555
		3	0.160	0.170	3.6488	0.302
		4	-0.050	-0.080	3.8873	0.421
		5	-0.049	-0.005	4.1259	0.531
		6	0.122	0.088	5.6187	0.467
		7	-0.183	-0.193	8.9778	0.254
		8	-0.076	-0.019	9.5653	0.297
		9	0.016	-0.061	9.5920	0.385
		10	-0.030	0.031	9.6858	0.468
		11	0.006	0.009	9.6899	0.558
		12	0.054	0.030	10.007	0.615

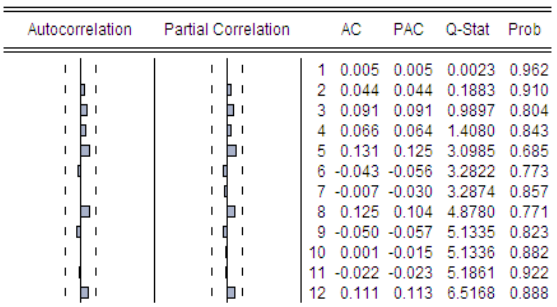
7) Correlogram of LF_T

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.977	0.977	90.745	0.000
		2	0.954	-0.025	178.15	0.000
		3	0.928	-0.061	261.84	0.000
		4	0.898	-0.113	341.07	0.000
		5	0.865	-0.077	415.42	0.000
		6	0.825	-0.156	483.91	0.000
		7	0.787	0.020	546.93	0.000
		8	0.749	-0.003	604.63	0.000
		9	0.704	-0.129	656.33	0.000
		10	0.660	-0.023	702.28	0.000
		11	0.614	-0.059	742.47	0.000
		12	0.569	0.015	777.41	0.000

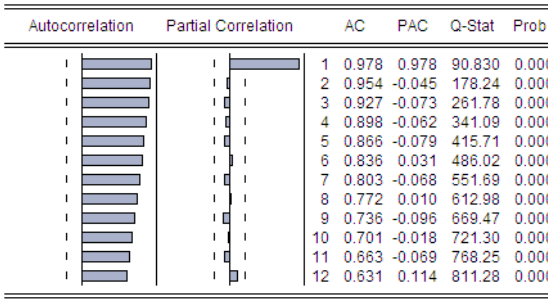
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.005	0.005	0.0023	0.962
		2	0.044	0.044	0.1883	0.910
		3	0.091	0.091	0.9897	0.804
		4	0.066	0.064	1.4080	0.843
		5	0.131	0.125	3.0985	0.685
		6	-0.043	-0.056	3.2822	0.773
		7	-0.007	-0.030	3.2874	0.857
		8	0.125	0.104	4.8780	0.771
		9	-0.050	-0.057	5.1335	0.823
		10	0.001	-0.015	5.1336	0.882
		11	-0.022	-0.023	5.1861	0.922
		12	0.111	0.113	6.5168	0.888

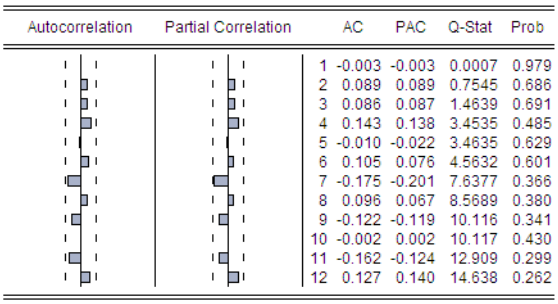
8) Correlogram of LH_T

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.978	0.978	90.830	0.000
		2	0.954	-0.045	178.24	0.000
		3	0.927	-0.073	261.78	0.000
		4	0.898	-0.062	341.09	0.000
		5	0.866	-0.079	415.71	0.000
		6	0.836	0.031	486.02	0.000
		7	0.803	-0.068	551.69	0.000
		8	0.772	0.010	612.98	0.000
		9	0.736	-0.096	669.47	0.000
		10	0.701	-0.018	721.30	0.000
		11	0.663	-0.069	768.25	0.000
		12	0.631	0.114	811.28	0.000

