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An Investigation of NonLinear Relationship Between Macroeconomic Variables and Stock Markets of Selected Asian Countries by Using NARDL Approach

by

Syed Farhan Ali

A thesis submitted in partial fulfillment for the degree of Master of Science

in the

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I dedicate my thesis work to my family and friends. A special feeling of gratitude to my loving parents whose words of encouragement and push for tenacity ring in my ears. My special thanks to my elder brother Zeeshan who never left my side and is very special to me. I also dedicate this thesis to my friends and teachers who have supported me throughout the process. I will always appreciate all what they have done, especially Sir, Arshad Hassan for helping me developing and polishing my financial empirical skills and special thanks for putting many hours of proofreading.

CERTIFICATE OF APPROVAL

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Abstract

The purpose of this research thesis is to examine the long and short-term effect of macroeconomic variables on the stock markets of Pakistan, India, Bangladesh, Indonesia, and Malaysia for the period January 2000 to June 2018. The study uses ARDL and NARDL approaches to examine the linear as well as non linear relationship between macroeconomic variables and stock markets. This study observes limited evidence of long run relationship in India only M2 has long run relationship with equity market. In Bangladesh industrial production index has long run relationship with equity market. In Malaysia money supply and GDP have long run relationship with equity market. In Indonesia no long run relationship is observed. However, in Pakistan, money supply, inflation rate, balance of trade, GDP, and foreign exchange reserves have long run relationship with Pakistan stock market. The short run relationship is found more pronounced in sample countries as significant presence of impact of macroeconomic variables on equity returns is found. The NARDL approach provides evidence of asymmetric relationship of M2, exchange rate, and oil prices is observed in Pakistan, India, and Malaysia. So, the policy makers should be vigilant regarding devising their monetary policy and investors should be careful that the impact of rise and fall in M2, exchange rate, and oil prices is not same.

Key words: ARDL as Auto-Regressive Distributive Lags, NARDL Non-Linear Auto-Regressive Distributive Lags

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Abbreviations

(*)	Significant
ARDL	Auto-Regressive Distributive Lags
BN	Billion
BSE	Bombay Stock Exchange
BT	Balance of Trade
Coeff	Coefficient
CPI	Consumer Price Index
DES	Dhaka Stock Exchange
ER	Exchange Rate
FDI	Foreign Direct Investment
FER	Foreign Exchange Reserves
GDP	Gross Domestic Product
I	Stock Index
IIP	Index of Industrial Production
INF	Inflation Rate
JKSE	Jakarta Stock Exchange
KLCI	Kuala Lampur Composite Index
KSE	Karachi Stock Exchange
LBSE	Log of Bombay Stock Exchange
LBT	Log of Balance of Trade
LCPI	Log of Consumer Price Index
LDES	Log of Dhaka Stock Exchange
LER	Log of Exchange Rate
LFDI	Log of Foreign Direct Investment

LFER	Log of Foreign Exchange Reserves
LGDP	Log of Gross Domestic Product
LIIP	Log of Index of Industrial Production
LINF	Log of Inflation Rate
LJKSE	Log of Jakarta Stock Exchange
LKLCI	Log of Kuala Lampur Composite Index
LKSE	Log of Karachi Stock Exchange
LM2	Log of Broad Money Supply
LOP	Log of Oil Prices
M2	Broad Money Supply
MN	Million
NARDL	Non-Linear Auto-Regressive Distributive Lags
OP	Oil Prices
Prob	Probability
S. Err	Standard Error
T-Stat	T-Statistics

Chapter 1

Introduction

1.1 The Background of the Study

The equity market is an indispensable limb for an economy because it helps in the redistribution of the financial resources among different economic entities. In today's economic world order equity markets helps in the redistribution of funds in more fruitful prospects. The discussion of economic development is incomplete if we don't mention the usefulness of the equity market.

The link between the equity market and the macroeconomic indicators are the main concern for the researchers over a long time to see their impact on each other. A decent amount of empirical research is carried out in the past to explore any association amid macroeconomic indicators and the equity market. The underlying purpose behind this is to help policymakers understand the variation in the equity return because of changes in macroeconomic variables.

Epaphra (2018) explore the link amid equity prices and the macroeconomic indicators in Tanzania (inflation rate, treasury bill rate, rate of exchange, and money stock). The analysis uncovers that there is a longstanding relationship between them. Furthermore, Hassan and Al refai (2012) examine the connection amid the equity market and macroeconomic indicators of the Jordanian market. The findings show that trade surplus, prices of oil, Reserves of foreign currency, and money supply influencing Jordanian market over the long run.

In contrary to the above discussion, there are some studies which defy the connection amid the macroeconomic indicators and equity market like the study of Gurloveleen and Bhatia (2015) haven't detect any effect of macroeconomic indicators at BSE500 index. A resembling conclusion is discovered by Barbic and Jurkic (2011) where no causal link amid macroeconomic indicators and equity market of Croatia, Hungary, and Poland is found.

The research to date usually tends to focus on the discovery of the symmetric relationship between the macroeconomic indicators and the equity market in the long and short term. Furthermore, according to Anoruo et al. (2011) the fundamental restriction of the symmetric model is that it assumes the symmetric nature of time series data. Whereas information is asymmetric in real time series.

A major development in the asymmetric relationship is given by Shin et al. (2014) in which they developed a co-integration nonlinear auto-regressive distributed lag (NARDL) model which is derived from the earlier work of Pesaran et al. (2001) in which both shorter and longer term asymmetries are discovered by means of decomposition of the explanatory variables in positive and negative partial sum.

One of the first notable exceptions is found by Ismail and Bin Isa (2009) who explore the asymmetric interactions amid the equity returns and currency exchange rate in Malaysia and for this purpose, they employ the Markov Vector Auto-regression Model for the time period 1990-2005. The results indicate that Markov Vector Auto-regression Model accommodate the data more appropriately than the linearized VAR. Identical results can also be seen in the study of Cuestas and Tang (2017) are first to estimate the exposure to exchange rates using a linear VAR template that has a serious model specification. In contrast, estimates of the non-linear dynamic model show that currency exchange rate exposure to returns of the industry is asymmetrical in nature.

Since the inception of Pakistan stock market, many dramatic changes have been taking place for the last two decades and a number of crises have occurred during

this period. In 2016 a milestone is achieved by merging Pakistan main stock exchanges into one, i.e. Pakistan Stock Exchange (PSX). Currently, PSX is standing at 41000.

There have been a considerable number of studies in the past studying the connection amid the equity market and macroeconomic indicators Khalid and Khan (2017) examine the association amid Karachi Stock 100 index and the economic indicators. Their findings suggest that the inflation rate, and rate of exchange significantly & positively influencing the Karachi equity returns in longer-term. However, a significantly & negatively association is present amid rates of interest and equity returns. In connection with the discussion, Pervaiz et al. (2018) concludes that inflation puts an adverse effect on the goodness of the market. In contrary to results there is a positive influence of rates of interest and conversion rates on the KSE 100 index Umer (2016) investigates the relationship between 11 economic indicators and their influence on the index of KSE-100 and find a longer-term positive impact on Money stock, indices of consumer prices, and prices of oil on KSE-100 index, whereas a negatively longer-run influence of rate of exchange, foreign currency reserve, gold rates, and the interest rates is found on KSE-100 index.

In the context of asymmetric relationship between macroeconomic variables and stock market is given by the study of Rizwan and Khan (2007) where he concludes that the effect of negative news on stock market performance is higher than the effect of the positive news and bad news causes more market volatility then good news in Pakistan stock market. Similar results can be seen in the study of Fatima and Bashir (2014) where they conclude that asymmetry exist between the stock market of Pakistan and macroeconomic variables as beta's of the dummy variables are negative in nature and concludes that when the prices of oil increases the stock market returns will decrease. Whereas when the oil prices decreases similar type of increase in the stock returns is not followed that indicates that the relationship between the variables is non linear in nature.

1.2 Theoretical Framework

Various economic models and theories have been proposed in the past to see the influence of economic variables on equity markets of a country. Among those theories and models three of the most widely acclaimed theories appear relevant namely, **The Efficient Market Hypothesis (EMH), Capital Asset Pricing Model (CAPM) & Arbitrage Pricing Theory (APT)** which are further discussed in detail.

1.2.1 Efficient Market Hypothesis (EMH)

Market efficiency theory is proposed by Malkiel and Fama (1970) according to EMH the stocks in the market should keep on trading at its market value at any point in time, So, it will not be possible for financier to buy underestimated equity or sell equity at higher value. The only course of obtaining a higher return is by some chance or by investing in riskier assets.

Market efficiency theory can be classified into three types i.e. (1) Weak (2) Semi-Strong (3) Strong form of market efficiency.

Weak-form market efficiency suggests that asset prices portray all preceding information accessible to the public, whereas the semi-strong market efficiency suggests that asset prices portray all the information available. Finally, Strong market efficiency suggests that asset prices, replicate all freely available information along with insider information and incorporate changes in its prices.

1.2.2 Capital Asset Pricing Model (CAPM)

The model of asset pricing is built upon previous efforts of Markowitz (1952) i.e. **the modern portfolio theory** is an asset portfolio mathematical framework that maximizes anticipated returns for a given risk level. It's an investment formalization and diversification extension.

Using this theory as a base model in 1960s, CAPM is introduced by the efforts of William F. Sharp, Jack Treynor, Jan Mossin, and John Linter. CAPM can

help investors in computing expected returns on investment with the given risk of investment, risk-free returns, anticipated market returns, and an asset portfolio beta. Where the risk-free returns are usually in the form of government bond yield, betas refer volatility of overall market.

1.2.3 Arbitrage Pricing Theory (APT)

Pricing theory of arbitrage is the most commonly used theory to connect to various macroeconomic indicators to the stock returns. It is an extension of (CAPM) and instead of using one factor only, i.e. The market premium. The APT considers multiple factors while explaining the stock prices.

Pricing theory of arbitrage supposed that expected returns are dependent on various macroeconomic and security-specific factors. The forces that influence the stock prices are unanticipated shifts in risk premiums; variations in industrial production; unexpected inflation; and, unexpected drive in the form of the term interest rate structure.(Roll and Ross, 1980).

1.3 Research Gap

Stock market variations are the main concern for the policymakers, researchers, and financial analyst because of its indispensable role in the economic development of a nation (Khalid and Khan, 2017).

The research to date usually tends to focus on the discovery of the symmetric relationship between the macroeconomic indicators and the equity market in the long and short term. There is a limited literature about the non-linear or asymmetric relationship with the macroeconomic indicators and equity market. Furthermore, there is an absence of comparative analysis of the symmetric and asymmetric relationship between the macroeconomic variables and equity market. So, there is a need to conduct a comparative analysis of the symmetric and asymmetric relationship between the macroeconomic variables and the stock market in

the long term and short term. Bahmani-Oskooee and Saha (2015), Raza et al. (2016), Cuestas and Tang (2017) and Cheah et al. (2017).

Various empirical studies conclude that future research should focus on a comparative analysis of multiple countries with more monetary indicators for an extended duration to observe the influence of macroeconomic indicators on equity market in the long term and short term. Khan et al. (2014); Pervaiz et al. (2018); Khalid and Khan (2017); Gurloveleen and Bhatia (2015); Megaravalli and Sampagnaro (2018); Jamaludin et al. (2017); Ismail et al. (2015); Epaphra (2018); Ullah et al. (2017).

The purpose of the present research is to fill the gap by studying the symmetric and asymmetric relationship and conducts a comparative analysis of nine major macroeconomic indicators on the stock market in the long- and short-term for the Asian countries including Pakistan(KSE-100), Bangladesh (DSE Broad), India (BSE-500 index), Indonesia (JSE Index) and Malaysia (KLCI).

1.4 Problem Statement

The relationship between macroeconomic variables and stock market are related in the short term and long term.

However, the link between these two is considered as asymmetric because positive and negative changes didnt behave in the same manner. This situation requires investigation specifically in the context of the Asian markets.

1.5 Research Questions

The prime objective of the research is to conduct a comparative analysis of symmetric and asymmetric long and short term effect of macroeconomic variables on the stock markets of Pakistan(KSE-100 index), Bangladesh (DSE Broad), India (BSE-500 index), Indonesia (JSE Index) and Malaysia (KLCI) which are as follows.

1. Does long term relationship exists between money supply and stock markets?

2. Does money supply effects the stock returns in the short term?
3. Does money supply has any asymmetric effect on the stock market in the long run?
4. Does money supply has any asymmetric impact on the stock stock returns in short run?
5. Does long term relationship exists between exchange rate and stock markets?
6. Does exchange rate effects the stock returns in the short term?
7. Does exchange rate has any asymmetric effect on the stock market in the long run?
8. Does exchange rate in the short run has any asymmetric impact on the stock stock returns?
9. Does long term relationship exists between inflation rate and stock market?
10. Does inflation rate effects the stock returns in the short term?
11. Does inflation rate has any asymmetric effect on the stock market in the long run?
12. Does inflation rate in the short run has any asymmetric impact on the stock stock returns?
13. Does long term relationship exists between gross domestic product (GDP) and stock markets?
14. Does gross domestic product impacts the stock returns in the short term?
15. Does balance of trade has any long term effect on the stock markets?
16. Does any short-term relationship exists between balane of trade and stock returns?
17. Does the Index of Industrial Production effects the stock markets in the long term?

18. Does any short term relationship between exists between index of industrial production and stock returns?

19. Does any asymmetric long term relationship exists between the index of industrial production and stock markets?

20. Does any asymmetric relationship exists between the index of industrail production and stock returns in the short term?

21. Does long term relationship exist between the oil prices and the stock market?

22. Does oil prices influence the stock returns in the short term?

23. Does any asymmetric relationship exist between the stock market and oil prices in the long term?

24. Does any short term asymmetric relationship exists between the oil prices and stock returns?

25. Does Foreign Direct Investment (FDI) effects stock market in the long term?

26. Does any short term relationship exists between the foreign direct investment and stock returns?

27. Does foreign reserves effects the stock index in the long term?

28. Does any short term relationship exist between the stock returns and foreign exchange reserves in the short term?

1.6 Research Objective

Based on the above questions following objectives are derived.

1. To provide insight about the long run relationship between macroeconomic variables and equity market.

2. To explore the presence of short run impact of macroeconomic variables on equity market returns.

3. To examine the asymmetric link between macroeconomic variables and equity market in long run and short run.

1.7 Significance of The Study

This study add understanding to the body of knowledge around by examining the effect of macroeconomic indicators (exchange rate, M2, GDP, trade balance, inflation rate, industrial production index, FDI, and FER) over stock markets of selected Asian countries of Bangladesh (DSE Broad), India (BSE-500 index), Indonesia (JSE Index) Malaysia (KLCI), and Pakistan (KSE-100 index). The specific significance may be summarized as.

1. The literature till date is found on the effects of macroeconomic variables on the stock market in linear context and some of the literature is on non-linear context but there is an absence of comparative analysis between the linear and non-linearity context till date is observed.

2. A comparative analysis between the symmetric and asymmetric behavior has been done using the ARDL and NARDL approach which differentiate positive and negative shocks.

3. This research is very useful for the government, investors, stock market players, policy makers, academic purpose and for the organizations as it helps to understand the dynamics of the market in light of variations in country macroeconomic fundamentals.

1.8 Plan of Study

This thesis is composed of five main chapters. First three chapters focus on the theoretical area of the relevant topic, whereas the last two chapters cover the empirical aspects of the study.

Chapter 1: It focuses on the fundamental idea of the study. This section introduces a topic by providing a background of the study, theoretical framework, research gap, problem statement, research questions, research objectives and significance of the study.

Chapter 2: This chapter narrates results of survey of topic including theoretical as well as empirical arguments from past researches.

Chapter 3: This chapter includes the definition of the variables and different methodologies adopted for investigation including symmetric(ARDL) and asymmetric(NARDL) models for checking the effects of macroeconomic variables on the stock market.

Chapter 4: This chapter elaborates the outcomes from empirical results and explains the finding. On the basis of thesis objectives, the findings are observed in the long and the short term and in the context of linearity and non-linearity.

Chapter 5: This chapter summarizes research outcomes and recommends different market forecasting according to market conditions of each Asian country.

Chapter 2

Literature Review

The Stock market acts an important part in the financial system of an economy. A fair amount of literature has been published on the influence of economic indicators on equity market of developed/underdeveloped economies. In this review, some prior studies are viewed which give us a more accurate view of the current situation.

Gurloveleen and Bhatia (2015) tries to see the effects on the BSE-500 index of 10 macroeconomic factors . The study uses the regression and Granger causality test for examining the behavior of data. It has been shown that only two macroeconomic variables i.e. Foreign institutional investors and rate of exchange are found significant. However, The Granger causality test have no relationship between the above related variables.

In connection to the above discussion, Ullah et al. (2017) study influence of macroeconomic indicators upon equity markets of SAARC using OLS models for (2005-2015). The results indicate that exchange rate, foreign currency reserves, and interest rates are found to have a positively relation to the equity market. However, contrary to the results, rate of inflation and the supply of money is found to pose no substantial influence on equity market performance. Epaphra (2018) tries to see the relationship between Tanzanian stock exchange and the macroeconomic factors, rate of inflation, treasury bill rate, rate of exchange and money supply. The study uses monthly time series data for 5 years. The Johansson

co-integration test and error correction model are used to explore the longer-run connection among economic indicators. The results indicate that economic indicators and the equity returns are cointegrating and a longer-term connection exists amid them. Findings of the study suggest that supply of money and exchange rate have influence on equity markets, Treasury bill have negative influence on the equity market. However, the rate of inflation have no effect on stock market performance.

Another insightful study conducted by Oskenbayev et al. (2011) sees the causal effect between the macroeconomic variables and the equity returns of Kazakhstan. For this purpose, ARDL, cointegrating test, and Granger causality test are utilized to study the connection. These findings suggest that the main determinants of the KASE are income per capita, inflation and exchange rates. The outcomes also suggest that oil prices have short-term effects on the stock market of Kazakhstan (KASE).

In an insightful study, the long and the short run relationship of macroeconomic indicators (inflation and exchange rates) with equity markets of India, China, and Japan is examined. Utilizing Granger causality test, Co-integration test, the study indicate that only the exchange rate poses a significant and positive effect on-the functioning of the equity market. In contrary to the results inflation rate have neither short nor long-term effect on asian equity markets. (Megaravalli and Sampagnaro, 2018).

Furthermore Jamaludin et al. (2017), focuses on the relationship between macroeconomic indicators (supply of money, Exchange rate, and inflation rates) and returns of equity market for 3 Asian Countries (Indonesia, Singapore, and Malaysia). By utilizing panel least squares regression technique, it shows that the rate of exchange poses a subsequent and positive effect on the functioning of the equity market. In contrary to the findings inflation rate pose a subsequent unfavorable influence on the equity market. Results also indicate no influence of money supply on the equity market.

While exploring the association among the macroeconomic indicators and stock exchange of SriLanka, Ismail et al. (2015) uses GDP, interest rate, balance of

payment, rate of inflation, and the exchange rate to see their influence on Sri Lankan stock exchange. Results indicates a significant positive influence of GDP and exchange rate on the equity market. In contrary to results significant and negative effect of the rate of inflation is found. However, the balance of payment has no significant influence on Sri Lankan stock exchange.

Moreover, in connection to the above discussion, Fayyad and Daly (2011) aim at finding an empirical association among equity returns & oil prices of seven countries. Vector Auto Regression (VAR) is used and results indicate that rapid surge in prices of oil or during global financial crises, oil prices provide ample evidence for the movement in the stock market. The GCC countries of Qatar and UAE and advanced country UK observe high response on stock returns as compared to other countries.

Ghosh et al. (2010) uses macroeconomic variables (Oil price, dollar price, cash reserve ratio, gold price, call money and food price inflation) and utilize pearson correlation and regression analysis techniques. The results indicate that dollar price, oil price, gold price, and cash reserve ratio poses a subsequent and positive influence on equity market. However, contrary to the results food price inflation is found to be insignificant.

In contrary to the above discussion, there are some studies which don't find any connection amid the economic indicators and the equity market. Gurloveleen and Bhatia (2015) find no impact of macroeconomic indicators on equity market. Another study of Barbic and Jurkic (2011) indicates no causal findings among macroeconomic indicators and stock returns of Croatia, Hungary, and Poland. Another empirical study indicates that the macroeconomic indicators used in the research have no influence on the equity markets of the UK. (Poon and Taylor, 1991).

2.1 Money Supply and Stock Returns

Empirically, there is an ongoing debate between the equity market returns and the supply of money. On one side there are studies which indicate that the stock

returns and supply of money are related because an increase in the supply of money postulates money demand is increasing which is a good indicator of a rise in macroeconomic activities that will bring a surge in the prices of stock. In contrary to the discussion there are studies which show that the relationship is negative between the equity returns and the supply of money because increase in supply of money results in an increase of inflation, this increases the discount rate which eventually lowers stock prices and decrease in inflation results in vice versa. (Chaudhuri and Smiles, 2004).

Umer (2016) examine the influence of macroeconomic variables on equity returns in long and short run. The tests employed include Johannsen Co-integrating, Granger Causality Test, and the correlation. The results indicate a positive association amid the equity market and the supply of money. Similar results are found in studies of Khan and Khan (2018), Kibria et al. (2014), Naik (2013), Patel (2012), and Ratanapakorn and Sharma (2007).

However, in contrary to the above discussion, Sikalao-Lekobane and Lekobane (2014) test whether macroeconomic variables influence price behavior on the equity market of Botswana. For testing purpose, Johansen Co-integration Approach are used. The results indicate supply of money is negatively associated with stock market returns in long run.

Moreover, there are some studies where the money supply doesn't have any impact on stock market. Some eminent studies include Khan and Zaman (2012), Gurloveleen and Bhatia (2015), Ullah et al. (2017), and Jamaludin et al. (2017). Based on the above discussion, it can be concluded that there is negative, positive and insignificant association among supply of money and equity market returns. On the basis of literature review it has been hypothesized.

H1: Money supply has a long term relationship with the equity market.

H2: Money supply has a positive impact on equity returns in the short term.

2.2 Exchange Rate and Stock Returns

The connection among the equity return and the exchange rate can be understood by analyzing the country economic nature. If the nature of the economy is export-centric then domestic currency depreciation will increase the demand for home country products and increases its attractiveness in the global market. On the other hand, if the nature of the economy is import-centric then if there is an appreciation in the domestic currency it will make the country's economy stronger.

In connection to the discussion above, Khalid and Khan (2017) explores the effect of macroeconomic indicators on the equity market with prime intent to probe the shorter- and longer-term association amid KSE-100 index and macroeconomic indicators by employing econometric techniques using ARDL and ECM. It has been shown that there is a significant and positive effect of the rate of exchange on the volatility of the equity market in the longer run. Similar results of the positive effect on the equity returns on the rate of exchange are found by Kibria et al. (2014), Gurloveleen and Bhatia (2015), Ullah et al. (2017), Megaravalli and Sampagnaro (2018), Jamaludin et al. (2017), and Ismail et al. (2015).

In contrary to the discussion above a negative and longer-term association between the rate of exchange and equity market is found by Umer (2016) and Sikalao-Lekobane and Lekobane (2014). Moreover, there are some studies which indicate an insignificant implication of the rate of exchange on the equity market confirmed by Ali et al. (2010) and Izedonmi and Abdullahi (2011). Based on the above discussion, it can be concluded a positive, negative and an insignificant association amid exchange rate and an equity market that leads to further investigation of the following hypothesis.

H3: There exist a long run relationship between exchange rate and equity market.

H4: In the short term exchange rate have a positive influence on the equity returns.

2.3 Inflation and Stock Return

The connection amid inflation and the equity market is inverse in nature. An increase in inflation will lower the market returns because inflation lowers the present value of net income by increasing the discount rate. (Abbasy, 2012).

Moreover, in connection to the discussion above, Talla (2013) show that increase in inflation from an economic perspective will lead people to shift their capital investment to consumption because of the increase in the cost of living. Several studies have revealed a negative relation of the rate of inflation to the stock returns which includes Epaphra (2018), Mehr-un Nisa and Nishat (2011), Sohail and Hussain (2009) and Bekhet and Mugableh (2012).

In contrary to the above discussion some studies do not support the negative relation between inflation and stock returns. They suggest stock itself served as a hedge against the inflation rate. (Olowe, 2007) and (Rjoub et al., 2009).

Moreover, in continuation of the discussion, there are some studies like Epaphra (2018) and Megaravalli and Sampagnaro (2018) where inflation is found to pose no influence on equity returns. On the grounds of the above discussion, in the conclusion, we can say there exists a positive, negative and insignificant association amid the inflation and stock return that leads us to the further investigation of the following hypothesis.

H5: Inflation rate has inverse relationship with the equity markets in the long term.

H6: In the short term inflation has a negative influence on the equity return.

2.4 Gross Domestic Product and Stock Returns

The stock market is directly linked to the gross domestic product because if GDP increases more than the expectation it contributes to a rise in corporate income which results in a bullish trend in the stock market. In contrary, if GDP

falls beyond the expectation inverse will happen. Theoretically, over the long run, as the economy grows, it contributes to a rise in corporate income. Numerous investigations argue about the positive connection amid these indicators which includes Levine and Zervos (1998), Hsing (2011), Ritter (2005), Glen (2002), Ibrahim (2003) and Fama (1981).