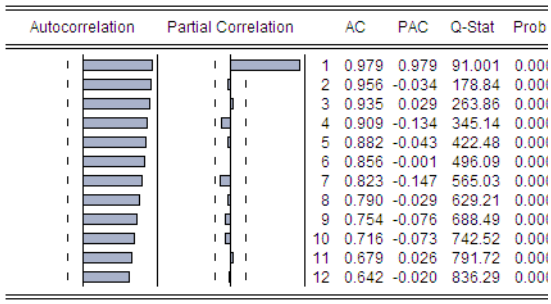
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.003	-0.003	0.0007	0.979
		2	0.089	0.089	0.7545	0.686
		3	0.086	0.087	1.4639	0.691
		4	0.143	0.138	3.4535	0.485
		5	-0.010	-0.022	3.4635	0.629
		6	0.105	0.076	4.5632	0.601
		7	-0.175	-0.201	7.6377	0.366
		8	0.096	0.067	8.5689	0.380
		9	-0.122	-0.119	10.116	0.341
		10	-0.002	0.002	10.117	0.430
		11	-0.162	-0.124	12.909	0.299
		12	0.127	0.140	14.638	0.262

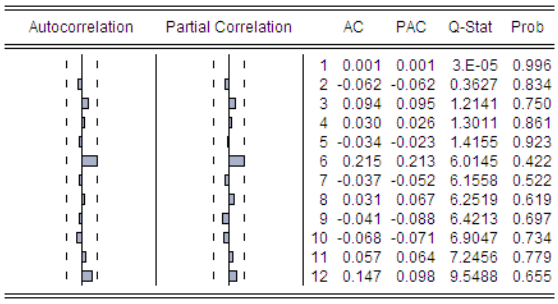
9) Correlogram of LINV

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.979	0.979	91.001	0.000
		2	0.956	-0.034	178.84	0.000
		3	0.935	0.029	263.86	0.000
		4	0.909	-0.134	345.14	0.000
		5	0.882	-0.043	422.48	0.000
		6	0.856	-0.001	496.09	0.000
		7	0.823	-0.147	565.03	0.000
		8	0.790	-0.029	629.21	0.000
		9	0.754	-0.076	688.49	0.000
		10	0.716	-0.073	742.52	0.000
		11	0.679	0.026	791.72	0.000
		12	0.642	-0.020	836.29	0.000

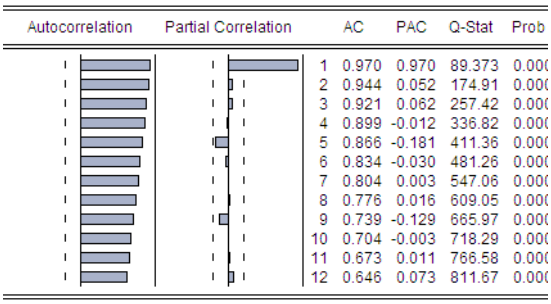
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.001	0.001	3.E-05	0.996
		2	-0.062	-0.062	0.3627	0.834
		3	0.094	0.095	1.2141	0.750
		4	0.030	0.026	1.3011	0.861
		5	-0.034	-0.023	1.4155	0.923
		6	0.215	0.213	6.0145	0.422
		7	-0.037	-0.052	6.1558	0.522
		8	0.031	0.067	6.2519	0.619
		9	-0.041	-0.088	6.4213	0.697
		10	-0.068	-0.071	6.9047	0.734
		11	0.057	0.064	7.2456	0.779
		12	0.147	0.098	9.5488	0.655

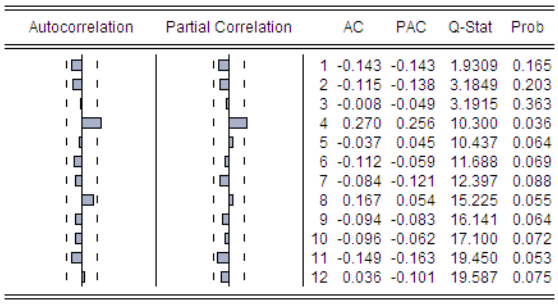
10) Correlogram of LL_P

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.970	0.970	89.373	0.000
		2	0.944	0.052	174.91	0.000
		3	0.921	0.062	257.42	0.000
		4	0.899	-0.012	336.82	0.000
		5	0.866	-0.181	411.36	0.000
		6	0.834	-0.030	481.26	0.000
		7	0.804	0.003	547.06	0.000
		8	0.776	0.016	609.05	0.000
		9	0.739	-0.129	665.97	0.000
		10	0.704	-0.003	718.29	0.000
		11	0.673	0.011	766.58	0.000
		12	0.646	0.073	811.67	0.000

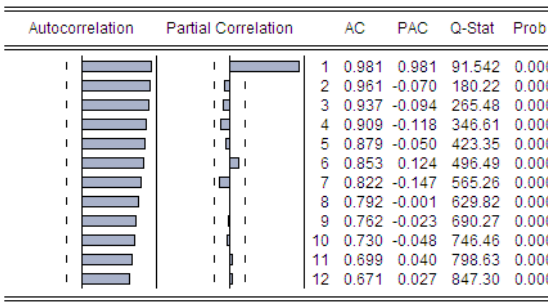
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.143	-0.143	1.9309	0.165
		2	-0.115	-0.138	3.1849	0.203
		3	-0.008	-0.049	3.1915	0.363
		4	0.270	0.256	10.300	0.036
		5	-0.037	0.045	10.437	0.064
		6	-0.112	-0.059	11.688	0.069
		7	-0.084	-0.121	12.397	0.088
		8	0.167	0.054	15.225	0.055
		9	-0.094	-0.083	16.141	0.064
		10	-0.096	-0.062	17.100	0.072
		11	-0.149	-0.163	19.450	0.053
		12	0.036	-0.101	19.587	0.075

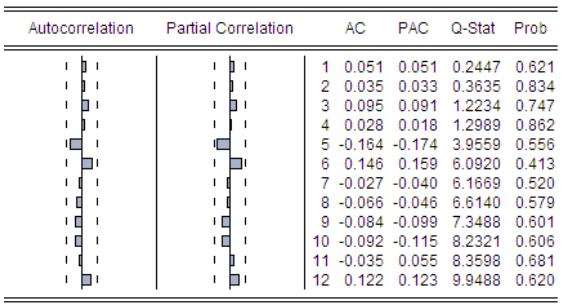
11) Correlogram of LMFG

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.981	0.981	91.542	0.000
		2	0.961	-0.070	180.22	0.000
		3	0.937	-0.094	265.48	0.000
		4	0.909	-0.118	346.61	0.000
		5	0.879	-0.050	423.35	0.000
		6	0.853	0.124	496.49	0.000
		7	0.822	-0.147	565.26	0.000
		8	0.792	-0.001	629.82	0.000
		9	0.762	-0.023	690.27	0.000
		10	0.730	-0.048	746.46	0.000
		11	0.699	0.040	798.63	0.000
		12	0.671	0.027	847.30	0.000

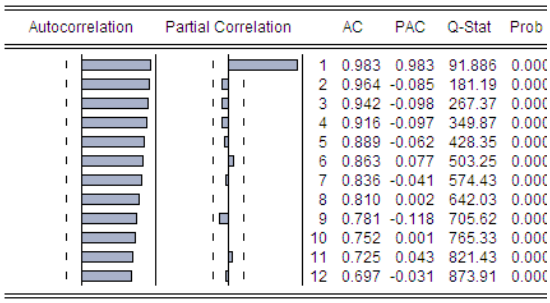
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.051	0.051	0.2447	0.621
		2	0.035	0.033	0.3635	0.834
		3	0.095	0.091	1.2234	0.747
		4	0.028	0.018	1.2989	0.862
		5	-0.164	-0.174	3.9559	0.556
		6	0.146	0.159	6.0920	0.413
		7	-0.027	-0.040	6.1669	0.520
		8	-0.066	-0.046	6.6140	0.579
		9	-0.084	-0.099	7.3488	0.601
		10	-0.092	-0.115	8.2321	0.606
		11	-0.035	0.055	8.3598	0.681
		12	0.122	0.123	9.9488	0.620

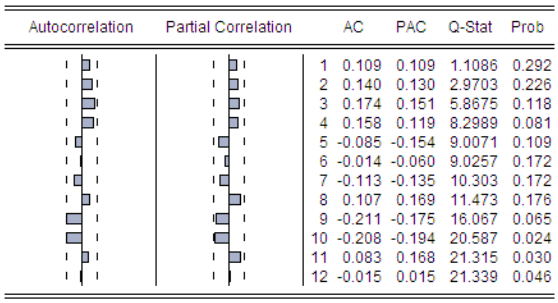
12) Correlogram of LMTR

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.983	0.983	91.886	0.000
		2	0.964	-0.085	181.19	0.000
		3	0.942	-0.098	267.37	0.000
		4	0.916	-0.097	349.87	0.000
		5	0.889	-0.062	428.35	0.000
		6	0.863	0.077	503.25	0.000
		7	0.836	-0.041	574.43	0.000
		8	0.810	0.002	642.03	0.000
		9	0.781	-0.118	705.62	0.000
		10	0.752	0.001	765.33	0.000
		11	0.725	0.043	821.43	0.000
		12	0.697	-0.031	873.91	0.000