So, based on the above discussion, it can be concluded there's a positive association amid GDP and the equity market that leads to further investigation of the following hypothesis.

H7: GDP have a positive relationship with the stock market in the long term.

H8: GDP growth rate have a positive impact on the stock returns in short run.

2.5 Balance of Trade and Stock Returns

The link amid the equity returns and balance of trade can either be positive or negative based on the sign of wealth effect channels (change in spending patterns that accompanies a change in perceived wealth) and exchange rate channels (increasing or decreasing domestic interest rates to make the domestic currency appreciate or depreciate which ultimately make the domestic product either more expensive or cheap in comparison to foreign goods) (Antonakakis et al., 2018).

In evaluating the effect of the trade balance on the equity returns it has been observed that there has been relatively little literature published on the association between the trade balance and the equity returns. Moreover, studies which tried to see the effect of trade balance mostly results in insignificant influence of the balance of trade on the equity market returns except for the study by Mehrara (2006) where a causal relationship is studied between the TEPAX index and balance of trade where the findings indicate a unidirectional long-run causality from balance of trade to equity returns. In connection to the discussion the insignificant effect

of balance of trade on equity returns is observed by studies of Gurloveleen and Bhatia (2015), Pilinkus et al. (2010), and Kwon and Shin (1999).

So, based on the above discussion, one can say that there is positive association between Balance of Trade and the equity returns that leads towards further investigation of the following hypothesis.

H9: Balance of Trade has a positive relationship with the stock markets in the long term.

H10: Balance of Trade has a positive short term impact on the stock returns.

2.6 Index of Industrial Production and Stock Return

The industrial production index captures the economic activity of a country. Theories have shown that during the period of economic expansion, industrial production surges and shrinks during the period of recession. Improved industrial production will also improve the profit streams of firms which have an encouraging influence on the economic health of a country.

In connection with the discussion above, positive influence of the industrial production on the equity market is explored. This positive relationship has been confirmed by Fama (1981) who report a positive connection among the equity returns and the industrial production index. The similar positive impact of industrial production is also given by Chen et al. (1986) who utilize the pricing theory of arbitrage to link US equity market to macroeconomic factors. The study conclude a positive correlation amid the industrial production and equity market of the US. Numerous studies have argued the positive influence of the index of industrial production on equity returns Sadorsky (1999), Kwon and Shin (1999), Patel (2012) and Nishat et al. (2004).

In contrary to the above discussion, however, there are some findings that show the negative influence of industrial production index on the equity returns like the

study conducted by Zhao (1999) find that the relationship between these variables is negative in Chinese market.

The similar result are reported in the study conducted by Papapetrou (2001) who conclude that industrial production growth holds an unfavorable influence on the equity market and implies that increase in stock returns does not necessary concludes higher levels of industrial production growth.

Moreover, in addition to the above discussion, there are findings that show the insignificant influence of industrial manufacturing index on the equity returns like the investigation done by Umer (2016) to test the impact of macro-economic variables on the equity market of Pakistan in the shorter and longer term, between time-frame of 2005-2015. The results conclude an insignificant influence of industrial production index on the equity returns. Similar results are confirmed by Khan and Khan (2018),Mohammad et al. (2009) and Gurloveleen and Bhatia (2015).

Based on the above discussion, it can be concluded that a positive, negative, and an insignificant association amid the Index of Industrial Production and the equity returns leads to the further investigation of the following hypothesis.

H11: The index of industrial production has a positive relationship with the equity markets in the long term.

H12: Industrial growth rate has positive influence on the equity returns in short run.

2.7 Oil Prices and Stock Returns

The variations that occur in the prices of oil globally affect the economy of any nation in a positive or negative manners. The manner depends on the nature of an economy, whether its an importer or exporter. In the case of the importer, it affects negatively. In contrary for exporter, it has positive influence. In case of Pakistan, India, Bangladesh, Indonesia, and Malaysia, although they are oil-producing countries, having said that they are not able to fulfill their requirement,

appropriately because of this reason they are a major importer of crude oil to fulfill their daily oil requirement.

Oil prices have a significant role in any economy because oil price variations heavily influence other factors of the economy. For instance, if the oil price rises there is a huge impact on energy because as the cost of energy rises will lead to a surge in the production cost and reduces profit margins of an economy that is why a negative consequence on prices of oil follows a surge in the equity performance of a country.

In connection with the above discussion, many empirical studies are conducted in past to confirm the negative influence of oil prices on equity returns and their results were in line with the concept that the surge in prices of oil negatively influences the equity return. Several studies have revealed the negative link amid oil price and the equity return Filis (2010), Sharma et al. (2018), Sadorsky (1999), Hassan and Al refai (2012), and Papapetrou (2001).

In contrary to the above discussion, there are some empirical studies which demonstrate a positive association amid prices of oil and the equity returns this can be seen in the studies of Umer (2016) and Basher and Sadorsky (2006).

However, there are some studies which show the insignificant influence of oil prices on equity returns.Khan and Zaman (2012), Gurloveleen and Bhatia (2015), Gay (2016), and Kandir (2008). So, based on the above discussion, it can be concluded that a negative, positive and an insignificant relation among the oil price and equity returns that lead to the further investigation of the following hypothesis.

H13: Oil prices has a negative relationship with the equity market in long run.

H14: Oil prices has a negative impact on the equity returns in short run.

2.8 Foreign Direct Investment (FDI) and Stock Returns

Adam and Tweneboah (2009) identify a triangular association among the stock market, buoyancy of the economy and direct foreign investments. FDI infusion in the economy leads to economic growth. This economic growth empowers equity market development and finally, Infusion of the FDI in the equity market grows because of the indirect influence of FDI on stock returns.

Influence of Foreign Direct Investment (FDI) can be complementary or substitute. If there exists a positive association amid the equity returns and FDI, then this relation is said to have a complementary relationship. But if the relationship is negative amid the equity returns and the FDI, then the relation is said to have a substitute relationship. (Shahbaz et al., 2013).

Moreover, if we talk about Pakistan the connection amid equity market and Direct foreign Investments is found to have a complementary relationship. Shahbaz et al. (2013) investigates the influence of direct foreign Investments on the equity market of Pakistan. The purpose was to explore the role of FDI on the equity market whether complimentary or substitute. The results conclude that there is a complementary part of foreign investments on Pakistan's equity market. Numerous studies have reported Similar results Gurloveleen and Bhatia (2015), Acheampong and Wiafe (2013), Adam and Tweneboah (2009), Errunza (1983), and Claessens et al. (2001).

In connection with the above discussion, however, some studies report no effect of FDI on the equity market has been observed like study of Umer (2016). So, based on the discussion, it can be concluded that a negative, positive and or insignificant connection between FDI and the equity market that lead to the further investigation of the following hypothesis.

H15: Foreign direct investment (FDI) has a positive long term relationship with the stock markets.

H16: Foreign direct investment growth rate has a positive influence on the stock returns in short run.

2.9 Foreign Exchange Reserve and Returns on Stock

The foreign currency resources are reserves of other currencies central bank of country holds. The foreign currency reserve helps countries to keep their currency stable against other currencies. The foreign exchange reserve also serve as a tool to be used in the economic policies and the rate of exchange. The foreign exchange reserves help the country to pay off its liabilities and debts.

The connection between foreign currency reserve and equity market is considered to be positive because when an ample foreign currency reserves held by the country,signals a positive image of economic health because when the currency is stable and country able to effectively pay off its debts and liabilities this posture of economy shows a positive image which indicates that the companies are also making good profit margins which ultimately impacts the stock market in a positive manner. So, we can conclude that foreign exchange reserves pose affirmative consequence on the equity markets.

Moreover, in connection to the discussion above this positive relationship has been proved by Mohammad et al. (2009) where they explore the relationship amid foreign currency reserves and share prices of KSE. The result of the study reveals a significant positive relation amid the foreign currency reserve and the equity returns. Numerous studies have revealed Similar results. Ullah et al. (2017), Abakah and Abakah (2016), Rahman et al. (2009), and Hussain et al. (2012).

In contrary to the above discussion, there are some studies which depict a negative connection between the foreign currency reserve and the equity market this negative relation can be found in the studies of Akbar et al. (2012), Umer (2016), and Sikalao-Lekobane and Lekobane (2014).

Moreover, in connection to the discussion, there are some studies which fail to show any influence of foreign exchange reserves on the equity market like Gurloveleen and Bhatia (2015). So, based on the above discussion, it can be concluded that a negative, positive and an insignificant connection between the foreign currency reserves and the equity returns that lead to the further investigation of the following hypothesis.

H17: The foreign exchange reserve has a positive relationship with the equity markets in the long term.

H18: The foreign exchange reserve growth rate has a positive impact on the equity returns in short run.

2.10 Asymmetric Behavior of Macroeconomic Variables on Returns on Stock

In contrary to the above discussion, all the above literature review was about the linear connection amid the macroeconomic indicators and equity returns. There is limited literature about the non-linear or asymmetric connection amid the macroeconomic indicators and equity returns. It is also worthy to mention that the non-linear relationship exists mainly for the variables whose frequencies are higher like (Currency Rate of Exchange, Supply of Money, rates of interest, prices of oil, and rate of Inflation) as compared to other variables whose frequencies are low like (GDP, Balance of Trade, Foreign Exchange Reserves and etc on a yearly or half-yearly basis).

One of the first notable exceptions is found by Ismail and Bin Isa (2009) who explore the asymmetric interactions amid the equity returns and currency exchange rate in Malaysia and for this purpose, they employ the Markov Vector Auto-regression Model for the time period 1990-2005. The results indicate that Markov Vector Auto-regression Model accommodate the data more appropriately than the linearized VAR. Identical results can also be seen in the study of Cuestas and Tang (2017) are first to estimate the exposure to exchange rates using a linear

VAR template that has a serious model specification. In contrast, estimates of the non-linear dynamic model show that currency exchange rate exposure to returns of the industry is asymmetrical in nature.

A major development in the asymmetric relationship is given by Shin et al. (2014) in which they developed a co-integration nonlinear auto-regressive distributed lag (NARDL) model which is derived from the earlier work of Pesaran et al. (2001) in which both shorter and longer term asymmetries are discovered by means of decomposition of the explanatory variables in positive and negative partial sum. Their model is estimated by using OLS and the reliable long-run inference can be accomplished by means of bound testing whichever I(0) otherwise I(1) regardless of the order in which variates are integrated.

Another insightful study conducted by Dhaoui et al. (2018) explore the interaction of oil price shocks with oil importing and exporting equity market returns by using the NARDL model. The results of the study indicate investors should Consider asymmetry in the prediction and the handling of the negative consequences of unforeseen events.

Tiryaki et al. (2019) try to examine the asymmetrical influence of industrial production index, real exchange rate, and the supply of money over the period of 1997-2017 and 2002-2017 using the NARDL model. The study has found that the effect of the modifications in the industrial output index, real conversion rate, and supply of money on equity markets is asymmetric and it is worth mentioning that after 2002 sub-sample, asymmetries are bigger in comparison with the entire sample period.

So based on the literature following hypothesis can be formulated:

H19: Money supply has a long term asymmetric relationship with the equity markets.

H20: Money supply has a short term asymmetric impact on the equity returns.

H21: Exchange rate has asymmetric relationship with the equity markets in the long term.

H22: Exchange rate has asymmetric short-term influence on the equity returns.

H23: Inflation rate has long-term asymmetric relationship with the equity markets.

H24: Inflation rate has short-term asymmetric influence on the equity returns.

H25: Index of industrial production has asymmetric relationship with the equity markets in the long term.

H26: Index of industrial production has a short-term asymmetric impact on the equity returns.

H27: Oil prices has long-term asymmetric relationship with the equity markets.

H28: Oil prices has asymmetric impact on the equity returns in the short-term.

Chapter 3

Research Methodology

3.1 Data

Investigation is undertaken on secondary data for a period of 222 months from January 2000 to June 2018. The macroeconomic variables used in the study include Money Supply, Exchange Rate, Rate of Inflation , Gross Domestic Product (GDP), Balance of Trade, Industrial Production, Prices of Oil, Foreign Direct Investment, and Reserves of Foreign Exchange of Pakistan, Bangladesh, India, Indonesia, and Malaysia.

The main sources of data include international macroeconomic funds (IMF) database, World Bank Stats, Reserve Bank of India, Central Bank of Malaysia, Bangladesh Bank, Bangladesh Bureau of Statistics (BBS), Bank Sentral Republik Indonesia, and Badan Pusat Statistik (Indonesia).

3.2 Description of Variable

3.2.1 Stock Market Index

Equity market index is a measure of performance of the equity market. The index is calculated from the prices of selected stocks usually by means of weighted

average prices of stock. The change in stock market index is called as market return. It is calculated as under.

$R_t = ln(\frac{I_t}{I_{t-1}})$

3.2.2 Money Supply

The supply money is characterized by means of an aggregate load of money circulating in an economy. Circulating money includes all the money coursing as printed notes, cash in the deposit accounts and as liquid asset resources. Valuation and examination of the money supply encourage financial analyst and policymakers to adjust the current strategy of expanding or shrink the supply of money. The proxy of money is taken as broad money measured through M2. Where as money growth is calculated as under.

$\Delta M2_t = \frac{M2_t - M2_{t-1}}{M2_{t-1}}$

3.2.3 Exchange Rate

Described by means of the price in nation currency in respect of foreign currency. The rate of conversion is consists of national currencies expressed in US Dollar form. They can be quoted either in the domestic or in the foreign-currencies. In a straight reference, a unit price is expressed as foreign currency in domestic currency term . On the other hand, the indirect reference can be expressed when a unit local currency stated in respect of currency of foreign.

$\Delta ER_t = \frac{ER_t - ER_{t-1}}{ER_{t-1}}$

3.2.4 Inflation Rate

Inflation may be defined as a percentage change in price of goods and services during a specific period of time. This study use consumer price index(CPI) as measure of change in prices of goods and services: The change in CPI is taken as inflation as expressed below.

$INF_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}$

3.2.5 Nominal Gross Domestic Product (GDP)

The nominal gross domestic product is GDP evaluated at current market prices where as GDP is the entire worth of everything manufactured domestically by the people and companies. The GDP growth rate is measured as under.

$\Delta GDP_t = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}$

3.2.6 Balance of Trade

The trade balance may be defined as the gap between a countrie's import and export value over a specific time interval. It also accounts for a major portion of balance of international payments of a country. The trade balance is also used as a measure for the economic strength of a country. It's growth rate is measured by using following formula.

$\Delta BT_t = \frac{BT_t - BT_{t-1}}{BT_{t-1}}$

3.2.7 Index of Industrial Production

The index of industrial production is composed of the output of the business which is integrated into the industrial sector of an economy e.g. Manufacturing, mining, and utilities. The industrial growth rate is measured as under.

$\Delta IIP_t = \frac{IIP_t - IIP_{t-1}}{IIP_{t-1}}$

3.2.8 Crude Oil Prices

Crude oil prices referred to the spot rate of one barrel of standard crude oil. The price of the oil is drived through demand and supply. Crude oil prices poses a major impact at economy. When the supply of the oil decreases its demand increase so does the prices of oil increases and when the supply of the oil increases its demand decrease so does the prices of oil decrease. The change in oil price is measured as under.

$\Delta OP_t = \frac{OP_t - OP_{t-1}}{OP_{t-1}}$

3.2.9 Foreign Direct Investment

The direct foreign investment is the investment of a firm or person of an specific country to the business interests located in another country. The foreign direct investments play a vital role in developing or emerging economies. The FDI growth rate is measured as under.

$\Delta FDI_t = \frac{FDI_t - FDI_{t-1}}{FDI_{t-1}}$

3.2.10 Foreign Exchange Reserve

The foreign exchange reserves can be defined as the currency of foreign countries owned by central bank of a country's. They are also known as foreign reserves. Maintaining foreign reserves is intended to back up liabilities and influence the country's monetary policy. The FER growth rate can be measured as under.

$\Delta M2_t = \frac{FER_t - FER_{t-1}}{FER_{t-1}}$

3.3 Econometric Model

Many methods can be used to find the evidence of a longer-term counterbalance connection between variables of time-series. Widely acclaimed methods contains Engle and Granger (1987), totally remodel procedure of OLS Phillips and Hansen (1990), maximum likelihood based on Johansen (1988) & Johansen (1991) and Johansen and Juselius (1990) tests.The basic obligation for the test includes the integration of variables.

In contrary to the above discussion,In recent years, Distributive lag auto-regressive (ARDL) approach to co-integration has become popular. This paper is also going to use the ARDL approach. In the first phase, the linear ARDL model will be empirically tested to observe symmetric impact of macroeconomic indicators at the equity returns and in second phase, Nonlinear ARDL model approach will be used to see the asymmetric behavior of the monitory variables and their impact on the stock returns.

3.3.1 Linear Auto Regressive Distributed Lag Model

For the purpose of avoiding the possibility of spurious regression, data is tested for the unit root as reported by Ouattara (2004) The bound tests are reported assuming that these variables are either I(0) or I(1) and no I(2) variables because if there is any I(2) variable in the model then computed F-stat proposed by Pesaran et al. (2001) become invalid. Likewise, additional diagnostic test's are used for detecting serial correlation, heteroscedasticity, and normality conflict.

Following model explores the connection amid equity market returns and macroeconomic indicators.

$$LI_t = \beta_0 + \beta_1 LIIP_t + \beta_2 LINF_t + \beta_3 LM2_t + \beta_4 LBT_t + \beta_5 LFDI_t + \beta_6 LFER_t + \beta_7 LGDP_t + \beta_8 LOP_t + \beta_9 LER_t \mu_t \tag{3.1}$$

Where:

I = Stock Index

IIP = Index of Industrial Production

INF = Inflation Rate

M2 = Broad Money Supply in $

BT = Balance of Trade in $

FDI = Direct Foreign Investment in $

FER = Foreign Currency Reserves in $

GDP = Domestic Gross Product in $

OP = Oil Prices in $

ER = Exchange Rate in $ per Domestic Currency

L = Log Form

The above equation may be represented as the ARDL:

$$\begin{aligned} LI_t = \beta_0 + \sum \Psi_i LI_{t-1} + \sum \beta_1 LIIP_{t-i} + \sum \beta_2 LINF_{t-i} + \sum \beta_3 LM2_{t-i} \\ + \sum \beta_4 LBT_{t-i} + \sum \beta_5 LFDI_{t-i} + \sum \beta_6 LFER_{t-i} + \sum \beta_7 LGDP_{t-i} \\ + \sum \beta_8 LOP_{t-i} + \sum \beta_9 LER_{t-i} + \mu_t \end{aligned} \tag{3.2}$$

Where:

i ranges from 1 to P

Finally, in last phase, equation for error correction is estimated using the variables differences and lagged long term solution and determines the speed at which returns are adjusted into equilibrium.

The following is the equation given for a general correction of error representation:

$$\begin{aligned} LI_t = \Gamma_0 + \Gamma_1 \Delta LIIP_{t-i} + \Gamma_2 \Delta LINF_{t-i} + \Gamma_3 \Delta LM2_{t-i} + \Gamma_4 \Delta LBT_{t-i} \\ + \Gamma_5 \Delta LFDI_{t-i} + \Gamma_6 \Delta LFER_{t-i} + \Gamma_7 \Delta LGDP_{t-i} + \Gamma_8 \Delta LOP_{t-i} \\ + \Gamma_9 \Delta LER_{t-i} + ECM + \mu_t \end{aligned} \tag{3.3}$$

Based on the literature, the impact on equity returns are expected to be positive for money supply, conversion rate, GDP, Industrial manufacturing index, Direct Foreign Investment, Reserves of Foreign Currency , and Trade Balance. Therefore, a positive sign is expected for the coefficients of these variables. i.e

$\Gamma_1 > 0, \Gamma_3 > 0, \Gamma_4 > 0, \Gamma_5 > 0, \Gamma_6 > 0, \Gamma_7 > 0, \Gamma_9 > 0$

In connection with the above discussion, Inflation Rate and Oil Prices are expected to pose a negative influence on equity markets. So, coefficients of these variables are anticipated to pose a negative sign. i.e

$\Gamma_2 < 0, \Gamma_8 < 0$

The stability of short- and long-term coefficients is finally investigated with the use of cumulative sums (CUSUM) and cumulative square sums (CUSUMSQ) tests. The statistics of CUSUM and CUSUMSQ are repeated and compared against

the break points. When the CUSUM and CUSUMSQ plots remain within 5% significant critical bounds, the null hypothesis for all coefficients of the regression are stable and may not be denied.

3.3.2 Non-Linear Auto Regressive Distributed Lag Model

In the second phase, the NARDL model approach will be used to analyze the existence of asymmetric effects of the Index of Industrial Production (IIP), Inflation Rate(INF), Broad Money Supply (M2), Balance of trade (BT), Foreign Direct Investment (FDI), Foreign Exchange Reserve (FER), Conversion Rate(ER), Domestic Gross Product (GDP) and Prices of Oil(OP) on equity markets of Pakistan, India, Bangladesh, Indonesia, and Malaysia.

The NARDL model is used for short- and long-term testing of potential asymmetric effects. The basic advantage for using ARDL or NARDL is that in co-integration analysis, it relaxes the fundamental assumption of all variables need to be integrated in the same order , either I[0] or I[1] or mutually exclusive the only exception is that there must be no I(2) variables.

NARDL is an asymmetrical extension of linear ARDL model of Pesaran and Shin (1998) & Pesaran et al. (2001).The strongest advantage of using NARDL framework is that It allows hidden co-integration testing so as to avoid ignorance of any connection that in a conventional linear setting is not visible . The NARDL model, therefore, makes it possible to distinguish between linear co-integration, nonlinear/asymmetric co-integration and lack of co-integration (Shahzad et al., 2017).

The following NARDL representation is utilized to investigate the link amid equity markets and macroeconomic indicators in the long run to test the asymmetric relationship between them;

$$\begin{aligned} LI_t = \Lambda_0 + \gamma_i LI_{t-1} + \sum \Lambda_1 LIIP_{t-i}(P) + \sum \Lambda_1 LIIP_{t-i}(N) + \sum \Lambda_2 LINF_{t-i}(P) \\ + \sum \Lambda_2 LINF_{t-i}(N) + \sum \Lambda_3 LM2_{t-i}(P) + \sum \Lambda_3 LM2_{t-i}(N) + \sum \Lambda_4 LBT_{t-i} \\ + \sum \Lambda_5 LFDI_{t-i} + \sum \Lambda_6 LFER_{t-i} + \sum \Lambda_7 LGDP_{t-i} + \sum \Lambda_8 LOP_{t-i}(P) \\ + \sum \Lambda_8 LOP_{t-i}(N) + \sum \Lambda_9 LER_{t-i}(P) + \sum \Lambda_9 LER_{t-i}(N) + \mu_t \end{aligned} \tag{3.4}$$

After NARDL model we then proceed to the estimation of the nonlinear error correction model in the short run to test the assymmetric relationship between the variables which is given below.

$$\begin{aligned} LI_t = \Pi_0 + \Pi_1 \Delta LIIP_{t-i}(P) + \Pi_1 \Delta LIIP_{t-i}(N) + \Pi_2 \Delta LINF_{t-i}(P) \\ + \Pi_2 \Delta LINF_{t-i}(N) + \Pi_3 \Delta LM2_{t-i}(P) + \Pi_3 \Delta LM2_{t-i}(N) + \Pi_4 \Delta LBT_{t-i} \\ + \Pi_5 \Delta LFDI_{t-i} + \Pi_6 \Delta LFER_{t-i} + \Pi_7 \Delta LGDP_{t-i} + \Pi_8 \Delta LOP_{t-i}(P) \\ + \Pi_8 \Delta LOP_{t-i}(N) + \Pi_9 \Delta LER_{t-i}(P) \\ + \Pi_9 \Delta LER_{t-i}(N) + ECM + \mu_t \end{aligned} \tag{3.5}$$

Chapter 4

Results, Data Analysis, and Discussion

4.1 An Application of Linear ARDL Model Pakistan

Table 4.1 reports descriptive statistics of Pakistan macroeconomic indicators. The KSE index has an average index value of 15663.76 with a max risk of 13628.27. The maximum value of index is 50591.57 whereas, minimum value is 1133.43. Industrial growth average value of index is 5.77% with the maximum risk of 8.21%. Nominal GDP average value is $178176 mn with the max risk of $74136 mn. Foreign exchange reserves have an average of $12267.04 mn with a max risk of $5684 mn. Foreign direct investment have an average of $175 mn with the max risk of $180 mn. PKR in terms of dollar has an average rate of $.013 with a max risk of $.003. Inflation in terms of CPI has an average rate of 7.71% with the max risk of 4.98%. Trade deficit has an average of -1284 mn with the minimum trade deficit of $-3807. Whereas money supply has an average of $69539 bn with the max risk of $32466 bn. Finally oil prices have an average per barrel value of $63 with max risk of $29.51 in its prices per barrel. Most of the variables are skewed positively that indicates the data is skewed on the right side. On the contrary

industrial production, foreign exchange reserves and trade balance are negatively skewed that indicates the variables are skewed on the left side. The KSE,GDP, FER, ER, BT, M2, and OP have a platykurtic distribution with flat data and thin tails.