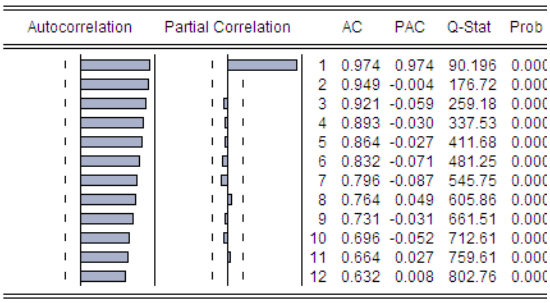
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.109	0.109	1.1086	0.292
		2	0.140	0.130	2.9703	0.226
		3	0.174	0.151	5.8675	0.118
		4	0.158	0.119	8.2989	0.081
		5	-0.085	-0.154	9.0071	0.109
		6	-0.014	-0.060	9.0257	0.172
		7	-0.113	-0.135	10.303	0.172
		8	0.107	0.169	11.473	0.176
		9	-0.211	-0.175	16.067	0.065
		10	-0.208	-0.194	20.587	0.024
		11	0.083	0.168	21.315	0.030
		12	-0.015	0.015	21.339	0.046

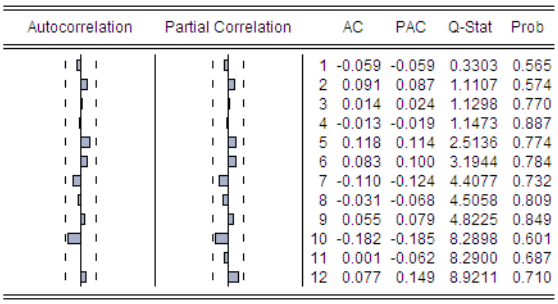
13) Correlogram of LOIL

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.974	0.974	90.196	0.000
		2	0.949	-0.004	176.72	0.000
		3	0.921	-0.059	259.18	0.000
		4	0.893	-0.030	337.53	0.000
		5	0.864	-0.027	411.68	0.000
		6	0.832	-0.071	481.25	0.000
		7	0.796	-0.087	545.75	0.000
		8	0.764	0.049	605.86	0.000
		9	0.731	-0.031	661.51	0.000
		10	0.696	-0.052	712.61	0.000
		11	0.664	0.027	759.61	0.000
		12	0.632	0.008	802.76	0.000

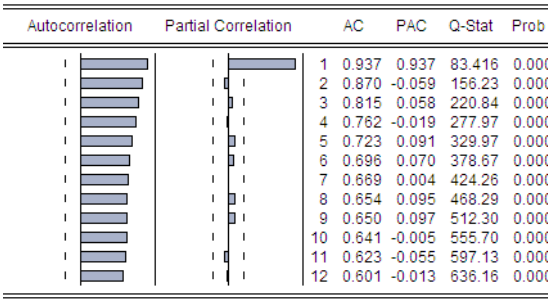
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.059	-0.059	0.3303	0.565
		2	0.091	0.087	1.1107	0.574
		3	0.014	0.024	1.1298	0.770
		4	-0.013	-0.019	1.1473	0.887
		5	0.118	0.114	2.5136	0.774
		6	0.083	0.100	3.1944	0.784
		7	-0.110	-0.124	4.4077	0.732
		8	-0.031	-0.068	4.5058	0.809
		9	0.055	0.079	4.8225	0.849
		10	-0.182	-0.185	8.2898	0.601
		11	0.001	-0.062	8.2900	0.687
		12	0.077	0.149	8.9211	0.710

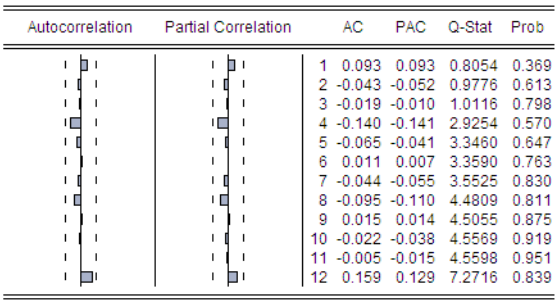
14) Correlogram of LPLT

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.937	0.937	83.416	0.000
		2	0.870	-0.059	156.23	0.000
		3	0.815	0.058	220.84	0.000
		4	0.762	-0.019	277.97	0.000
		5	0.723	0.091	329.97	0.000
		6	0.696	0.070	378.67	0.000
		7	0.669	0.004	424.26	0.000
		8	0.654	0.095	468.29	0.000
		9	0.650	0.097	512.30	0.000
		10	0.641	-0.005	555.70	0.000
		11	0.623	-0.055	597.13	0.000
		12	0.601	-0.013	636.16	0.000

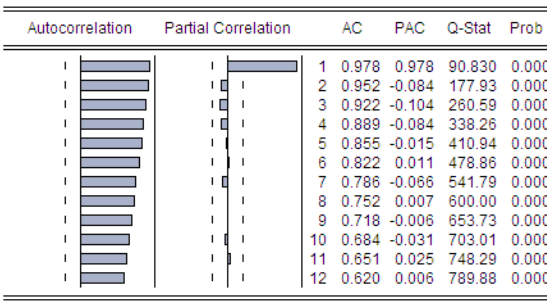
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.093	0.093	0.8054	0.369
		2	-0.043	-0.052	0.9776	0.613
		3	-0.019	-0.010	1.0116	0.798
		4	-0.140	-0.141	2.9254	0.570
		5	-0.065	-0.041	3.3460	0.647
		6	0.011	0.007	3.3590	0.763
		7	-0.044	-0.055	3.5525	0.830
		8	-0.095	-0.110	4.4809	0.811
		9	0.015	0.014	4.5055	0.875
		10	-0.022	-0.038	4.5569	0.919
		11	-0.005	-0.015	4.5598	0.951
		12	0.159	0.129	7.2716	0.839

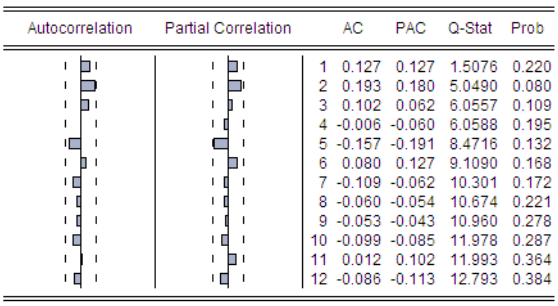
15) Correlogram of LS&S

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.978	0.978	90.830	0.000
		2	0.952	-0.084	177.93	0.000
		3	0.922	-0.104	260.59	0.000
		4	0.889	-0.084	338.26	0.000
		5	0.855	-0.015	410.94	0.000
		6	0.822	0.011	478.86	0.000
		7	0.786	-0.066	541.79	0.000
		8	0.752	0.007	600.00	0.000
		9	0.718	-0.006	653.73	0.000
		10	0.684	-0.031	703.01	0.000
		11	0.651	0.025	748.29	0.000
		12	0.620	0.006	789.88	0.000

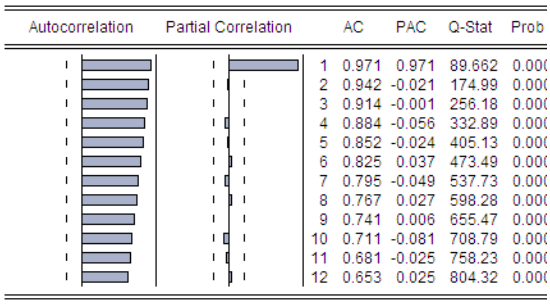
a) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.127	0.127	1.5076	0.220
		2	0.193	0.180	5.0490	0.080
		3	0.102	0.062	6.0557	0.109
		4	-0.006	-0.060	6.0588	0.195
		5	-0.157	-0.191	8.4716	0.132
		6	0.080	0.127	9.1090	0.168
		7	-0.109	-0.062	10.301	0.172
		8	-0.060	-0.054	10.674	0.221
		9	-0.053	-0.043	10.960	0.278
		10	-0.099	-0.085	11.978	0.287
		11	0.012	0.102	11.993	0.364
		12	-0.086	-0.113	12.793	0.384