On the contrary IIP, FDI, and CPI follows a leptokurtic distribution with peaked data and flat tails. Finally, most of the variables Jarque-Bera probabilities are significant that indicates that the data is non-random in nature except of foreign exchange reserves and balance of trade that reports that the data is random in nature.

Table 4.1: Descriptive Statistics Pakistan

	KSE	**IIP**	**GDP**	**FER**	**FDI**	**ER**	**CPI**	**BT**	**M2**	**OP**
Mean	15663.760	5.768	178176.000	12267.040	175.344	0.013	7.707	-1283.700	69539.040	62.726
Median	11253.180	5.574	169730.300	12535.000	125.327	0.012	7.067	-1291.604	65943.330	58.145
Maximum	50591.570	33.375	312570.000	24025.800	1262.865	0.019	25.300	964.639	139024.600	132.830
Minimum	1133.430	-21.820	73467.790	1062.000	-53.943	0.008	1.300	-3806.955	23652.360	18.520
Std. Dev.	13628.270	8.210	74136.670	5683.883	180.280	0.003	4.980	918.808	32466.390	29.511
Skewness	0.999	-0.042	0.208	-0.243	2.371	0.033	1.379	-0.322	0.457	0.357
Kurtosis	2.800	4.252	1.796	2.605	10.972	1.300	5.110	2.585	2.318	1.939
Jarque-Bera	37.290	14.574	15.004	3.627	795.733	26.778	111.556	5.428	12.042	15.127
Probability	0.000	0.001	0.001	0.163	0.000	0.000	0.000	0.066	0.002	0.001

Table 4.2 reports the results of unit root test to identify the order of integration of variable's. The data is presented in log form for smoothing the coefficients. For unit root testing ADF and the Phillip-Perron testing are used at level and 1st difference with constant and trend assumptions. The findings suggest that the majority of time series are non stationary that becomes stable at the 1st difference. Only the index of industrial production and foreign direct investment are stationary at level. The reason for implying both the assumptions of trend and no trend is to check the nature of variables.

Table 4.2: Unit Root Analysis Pakistan

Unit Root Test	ADF@Level	ADF@1st Diff	PP@Level	PP@1st Diff	Integrated
LIIP	-7.9168	-16.1804	-7.9039	-38.7842	I(0)
LCPI	-1.4018	-6.2461	-2.0670	-13.1826	I(1)
LKSE	-0.9112	-13.8481	-0.9169	-13.8490	I(1)
LM2	-2.1439	-4.0455	-0.8942	-15.2218	I(1)
LBT	3.8478	-0.8297	5.2367	-9.4879	I(1)
LFDI	-2.3279	-12.0381	-9.8243	-55.7136	I(0)
LFER	-2.5892	-8.1881	-2.4180	-14.5545	I(1)
LER	0.0860	-13.0003	-0.0778	-12.9884	I(1)
LGDP	-2.1783	-3.9615	-1.2680	-4.0867	I(1)
LOP	-1.9097	-11.1270	-1.8845	-11.1187	I(1)

The ARDL method can be implemented irrespective of the integration order, The purpose behind conducting stationary test is to identify the current model.

TABLE 4.3: Lag Length Selection Pakistan

Lag	LL	AIC	SC	HQ
0	-172.9795	1.671	1.8258	1.7335
1	2641.559	-23.11926	-21.4170*	-22.4318
2	2905.792	-24.6191	-21.3693	-23.3066*
3	3021.45	-24.7621*	-19.9648	-22.8246

Table 4.3 provides the criteria for selecting a number of lags to be used. Sequentially modified LR test statistic, Final prediction error, Akaike information, Schwarz information, and Hannan-Quinn information criterion's are commonly used to determine optimum number of lags to be used. The lag period which provides the lowest critical value is identified as the lag period of the model unless no auto-correlation is observed. The decision is based on AIC. So, the lag that minimizes the Akaike information is 3 and no auto-correlation exist at this duration of lag.

TABLE 4.4: Diagnostic Test Pakistan

Item	Test Applied	Value	Prob
Serial Correlation	Score Test (F-stat)	0.4985	0.6837
Normality	Histogram Test (Jarque-Bera)	62.9061	0.0000
Functional Form	Ramsey Test (F-Stat)	0.1030	0.7486
Heteroscedasticity	White Test (F-stat)	2.5095	0.0004

Table 4.4 provides information about diagnostic testing. The table indicates no autocorrelation issue. Moreover, there is no error in model specification with functional form reference. The time series data is mostly not normally distributed. Shrestha and Chowdhury (2005) concludes that heteroscedasticity presence has no influence son estimates because times-series data are mixtures of different integration order so the presence of heteroscedasticity is natural to be detected.

Table 4.5 provides information regarding the AIC-based selected ARDL. Findings indicate that industrial manufacturing indices, Gross domestic product, Balance of trade, the supply of money, and rate of Inflation have a statistically significant impact on KSE equity market whereas Reserves of Foreign Exchange, Direct Foreign investment, exchange rate, and Prices of oil have statistically insignificant

Table 4.5: ARDL Representation Pakistan

(1, 1, 0, 1, 3, 3, 0, 0, 0, 3) AIC Based Selected ARDL

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
LKSE (-1)	0.7743	0.0382	20.2888	0.0000
LIIP	-0.0261	0.0154	-1.6964	0.0914
LIIP (-1)	0.0312	0.0143	2.1770	0.0307
LGDP	1.6716	2.2386	0.7467	0.4561
LGDP (-1)	0.2748	4.4908	0.0612	0.9513
LGDP (-2)	-6.8554	4.4896	-1.5270	0.1284
LGDP (-3)	4.1819	2.0954	1.9958	0.0473
LFER	-0.0220	0.0656	-0.3355	0.7376
LFER (-1)	-0.1516	0.0881	-1.7204	0.0869
LFER (-2)	0.0426	0.0821	0.5192	0.6042
LFER (-3)	0.0962	0.0597	1.6119	0.1086
LFDI	-0.0043	0.0079	-0.5418	0.5885
LER	-0.1309	0.1030	-1.2714	0.2051
LCPI	-0.0291	0.0135	-2.1592	0.0321
LBT	-0.0010	0.0109	-0.0921	0.9267
LBT (-1)	0.0360	0.0234	1.5356	0.1262
LBT (-2)	0.0451	0.0224	2.0100	0.0458
LBT (-3)	0.0488	0.0231	2.1098	0.0361
LM2	0.5741	0.2515	2.2823	0.0235
LM2(-1)	0.5770	0.2647	2.1793	0.0305
LOP	0.0371	0.0216	1.7183	0.0873
D1	-0.0463	0.0517	-0.8950	0.3719
C	-3.2207	0.8154	-3.9499	0.0001
F-stat	2345.9330			
Prob(F-stat)	0.0000			
D-W Stat	1.9113			

influence on the equity prices. It shows macroeconomic indicators explain the KSE 100 index equity return significantly.

Table 4.6 gives the information regarding the results of the bound test of ARDL. The bound tests are reported assuming that these variables are either I(0) else I(1) and no I(2) variables because if there is any I(2) variable in the model then computed F-stat proposed by Pesaran et al. (2001) will become invalid.

The tables provide upper and lower limits for different levels of confidence intervals. The model is based on a 95% confidence interval for selecting the model. The F-statistic value is 6.0950 which is more than the 3.3 upper bound which concludes a longer-term co-integration exists in our variables of interest.

Table 4.6: ARDL Bound Test Pakistan

Test Stat	**Value**	**k**
F-stat	6.0950	9
Critical Value Bounds		
Significance	**Lower Limit**	**Upper Limit**
0.10	1.88	2.99
0.05	2.14	3.3
0.025	2.37	3.6
0.01	2.65	3.97

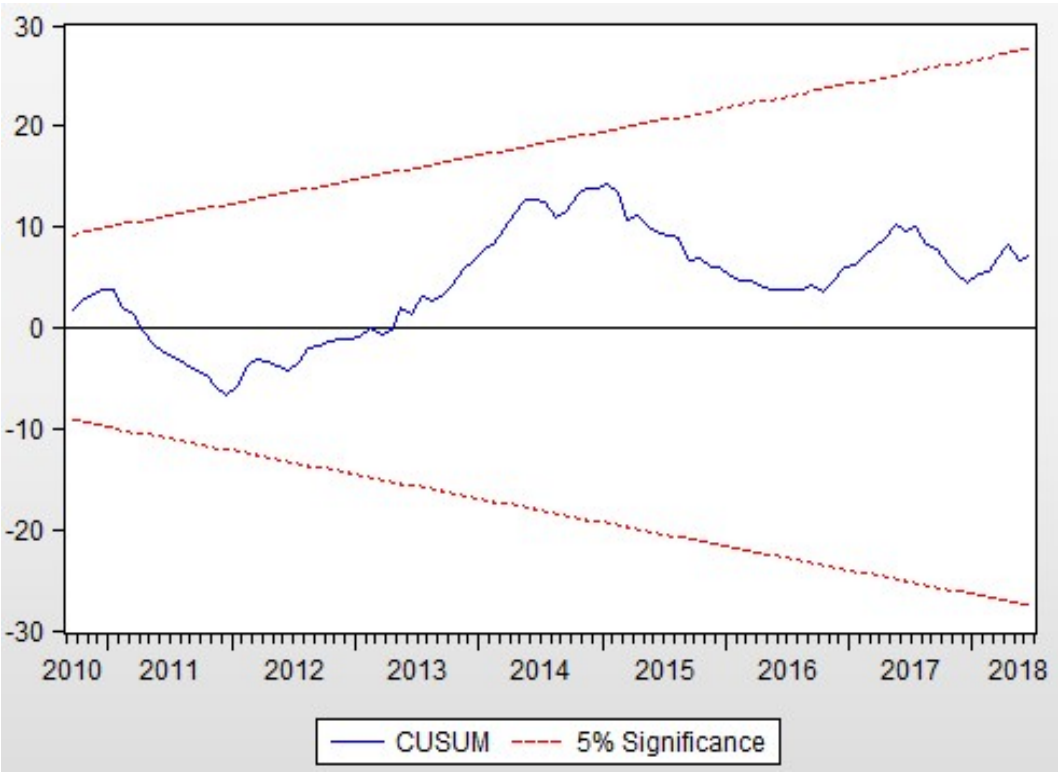

Figure 4.1: Cumulative Sum of Recursive Residuals Pakistan

Fig 4.1 and **Fig 4.2** reports CUSUM and the CUSUM of the squares plot for stability checking of coefficients in the longer- and shorter-term Error correction model of ARDL. **Figure 4.1** shows CUSUM and **Figure 4.2** shows CUSUM of the squares. The CUSUM and CUSUM of squares are inside critical limits of 0.05, which shows structural stability of the model and overall goodness of fit.

From **Table 4.7** it is noted that industrial manufacturing index, foreign direct investment,exchange rate, and prices of oil have an insignificant statistical connection with KSE index. On the contrary gross domestic product, foreign exchange

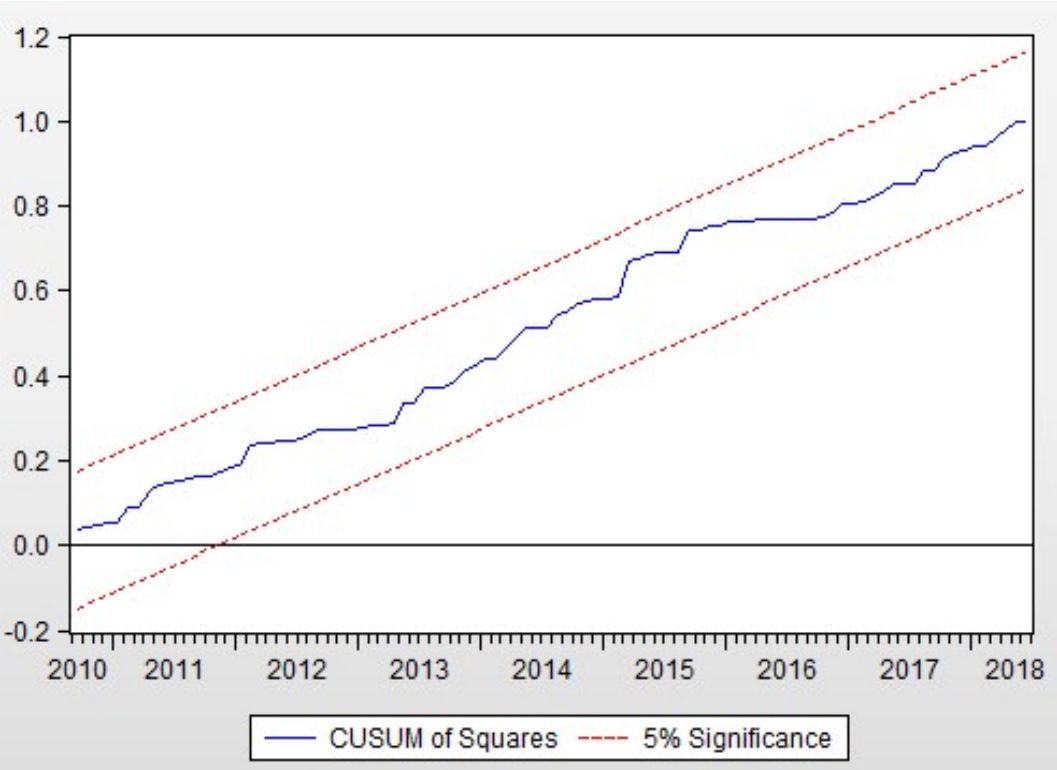

FIGURE 4.2: Cumulative Sum of Squares of Recursive Residuals Pakistan

TABLE 4.7: ARDL Model for Estimated Long Run Coefficients Pakistan

Reg	Coeff	S. Err	T-Stat	Prob
LIIP	0.0225	0.0651	0.3465	0.7293
LGDP	-3.2211	0.8874	-3.6297	0.0004
LFER	-0.1546	0.0735	-2.1019	0.0368
LFDI	-0.0191	0.0356	-0.5354	0.5930
LER	-0.5798	0.4774	-1.2147	0.2259
LCPI	-0.1289	0.0610	-2.1140	0.0358
LBT	0.5708	0.1210	4.7162	0.0000
LM2	5.0992	0.6704	7.6065	0.0000
LOP	0.1644	0.0974	1.6879	0.0930
D1	-0.2051	0.2312	-0.8871	0.3761
C	-14.2678	2.5585	-5.5766	0.0000

reserves, inflation rate, balance of trade and broad money have a statistically significant influence on KSE 100 index in the longer-run. The gross domestic product, foreign exchange reserves, and inflation rates have a significant and negative relationship with the stock returns of KSE-100 index, whereas the trade balance and supply of money have a significant and positive influence on the stock returns of KSE 100 index.

Table 4.8: Error Correction Model for Short Run Effects Pakistan

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLIIP	-0.0261	0.0154	-1.6964	0.0914
ΔLGDP	1.6716	2.2386	0.7467	0.4561
ΔLGDP (-1)	6.8554	4.4896	1.5270	0.1284
ΔLGDP (-2)	-4.1819	2.0954	-1.9958	0.0473
ΔLFER	-0.0220	0.0656	-0.3355	0.7376
ΔLFER (-1)	-0.0426	0.0821	-0.5192	0.6042
ΔLFER (-2)	-0.0962	0.0597	-1.6119	0.1086
ΔLFDI	-0.0043	0.0079	-0.5418	0.5885
ΔLER	-0.1309	0.1030	-1.2714	0.2051
ΔLCPI	-0.0291	0.0135	-2.1592	0.0321
ΔLBT	-0.0010	0.0109	-0.0921	0.9267
ΔLBT (-1)	-0.0451	0.0224	-2.0100	0.0458
ΔLBT (-2)	-0.0488	0.0231	-2.1098	0.0361
ΔLM2	0.5741	0.2515	2.2823	0.0235
ΔLOP	0.0371	0.0216	1.7183	0.0873
ΔD1	-0.0463	0.0517	-0.8950	0.3719
ECM (-1)	-0.2257	0.0382	-5.9151	0.0000

ECM=LKSE-(0.0225*LIIP-3.2211*LGDP-0.1546*LFER-0.0191*LFDI -0.5798*LER-0.1289*LCPI+0.5708*LBT+5.0992*LM2+0.1644*LOP -0.2051*D1-14.2678)

Table 4.8 provides the shorter-run dynamic association amid the macroeconomic indicators and the equity returns of KSE 100 index. The error correction model provides that foreign exchange reserves, foreign direct investments, exchange rate, oil prices, and industrial production are statistically insignificant. whereas rate of inflation and supply of money, gross domestic product, and balance of trade have statistically significant impact on returns of Pakistan's stock market in the short-run. It is important to point out that foreign exchange reserve is statistically significant in the longer-run but becomes insignificant in the shorter-run.

Error correction model ECM (-1) provides one period adjustment from a long-term disequilibrium. The ECM demonstrates the extent to which the short term imbalance is eliminated in the longer-term. Practically in long run relationship,

the ECM value must be significant and negative and the same can be seen in the ECM results.

The ECM term coefficient is negative and significant and shows that the adjusting system is quite quick as 22 percent of price disequilibrium is corrected from its equilibrium route.

The structural break is observed during August-September 2010 that has been accounted for through dummy in Cusum and Cusum square graph.

4.2 An Application of Non-Linear ARDL Model Pakistan

4.2.1 Asymmetric Effect of Industrial Growth on Equity Market of Pakistan

Table 4.9: Asymmetric Effect of Industrial Growth on Equity Market of Pakistan in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LIIP (P)	0.0307	0.0625	0.4912	0.6239
LIIP (N)	-0.1002	0.0716	-1.3993	0.1633
LGDP	-2.6665	0.7168	-3.7203	0.0003
LFER	-0.3586	0.0787	-4.5572	0.0000
LFDI	0.0094	0.0291	0.3229	0.7472
LER	1.2567	0.6835	1.8388	0.0675
LCPI	-0.0634	0.0504	-1.2589	0.2096
LBT	0.4509	0.0954	4.7267	0.0000
LM2	4.0711	0.5862	6.9455	0.0000
LOP	-0.0241	0.0876	-0.2754	0.7833
D1	-0.2371	0.1872	-1.2665	0.2069
C	-0.0584	5.0978	-0.0115	0.9909

Table 4.9 provides the long-term asymmetric relationship between industrial production index on (KSE-100) index. The coefficient associated with the positive changes in IIP is positive but not significant, whereas the coefficient associated with the negative changes in the IIP is also positive but not significant as well. So

we cannot say that the relationship is asymmetric in nature in the long-term. So this unequal, but insignificant impact of positive and negative signs of the industrial manufacturing index on the stock exchange provide no asymmetric connection exists amid the two variables in long-term.

TABLE 4.10: Asymmetric Impact of Industrial Growth on Equity Returns of Pakistan in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLIIP POS	-0.0414	0.0249	-1.6659	0.0974
ΔLIIP POS (-1)	0.0125	0.0273	0.4561	0.6488
ΔLIIP POS (-2)	-0.0460	0.0224	-2.0573	0.0410
ΔLIIP NEG	-0.0274	0.0183	-1.4991	0.1355
ΔLGDP	-0.1123	2.6857	-0.0418	0.9667
ΔLGDP (-1)	10.8633	4.7021	2.3103	0.0219
ΔLGDP (-2)	-4.7519	2.0623	-2.3042	0.0223
ΔLFER	-0.0833	0.0665	-1.2527	0.2119
ΔLFER (-1)	-0.0749	0.0806	-0.9296	0.3537
ΔLFER (-2)	-0.0886	0.0585	-1.5139	0.1317
ΔLFDI	0.0026	0.0080	0.3213	0.7483
ΔLER	0.3437	0.1894	1.8152	0.0711
ΔLCPI	-0.0174	0.0135	-1.2815	0.2016
ΔLBT	-0.0022	0.0106	-0.2086	0.8349
ΔLBT (-1)	-0.0448	0.0221	-2.0319	0.0435
ΔLBT (-2)	-0.0507	0.0230	-2.2022	0.0288
ΔLM2	0.5108	0.2607	1.9597	0.0515
ΔLOP	-0.0066	0.0240	-0.2748	0.7838
ΔD1	-0.0649	0.0509	-1.2746	0.2040
ECM (-1)	-0.2735	0.0414	-6.6142	0.0000

Table 4.10 provides the short-term asymmetric effects of IIP on the KSE-100 index. The coefficient associated with the positive changes in IIP is negative and significant after 2 lags i.e. With the 1% increase in IIP, the stock return will be lowered by 0.046% after 2 periods because the coefficient value decreased after 2 lags. On the contrary, the coefficient associated with the negative changes in the IIP is insignificant, so there is no effect of 1 unit decrease in IIP on the equity returns in the shorter-term. So based on the above discussion, It can be said that there is an asymmetric connection amid the IIP and equity returns based on the positive and negative signs and their significance.

4.2.2 Asymmetric Effect of Exchange Rate on Equity Market of Pakistan

Table 4.11: Asymmetric Effect of Exchange Rate on Equity Market of Pakistan in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LER (P)	3.5114	0.9574	3.6675	0.0003
LER (N)	0.0843	0.3641	0.2315	0.8172
LIIP	-0.0958	0.0475	-2.0176	0.0450
LGDP	-2.0318	0.6759	-3.0058	0.0030
LFER	-0.3767	0.0664	-5.6767	0.0000
LFDI	0.0135	0.0261	0.5188	0.6045
LCPI	-0.1324	0.0448	-2.9568	0.0035
LBT	0.3443	0.0869	3.9598	0.0001
LM2	3.5146	0.5655	6.2150	0.0000
LOP	0.2592	0.0756	3.4258	0.0007
D1	-0.1585	0.1666	-0.9514	0.3426
C	-6.2470	3.1465	-1.9854	0.0485

Table 4.11 reports the long-term asymmetric link between exchange rate on the equity market. The PKR is shown in terms of dollar. The coefficient with the positive change in the ER is significant and positive in the longer term that indicates appreciation in value of PKR have a positive effect on the equity market. whereas depreciation is PKR have no effect on the equity market on long term. So, this unequal impact of positive and negative signs of exchange rate on the stock exchange proves an asymmetric relationship exists between the variables in long run.

Table 4.12 shows the short-term effect of exchange rate on Stock Returns (KSE). The coefficient associated with the positive change is negative but insignificant, so this indicates appreciation in PKR poses no impact in the short-term. In contrary, coefficient associated with negative change in the ER is significant and negative which indicates that with the 1 unit decrease in the value of PKR the stock returns will be decreased by 2.08%. This behavior indicates no influence of the appreciation of rupee on the equity return in short run, but depreciation posed a substantial influence on equity return in Pakistan.

TABLE 4.12: Asymmetric Impact of Exchange Rate on Equity Return in Short-Run in Pakistan

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLER (P)	-0.5108	0.5143	-0.9931	0.3219
ΔLER (N)	2.0829	0.5853	3.5585	0.0005
ΔLIIP	-0.0279	0.0130	-2.1453	0.0332
ΔLGDP	3.5735	1.4468	2.4700	0.0144
ΔLFER	-0.0963	0.0647	-1.4887	0.1382
ΔLFER (-1)	-0.0287	0.0786	-0.3647	0.7157
ΔLFER (-2)	-0.1565	0.0578	-2.7059	0.0074
ΔLFDI	0.0039	0.0077	0.5146	0.6074
ΔLCPI	-0.0386	0.0129	-2.9965	0.0031
ΔLBT	-0.0039	0.0105	-0.3743	0.7086
ΔLBT (-1)	-0.0373	0.0213	-1.7486	0.0819
ΔLBT (-2)	-0.0370	0.0222	-1.6680	0.0969
ΔLM2	0.2532	0.2599	0.9741	0.3312
ΔLOP	0.0756	0.0212	3.5650	0.0005
ΔD1	-0.0462	0.0484	-0.9555	0.3405
ECM (-1)	-0.2916	0.0406	-7.1896	0.0000

So based on the discussion, it is observed that there is an asymmetric association exists amid exchange rate and equity returns based on their significance and their positive and negative signs.

4.2.3 Asymmetric Effect of Money Supply on Equity Market of Pakistan

Table 4.13 indicates the asymmetric relationship between broad money on the Stock market. The coefficient associated with the positive change in M2 is also significant and positive. On the contrary, the coefficient associated with the negative change in M2 is also significant but negative. So this positive and negative significant unequal influence of M2 on the stock returns indicates that an asymmetric connection exist between the variables in longer-term.