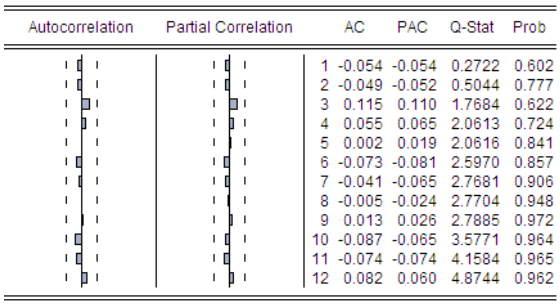
16) Correlogram of LSRV

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.971	0.971	89.662	0.000
		2	0.942	-0.021	174.99	0.000
		3	0.914	-0.001	256.18	0.000
		4	0.884	-0.056	332.89	0.000
		5	0.852	-0.024	405.13	0.000
		6	0.825	0.037	473.49	0.000
		7	0.795	-0.049	537.73	0.000
		8	0.767	0.027	598.28	0.000
		9	0.741	0.006	655.47	0.000
		10	0.711	-0.081	708.79	0.000
		11	0.681	-0.025	758.23	0.000
		12	0.653	0.025	804.32	0.000

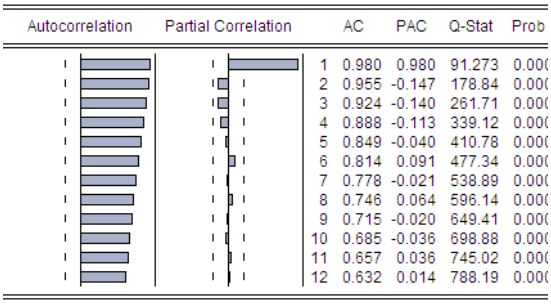
b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.054	-0.054	0.2722	0.602
		2	-0.049	-0.052	0.5044	0.777
		3	0.115	0.110	1.7684	0.622
		4	0.055	0.065	2.0613	0.724
		5	0.002	0.019	2.0616	0.841
		6	-0.073	-0.081	2.5970	0.857
		7	-0.041	-0.065	2.7681	0.906
		8	-0.005	-0.024	2.7704	0.948
		9	0.013	0.026	2.7885	0.972
		10	-0.087	-0.065	3.5771	0.964
		11	-0.074	-0.074	4.1584	0.965
		12	0.082	0.060	4.8744	0.962

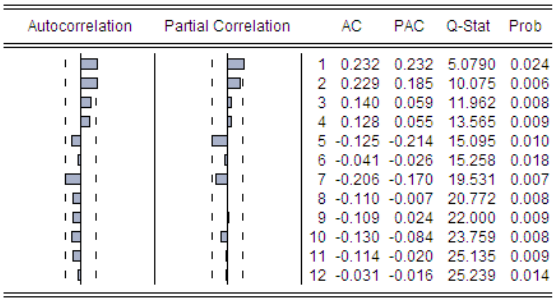
17) Correlogram of LTRD

a) At Level



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.980	0.980	91.273	0.000
		2	0.955	-0.147	178.84	0.000
		3	0.924	-0.140	261.71	0.000
		4	0.888	-0.113	339.12	0.000
		5	0.849	-0.040	410.78	0.000
		6	0.814	0.091	477.34	0.000
		7	0.778	-0.021	538.89	0.000
		8	0.746	0.064	596.14	0.000
		9	0.715	-0.020	649.41	0.000
		10	0.685	-0.036	698.88	0.000
		11	0.657	0.036	745.02	0.000
		12	0.632	0.014	788.19	0.000

b) At 1st Difference



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.232	0.232	5.0790	0.024
		2	0.229	0.185	10.075	0.006
		3	0.140	0.059	11.962	0.008
		4	0.128	0.055	13.565	0.009
		5	-0.125	-0.214	15.095	0.010
		6	-0.041	-0.026	15.258	0.018
		7	-0.206	-0.170	19.531	0.007
		8	-0.110	-0.007	20.772	0.008
		9	-0.109	0.024	22.000	0.009
		10	-0.130	-0.084	23.759	0.008
		11	-0.114	-0.020	25.135	0.009
		12	-0.031	-0.016	25.239	0.014