Table 4.14 provides the asymmetric impact of the money supply on the equity returns in the short-term. The coefficient associated with the positive change in M2 is also positive but insignificant which indicates that a 1 unit increase in M2 poses no influence on the equity return. On the contrary, coefficient associated

Table 4.13: Asymmetric Effect of Money Supply on Equity Index in Long-Run in Pakistan

Reg	Coeff	S. Err	T-Stat	Prob
LM2 (P)	5.3516	0.7026	7.6168	0.0000
LM2 (N)	6.8046	1.1860	5.7373	0.0000
LOP	0.1690	0.1099	1.5381	0.1256
LIIP	0.0249	0.0691	0.3607	0.7187
LGDP	-3.5309	0.9249	-3.8177	0.0002
LFER	-0.0843	0.0919	-0.9173	0.3601
LFDI	-0.0300	0.0365	-0.8203	0.4130
LER	-2.3406	1.2606	-1.8568	0.0648
LCPI	-0.1050	0.0631	-1.6643	0.0976
LBT	0.4452	0.1365	3.2616	0.0013
D1	-0.0665	0.2317	-0.2871	0.7743
C	34.5205	10.2155	3.3792	0.0009

Table 4.14: Asymmetric Impact of Money Supply on Equity Returns in Short-Run in Pakistan

Reg	Coeff	S. Err	T-Stat	Prob
ΔLM2 (P)	0.4037	0.3219	1.2543	0.2112
ΔLM2 (N)	1.4722	0.3508	4.1962	0.0000
ΔLOP	0.0366	0.0228	1.6042	0.1102
ΔLIIP	-0.0274	0.0153	-1.7905	0.0749
ΔLGDP	-0.7639	0.1912	-3.9959	0.0001
ΔLFER	-0.0182	0.0203	-0.9006	0.3689
ΔLFDI	-0.0065	0.0078	-0.8338	0.4054
ΔLER	-0.5064	0.2866	-1.7666	0.0788
ΔLCPI	-0.0227	0.0134	-1.6936	0.0919
ΔLBT	0.0001	0.0111	0.0106	0.9916
ΔLBT (-1)	-0.0290	0.0228	-1.2712	0.2051
ΔLBT (-2)	-0.0418	0.0234	-1.7902	0.0749
ΔD1	-0.0144	0.0499	-0.2884	0.7734
ECM (-1)	-0.2163	0.0391	-5.5337	0.0000

with the negative change in M2 is also significant but negative which indicates that 1 unit decrease in M2 will pose a decrease in stock returns by 1.47%. This shows that in short term increase in M2 cause no change in the stock returns, but a decrease of M2 shows the immediate influence on the equity returns in the short run. So based on the discussion, it can be said that there is an asymmetric connection exists between money supply and equity return.

4.2.4 Asymmetric Effect of Oil Price on Equity Market of Pakistan

Table 4.15: Asymmetric Effect of Oil Price on Equity Market of Pakistan in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LOP (P)	-0.1846	0.2122	-0.8701	0.3854
LOP (N)	-0.0743	0.1169	-0.6352	0.5261
LM2	5.5309	0.6412	8.6257	0.0000
LIIP	0.0671	0.0732	0.9171	0.3603
LGDP	-2.9621	0.9514	-3.1136	0.0021
LFER	-0.1832	0.0955	-1.9185	0.0566
LFDI	-0.0758	0.0455	-1.6673	0.0971
LER	-0.5564	0.8461	-0.6576	0.5116
LCPI	0.0518	0.0671	0.7716	0.4413
LBT	0.5706	0.1298	4.3962	0.0000
D1	-0.3180	0.2129	-1.4939	0.1369
C	-20.6493	9.2348	-2.2360	0.0265

Table 4.15 indicates the asymmetric relation between oil prices and the equity market. The positive & negative change in oil prices have no relationship with equity market because both coefficients are insignificant. So no longer term asymmetric relation exists amid the stock market and oil prices.

Table 4.16: Asymmetric Impact of Oil Price on Equity Returns of Pakistan in Short-Run

Reg	**Coeff**	**S.Err**	**T-Stat**	**Prob**
ΔLOP (P)	0.1324	0.1335	0.9916	0.3227
ΔLOP (P) (-1)	0.0752	0.1787	0.4207	0.6744
ΔLOP (P) (-2)	-0.4380	0.1260	-3.4771	0.0006
ΔLOP (N)	-0.1207	0.1002	-1.2047	0.2299
ΔLOP (N) (-1)	-0.1513	0.1604	-0.9430	0.3469
ΔLOP (N) (-2)	0.3329	0.1012	3.2878	0.0012
ΔLM2	0.6638	0.2574	2.5786	0.0107
ΔLIIP	-0.0160	0.0184	-0.8682	0.3864
ΔLGDP	0.4389	2.2275	0.1970	0.8440
ΔLGDP (-1)	10.1994	4.3236	2.3590	0.0194
ΔLGDP (-2)	-5.2922	2.0231	-2.6159	0.0096
ΔLFER	-0.0615	0.0649	-0.9473	0.3447
ΔLFER (-1)	-0.1322	0.0586	-2.2550	0.0253
ΔLFDI	-0.0069	0.0082	-0.8365	0.4040
ΔLER	-0.1374	0.2150	-0.6390	0.5236
ΔLCPI	-0.0501	0.0302	-1.6576	0.0991
ΔLCPI (-1)	0.0029	0.0437	0.0660	0.9474
ΔLCPI (-2)	-0.0643	0.0312	-2.0614	0.0407
ΔLBT	-0.0102	0.0105	-0.9710	0.3328
ΔLBT (-1)	-0.0563	0.0221	-2.5450	0.0117
ΔLBT (-2)	-0.0559	0.0228	-2.4520	0.0151
ΔD1	-0.0785	0.0503	-1.5622	0.1200
ECM (-1)	-0.2469	0.0428	-5.7701	0.0000

Table 4.16 provides the short-term asymmetric effects of OP on the KSE returns. The coefficient associated with the positive changes in the OP is negative and significant after 2 periods. On the contrary, the coefficient associated with the negative changes in the OP is insignificant, so there is no effect of decrease in OP on the equity returns in the short-run.

Therefore there is an asymmetric relation exists amid the OP and equity return in short-run.

4.2.5 Asymmetric Effect of Inflation on Equity Market of Pakistan

Table 4.17 indicates the asymmetric relationship between CPI and the equity market. Coefficient related with the positive change in CPI is negative, but insignificant. In contrary, coefficient related with the negative change in CPI is positive and significant. So this significant unequal link of CPI with the stock market indicates that an asymmetric relation exist amid the variables in the longer-term.

Table 4.17: Asymmetric Effect of Inflation on Equity Market of Pakistan in Long-Term

Reg	Coeff	S. Err	T-Stat	Prob
LINF (P)	-0.0502	0.0543	-0.9245	0.3564
LINF (N)	-0.3985	0.1002	-3.9750	0.0001
LIIP	-0.0540	0.0591	-0.9140	0.3619
LGDP	-2.1430	0.7725	-2.7741	0.0061
LFER	-0.2855	0.0696	-4.1035	0.0001
LFDI	-0.0287	0.0298	-0.9623	0.3371
LER	1.3508	0.6587	2.0509	0.0416
LBT	0.5800	0.1000	5.8030	0.0000
LM2	2.4994	0.9173	2.7246	0.0070
LOP	0.5039	0.1312	3.8419	0.0002
D1	-0.1434	0.1881	-0.7628	0.4465
C	7.4208	6.8790	1.0788	0.2821

Table 4.18 provides the short-term asymmetric impact of the CPI on the KSE returns. The coefficient associated with the positive changes in the CPI is negative, but insignificant as reported in the longer-term. However, in case of negative shock the coefficient associated with negative shock is also negative and indicates that with 1 unit decrease in inflation rate the stock returns will increase by .11%

So based on the above discussion, We can say there is an asymmetric relation exists amid the INF and equity return based on positive and negative signs and their significance in the short-run.

Table 4.18: Asymmetric Influence of Inflation on Equity Returns of Pakistan in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLINF (P)	-0.0136	0.0144	-0.9442	0.3463
ΔLINF (N)	-0.1082	0.0286	-3.7794	0.0002
ΔLIIP	-0.0355	0.0156	-2.2783	0.0238
ΔLGDP	3.1311	2.2401	1.3977	0.1638
ΔLGDP (-1)	6.6301	4.4226	1.4992	0.1355
ΔLGDP (-2)	-4.5129	2.0800	-2.1696	0.0313
ΔLFER	-0.0644	0.0668	-0.9635	0.3365
ΔLFER (-1)	-0.0512	0.0874	-0.5854	0.5590
ΔLFER (-2)	-0.1292	0.0644	-2.0049	0.0464
ΔLFDI	-0.0078	0.0081	-0.9616	0.3375
ΔLER	0.3670	0.1906	1.9254	0.0557
ΔLBT	0.0034	0.0110	0.3053	0.7605
ΔLBT (-1)	-0.0579	0.0232	-2.4957	0.0134
ΔLBT (-2)	-0.0598	0.0237	-2.5228	0.0125
ΔLM2	0.5334	0.2538	2.1020	0.0369
ΔLM2 (-1)	-0.0872	0.3086	-0.2825	0.7779
ΔLM2 (-2)	0.5407	0.2629	2.0568	0.0411
ΔLOP	0.0800	0.0620	1.2914	0.1981
ΔLOP (-1)	-0.1329	0.0640	-2.0777	0.0391
ΔD1	-0.0390	0.0510	-0.7644	0.4456
ECM (-1)	-0.2717	0.0478	-5.6789	0.0000

4.3 An Application of Linear ARDL Model India

Table 4.19: Descriptive Statistics India

	BSE	BT	CPI	ER	FDI	FER	GDP	IIP	M2	OP
Mean	6076.579	-7598.741	6.375	0.020	1599.914	212055.000	341137.200	5.850	255883.200	62.726
Median	6218.655	-7713.007	5.405	0.021	1353.000	254526.000	324080.800	5.650	268294.100	58.145
Maximum	15347.190	238.000	16.216	0.025	8579.000	399442.000	704270.200	20.000	518717.700	132.830
Minimum	850.560	-20210.850	1.460	0.015	-1336.000	31941.000	105316.300	-7.200	76748.740	18.520
Std. Dev.	3903.098	5471.116	2.941	0.003	1480.405	107747.000	171335.500	4.674	120859.800	29.511
Skewness	0.458	-0.212	0.873	-0.434	1.145	-0.305	0.164	0.425	-0.053	0.357
Kurtosis	2.332	1.876	3.228	1.934	4.602	1.826	1.766	3.907	1.777	1.939
Jarque-Bera	11.881	13.358	28.651	17.458	72.268	16.204	15.087	14.295	13.927	15.127
Probability	0.003	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001

Table 4.19 reports the descriptive statistics of India. The BSE has an average value of is 6077 with a max risk of 3903 on the index. Balance of trade has an average of -$7599 mn with the max risk of $5471 mn. Inflation in terms of CPI has an average rate of 6.38% with the max risk of 2.94%. Indian rupee in terms of dollar exchange rate has an average rate of $.02 with max risk of .003 in its exchange rate. Foreign direct investment has an average value of $1600 mn with a max risk of $1480 mn. Foreign exchange reserve has an average value of $212055 mn with the max risk of $107747 mn. Gross domestic product has an average value of $341137 mn with a max risk of $171336 mn. The industrial growth rate has an average of 5.85% with the max risk of 4.67%. Broad money has an average value of $255883 mn with max risk of $120860 mn. Finally oil price has an average per barrel value of $62.73 with the max risk of $29.51 in its per barrel price. Trade balance, exchange rate, foreign exchange reserves, and broad money are negatively skewed

that indicates that these variables are skewed left side whereas rest of the variables are positively skewed on the right side. CPI, foreign direct investment, and industrial growth rate have a leptokurtic distribution with peaked data and flat tails, whereas Bombay stock exchange, trade balance, exchange rate, foreign exchange reserve, domestic gross product, broad money and oil price have a platykurtic distribution with flat data and thin tails. Finally, all the variables of interest of Jarque-Bera probabilities are significant which indicates that the data is non-random in nature.

Table 4.20: Unit Root Analysis India

Unit Root Test	ADF@Level	ADF@1st Diff	PP@Level	PP@1st Diff	Integrated
LIIP	-4.0561	-14.8783	-5.5049	-26.4001	I(0)
LCPI	-2.7999	-14.3246	-2.6141	-16.7474	I(1)
LBSE	-2.2535	-13.1994	-2.5927	-13.3060	I(0)
LM2	-1.2206	-16.5424	-1.3196	-17.4667	I(1)
LBT	-4.2329	-19.5301	-10.3688	-49.8950	I(0)
LFDI	-13.2036	-11.5863	-13.3717	-136.7976	I(0)
LFER	-3.2432	-5.4757	-3.1525	-10.7695	I(0)
LER	-0.5201	-10.6279	-0.2110	-10.6350	I(1)
LGDP	-2.3450	-2.8460	-0.6561	-6.7100	I(1)
LOP	-1.9097	-11.1270	-1.8845	-11.1187	I(1)

In **Table 4.20** data is presented in log form for smoothing the coefficients. The table reports the results of the unit root test to identify the order of Integration of variables. For unit root testing ADF and the Phillip-Perron test are used at the level and 1st difference with constant and trend assumptions. The findings suggest that half of the time series are non stationary that becomes

stable at the 1st difference. Rest of the time series is stationary at level. The reason for implying both the assumptions of trend and no trend is to check the nature of variables. The ARDL method can be implemented irrespective of the integration order, The purpose behind conducting the stationary test is to identify the current model.

TABLE 4.21: Lag Length Selection India

Lag	LL	AIC	SC	HQ
0	-47.2842	0.5231	0.6779	0.5856
1	2400.748	-20.9201	-19.2178*	-20.2326*
2	2555.662	-21.4216*	-18.1718	-20.1091
3	2620.677	-21.1021	-16.3048	-19.1646

Table 4.21 provides the criteria for selecting a number of lags to be used. Sequentially modified LR test statistic, Final prediction error, Akaike information, Schwarz information, and Hannan-Quinn information criterion's are commonly used to determine optimum number of lags to be used. The lag period that provide the lowest critical value is identified as the lag period of the model unless no auto-correlation is observed. The decision is based on AIC. So, the lag that minimizes the Akaike information is 2 and no auto-correlation exist at this duration of lag.

TABLE 4.22: Diagnostic Test India

Item	Test Applied	Value	Prob
Serial Correlation	Score Test (F-Stat)	0.0420	0.9589
Normality	Histogram Test (Jarque-Bera)	29.0917	0.0000
Functional Form	Ramsey Test (F-Stat)	2.8530	0.0927
Heteroscedasticity	White Test (F-Stat)	2.3921	0.0033

Table 4.22 provides information about diagnostic testing. The table indicates no autocorrelation issue. Moreover, there is no error in model specification with functional form reference. The time series data is mostly not normally distributed. Shrestha and Chowdhury (2005) concludes that heteroscedasticity presence has no influence on estimates because times-series data are mixtures of different integration order so the presence of heteroscedasticity is natural to be detected.

Table 4.23: ARDL Representation India

(1, 0, 0, 1, 0, 2, 1, 0, 0, 0) AIC Based Selected ARDL

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
LBSE (-1)	0.8963	0.0285	31.3970	0.0000
LBT	0.0080	0.0078	1.0287	0.3048
LCPI	-0.0212	0.0150	-1.4135	0.1590
LER	1.2968	0.3064	4.2324	0.0000
LER (-1)	-1.4369	0.3015	-4.7659	0.0000
LFDI	0.0036	0.0073	0.4940	0.6218
LFER	0.7219	0.2057	3.5096	0.0006
LFER (-1)	-0.9412	0.3033	-3.1032	0.0022
LFER (-2)	0.2628	0.1890	1.3905	0.1659
LGDP	0.2262	0.2005	1.1284	0.2605
LGDP (-1)	-0.3420	0.2002	-1.7088	0.0890
LIIP	-0.0010	0.0152	-0.0663	0.9472
LM2	0.1871	0.0849	2.2035	0.0287
LOP	0.0334	0.0205	1.6302	0.1046
D1	-0.0329	0.0396	-0.8309	0.4070
C	-1.2391	0.3629	-3.4143	0.0008
F-stat	2473.4070			
Prob(F-stat)	0.0000			
D-W Stat	2.0332			

Table 4.23 provides information for AIC-based selected ARDL. Findings indicate that exchange rate, foreign exchange reserve, and supply of money are statistically significantly effecting the BSE equity market. Whereas trade balance, rate of inflation, foreign direct investment, domestic gross product, Industrial production index and prices of oil have a statistically insignificant impact on the equity market. The table indicates macroeconomic indicators significantly describe the equity market of the BSE-500.

Table 4.24: ARDL Bound Test India

Test Stat	**Value**	**k**
F-statistic	2.8877	9
Critical Value Bounds		
Significance	**Lower Limit**	**Upper Limit**
0.10	1.88	2.99
0.05	2.14	3.3
0.025	2.37	3.6
0.01	2.65	3.97

In **Table 4.24** the bound tests are reported assuming that these variables are either I(0) else I(1) and no I(2) variables because if there is any I(2) variable in the model then computed F-stat proposed by Pesaran et al. (2001) will become invalid. The table provide upper and lower limits for different levels of confidence intervals. Our model is based on 95% confidence interval for selecting the model. The F-stat value is 2.89 that is lower than upper bound of 3.3 but higher than lower bound i.e. 2.14 which shows that longer-term relation cannot be determined or inconclusive.

Given below are CUSUM and the CUSUM of the squares plot for stability checking of coefficients in the longer- and shorter-term error correction model of ARDL. **Figure 4.3** shows CUSUM and **Figure 4.4** shows CUSUM of the squares. The CUSUM and CUSUM of squares are inside critical limits of 0.05, which shows structural stability of the model and overall goodness of fit.

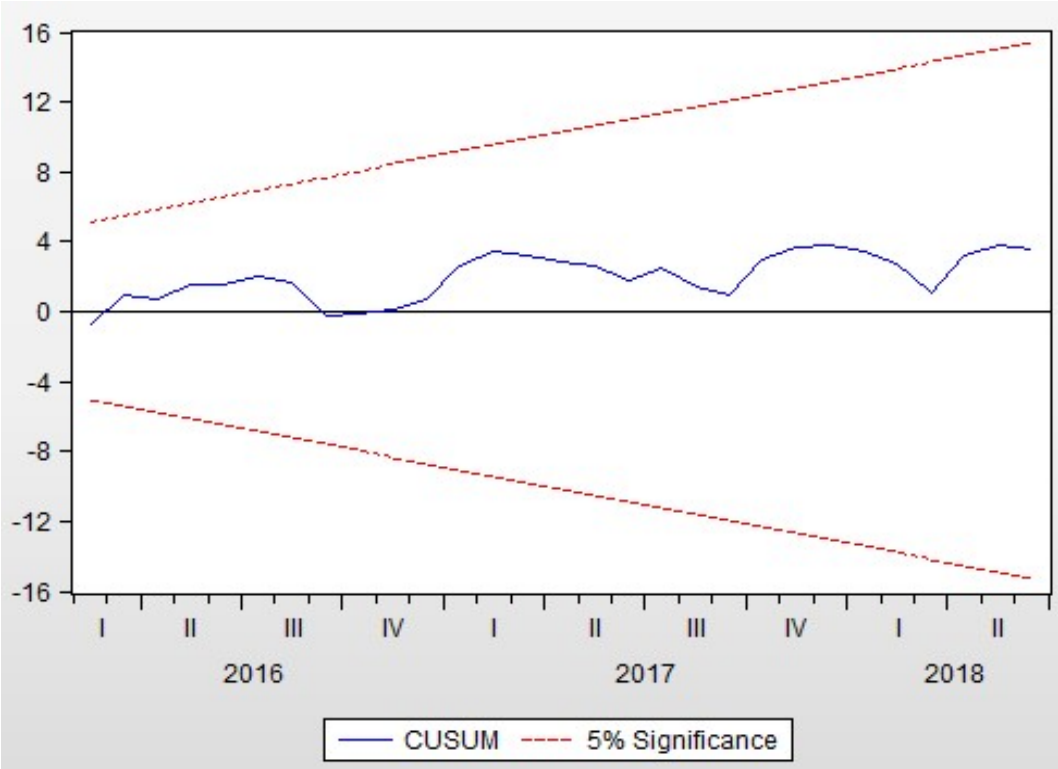

FIGURE 4.3: Cumulative Sum of Recursive Residuals India

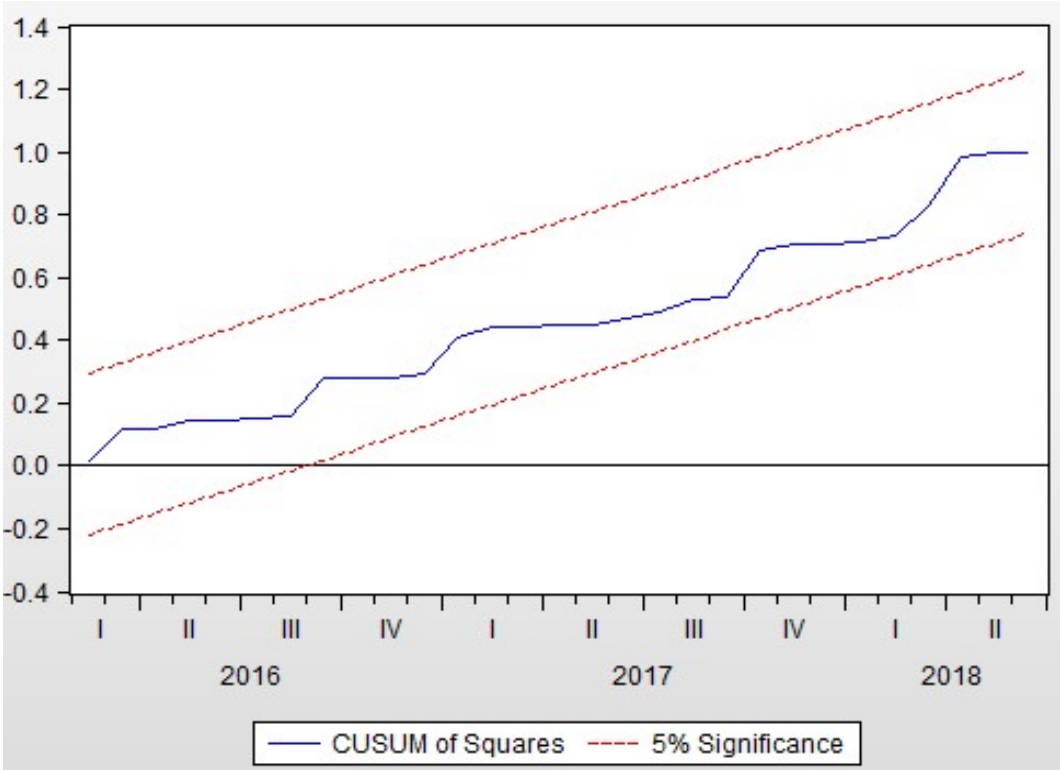

FIGURE 4.4: Cumulative Sum of Squares of Recursive Residuals India

TABLE 4.25: ARDL Model for Estimated Long Run Coefficients India

Regressor	Coeff	S. Err	T-Stat	Prob
LBT	0.0771	0.0752	1.0246	0.3068
LCPI	-0.2048	0.1403	-1.4599	0.1459
LER	-1.3518	0.7228	-1.8702	0.0629
LFDI	0.0349	0.0704	0.4954	0.6209
LFER	0.4193	0.3024	1.3864	0.1672
LGDP	-1.1173	0.8985	-1.2435	0.2151
LIIP	-0.0097	0.1478	-0.0658	0.9476
LM2	1.8052	0.8679	2.0800	0.0388
LOP	0.3222	0.2096	1.5375	0.1257
D1	-0.3173	0.3896	-0.8145	0.4163
C	-11.9535	2.0560	-5.8139	0.0000

From the **Table 4.25** it is noted that balance of trade, inflation rate, exchange rate, direct foreign investment, reserves of foreign currency, domestic gross product, index of industrial production and oil prices have an insignificant statistical relationship with BSE index in the longer-run. In contrary, only broad money

have statistically significant relationship with the BSE equity market that indicates that broad money have a longer-term connection with the BSE-500 equity market.

TABLE 4.26: Error Correction Model for Short Run Effects India

Regressor	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLBT	0.0080	0.0078	1.0287	0.3048
ΔLCPI	-0.0212	0.0150	-1.4135	0.1590
ΔLER	1.2968	0.3064	4.2324	0.0000
ΔLFDI	0.0036	0.0073	0.4940	0.6218
ΔLFER	0.7219	0.2057	3.5096	0.0006
ΔLFER (-1)	-0.2628	0.1890	-1.3905	0.1659
ΔLGDP	0.2262	0.2005	1.1284	0.2605
ΔLIIP	-0.0010	0.0152	-0.0663	0.9472
ΔLM2	0.1871	0.0849	2.2035	0.0287
ΔLOP	0.0334	0.0205	1.6302	0.1046
ΔD1	-0.0329	0.0396	-0.8309	0.4070
ECM (-1)	-0.1037	0.0285	-3.6309	0.0004

ECM = LBSE - (0.0771*LBT -0.2048*LCPI -1.3518*LER + 0.0349*LFDI + 0.4193*LFER -1.1173*LGDP -0.0097*LIIP + 1.8052*LM2 +0.3222*LOP -0.3173*D1 -11.9535)

Table 4.26 provides the shorter-run dynamic association between the macroeconomic indicators and the equity returns of BSE-500. The error correction model provides that exchange rate, foreign exchange reserves and supply of money are statistically significant. It is worth mentioning that exchange rate and foreign exchange reserves are not statistically significant in long term but becomes statistically significant in short-term.

Error correction model ECM (-1) provides one period adjustment from a long-term disequilibrium. The ECM demonstrates the extent to which the short-term imbalance is eliminated in the longer-run. Practically in long run relationship, the ECM value must be significant and negative and the same can be seen in the ECM results.

The ECM term coefficient is negative and significant and shows that the adjusting system is quite quick as 10 percent of price disequilibrium is corrected from its equilibrium route.

The structural break is observed during January-March 2016 that has been accounted for through dummy in cusum and cusum square graph.

4.4 An Application of Non-Linear ARDL Model India

4.4.1 Asymmetric Effect of Industrial Growth on Equity Market of India

Table 4.27: Asymmetric Effect of Industrial Growth on Equity Market of India in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LIIP (P)	0.0651	0.1346	0.4837	0.6291
LIIP (N)	-0.0726	0.1469	-0.4946	0.6214
LBT	0.0947	0.0701	1.3508	0.1783
LCPI	-0.1378	0.1327	-1.0383	0.3004
LER	1.3218	1.6537	0.7993	0.4250
LFDI	0.0323	0.0642	0.5027	0.6157
LFER	0.6355	0.3253	1.9534	0.0521
LGDP	-1.9187	1.0598	-1.8105	0.0717
LM2	1.3868	0.7945	1.7455	0.0824
LOP	0.2740	0.1893	1.4474	0.1493
D1	-0.2728	0.3540	-0.7706	0.4418
C	9.9637	13.6478	0.7301	0.4662

Table 4.27 reports the asymmetric effect of IIP on the stock index. The coefficient associated with the positive change in IIP is also positive but insignificant which demonstrate no longer-term positive influence of IIP on the equity market of India. On the contrary, the coefficient associated with the negative change in IIP is positive, but insignificant which shows no negative influence of IIP on the equity market of India. So it can be said that no asymmetric relation exists among the variables in the long run.

From **Table 4.28** similar results are provided in the long-term relationship where no short-run asymmetric connection exists amid IIP and equity return in

Table 4.28: Asymmetric Influence of Industrial Growth on Equity Returns of India in Short-Run

Reg	Coeff	S. Err	T-Stat	Prob
ΔLIIP (P)	0.0074	0.0160	0.4602	0.6458
ΔLIIP (N)	-0.0082	0.0158	-0.5206	0.6032
ΔLBT	0.0107	0.0079	1.3541	0.1772
ΔLCPI	-0.0156	0.0154	-1.0153	0.3112
ΔLER	1.4704	0.3241	4.5373	0.0000
ΔLFDI	0.0037	0.0073	0.5013	0.6167
ΔLFER	0.7266	0.2049	3.5454	0.0005
ΔLFER (-1)	-0.3152	0.1911	-1.6493	0.1006
ΔLGDP	0.1595	0.2041	0.7818	0.4352
ΔLM2	0.1571	0.0867	1.8125	0.0714
ΔLOP	0.0310	0.0205	1.5165	0.1310
ΔD1	-0.0309	0.0395	-0.7832	0.4344
ECM (-1)	-0.1133	0.0291	-3.8962	0.0001

the short run. Because there is no significance in the coefficients of positive and negative signs.

4.4.2 Asymmetric Effect of Exchange Rate on Equity Market of India

Table 4.29: Asymmetric Effect of Exchange Rate on Equity Market of India in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LER (P)	1.7975	2.5225	0.7126	0.4769
LER (N)	-0.0922	1.1241	-0.0820	0.9347
LCPI	-0.1699	0.1364	-1.2454	0.2144
LBT	0.0936	0.0740	1.2652	0.2072
LFDI	0.0274	0.0672	0.4072	0.6843
LFER	0.5774	0.3292	1.7538	0.0810
LGDP	-1.8300	1.1234	-1.6290	0.1049
LIIP	0.0054	0.1394	0.0389	0.9690
LM2	1.4157	0.8467	1.6721	0.0961
LOP	0.2600	0.2003	1.2976	0.1959
D1	-0.3002	0.3724	-0.8062	0.4211
C	4.3023	9.7601	0.4408	0.6598

The **Table 4.29** reports the asymmetric influence of ER on the equity markets. The coefficient associated with the positive change in the ER is also positive but insignificant which indicates no longer-term positive influence of ER on the equity markets of India. On the contrary, the coefficient associated with the negative change in the ER is positive, but insignificant which shows no negative influence of ER on the equity markets of India. So it can be said that no asymmetric association exists amid the variables in the long term.

TABLE 4.30: Asymmetric Influence of Exchange Rate on Equity Return in Short-Run in India

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLER (P)	1.5912	0.6052	2.6291	0.0092
ΔLER (N)	1.2910	0.4560	2.8309	0.0051
ΔLCPI	-0.0185	0.0152	-1.2160	0.2254
ΔLBT	0.0102	0.0080	1.2763	0.2033
ΔLFDI	0.0030	0.0073	0.4062	0.6850
ΔLFER	0.7354	0.2067	3.5571	0.0005
ΔLFER (-1)	-0.2794	0.1901	-1.4697	0.1432
ΔLGDP	0.1734	0.2055	0.8435	0.4000
ΔLIIP	0.0006	0.0153	0.0387	0.9691
ΔLM2	0.1544	0.0891	1.7330	0.0846
ΔLOP	0.0283	0.0210	1.3505	0.1784
ΔD1	-0.0327	0.0398	-0.8232	0.4114
ECM (-1)	-0.1090	0.0292	-3.7383	0.0002

Table 4.30 provides the asymmetric impact of ER on the equity returns in the short-term. The coefficient associated with the positive shock in the ER is also positive and significant which indicates that 1 unit appreciation in Indian rupee have a 1.59% increase in the stock returns. On the contrary, the coefficient associated with the negative change in the ER is also significantly negative and indicates that 1 unit devaluation of Indian rupee will have a decrease in stock returns by 1.29%. This indicates that in the short-term increase or decrease in ER cause a change in the stock returns. So, based on the discussion, it can be said that there is an asymmetric association exists amid ER and equity returns based on their significance and the coefficient signs.

4.4.3 Asymmetric Effect of Money Supply on Equity Index of India

TABLE 4.31: Asymmetric Effect of Money Supply on Equity Index in Long-Run India

Reg	Coeff	S. Err	T-Stat	Prob
LM2 (P)	1.8132	0.8133	2.2294	0.0269
LM2 (N)	1.3048	0.8947	1.4583	0.1463
LOP	0.3168	0.1958	1.6180	0.1072
LIIP	-0.0299	0.1419	-0.2109	0.8331
LGDP	-1.3759	0.9135	-1.5061	0.1336
LFER	0.3600	0.2827	1.2733	0.2044
LFDI	0.0389	0.0661	0.5895	0.5562
LER	-0.3103	1.0979	-0.2826	0.7778
LCPI	-0.1374	0.1439	-0.9546	0.3409
LBT	0.0671	0.0706	0.9501	0.3432
D1	-0.2064	0.3737	-0.5523	0.5814
C	16.0435	11.7112	1.3699	0.1722

The **Table 4.31** reports the asymmetric effect of broad money on the stock market of India. The coefficient associated with the positive shock in M2 is also significantly positive. On the contrary, the coefficient associated with the negative shock in M2 is also negative, but insignificant. So, this positive and negative significant unequal influence of M2 on the stock index indicates an asymmetric association exists amid the variables in long-run.

Table 4.32 provides the asymmetric influence of the money supply on the equity returns in the short-term. The coefficient associated with the positive shock in M2 is also significantly positive and indicates that a 1 unit raise in M2 cause stock returns to increase by.20%. On the contrary, the coefficient related to the negative change in M2 is also negative, but insignificant and reports that 1 unit decrease in M2 will have no impact on stock returns. This indicates that the increase in M2 in the short term cause change in the stock returns, but a decrease of M2 shows no influence on the equity returns in the short-term. So based on the discussion, it can be said that there is an asymmetric relation exists amid M2 and equity returns based on their significance and coefficient signs.

Table 4.32: Asymmetric Impact of Money Supply on Equity Returns in Short-Run India

Reg	Coeff	S. Err	T-Stat	Prob
ΔLM2 (P)	0.2007	0.0859	2.3365	0.0204
ΔLM2 (N)	0.1444	0.0943	1.5312	0.1273
ΔLOP	0.0351	0.0206	1.7067	0.0894
ΔLIIP	-0.0033	0.0154	-0.2157	0.8294
ΔLGDP	0.2276	0.2004	1.1356	0.2575
ΔLFER	0.7271	0.2057	3.5347	0.0005
ΔLFER (-1)	-0.2619	0.1889	-1.3865	0.1671
ΔLFDI	0.0043	0.0073	0.5868	0.5580
ΔLER	1.3541	0.3113	4.3502	0.0000
ΔLCPI	-0.0152	0.0161	-0.9447	0.3459
ΔLBT	0.0074	0.0078	0.9547	0.3409
ΔD1	-0.0229	0.0407	-0.5608	0.5755
ECM (-1)	-0.1107	0.0293	-3.7732	0.0002

4.4.4 Asymmetric Effect of Oil Price on Equity Market of India

Table 4.33: Asymmetric Effect of Oil Price on Equity Market of India in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LOP (P)	0.8258	0.4990	1.6551	0.0994
LOP (N)	0.3537	0.2628	1.3459	0.1798
LBT	0.1176	0.0987	1.1911	0.2350
LCPI	-0.1932	0.1721	-1.1228	0.2628
LER	-0.0297	1.2480	-0.0238	0.9810
LFDI	0.0495	0.0879	0.5627	0.5742
LFER	0.1899	0.3681	0.5158	0.6065
LGDP	-1.8478	1.4163	-1.3047	0.1935
LIIP	-0.0499	0.1884	-0.2650	0.7913
LM2	1.2493	1.0941	1.1419	0.2548
D1	-0.2066	0.4803	-0.4302	0.6675
C	10.7006	17.9688	0.5955	0.5522

The **Table 4.33** reports the asymmetric relation amid oil prices and the equity market. The positive and negative change in oil prices has no influence on the equity market because both the coefficient of positive and negative are insignificant

in nature. So, it can be said that there is no long-term asymmetric relation exists between the stock index and oil prices.

TABLE 4.34: Asymmetric Influence of Oil Price on Equity Returns of India in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLOP (P)	0.0706	0.0336	2.0970	0.0372
ΔLOP (N)	0.0302	0.0209	1.4461	0.1497
ΔLBT	0.0100	0.0081	1.2466	0.2140
ΔLCPI	-0.0165	0.0153	-1.0811	0.2809
ΔLER	1.3416	0.3130	4.2866	0.0000
ΔLFDI	0.0042	0.0075	0.5645	0.5730
ΔLFER	0.7014	0.2078	3.3755	0.0009
ΔLGDP	0.1701	0.2089	0.8146	0.4163
ΔLIIP	-0.0043	0.0154	-0.2763	0.7826
ΔLM2	0.1067	0.0951	1.1222	0.2631
ΔD1	-0.0177	0.0409	-0.4312	0.6668
ECM (-1)	-0.0854	0.0289	-2.9601	0.0034

Table 4.34 provides the asymmetric impact of OP on the equity returns in the short-term. The coefficient associated with the positive change in the OP is also significantly positive and indicates that a unit increase in oil price cause stock returns to increase by.07%. On the contrary, the coefficient associated with the negative change in the OP is also negative, but insignificant and indicates that 1 unit decrease in OP will pose no change in stock returns. This indicates that in the short run increase in OP cause change in the stock returns, but a decrease of M2 shows no influence on the equity returns. So on the basis of the discussion, it can be said that there is an asymmetric relation exists amid oil prices and returns.

4.4.5 Asymmetric Effect of Inflation on Equity Market of India

From **Table 4.35** the asymmetric relationship between the CPI and the equity market is reported. The positive and negative change in the CPI has no influence on the equity market because both the coefficient of positive and negative are insignificant in nature. It indicates that there is no long-term asymmetric relation exists amid the equity market and CPI.

Table 4.35: Asymmetric Effect of Inflation on Equity Market of India in Long-Term

Reg	Coeff	S. Err	T-Stat	Prob
LCPI (P)	0.0628	0.1797	0.3494	0.7271
LCPI (N)	-0.2356	0.1371	-1.7183	0.0872
LBT	0.0878	0.0731	1.2025	0.2306
LER	0.2034	0.8719	0.2333	0.8158
LFDI	0.0506	0.0684	0.7389	0.4608
LFER	-0.0720	0.3189	-0.2258	0.8216
LGDP	-1.1174	0.8676	-1.2879	0.1992
LIIP	-0.0617	0.1487	-0.4150	0.6786
LM2	0.9065	0.8621	1.0515	0.2943
LOP	0.3970	0.2105	1.8860	0.0607
D5	-0.1463	0.3752	-0.3898	0.6971
C	8.5557	10.2737	0.8328	0.4059

Table 4.36: Asymmetric Impact of Inflation on Equity Returns of India in Short-Run

Reg	Coeff	S. Err	T-Stat	Prob
ΔLCPI (P)	0.0068	0.0194	0.3520	0.7252
ΔLCPI (N)	-0.0256	0.0157	-1.6327	0.1041
ΔLBT	0.0096	0.0079	1.2068	0.2289
ΔLER	1.4072	0.3147	4.4710	0.0000
ΔLFDI	0.0055	0.0075	0.7333	0.4642
ΔLFER	0.6690	0.2049	3.2642	0.0013
ΔLGDP	0.1917	0.2043	0.9380	0.3493
ΔLIIP	-0.0067	0.0154	-0.4370	0.6625
ΔLM2	0.0986	0.0917	1.0752	0.2836
ΔLOP	0.0432	0.0214	2.0233	0.0443
ΔD1	-0.0159	0.0405	-0.3926	0.6950
ECM (-1)	-0.1088	0.0296	-3.6707	0.0003

From **Table 4.36** similar results are observed that both the positive and negative change in CPI causes no impact on the equity returns in the short-term as well.

4.5 An Application of Linear ARDL Model Bangladesh

Table 4.37: Descriptive Statistics Bangladesh

	DSE	CPI	BT	ER	FDI	FER	GDP	IIP	M2	OP
Mean	3158.332	6.443	-734.535	0.015	93.736	10431.700	119619.700	9.431	53757.120	62.726
Median	2922.160	6.341	-669.264	0.015	67.000	6224.482	100119.300	9.023	40592.320	58.145
Maximum	8364.240	12.716	-57.686	0.020	345.000	33369.000	274047.700	30.389	132614.200	132.830
Minimum	484.440	1.144	-2516.444	0.012	-39.667	1045.152	52484.870	-5.000	13240.200	18.520
Std. Dev.	1982.987	2.512	429.427	0.002	82.713	9909.322	64156.700	6.145	36921.540	29.511
Skewness	0.233	0.112	-0.886	0.520	0.966	1.037	0.856	0.238	0.714	0.357
Kurtosis	1.871	2.986	4.064	2.082	3.403	2.702	2.568	2.963	2.158	1.939
Jarque-Bera	13.814	0.469	39.553	17.811	36.028	40.600	28.829	2.113	25.426	15.127
Probability	0.001	0.791	0.000	0.000	0.000	0.000	0.000	0.348	0.000	0.001

The **Table 4.37** reports the descriptive statistics of Bangladesh. The DSE has an average value of 3158 on the index with the max risk of 1983 on the indices. The inflation in terms of CPI has an average inflation rate of 6.44% with a max risk of 2.51%. Balance of trade has an average of -$734 mn with the max risk of $429 mn. The exchange rate of Bangladeshi Taka in terms of dollar has an average rate of $.015 with the max risk of $.002. Foreign direct investment has an average investment of $94 mn with a max risk of $83 mn. Foreign exchange reserve has an average reserves of $10432 mn with the max risk of $9909 mn. The GDP has an average of $119620 with a max risk of $64157 mn. Industrial production growth has an average of 9.43% with a max risk of 6.14%. Broad money supply has an average supply of $53757 billion in the economy with the max risk of $36922 billion. Oil prices have an average per barrel price of $63 with the max risk of $30 in its per barrel prices. All the variables except of trade balance are positively skewed

whereas trade balance is negatively skewed. Most of the variables follows a platykurtic distribution with flat data and thin tails. Only the trade balance and FDI follows a leptokurtic distribution with peaked data and flat tails. Finally, all the variables of interest of Jarque-Bera probabilities are significant except of CPI and industrial production growth that indicates that all the variables are non-random in nature and only BT and FDI are random in nature.

Table 4.38: Unit Root Analysis Bangladesh

	ADF@Level	**ADF@1st Diff**	**PP@Level**	**PP@1st Diff**	**Integrated**
LIIP	-6.6122	-16.2703	-12.6854	-66.0186	I(0)
LCPI	-2.4301	-17.2299	-2.2928	-17.3213	I(1)
LDSE	-1.8112	-14.4312	-1.7990	-14.4379	I(1)
LM2	-2.6041	-2.6135	-2.1608	-17.2411	I(0)
LBT	3.6228	-5.9823	-12.6514	-26.9498	I(0)
LFDI	-4.8364	-10.7067	-5.7608	-23.9605	I(0)
LFER	-4.2369	-4.9620	-3.9603	-23.3299	I(0)
LER	-2.8081	-15.4934	-2.6492	-15.8223	I(0)
LGDP	-3.1261	-2.2865	-3.0252	-2.3362	I(0)
LOP	-1.9097	-11.1270	-1.8845	-11.1187	I(1)

The **Table 4.38** reports the results of unit root test to identify the order of Integration of variable's. The data is presented in log form for smoothing the coefficients. For unit root testing ADF and the Phillip-Perron testing are used at level and 1st difference with constant and trend assumptions. The findings suggest that the majority of time series are stationary at level. Only LCPI, LDSE and LOP are non stationary that becomes stable at the 1st difference.

The reason for implying both the assumptions of trend and no trend is to check the nature of variables. The ARDL method can be implemented irrespective of the integration order, The purpose behind conducting stationary test is to identify the current model.

TABLE 4.39: Lag Length Selection Bangladesh

Lag	LL	AIC	SC	HQ
0	168.8277	-1.4505	-1.2957	-1.3880
1	2956.6900	-25.9972	-24.2949	-25.3097
2	3235.6470	-27.6315*	-24.3817*	-26.3190*
3	3311.8650	-27.4143	-22.6170	-25.4768

Table 4.39 reports the criteria for selecting a number of lags to be used. Sequentially modified LR test statistic, Final prediction error, Akaike information, Schwarz information, and Hannan-Quinn information criterion's are commonly used to determine optimum number of lags to be used. The lag period which provides the lowest critical value is identified as the lag period of the model unless no auto-correlation is observed. The decision is based on AIC. So, the lag that minimizes the Akaike information is 2 and no auto-correlation exist at this duration of lag.

TABLE 4.40: Diagnostic Test Bangladesh

Item	Test Applied	Value	Prob
Serial Correlation	Score Test (F-Stat)	1.5599	0.2127
Normality	Histogram Test (Jarque-Bera)	97.5795	0.0000
Functional Form	Ramsey Test (F-Stat)	0.1288	0.7201
Heteroscedasticity	White Test (F-Stat)	1.4128	0.1381

Table 4.40 reports the information about diagnostic testing. The table indicates no autocorrelation issue. Moreover, there is no error in model specification with functional form reference. The time series data is mostly not normally distributed. Shrestha and Chowdhury (2005) concludes that heteroscedasticity presence has no influence on estimates because times-series data are mixtures of different integration order so the presence of heteroscedasticity is natural to be detected.

Table 4.41: ARDL Representation Bangladesh

(1, 0, 0, 0, 0, 2, 1, 1, 0, 0) AIC Based Selected ARDL

Reg	Coeff	S. Err	T-Stat	Prob
LDSE (-1)	0.9239	0.0247	37.3617	0.0000
LER	0.1036	0.1500	0.6904	0.4907
LFDI	-0.0100	0.0081	-1.2248	0.2221
LFER	0.0642	0.0439	1.4628	0.1451
LGDP	-0.1963	0.1750	-1.1218	0.2633
LIIP	-0.0083	0.0104	-0.7961	0.4269
LIIP (-1)	0.0032	0.0101	0.3125	0.7550
LIIP (-2)	-0.0327	0.0102	-3.1981	0.0016
LM2	0.8869	0.3049	2.9091	0.0040
LM2 (-1)	-0.7316	0.3078	-2.3767	0.0184
LOP	0.0313	0.0238	1.3120	0.1910
LCPI	-0.0554	0.0316	-1.7535	0.0810
LCPI (-1)	0.0497	0.0304	1.6372	0.1031
LBT	0.0110	0.0101	1.0878	0.2780
D1	-0.0071	0.0286	-0.2499	0.8029
D2	-0.0347	0.0274	-1.2681	0.2062
C	1.0458	0.8004	1.3067	0.1928
F-stat	2012.0560			
Prob (F-stat)	0.0000			
D-W Stat	2.0917			

Table 4.41 reports AIC-based selected ARDL model. Findings indicate that only industrial production and broad money have a statistically significant effect on the Dhaka equity market where the industrial production has a significant but negative impact and broad money has a significantly positive impact on the Dhaka equity market. On the contrary, the Exchange rate, FDI, FER, Gross domestic product, CPI, balance of trade and oil prices values are statistically insignificant and have no effect on the Dhaka equity market.

The bound tests are reported assuming that these variables are either I[(0) else I[(1) and no I(2) variables because if there is any I(2) variable in the model then computed F-stat proposed by Pesaran et al. (2001) will become invalid. **Table 4.42** reports the information regarding the results of the bound test of ARDL. The tables provide upper and lower limits for different levels of confidence intervals. Our model is based on 95% confidence interval for selecting the model. The F-stat

Table 4.42: ARDL Bound Test Bangladesh

Test Stat	**Value**	**k**
F-stat	2.9981	9
Critical Value Bounds		
Significance	**Lower Limit**	**Upper Limit**
0.10	1.88	2.99
0.05	2.14	3.3
0.025	2.37	3.6
0.01	2.65	3.97

value is 3.00 that is lower than upper bound of 3.3 but higher than lower bound i.e. 2.14 which shows that longer-term relation cannot be determined or inconclusive.

Fig 4.5 and Fig 4.6 reports CUSUM and the CUSUM of the squares plot for stability checking of coefficients in the long and short-term Error correction model of ARDL. **Figure 4.5** shows CUSUM and **Figure 4.6** shows CUSUM of the squares. The CUSUM and CUSUM of squares are inside critical limits of 0.05 that indicates structural stability of the model and overall goodness of fit.

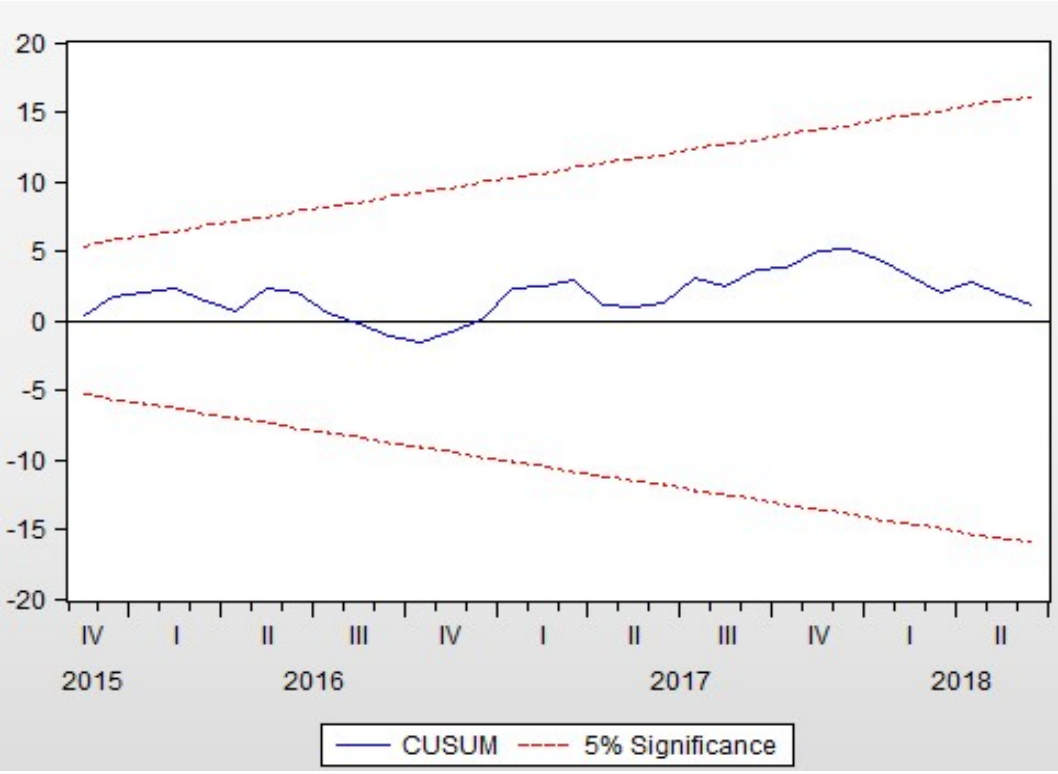

Figure 4.5: Cumulative Sum of Recursive Residuals Bangladesh

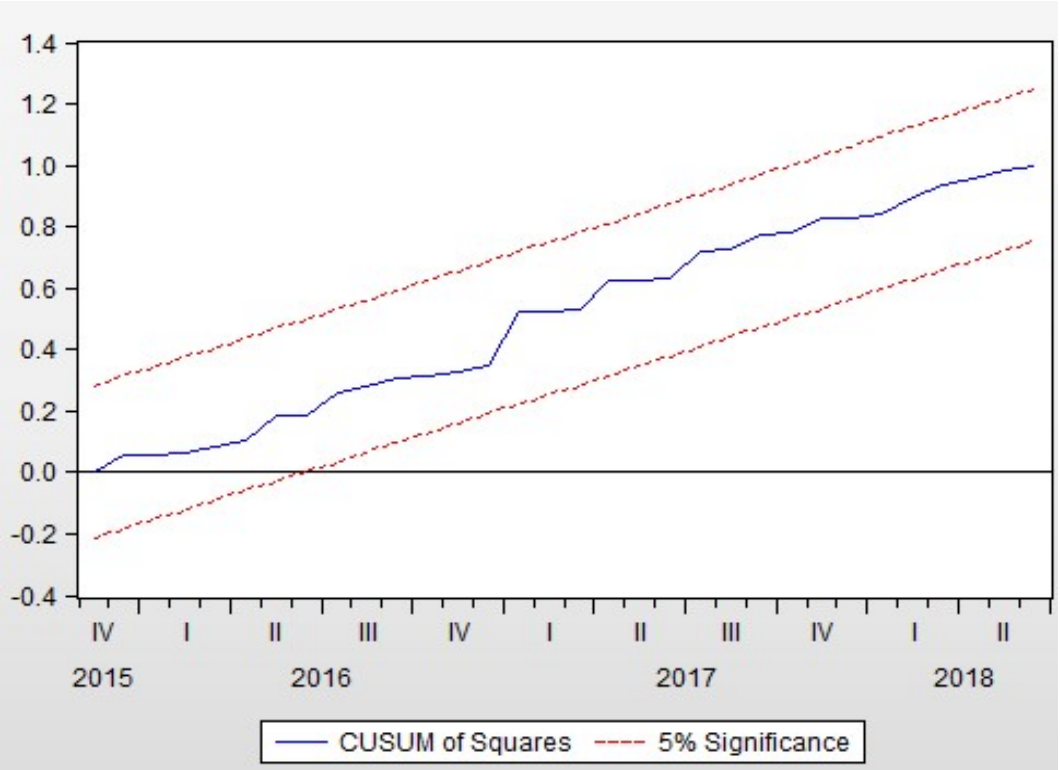

FIGURE 4.6: Cumulative Sum of Squares of Recursive Residuals Bangladesh

TABLE 4.43: ARDL Model for Estimated Long Run Coefficients Bangladesh

Reg	Coeff	S. Err	T-Stat	Prob
LER	1.3613	1.9532	0.6969	0.4866
LFDI	-0.1309	0.1110	-1.1795	0.2396
LFER	0.8444	0.6773	1.2467	0.2139
LGDP	-2.5809	2.2263	-1.1593	0.2477
LIIP	-0.4970	0.2470	-2.0124	0.0455
LM2	2.0417	1.6215	1.2592	0.2094
LOP	0.4109	0.2719	1.5109	0.1324
LCPI	-0.0748	0.2490	-0.3002	0.7643
LBT	0.1451	0.1421	1.0206	0.3087
D1	-0.0940	0.3700	-0.2539	0.7998
D2	-0.4564	0.3776	-1.2087	0.2282
C	13.7475	10.9001	1.2612	0.2087

From **Table 4.43** it is noted that only industrial production index is statistically significant, but has a negative impact on the Dhaka equity market in the long run. On the contrary rest of the variables of interest have no statistical significant relationship with the Dhaka equity market in the long-term and indicates that Dhaka stock market acts randomly and it cannot be predicted by studying the

macroeconomic behavior of the variables except of the industrial production index that indicates to effect the stock market in the long run.

TABLE 4.44: Error Correction Model for Short Run Effects Bangladesh

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLER	0.1036	0.1500	0.6904	0.4907
ΔLFDI	-0.0100	0.0081	-1.2248	0.2221
ΔLFER	0.0642	0.0439	1.4628	0.1451
ΔLGDP	-0.1963	0.1750	-1.1218	0.2633
ΔLIIP	-0.0083	0.0104	-0.7961	0.4269
ΔLIIP (-1)	0.0327	0.0102	3.1981	0.0016
ΔLM2	0.8869	0.3049	2.9091	0.0040
ΔLOP	0.0313	0.0238	1.3120	0.1910
ΔLCPI	-0.0554	0.0316	-1.7535	0.0810
ΔLBT	0.0110	0.0101	1.0878	0.2780
ΔD1	-0.0071	0.0286	-0.2499	0.8029
ΔD2	-0.0347	0.0274	-1.2681	0.2062
ECM (-1)	-0.0761	0.0247	-3.0763	0.0024

ECM=LDSE-(1.3613*LER-0.1309*LFDI+0.8444*LFER-2.5809*LGDP -0.4970*LIIP+2.0417*LM2-0.0748*LCPI+0.1451*LBT+0.4109*LOP -0.0940*D1-0.4564*D2+13.7475)

Table 4.44 provides the shorter-run dynamic association amid the macroeconomic indicators and the equity returns of Dhaka. The error correction model reports that only industrial production growth and broad money have a statistically significant and positive influence on the equity returns in the short term. It is important to point out that IIP poses a negative effect on the equity market in the long-term but poses a positive influence in the shorter-term.

Error correction model ECM (-1) provides one period adjustment from a long-term disequilibrium. The ECM demonstrates the extent to which the short-term imbalance is eliminated in the long-run. Practically in the long run relationship, the ECM value must be significant and negative and same can be seen in the ECM results.

The ECM term coefficient is negative and significant and shows that the adjusting system is quite quick as 8 percent of price disequilibrium is be corrected from the last period.

The structural break is observed during January 2012 to May 2016 that has been accounted for through dummy in the Cusum and Cusum squares graph.

4.6 An Application of Non-Linear ARDL Model Bangladesh

4.6.1 Asymmetric Effect of Industrial Growth on Equity Market of Bangladesh

TABLE 4.45: Asymmetric Effect of Industrial Growth on Equity Market of Bangladesh in Long-Run

Reg	Coeff	S. Err	t-Stat	Prob
LIIP (P)	-0.3321	0.2376	-1.3973	0.1639
LIIP (N)	-0.5175	0.2478	-2.0884	0.0380
LER	3.7249	2.3940	1.5559	0.1213
LFDI	-0.1118	0.1036	-1.0789	0.2820
LFER	0.6522	0.6238	1.0454	0.2971
LGDP	-4.8370	2.5901	-1.8675	0.0633
LM2	0.8905	1.7603	0.5059	0.6135
LOP	0.5421	0.2659	2.0389	0.0428
LBT	0.1623	0.1366	1.1881	0.2362
LCPI	-0.1494	0.2453	-0.6092	0.5431
D1	-0.2013	0.3496	-0.5758	0.5654
D2	-0.3279	0.3515	-0.9328	0.3521
C	57.7683	30.4915	1.8946	0.0596

The **Table 4.45** provides the long-term asymmetric effects of industrial production index on Dhaka Equity market. The coefficient associated with the positive change in IIP is negative, but insignificant that indicates 1 unit increase in IIP cause no change in the stock market. On the contrary, the coefficient associated with the negative change in IIP is positive and significant that shows with 1 unit decrease in IIP will result in an increase of.52% in the stock market of Bangladesh. It can be said that positive and negative significance and unequal influence of IIP on the stock index indicates asymmetric relationship exists amid the variables in longer-run.

Table 4.46: Asymmetric Impact of Industrial Growth on Equity Returns of Bangladesh in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLIIP (P)	0.0021	0.0207	0.1000	0.9204
ΔLIIP (P)(-1)	0.0238	0.0136	1.7475	0.0821
ΔLIIP (N)	-0.0173	0.0142	-1.2182	0.2246
ΔLIIP (N)(-1)	0.0388	0.0206	1.8856	0.0608
ΔLER	0.3011	0.1856	1.6224	0.1063
ΔLFDI	-0.0090	0.0082	-1.1065	0.2698
ΔLFER	0.0527	0.0447	1.1796	0.2396
ΔLGDP	-0.3910	0.2073	-1.8861	0.0607
ΔLM2	0.8225	0.3127	2.6306	0.0092
ΔLOP	0.0438	0.0249	1.7602	0.0799
ΔLBT	0.0131	0.0103	1.2704	0.2054
ΔLCPI	-0.0624	0.0321	-1.9445	0.0532
ΔD1	-0.0163	0.0291	-0.5588	0.5769
ΔD2	-0.0265	0.0278	-0.9541	0.3412
ECM (-1)	-0.0808	0.0253	-3.1963	0.0016

Table 4.46 provides the short-term asymmetric impact of IIP on the DSE. The positive and negative change's in IIP have no influence on the stock returns because both the coefficient of positive and negative are insignificant in nature. So it can be said that there is no short-term asymmetric relation exists between the equity returns and IIP.

4.6.2 Asymmetric Effect of Exchange Rate on Equity Market of Bangladesh

Table 4.47 observes the asymmetric relationship amid the exchange rate and the equity market of Bangladesh. The positive and negative change in the ER poses no effect on the equity market because both the coefficient of positive and negative are insignificant in nature. This indicates that by the appreciation or depreciation of the Bangladeshi Taka there is no effect on the equity index. So, it can be said that there is no long-term asymmetric relationship exists amid the equity market and ER.

Table 4.47: Asymmetric Effect of Exchange Rate on Equity Market of Bangladesh in Long-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
LER (P)	1.3082	4.0841	0.3203	0.7491
LER (N)	1.3481	2.1480	0.6276	0.5310
LFDI	-0.1309	0.1112	-1.1775	0.2404
LFER	0.8475	0.7105	1.1928	0.2343
LGDP	-2.5938	2.3960	-1.0826	0.2803
LIIP	-0.4964	0.2505	-1.9819	0.0489
LM2	2.0501	1.7198	1.1920	0.2346
LOP	0.4101	0.2779	1.4755	0.1416
LBT	0.1448	0.1438	1.0071	0.3151
LCPI	-0.0741	0.2534	-0.2924	0.7703
D1	-0.0939	0.3707	-0.2532	0.8003
D2	-0.4567	0.3790	-1.2053	0.2295
C	8.4224	12.7838	0.6588	0.5108

Table 4.48: Asymmetric Impact of Exchange Rate on Equity Return in Short-Run in Bangladesh

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLER (P)	0.0996	0.3069	0.3246	0.7458
ΔLER (N)	0.1026	0.1626	0.6312	0.5286
ΔLFDI	-0.0100	0.0082	-1.2202	0.2238
ΔLFER	0.0645	0.0481	1.3402	0.1817
ΔLGDP	-0.1975	0.1918	-1.0296	0.3044
ΔLIIP	-0.0083	0.0104	-0.7921	0.4292
ΔLIIP (-1)	0.0327	0.0103	3.1900	0.0016
ΔLM2	0.8870	0.3057	2.9018	0.0041
ΔLOP	0.0312	0.0240	1.3003	0.1950
ΔLBT	0.0110	0.0102	1.0793	0.2817
ΔLCPI	-0.0554	0.0318	-1.7431	0.0828
ΔD1	-0.0071	0.0287	-0.2493	0.8034
ΔD2	-0.0348	0.0277	-1.2557	0.2107
ECM (-1)	-0.0761	0.0251	-3.0282	0.0028

From **Table 4.48** reports similar results that both the positive and negative changes in ER cause no impact on the equity returns of Bangladesh in the short-term.

4.6.3 Asymmetric Effect of Money Supply on Equity Index of Bangladesh

TABLE 4.49: Asymmetric Effect of Money Supply on Equity Index in Long-Run in Bangladesh

Reg	Coeff	S. Err	T-Stat	Prob
LM2 (P)	3.0375	1.624	1.8704	0.0629
LM2 (N)	7.6297	4.7575	1.6037	0.1103
LER	-1.4846	3.169	-0.4685	0.6399
LFDI	-0.1349	0.1059	-1.2739	0.2041
LFER	1.1879	0.7711	1.5406	0.125
LGDP	-4.2255	2.506	-1.6861	0.0933
LIIP	-0.4834	0.2321	-2.083	0.0385
LOP	0.4199	0.2584	1.625	0.1057
LBT	0.1304	0.1336	0.9762	0.3301
LCPI	-0.1401	0.2487	-0.5634	0.5738
D1	-0.1592	0.3521	-0.4523	0.6516
D2	-0.4602	0.3594	-1.2804	0.2019
C	37.4974	22.3063	1.681	0.0943

Table 4.49 reports the asymmetric relationship between the M2 and the equity index of Bangladesh. The positive and negative change in the M2 poses no effect on the equity markets because both the coefficient of positive and negative are insignificant in nature that indicates that by increase or decrease in M2 there is no effect on the equity market. Finally, it can be said that there is no long-term asymmetric relationship amid the equity market and broad money supply.

Table 4.50 provides the asymmetric impact of the money supply on the equity returns in the short-term. The coefficient associated with the positive shock in M2 is significantly positive and indicates that with a 1 unit increase in M2 cause stock returns to increase by .92%. On the contrary, the coefficient associated with the negative shock in M2 is negative, but insignificant and indicates that 1 unit decrease in M2 will pose no change in stock returns. It indicates that in short

Table 4.50: Asymmetric Influence of Money Supply on Equity Returns in Bangladesh in Short-Run

Reg	Coeff	S. Err	T-Stat	Prob
ΔLM2 (P)	0.9232	0.3936	2.3457	0.0200
ΔLM2 (N)	0.6126	0.3705	1.6538	0.0997
ΔLER	-0.1192	0.2489	-0.4790	0.6324
ΔLFDI	-0.0108	0.0082	-1.3287	0.1854
ΔLFER	0.0954	0.0507	1.8813	0.0614
ΔLGDP	-0.3393	0.1979	-1.7146	0.0879
ΔLIIP	-0.0100	0.0104	-0.9638	0.3363
ΔLIIP (-1)	0.0325	0.0103	3.1603	0.0018
ΔLOP	0.0337	0.0239	1.4120	0.1595
ΔLBT	0.0105	0.0102	1.0278	0.3053
ΔLCPI	-0.0597	0.0317	-1.8836	0.0610
ΔD1	-0.0128	0.0289	-0.4422	0.6589
ΔD2	-0.0370	0.0275	-1.3447	0.1802
ECM (-1)	-0.0803	0.0246	-3.2599	0.0013

term increase in M2 cause change in the stock returns, but a decrease of M2 shows no influence on the equity returns in the short-term. So based on the discussion, It can be said that there is an asymmetric relationship exist amid money supply and equity returns of Bangladesh.

4.6.4 Asymmetric Effect of Oil Price on Equity Market of Bangladesh

Table 4.51 observes the asymmetric relationship amid the OP and the stock market of Bangladesh in the long-term. The positive and negative change in the OP poses no effect on the equity market because both the coefficient of positive and negative are insignificant in nature and indicates that with the rise or fall in the prices of oil no impact on the stock returns is reported. Finally, it can be said that there is no long-term asymmetric relationship exists amid the stock market and oil prices in the long-run.

Table 4.52 reports similar results as seen in the long-term that both the positive and negative changes in OP cause no influence on the equity returns of Bangladesh in the short-term.

Table 4.51: Asymmetric Effect of Oil Price on Equity Market of Bangladesh in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LOP (P)	0.5579	0.4071	1.3704	0.1721
LOP (N)	0.3407	0.3010	1.1320	0.2590
LER	2.1753	2.5694	0.8466	0.3982
LFDI	-0.1189	0.1074	-1.1064	0.2699
LFER	0.7430	0.6629	1.1208	0.2637
LGDP	-2.3242	2.1767	-1.0678	0.2869
LIIP	-0.4552	0.2436	-1.8691	0.0631
LM2	1.4597	2.0106	0.7260	0.4687
LBT	0.1414	0.1347	1.0500	0.2950
LCPI	-0.0631	0.2369	-0.2662	0.7903
D1	-0.0485	0.3667	-0.1321	0.8950
D2	-0.3918	0.3787	-1.0346	0.3021
C	21.6132	17.7541	1.2174	0.2249

Table 4.52: Asymmetric Impact of Oil Price on Equity Returns of Bangladesh in Short-Run

Reg	Coeff	S. Err	T-Stat	Prob
ΔLOP (P)	0.0448	0.0389	1.1533	0.2502
ΔLOP (N)	0.0274	0.0254	1.0760	0.2832
ΔLER	0.1748	0.2202	0.7935	0.4284
ΔLFDI	-0.0095	0.0082	-1.1646	0.2455
ΔLFER	0.0597	0.0452	1.3208	0.1880
ΔLGDP	-0.1867	0.1767	-1.0566	0.2920
ΔLIIP	-0.0077	0.0105	-0.7376	0.4616
ΔLIIP (-1)	0.0324	0.0103	3.1529	0.0019
ΔLM2	0.8499	0.3167	2.6834	0.0079
ΔLBT	0.0114	0.0102	1.1148	0.2663
ΔLCPI	-0.0554	0.0317	-1.7504	0.0816
ΔD1	-0.0039	0.0296	-0.1316	0.8955
ΔD2	-0.0315	0.0284	-1.1083	0.2690
ECM (-1)	-0.0803	0.0266	-3.0219	0.0028

4.6.5 Asymmetric Effect of Inflation on Bangladesh Equity Market

Table 4.53: Asymmetric Effect of Inflation on Bangladesh Equity Market in Long-Term

Reg	Coeff	S. Err	T-Stat	Prob
LCPI (P)	-0.1262	0.2334	-0.5406	0.5894
LCPI (N)	-0.3865	0.2933	-1.3178	0.1891
LER	2.5910	2.1232	1.2203	0.2238
LFDI	-0.1082	0.1010	-1.0713	0.2853
LFER	0.7998	0.6159	1.2986	0.1956
LGDP	-1.2102	2.6624	-0.4545	0.6499
LIIP	-0.4260	0.2253	-1.8913	0.0600
LM2	0.2926	2.3979	0.1220	0.9030
LOP	0.4921	0.2429	2.0261	0.0441
LBT	0.1458	0.1276	1.1432	0.2543
D1	-0.1465	0.3291	-0.4452	0.6566
D2	-0.4192	0.3413	-1.2280	0.2209
C	19.9795	10.7880	1.8520	0.0655

The **Table 4.53** reports the asymmetric relationship between the CPI and the equity market of Bangladesh. The positive and negative change in the coefficients CPI poses no effect on the equity index because both the coefficients of positive and negative change are insignificant in nature and reports that with the increase or decrease of CPI there is no effect on the stock market. So, it can be said that there is no long-term asymmetric relationship exists between the equity market and CPI.

Table 4.54 similar results are reported in the short-term that both the positive and negative change in coefficients of OP cause no impact on the equity returns of Bangladesh.

Table 4.54: Asymmetric Influence of Inflation on Bangladesh Equity Returns in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLCPI (P)	-0.0779	0.0552	-1.4100	0.1601
ΔLCPI (P)(-1)	-0.0941	0.0514	-1.8319	0.0685
ΔLCPI (N)	-0.0329	0.0246	-1.3337	0.1838
ΔLER	0.2203	0.1920	1.1473	0.2526
ΔLFDI	-0.0092	0.0082	-1.1196	0.2642
ΔLFER	0.0680	0.0442	1.5383	0.1256
ΔLGDP	-0.1029	0.2233	-0.4609	0.6454
ΔLIIP	-0.0085	0.0105	-0.8130	0.4172
ΔLIIP (-1)	0.0325	0.0103	3.1408	0.0019
ΔLM2	0.7648	0.3248	2.3544	0.0195
ΔLOP	0.0418	0.0248	1.6907	0.0925
ΔLBT	0.0124	0.0102	1.2113	0.2272
ΔD1	-0.0125	0.0287	-0.4342	0.6646
ΔD2	-0.0356	0.0275	-1.2970	0.1961
ECM (-1)	-0.0850	0.0267	-3.1890	0.0017

4.7 An Application of Linear ARDL Model Indonesia

Table 4.55: Descriptive Statistics Indonesia

	JKSE	IIP	GDP	FER	FDI	ER	CPI	BT	M2	OP
Mean	2748.338	4.266	145672.300	67238.770	840.788	0.0001	6.889	1157.904	217530.500	62.726
Median	2430.095	3.876	135046.800	55782.150	758.528	0.0001	6.340	1322.798	184664.000	58.145
Maximum	6605.630	34.496	263690.100	125721.300	2798.523	0.0001	18.347	3683.189	399965.600	132.830
Minimum	358.230	-13.634	37082.610	25813.500	-3109.802	0.0001	-1.165	-2329.128	69817.260	18.520
Std. Dev.	1920.501	5.815	79029.360	34108.780	968.721	0.0000	3.654	1049.644	109251.900	29.511
Skewness	0.238	0.981	0.002	0.203	-0.606	-0.6805	0.992	-0.621	0.168	0.357
Kurtosis	1.602	9.048	1.350	1.381	5.064	2.0228	3.885	3.593	1.445	1.939
Jarque-Bera	20.166	373.918	25.185	25.770	52.965	25.9669	43.667	17.516	23.417	15.127
Probability	0.000	0.000	0.000	0.000	0.000	0.0000	0.000	0.000	0.000	0.001

The **Table 4.55** reports the descriptive statistics of Indonesia. The JKSE has an average value on the index is 2748 with the max risk on the stock index is 1921. Industrial production has an average growth rate of 4.3% with a max risk of 5.8%. Nominal gross domestic product has an average of $145672 mn with the max risk of $79029 mn. FER has an average reserves of $67239 mn with the max risk of $34109 mn. The foreign direct investment has an average investment of $841 mn with the max risk of $967 mn. The Indonesian rupiah in terms of the US dollar has an average exchange rate of $.0001 with the max risk of 0.00%. The inflation in terms of CPI has an average inflation rate of 6.9% with the max risk of 3.6%. Balance of trade has an average $1158 mn balance with the max risk of $1050 mn. The broad money supply has an average supply of $217531 mn in an economy with the max risk of $109252 mn. Finally, oil price per barrel has an average price of $63 with the max risk in per barrel price is $30. Most of the variables are

skewed on the right side. Only the FDI, ER, and BT are negatively skewed on the left side. The industrial production, foreign direct investment, CPI, and trade balance follows the leptokurtic distribution which means that the data is peaked with flat tails. On the contrary, Jakarta stock market, GDP, FER, ER, M2, and OP follows a platykurtic distribution with flat data with thin tails. Finally, all the macroeconomic indicators of interest have statistically significant Jarque-Bera values that indicates that the data is non-random in nature.

Table 4.56: Unit Root Analysis Indonesia

	ADF Level	**ADF 1st Diff**	**PP-Level**	**PP-1st Diff**	**Integrated of**
LJKSE	-0.7878	-11.8994	-0.6306	-11.9378	I(1)
LIIP	-5.1960	-13.2878	-12.6468	-35.1924	I(0)
LCPI	-7.1927	-11.7417	-4.0739	-12.0747	I(0)
LM2	-0.3834	-13.9097	-0.3983	-13.8907	I(1)
LBT	-1.7313	-10.8402	-12.4810	-60.8710	I(0)
LFDI	-4.4953	-10.0568	-5.9359	-63.6003	I(0)
LFER	-0.7886	-12.0543	-0.7814	-12.2016	I(1)
LER	-2.1868	-12.9146	-1.0452	-12.8421	I(1)
LGDP	-1.6831	-3.0894	-1.3370	-6.3667	I(1)
LOP	-1.9097	-11.1270	-1.8845	-11.1187	I(1)

The **Table 4.56** reports the results of unit root test to identify the order of Integration of variable's. The data is presented in log form for smoothing the coefficients. For unit root testing ADF and the Phillip-Perron testing are used at level and 1st difference with constant and trend assumptions. The findings suggest that the majority of time series are non stationary that becomes stable at the

1st difference. Only the industrial production growth rate, inflation rate in terms of CPI, trade balance, and FDI are stationary at the level. The reason for implying both the assumptions of trend and no trend is to check the nature of variables. The ARDL method can be implemented irrespective of the integration order, The purpose for conducting difference stationary test is to identify the current model.

TABLE 4.57: Lag Length Selection Indonesia

Lag	**LL**	**AIC**	**SC**	**HQ**
0	34.5770	-0.2244	-0.0697	-0.1619
1	2474.5120	-21.5937	-19.8914*	-20.9062
2	2656.0510	-22.3384	-19.0886	-21.0259*
3	2780.1310	-22.5583*	-17.7610	-20.6208

The **Table 4.57** reports the criteria for selecting a number of lags to be used. Sequentially modified LR test statistic, Final prediction error, Akaike information, Schwarz information, and Hannan-Quinn information criterion's are commonly used to determine optimum number of lags to be used. The lag period that provides the lowest critical value is identified as the lag period of the model unless no auto-correlation is observed. The decision is based on AIC. So, the lag that minimizes the Akaike information is 3 and no auto-correlation exist at this duration of lag.

TABLE 4.58: Diagnostic Test Indonesia

Item	**Test Applied**	**Value**	**Prob**
Serial Correlation	Score Test (F-Stat)	1.2838	0.2812
Normality	Histogram Test (Jarque-Bera)	31.9189	0.0000
Functional Form	Ramsey Test (F-Stat)	1.4671	0.2273
Heteroscedasticity	White Test (F-Stat)	2.8626	0.0001

Table 4.58 provides information about diagnostic testing. The table indicates no autocorrelation issue. Moreover, there is no error in model specification with functional form reference. The time series data is mostly not normally distributed. Shrestha and Chowdhury (2005) concludes that heteroscedasticity presence has no influence on estimates because times-series data are mixtures of different integration order so the presence of heteroscedasticity is natural to be detected.

Table 4.59: ARDL Representation Indonesia

(1, 2, 2, 1, 0, 2, 2, 0, 0, 2) AIC Based Selected ARDL

Reg	Coeff	S. Err	T-Stat	Prob
LJKSE (-1)	0.9794	0.0256	38.2909	0.0000
LIIP	0.0068	0.0099	0.6942	0.4884
LIIP (-1)	-0.0145	0.0109	-1.3301	0.1850
LIIP (-2)	-0.0156	0.0108	-1.4455	0.1499
LGDP	0.4572	0.2913	1.5698	0.1181
LGDP (-1)	-1.0438	0.4662	-2.2392	0.0263
LGDP (-2)	0.7067	0.2464	2.8681	0.0046
LFER	0.6394	0.1237	5.1686	0.0000
LFER (-1)	-0.6448	0.1215	-5.3053	0.0000
LFDI	0.0014	0.0038	0.3715	0.7107
LER	0.6612	0.1482	4.4599	0.0000
LER (-1)	-1.1094	0.1830	-6.0623	0.0000
LER (-2)	0.4342	0.1508	2.8790	0.0044
LCPI	-0.0688	0.0340	-2.0234	0.0444
LCPI (-1)	-0.0164	0.0475	-0.3452	0.7303
LCPI (-2)	0.0658	0.0287	2.2877	0.0232
LBT	-0.0063	0.0076	-0.8349	0.4048
LM2	-0.0993	0.1020	-0.9732	0.3316
LOP	0.0197	0.0478	0.4126	0.6803
LOP (-1)	0.0631	0.0698	0.9034	0.3674
LOP (-2)	-0.1027	0.0471	-2.1803	0.0304
D1	-0.0115	0.0180	-0.6366	0.5251
C	0.1247	0.5716	0.2181	0.8276
F-stat	3401.7800			
Prob (F-stat)	0.0000			
D-W Stat	1.8516			

Table 4.59 reports AIC-based selected ARDL. Findings indicate that GDP, FER, CPI, ER, and the OP have a statistically significant influence on the equity market. On the contrary IIP, FDI, BT, and M2 have a statistically insignificant effect on the equity index.

The bound tests are reported assuming that these variables are either I(0) or I(1) and no I(2) variables because if there is any I(2) variable in the model then computed F-stat proposed by Pesaran et al. (2001) will become invalid. **Table 4.60** reports the information regarding the results of the bound test of ARDL. The tables provide upper and lower limits for different levels of confidence intervals. The model is based on 95% confidence interval for selecting the model. The F-stat

Table 4.60: ARDL Bound Test Indonesia

Test Stat	**Value**	**k**
F-stat	0.8165	9
Critical Value Bounds		
Significance	**Lower Limit**	**Upper Limit**
0.10	1.88	2.99
0.05	2.14	3.3
0.025	2.37	3.6
0.01	2.65	3.97

value is 0.82 that is lower than upper bound of 3.3 but higher than lower bound i.e. 2.14 which shows that longer-term relation cannot be determined or inconclusive.

Fig 4.7 and Fig 4.8 reports CUSUM and the CUSUM of the squares plot for stability checking of coefficients in the long- and short-term Error correction model of ARDL. **Figure 4.7** shows CUSUM and **Figure 4.8** shows CUSUM of the squares. The CUSUM and CUSUM of squares are inside critical limits of 0.05 that indicates structural stability of the model and overall goodness of fit.

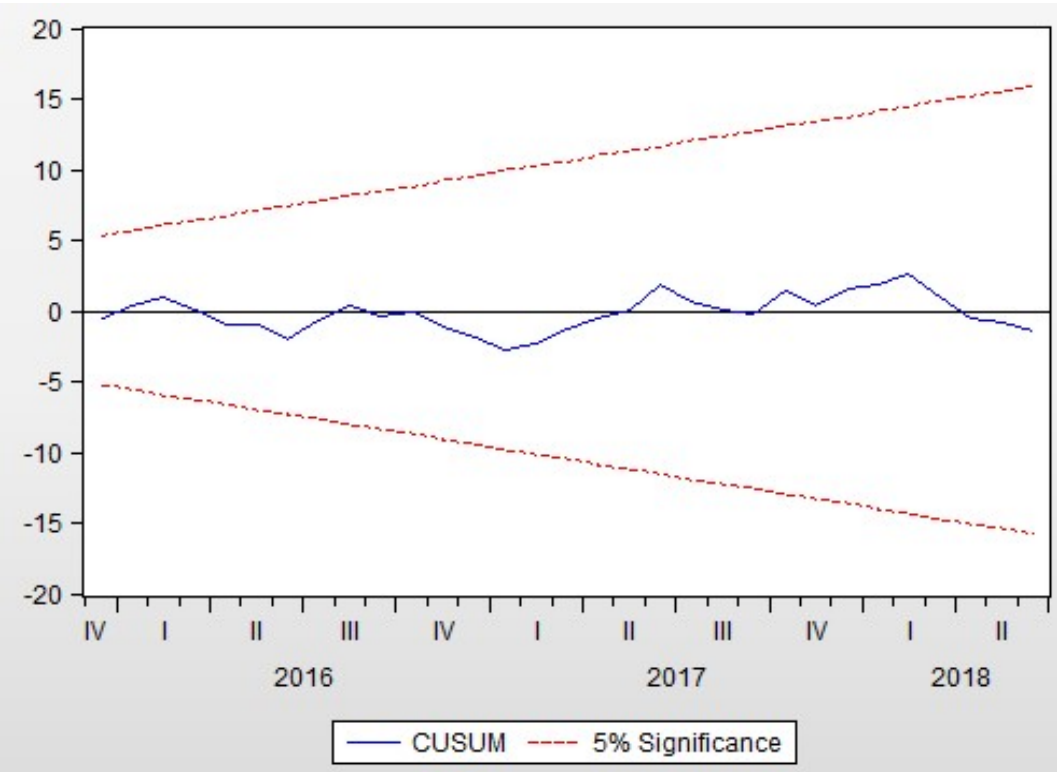

Figure 4.7: Cumulative Sum of Recursive Residuals Indonesia

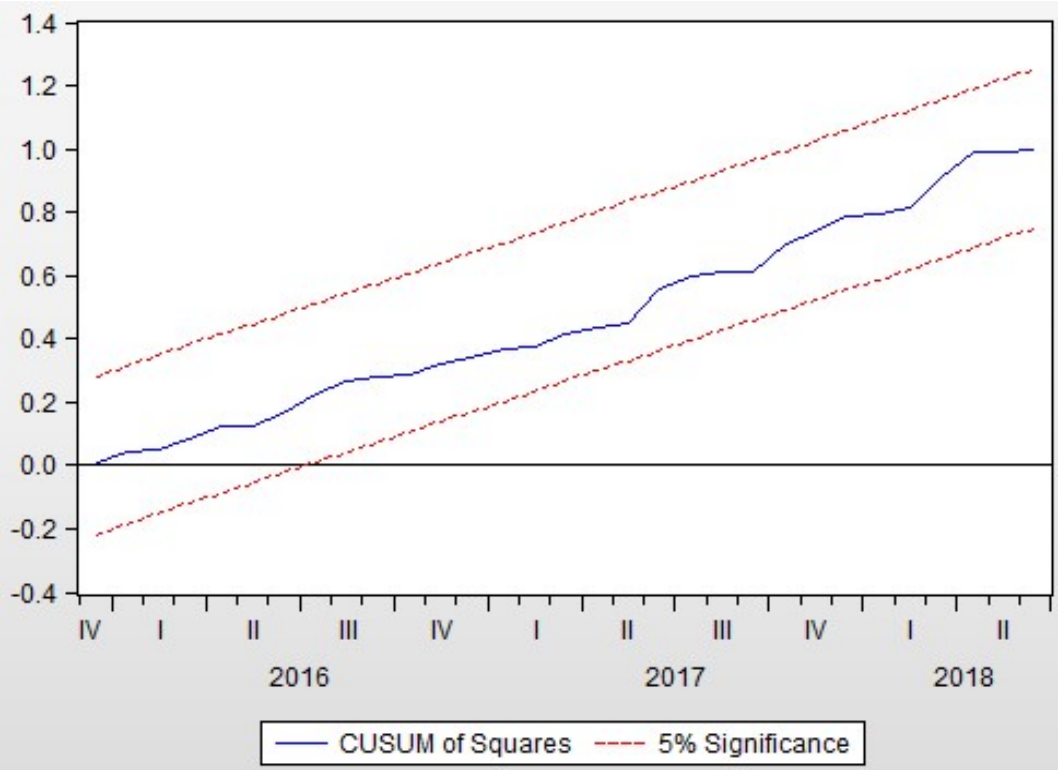

FIGURE 4.8: Cumulative Sum of Squares of Recursive Residuals Indonesia

TABLE 4.61: ARDL Model for Estimated Long Run Coefficients Indonesia

Reg	Coeff	S. Err	T-Stat	Prob
LIIP	-1.1283	1.6239	-0.6948	0.4880
LGDP	5.8303	7.6437	0.7628	0.4465
LFER	-0.2626	2.3089	-0.1137	0.9096
LFDI	0.0679	0.1998	0.3397	0.7345
LER	-0.6844	2.1910	-0.3124	0.7551
LCPI	-0.9426	1.2288	-0.7671	0.4440
LBT	-0.3072	0.5661	-0.5426	0.5880
LM2	-4.8161	8.4535	-0.5697	0.5695
LOP	-0.9690	2.0618	-0.4700	0.6389
D1	-0.5569	1.1817	-0.4713	0.6379
C	6.0484	33.7045	0.1795	0.8578

Table 4.61 it is observed that none of the macroeconomic variables has a statistically significant effect on the stock market of the Jakarta stock exchange this table also provide no long-term relationship exists between the equity market and the variables of interest.

Table 4.62: Error Correction Model for Short Run Effects Indonesia

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLIIP	0.0068	0.0099	0.6942	0.4884
ΔLIIP (-1)	0.0156	0.0108	1.4455	0.1499
ΔLGDP	0.4572	0.2913	1.5698	0.1181
ΔLGDP (-1)	-0.7067	0.2464	-2.8681	0.0046
ΔLFER	0.6394	0.1237	5.1686	0.0000
ΔLFDI	0.0014	0.0038	0.3715	0.7107
ΔLER	0.6612	0.1482	4.4599	0.0000
ΔLER (-1)	-0.4342	0.1508	-2.8790	0.0044
ΔLCPI	-0.0688	0.0340	-2.0234	0.0444
ΔLCPI (-1)	-0.0658	0.0287	-2.2877	0.0232
ΔLBT	-0.0063	0.0076	-0.8349	0.4048
ΔLM2	-0.0993	0.1020	-0.9732	0.3316
ΔLOP	0.0197	0.0478	0.4126	0.6803
ΔLOP (-1)	0.1027	0.0471	2.1803	0.0304
ΔD1	-0.0115	0.0180	-0.6366	0.5251
ECM (-1)	-0.0206	0.0256	-0.8058	0.4213

ECM=LJKSE-(-1.1283*LIIP+5.8303*LGDP-0.2626*LFER +0.0679*LFDI-0.6844*LER-0.9426*LCPI-0.3072*LBT-4.8161*LM2 -0.9690*LOP-0.5569*D1 +6.0484)

The **Table 4.62** reports the short-run dynamic association between the macroeconomic indicators and the stock returns of Jakarta. The error correction model provides that foreign exchange reserve, exchange rate, consumer price index, gross domestic product, and oil prices are statistically significant and have an impact on the equity returns of JKSE in the short-term. On the contrary industrial production growth, direct foreign investment, balance of trade, and broad money supply have a statistically insignificant influence on the equity returns of Jakarta.

Error correction model ECM (-1) reports one period adjustment from a long-term disequilibrium. The ECM demonstrates the extent to which the short-run imbalance is eliminated in the long-term. Practically in long run relationship, the ECM value must be significant and negative but in this case opposite can be seen in the ECM results that the ECM (-1) value is statistically insignificant and negative that indicates no adjustment is conducted to rectify the disequilibrium.

The structural break is observed during November, 2015 to June, 2018 that has been accounted for through dummy in Cusum and Cusum of squares graph.

4.8 An Application of Non-Linear ARDL Model Indonesia

4.8.1 Asymmetric Effect of Industrial Growth on Equity Market of Indonesia

TABLE 4.63: Asymmetric Effect of Industrial Growth on Equity Market of Indonesia in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LIIP (P)	0.0920	0.1206	0.7625	0.4467
LIIP (N)	-0.0545	0.1203	-0.4526	0.6513
LBT	-0.0384	0.0884	-0.4344	0.6645
LCPI	-0.4474	0.1988	-2.2502	0.0255
LER	-0.1271	0.5932	-0.2142	0.8306
LFDI	0.0070	0.0421	0.1667	0.8678
LFER	0.9044	0.6300	1.4354	0.1527
LGDP	-0.1557	0.8910	-0.1748	0.8614
LM2	-1.1747	1.2448	-0.9437	0.3465
LOP	0.1844	0.2206	0.8361	0.4041
D1	-0.2232	0.2188	-1.0201	0.3089
C	10.7948	9.5758	1.1273	0.2610

Table 4.63 provides the asymmetric connection between the Industrial production growth and the equity market of Indonesia. The positive and negative change in the coefficients of IIP have no influence on the equity market because both the coefficients of positive and negative are insignificant in nature. So, it can be said that with the increase or decrease of IIP there is no impact on the stock index. Finally, It indicates that there is no long-term asymmetric relation exists between the stock market and index of industrial production.

From **Table 4.64** similar results are reported that both the positive and negative change in coefficients of IIP cause no impact on the equity returns of Indonesia in the short-term.

Table 4.64: Asymmetric Influence of Industrial Growth on Indonesia Equity Returns in Short-Run

Reg	Coeff	S. Err	T-Stat	Prob
ΔLJKSE (-1)	0.1182	0.0698	1.6931	0.0920
ΔLIIP (P)	0.0243	0.0127	1.9134	0.0571
ΔLIIP (N)	-0.0047	0.0104	-0.4552	0.6495
ΔLBT	-0.0033	0.0075	-0.4485	0.6543
ΔLCPI	-0.0455	0.0370	-1.2294	0.2204
ΔLCPI (-1)	-0.1238	0.0477	-2.5968	0.0101
ΔLCPI (-2)	0.0610	0.0284	2.1457	0.0331
ΔLER	0.6362	0.1376	4.6252	0.0000
ΔLER (-1)	-0.4199	0.1354	-3.1009	0.0022
ΔLFDI	0.0006	0.0037	0.1668	0.8677
ΔLFER	0.6968	0.1223	5.6949	0.0000
ΔLGDP	-0.0136	0.0775	-0.1750	0.8612
ΔLM2	-0.1024	0.0996	-1.0277	0.3054
ΔLOP	0.0161	0.0216	0.7459	0.4566
ΔD1	-0.0195	0.0175	-1.1092	0.2687
ECM (-1)	-0.0872	0.0296	-2.9450	0.0036

4.8.2 Asymmetric Effect of Exchange Rate on Equity Market of Indonesia

Table 4.65 provide the asymmetric relationship between the ER and the equity market of Indonesia. The positive and negative change in the ER poses no influence on the equity market because both the coefficients of positive and negative change are insignificant in nature that indicates that with the increase or decrease of Indonesian rupiah there is no effect on the equity market. So, it can be said that there is no long-term asymmetric relationship exists amid the stock market and exchange rate.

Table 4.66 shows the asymmetric impact of ER on the equity return in the short-term. The coefficient associated with the positive change in the ER is also positive in the current month but becomes negative after a single month because both the positive change of ER is significant in nature that shows that with 1 unit increase in ER cause the equity returns to increased by.50% but in the next month 1 unit increase in ER will cause stock returns to decrease by. 51%. On the contrary, the coefficient associated with the negative change in the ER is

Table 4.65: Asymmetric Effect of Exchange Rate on Equity Market of Indonesia in Long-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
LER (P)	3.3366	4.8235	0.6917	0.4899
LER (N)	-2.0698	1.7942	-1.1536	0.2501
LFDI	0.0473	0.1315	0.3596	0.7195
LFER	1.7515	2.3798	0.7360	0.4626
LGDP	-1.7210	3.6293	-0.4742	0.6359
LIIP	-0.7947	0.9128	-0.8706	0.3850
LM2	-4.1612	5.3908	-0.7719	0.4411
LOP	0.8230	0.7421	1.1090	0.2688
LBT	-0.2098	0.3328	-0.6304	0.5292
LCPI	-1.6809	1.5052	-1.1167	0.2655
D1	-0.6913	0.8901	-0.7767	0.4383
C	57.0320	60.1094	0.9488	0.3439

Table 4.66: Asymmetric Impact of Exchange Rate on Indonesia Equity Return in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLER (P)	0.5073	0.2305	2.2013	0.0289
ΔLER (P)(-1)	-0.5256	0.2057	-2.5556	0.0114
ΔLER (N)	0.7963	0.2425	3.2834	0.0012
ΔLER (N)(-1)	-0.3858	0.2559	-1.5077	0.1332
ΔLFDI	0.0014	0.0037	0.3772	0.7064
ΔLFER	0.6338	0.1222	5.1843	0.0000
ΔLGDP	0.3198	0.3104	1.0301	0.3043
ΔLGDP (-1)	-0.5403	0.2448	-2.2073	0.0285
ΔLIIP	0.0068	0.0097	0.7014	0.4839
ΔLIIP (-1)	0.0179	0.0106	1.6784	0.0949
ΔLM2	-0.1224	0.1038	-1.1793	0.2397
ΔLOP	0.0242	0.0228	1.0630	0.2891
ΔLBT	-0.0062	0.0075	-0.8274	0.4090
ΔLCPI	-0.0669	0.0365	-1.8323	0.0684
ΔLCPI (-1)	-0.1299	0.0476	-2.7270	0.0070
ΔLCPI (-2)	0.0546	0.0287	1.8999	0.0589
ΔD1	-0.0203	0.0179	-1.1363	0.2572
ECM (-1)	-0.0294	0.0258	-1.1392	0.2560

significantly negative that indicates that 1 unit decrease in ER will pose a decrease in stock returns by. 80%. So based on the discussion, it can be said that there is an asymmetric association exist between ER and the equity returns.

4.8.3 Asymmetric Effect of Money Supply on Indonesia Equity Index

Table 4.67 reports the asymmetric relationship between the M2 and the equity market of Indonesia. The positive and negative change in the coefficients of M2 poses no effect on the equity index because both the coefficients of positive and negative are insignificant in nature and indicates that with the unit increase or decrease of M2 there is no impact on the stock returns is observed. Finally, It can be said that there is no long term asymmetric relation exists between the equity market and broad money supply.

Table 4.67: Asymmetric Effect of Money Supply on Indonesia Equity Index in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LM2 (P)	-4.2151	8.3410	-0.5054	0.6139
LM2 (N)	-12.4492	19.3368	-0.6438	0.5205
LOP	0.8368	1.1944	0.7006	0.4844
LBT	-0.2220	0.5268	-0.4214	0.6739
LCPI	-2.4762	3.3337	-0.7428	0.4585
LER	2.2129	5.6576	0.3911	0.6961
LFDI	0.0776	0.2166	0.3585	0.7204
LFER	1.0900	3.0203	0.3609	0.7186
LGDP	-1.4402	5.4166	-0.2659	0.7906
LIIP	-1.3372	1.9911	-0.6716	0.5026
D1	-0.6790	1.3625	-0.4984	0.6188
C	36.2007	94.4838	0.3831	0.7020

Table 4.68 similar results are observed in the short-term that both the positive and negative change in M2 cause no influence on the equity return of Indonesia.

Table 4.68: Asymmetric Influence of Money Supply on Indonesia Equity Returns in Short-Run

Reg	Coeff	S. Err	T-Stat	Prob
ΔLM2 (P)	-0.0805	0.1012	-0.7949	0.4276
ΔLM2 (N)	0.3408	0.3677	0.9267	0.3552
ΔLOP	0.0160	0.0224	0.7118	0.4774
ΔLBT	-0.0042	0.0074	-0.5690	0.5700
ΔLCPI	-0.0686	0.0364	-1.8857	0.0608
ΔLCPI (-1)	-0.1319	0.0474	-2.7793	0.0060
ΔLCPI (-2)	0.0520	0.0287	1.8149	0.0711
ΔLER	0.4879	0.1822	2.6783	0.0080
ΔLER (-1)	-0.4951	0.1522	-3.2518	0.0014
ΔLFDI	0.0015	0.0037	0.4019	0.6882
ΔLFER	0.6140	0.1217	5.0455	0.0000
ΔLGDP	0.4327	0.3073	1.4081	0.1607
ΔLGDP (-1)	-0.5877	0.2419	-2.4291	0.0160
ΔLIIP	0.0080	0.0097	0.8207	0.4128
ΔLIIP (-1)	0.0190	0.0106	1.7897	0.0750
ΔD1	-0.0130	0.0176	-0.7372	0.4619
ECM (-1)	-0.0191	0.0257	-0.7428	0.4585

Table 4.69: Asymmetric Effect of Oil Price on Equity Market of Indonesia in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LOP (P)	2.5416	2.9927	0.8493	0.3968
LOP (N)	-0.8173	1.9202	-0.4256	0.6708
LBT	-0.3209	0.5952	-0.5391	0.5904
LCPI	-1.1933	1.5476	-0.7711	0.4416
LER	6.7315	10.6570	0.6316	0.5283
LFDI	0.0493	0.1966	0.2508	0.8022
LFER	1.7272	3.3771	0.5115	0.6096
LGDP	-5.4549	9.1678	-0.5950	0.5525
LIIP	-0.9705	1.5005	-0.6468	0.5185
LM2	-5.4704	9.3998	-0.5820	0.5612
D1	-1.8755	2.7600	-0.6795	0.4976
C	176.1209	256.7042	0.6861	0.4935

4.8.4 Asymmetric Effect of Oil Price on Equity Market of Indonesia

Table 4.69 shows the asymmetric relationship between the OP and the equity markets of Indonesia. The positive and negative change in the OP poses no effect on the equity market because both the coefficient of positive and negative change are insignificant in nature and reports that with the increase or decrease of oil price there is no effect on the stock market. So, it can be said that there is no long-term asymmetric relationship exists between the equity market and the oil price.

Table 4.70 results are similar in the short-run as well that both the positive and negative change in the coefficients of OP cause no influence on the equity returns of Indonesia in the short-term.

Table 4.70: Asymmetric Impact of Oil Price on Indonesia Equity Returns in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLOP (P)	0.0506	0.0282	1.7964	0.0740
ΔLOP (N)	-0.0163	0.0224	-0.7253	0.4691
ΔLBT	-0.0064	0.0075	-0.8495	0.3966
ΔLCPI	-0.0594	0.0337	-1.7631	0.0794
ΔLCPI (-1)	-0.0703	0.0285	-2.4668	0.0145
ΔLER	0.7336	0.1491	4.9212	0.0000
ΔLER (-1)	-0.4347	0.1494	-2.9089	0.0040
ΔLFDI	0.0010	0.0037	0.2629	0.7929
ΔLFER	0.6736	0.1217	5.5357	0.0000
ΔLGDP	0.2838	0.3023	0.9389	0.3489
ΔLGDP (-1)	-0.6172	0.2434	-2.5356	0.0120
ΔLIIP	0.0081	0.0098	0.8283	0.4085
ΔLIIP (-1)	0.0158	0.0107	1.4847	0.1392
ΔLM2	-0.1089	0.1015	-1.0733	0.2844
ΔD1	-0.0374	0.0217	-1.7224	0.0866
ECM (-1)	-0.0199	0.0254	-0.7836	0.4342

4.8.5 Asymmetric Effect of Inflation on Indonesia Equity Market

The **Table 4.71** shows the asymmetric relationship between the inflation in terms of CPI and the equity market of Indonesia. The positive and negative change in the coefficients of CPI poses no influence on the equity market because both the coefficient of positive and negative are insignificant in nature.

TABLE 4.71: Asymmetric Effect of Inflation on Indonesia Equity Market in Long-Term

Reg	Coeff	S. Err	T-Stat	Prob
LCPI (P)	-0.5382	0.6353	-0.8471	0.3979
LCPI (N)	-2.0688	1.2184	-1.6980	0.0911
LER	2.3669	2.2943	1.0317	0.3035
LFDI	0.0393	0.0858	0.4581	0.6474
LFER	0.2369	1.0738	0.2206	0.8257
LGDP	-1.2791	2.0192	-0.6335	0.5272
LIIP	-0.7394	0.6020	-1.2282	0.2208
LM2	-2.9860	3.0395	-0.9824	0.3271
LOP	0.4858	0.4001	1.2142	0.2261
LBT	-0.1595	0.2057	-0.7756	0.4389
D1	-0.9664	0.7195	-1.3432	0.1807
C	73.6626	53.0965	1.3873	0.1669

So, it can be said that there is no longer-term asymmetric relation exists amid the equity markets and rate of inflation.

Table 4.72 provides the asymmetric influence of CPI on the equity returns in the short-term. The coefficient associated with the positive change in CPI is negative and significant after 1 lag which shows that a 1 unit increase in CPI cause the stock returns to decrease by. 12%.

On the contrary, the coefficient associated with the negative change in CPI is positive and significant which indicates that 1 unit decrease in CPI will pose a raise in the equity returns by. 09%.

This shows that in short term increase in CPI cause change in the equity returns. So based on the discussion, it can be said that there is an asymmetric relation exists between CPI and the equity returns in the short-run.

Table 4.72: Asymmetric Impact of Inflation on Equity Returns of Indonesia in Short-Run

Reg	**Coeff**	**S. Err**	**T-Ratio**	**Prob.**
ΔLCPI (P)	-0.0519	0.0586	-0.8857	0.3769
ΔLCPI (P)(-1)	-0.1184	0.0409	-2.8941	0.0042
ΔLCPI (N)	-0.0921	0.0233	-3.9463	0.0001
ΔLER	0.7172	0.1587	4.5200	0.0000
ΔLER (-1)	-0.4389	0.1509	-2.9082	0.0041
ΔLFDI	0.0017	0.0037	0.4757	0.6348
ΔLFER	0.6412	0.1209	5.3019	0.0000
ΔLGDP	0.3884	0.3095	1.2549	0.2110
ΔLGDP (-1)	-0.6346	0.2396	-2.6487	0.0087
ΔLIIP	0.0056	0.0097	0.5821	0.5612
ΔLIIP (-1)	0.0199	0.0104	1.9093	0.0577
ΔLM2	-0.1329	0.1064	-1.2491	0.2131
ΔLOP	0.0216	0.0232	0.9313	0.3529
ΔLBT	-0.0071	0.0075	-0.9503	0.3431
ΔD1	-0.0430	0.0223	-1.9295	0.0551
ECM (-1)	-0.0445	0.0286	-1.5558	0.1214

4.9 An Application of Linear ARDL Model Malaysia

Table 4.73: Descriptive Statistics Malaysia

	FTSE	FER	FDI	ER	CPI	BT	GDP	IIP	M2	OP
Mean	1258.997	91503.000	619.759	0.280	2.300	2156.502	54731.710	4.368	270650.100	62.726
Median	1277.980	96984.400	507.114	0.269	2.050	2156.830	56203.640	4.465	265675.600	58.145
Maximum	1882.710	155165.300	1665.740	0.335	8.522	4845.808	88413.280	25.470	468216.300	132.830
Minimum	572.880	25936.000	-347.108	0.224	-2.480	397.754	21533.020	-17.600	88734.930	18.520
Std. Dev.	420.462	39408.420	477.188	0.029	1.473	872.221	22587.550	6.473	133260.200	29.511
Skewness	-0.052	-0.181	0.429	0.241	0.956	0.304	-0.096	-0.064	-0.041	0.357
Kurtosis	1.484	1.902	2.198	2.102	7.866	2.948	1.451	5.011	1.446	1.939
Jarque-Bera	21.372	12.357	12.769	9.620	252.888	3.453	22.529	37.562	22.405	15.127
Probability	0.000	0.002	0.002	0.008	0.000	0.178	0.000	0.000	0.000	0.001

The **Table 4.73** provide the descriptive statistics of Malaysia. The FTSE Bursa Malaysia average value on index is 1259 whereas the max risk is of 421. foreign exchange reserves average reserves are $91503 mn with the max risk of $39408 mn. FDI average investments are $620 mn with the max risk of $477 mn. Malaysia ringgit in terms of dollar exchange average rate is $.28 with the max risk in Er is of $.03. The inflation in terms of CPI average rate is 2.3% whereas max risk associated is of 1.5%. Trade balance has an average of $2156 mn with the max risk of $872 mn. GDP average economy is of $54732 mn with the max risk of $22588 mn. The industrial average growth rate is 4.4% with the max risk associated is of 6.5%. The average broad money supply in economy is $270650 bn with the max risk associtaed is of $133260 bn. Finally, oil price per barrel average price is of $63 whereas max risk associated is of $30. The FTSE, FER, GDP, IIP, M2 and negatively skewed that indicates that the data is on the left side. Whereas,

FDI, ER,CPI, BT, and OP are postively skewed that indicates that the data is on the right side. All the variables except FDI and IIP follows platykurtic distribution which means that the data is flat with thin tails. On the contrary, foreign direct investment and industrial production growth follows the leptokurtic distribution which means that the data is peaked with flat tails. Finally, All the variables except trade balance have statistically significant Jarque-Bera probability which means that the data is nonrandom in nature and only trade balance has a random nature.

Table 4.74: Unit Root Analysis Malaysia

	ADF@Level	**ADF@1st Diff**	**PP@Level**	**PP@1st Diff**	**Integrated**
LIIP	-4.5918	-16.9981	-4.5183	-17.2521	I(0)
LCPI	-5.9849	-9.1402	-4.3425	-7.7931	I(0)
LFTSE	-3.1839	-13.1212	-2.9840	-13.2065	I(0)
LM2	-1.5186	-10.0731	-1.4687	-10.0914	I(1)
LBT	-4.1734	-23.7927	-6.9611	-41.0450	I(0)
LFDI	-3.2838	-10.3271	-6.2673	-32.5715	I(0)
LFER	-1.5086	-8.4539	-1.6017	-8.6184	I(1)
LER	-1.4579	-9.9208	-1.3154	-9.8460	I(1)
LGDP	-1.0339	-3.3734	-1.3173	-5.8093	I(1)
LOP	-1.9097	-11.1270	-1.8845	-11.1187	I(1)

Table 4.74 reports the result of unit root test to identify the order of Integration of variable's. For unit root testing ADF and the Phillip-Perron testing are used at level and 1st difference with constant and trend assumptions. The results indicates that half of time series are non stationary that becomes stable at the 1st difference. Rest of the time series are stationary at level. The reason for implying both the assumptions of trend and no trend is to check the nature of variables.

The ARDL method can be implemented irrespective of the integration order. The purpose for conducting stationary test is to identify the model.

TABLE 4.75: Lag Length Selection Malaysia

Lag	LL	AIC	SC	HQ
0	377.6397	-3.3574	-3.2027	-3.2949
1	3059.9440	-26.9401	-25.2378*	-26.2526
2	3295.0510	-28.1740	-24.9242	-26.8615*
3	3399.3220	-28.2130*	-23.4157	-26.2755

The **Table 4.75** reports the criteria for selecting a number of lags to be used. Sequentially modified LR test statistic, Final prediction error, Akaike information, Schwarz information, and Hannan-Quinn information criterion's are commonly used to determine optimum number of lags to be used. The lag period which provides the lowest critical value is identified as the lag period of the model unless no auto-correlation is observed. The decision is based on AIC. So, the lag that minimizes the Akaike information is 3 and no auto-correlation exist at this duration of lag.

TABLE 4.76: Diagnostic Test Malaysia

Item	Test Applied	Value	Prob
Serial Correlation	Score Test (F-Stat)	0.2412	0.8675
Normality	Histogram Test (Jarque-Bera)	11.3480	0.0034
Functional Form	Ramsey Test (F-Stat)	0.6167	0.4332
Heteroscedasticity	White Test (F-Stat)	1.8798	0.0115

Table 4.76 results indicate information about diagnostic testing. The table indicates no autocorrelation issue. Moreover, there is no error in model specification with functional form reference. The time series data is mostly not normally distributed. Shrestha and Chowdhury (2005) concludes that heteroscedasticity presence has no influence on estimates because times-series data are mixtures of different integration order so the presence of heteroscedasticity is natural to be detected.

The **Table 4.77** provides information regarding the AIC-based selected ARDL. Findings indicate that foreign currency reserves, MYR to Dollar exchange rate,

Table 4.77: ARDL Representation Malaysia

(1, 3, 0, 3, 2, 1, 1, 2, 0, 0) AIC Based Selected ARDL

Reg	Coeff	S. Err	T-Stat	Prob
LFTSE (-1)	0.8181	0.0339	24.1199	0.0000
LGDP	0.2698	0.2666	1.0121	0.3127
LGDP (-1)	-0.6494	0.4722	-1.3753	0.1706
LGDP (-2)	0.7068	0.4630	1.5266	0.1285
LGDP (-3)	-0.5339	0.2507	-2.1291	0.0345
LIIP	0.0121	0.0094	1.2871	0.1996
LM2	0.5903	0.2598	2.2720	0.0242
LM2 (-1)	0.1688	0.3503	0.4818	0.6305
LM2 (-2)	-0.6908	0.2943	-2.3473	0.0199
LM2 (-3)	0.2189	0.1520	1.4405	0.1513
LOP	0.0397	0.0332	1.1974	0.2326
LOP (-1)	-0.1129	0.0468	-2.4129	0.0168
LOP (-2)	0.0483	0.0333	1.4522	0.1481
LFER	0.2709	0.0884	3.0652	0.0025
LFER (-1)	-0.2548	0.0902	-2.8235	0.0052
LFDI	-0.0004	0.0039	-0.0985	0.9216
LFDI (-1)	0.0060	0.0038	1.5558	0.1214
LER	-0.0421	0.3132	-0.1345	0.8931
LER (-1)	-0.7538	0.4536	-1.6618	0.0982
LER (-2)	0.7750	0.3246	2.3872	0.0179
LCPI	-0.0025	0.0090	-0.2785	0.7809
LBT	-0.0092	0.0070	-1.3229	0.1874
D1	0.0138	0.0153	0.9000	0.3693
C	-0.1471	0.1323	-1.1117	0.2676
F-statistic	1043.0030			
Prob(F-statistic)	0.0000			
D-W Stat	2.0838			

gross domestic product, supply of money, and prices of oil have a statistically significant effect on the stock market of the FTSE Bursa Malaysia stock exchange. On the Contrary foreign direct investment, rate of inflation, trade balance and industrial production index have no statistical significant effect on the FTSE Bursa Malaysia index. The table reports that macroeconomic indicators significantly describes the equity market of the FTSE Bursa Malaysia.

The bound tests are reported assuming that these variables are either I(0) or I(1) and no I(2) variables because if there is any I(2) variable in the model then computed F-stat proposed by Pesaran et al. (2001) will become invalid. The **Table**

Table 4.78: ARDL Bound Test Malaysia

Test Stat	**Value**	**k**
F-stat	4.9740	9
Critical Value Bounds		
Significance	**Lower Limit**	**Upper Limit**
0.10	1.88	2.99
0.05	2.14	3.3
0.025	2.37	3.6
0.01	2.65	3.97

4.78 provides the information regarding the results of the bound test of ARDL. The tables provide upper and lower limits for different levels of confidence intervals. The model is based on a 95% confidence interval for selecting the model. The F-statistic value is 4.97 which is more than the 3.3 upper bound which concludes a longer-term co-integration exists in our variables of interest.

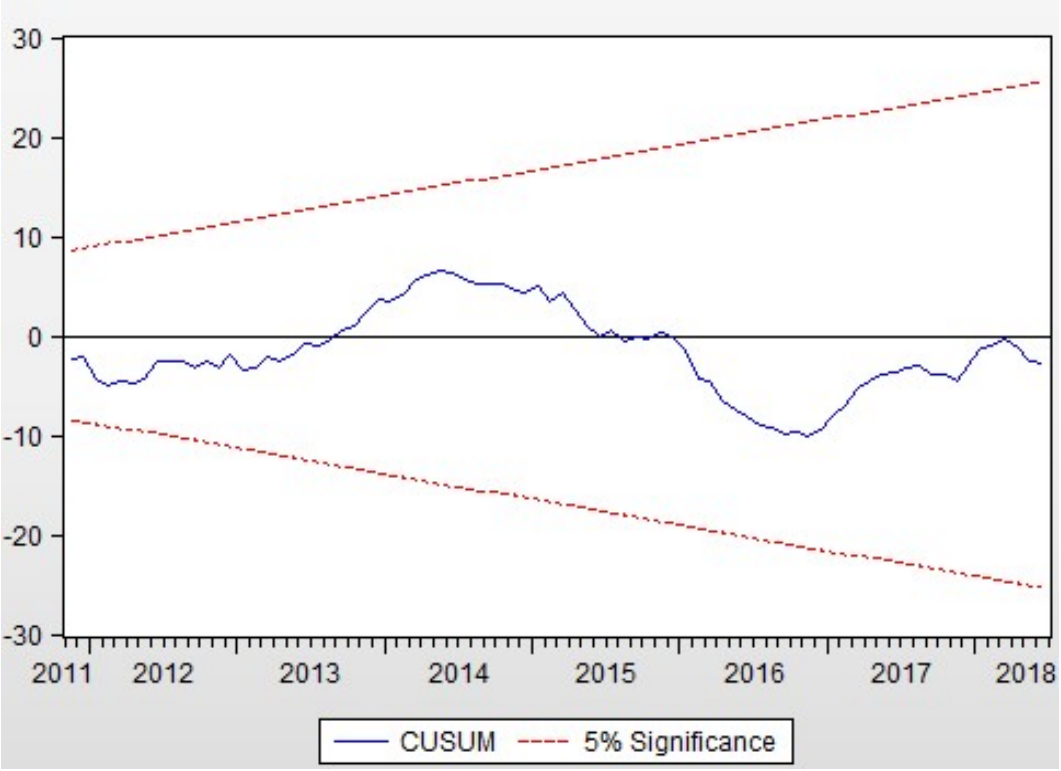

Figure 4.9: Cumulative Sum of Recursive Residuals Malaysia

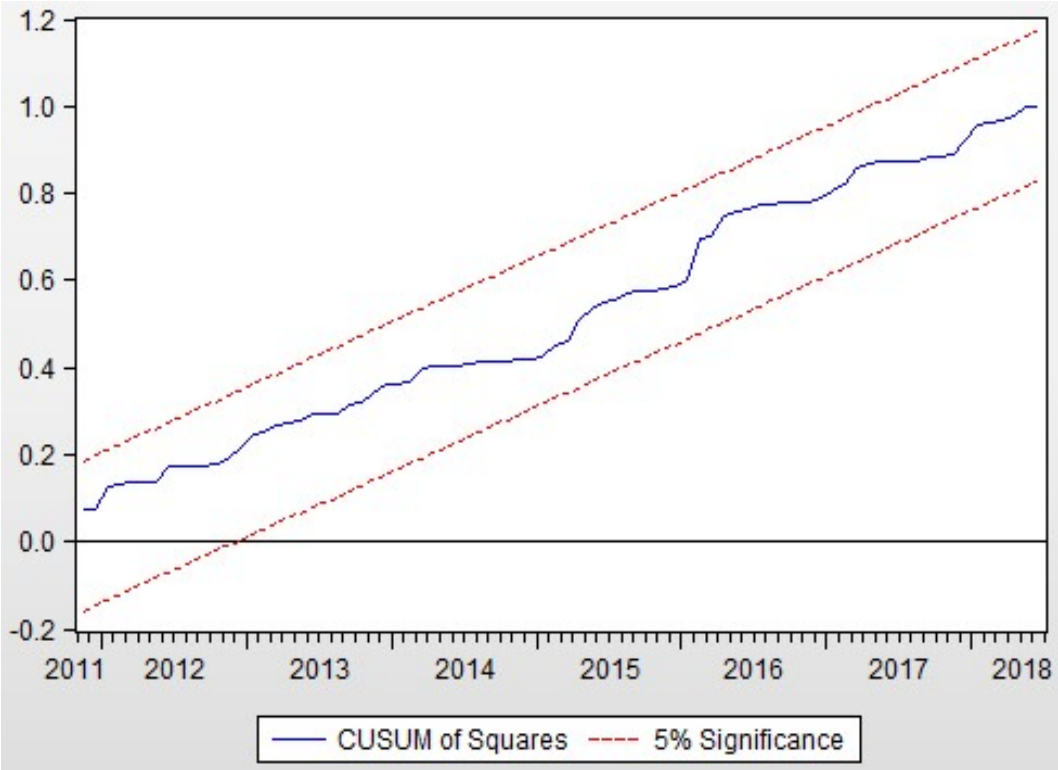

FIGURE 4.10: Cumulative Sum of Squares of Recursive Residuals Malaysia

Fig 4.9 and Fig 4.10 provides information about the CUSUM and the CUSUM of the squares plot for stability checking of coefficients in the longer- and shorter-term Error correction model of ARDL. **Figure 4.9** shows CUSUM and **Figure 4.10** shows CUSUM of the squares. The CUSUM and CUSUM of squares are inside critical limits of 0.05, which shows structural stability of the model and overall goodness of fit.

TABLE 4.79: ARDL Model for Estimated Long Run Coefficients Malaysia

Reg	Coeff	S. Err	T-Stat	Prob
LGDP	-1.1363	0.4786	-2.3742	0.0186
LIIP	0.0666	0.0465	1.4311	0.1540
LM2	1.5791	0.3947	4.0004	0.0001
LOP	-0.1365	0.1138	-1.1996	0.2317
LFER	0.0883	0.1228	0.7188	0.4731
LFDI	0.0307	0.0185	1.6566	0.0992
LER	-0.1150	0.2544	-0.4522	0.6516
LCPI	-0.0137	0.0494	-0.2776	0.7816
LBT	-0.0509	0.0374	-1.3579	0.1761
D1	0.0760	0.0871	0.8725	0.3840
C	-0.8087	0.6830	-1.1841	0.2378

Table 4.79 shows that GDP has a statistically significant but negative influence on the FTSE Bursa Malaysia equity market, whereas supply of money has a statistically significantly positive impact on the FTSE Bursa Malaysia equity market. On the contrary, foreign currency reserves, FDI, exchange rate, rate of Inflation, trade balance, industrial production index and prices of oil do not pose any statistically significant effect on the FTSE Bursa Malaysia in the long term.

Table 4.80 provides short-term dynamic association between the macroeconomic indicators and the equity returns of the FTSE Bursa Malaysia. The error correction representation of the selected ARDL model indicates that foreign exchange reserve and exchange rate that are statistically insignificant in the longer term becomes statistically significant in the short-term. whereas, both the money supply and gross domestic product remains statistically significant in the long as well as in the short term.

Practically in long run relationship, the ECM value must be statistically significant and negative and the same can be seen in the ECM results that the ECM (-1) value is statistically significant and negative.

Table 4.80: Error Correction Model for Short Run Effects Malaysia

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLGDP	0.2698	0.2666	1.0121	0.3127
ΔLGDP (-1)	-0.7068	0.4630	-1.5266	0.1285
ΔLGDP (-2)	0.5339	0.2507	2.1291	0.0345
ΔLIIP	0.0121	0.0094	1.2871	0.1996
ΔLM2	0.5903	0.2598	2.2720	0.0242
ΔLM2 (-1)	0.6908	0.2943	2.3473	0.0199
ΔLM2 (-2)	-0.2189	0.1520	-1.4405	0.1513
ΔLOP	0.0397	0.0332	1.1974	0.2326
ΔLOP (-1)	-0.0483	0.0333	-1.4522	0.1481
ΔLFER	0.2709	0.0884	3.0652	0.0025
ΔLFDI	-0.0004	0.0039	-0.0985	0.9216
ΔLER	-0.0421	0.3132	-0.1345	0.8931
ΔLER (-1)	-0.7750	0.3246	-2.3872	0.0179
ΔLCPI	-0.0025	0.0090	-0.2785	0.7809
ΔLBT	-0.0092	0.0070	-1.3229	0.1874
ΔD1	0.0138	0.0153	0.9000	0.3693
ECM (-1)	-0.1819	0.0339	-5.3613	0.0000

ECM = LFTSE - (-1.1363*LGDP + 0.0666*LIIP+1.5791*LM2 -0.1365*LOP + 0.0883*LFER + 0.0307*LFDI -0.1150*LER -0.0137*LCPI - 0.0509*LBT + 0.0760*D1 -0.8087)

The coefficient of the ECM term suggests that -0.18 percent adjustment of the previous month disequilibrium in stock prices from its equilibrium path will be corrected in the current month.

The structural break is observed during October, 2011 to March, 2012 that has been accounted for through dummy in Cusum and Cusum of squares graph.

4.10 An Application of Non-Linear ARDL Model Malaysia

4.10.1 Asymmetric Effect of Industrial Growth on Equity Market of Malaysia

Table 4.81: Asymmetric Effect of Industrial Growth on Equity Market of Malaysia in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LIIP (P)	0.0609	0.0497	1.2243	0.2223
LIIP (N)	0.0596	0.0590	1.0099	0.3138
LGDP	-1.1315	0.5657	-2.0000	0.0469
LM2	1.5687	0.4478	3.5034	0.0006
LOP	-0.1085	0.1342	-0.8084	0.4198
LCPI	-0.0156	0.0525	-0.2975	0.7664
LER	-0.1746	0.2928	-0.5962	0.5518
LFDI	0.0356	0.0201	1.7703	0.0783
LFER	0.0678	0.1502	0.4514	0.6522
LBT	-0.0551	0.0400	-1.3779	0.1698
D1	0.0879	0.0931	0.9447	0.3460
C	-0.4634	3.6020	-0.1286	0.8978

Table 4.81 reports the asymmetric relationship between the industrial production growth and the equity market of Malaysia. The positive and negative change in the coefficients of IIP have no effect on the equity market because both the

coefficients of positive and negative are insignificant in nature. So, it can ve said that with the increase or decrease of IIP no effect on the stock market is observed. Finally, No long-term asymmetric relationship exists between the stock market and index of industrial production.

TABLE 4.82: Asymmetric Influence of Industrial Growth on Malaysia Equity Returns in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLIIP(P)	0.0393	0.0199	1.9676	0.0505
ΔLIIP(N)	0.0102	0.0113	0.9045	0.3669
ΔLGDP	0.3066	0.2768	1.1075	0.2695
ΔLGDP (-1)	-0.6997	0.4627	-1.5121	0.1321
ΔLGDP (-2)	0.5319	0.2508	2.1206	0.0352
ΔLM2	0.5825	0.2611	2.2310	0.0268
ΔLM2 (-1)	0.7536	0.2968	2.5387	0.0119
ΔLM2 (-2)	-0.2599	0.1547	-1.6803	0.0945
ΔLOP	0.0440	0.0333	1.3224	0.1876
ΔLOP (-1)	-0.0569	0.0348	-1.6343	0.1038
ΔLCPI	-0.0027	0.0090	-0.2980	0.7660
ΔLER	-0.0633	0.3152	-0.2008	0.8410
ΔLER (-1)	-0.7593	0.3247	-2.3386	0.0204
ΔLFDI	0.0004	0.0039	0.1139	0.9095
ΔLFER	0.2658	0.0889	2.9911	0.0031
ΔLBT	-0.0095	0.0071	-1.3249	0.1868
ΔD1	0.0151	0.0154	0.9837	0.3265
ECM (-1)	-0.1719	0.0369	-4.6642	0.0000

Table 4.82 similar results as seen in the long-term are reported and indicates that both the positive and negative change in the coefficients of IIP cause no influence on the equity returns of Malaysia in the short-term.

4.10.2 Asymmetric Effect of Exchange Rate on Equity Market of Malaysia

From the **Table 4.83** provides the asymmetric relationship between the Malaysia ringgit to US dollar exchange rate and the equity market of Malaysia. The positive and negative change in the coefficients of ER have no effect on the equity index because both the coefficients of positive and negative are insignificant in nature

Table 4.83: Asymmetric Effect of Exchange Rate on Equity Market of Malaysia in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LER(P)	-0.9722	0.7560	-1.2860	0.1999
LER(N)	-0.4338	0.3706	-1.1703	0.2433
LFDI	0.0355	0.0239	1.4843	0.1393
LFER	-0.0639	0.2575	-0.2482	0.8042
LGDP	-0.4172	0.5634	-0.7404	0.4599
LIIP	0.1074	0.0538	1.9957	0.0473
LM2	1.4718	0.4663	3.1564	0.0018
LOP	-0.1664	0.1501	-1.1088	0.2688
LBT	-0.0476	0.0478	-0.9968	0.3201
LCPI	-0.0781	0.0602	-1.2982	0.1957
D1	0.1293	0.1157	1.1172	0.2652
C	-5.0728	3.6447	-1.3918	0.1655

and indicates that with the increase or decrease of ER there is no effect on the stock market. So, it is observed that there is no long-term asymmetric relationship exists between the stock market and the exchange rate.

Table 4.84: Asymmetric Impact of Exchange Rate on Equity Return in Short-Run in Malaysia

Reg	Coeff	S. Err	T-Stat	Prob
ΔLER(P)	-0.1434	0.0926	-1.5484	0.1231
ΔLER(N)	0.5314	0.2903	1.8303	0.0687
ΔLFDI	-0.0006	0.0040	-0.1490	0.8817
ΔLFER	0.2590	0.0859	3.0158	0.0029
ΔLGDP	0.2038	0.2093	0.9739	0.3313
ΔLIIP	0.0158	0.0094	1.6781	0.0949
ΔLM2	0.2170	0.0562	3.8618	0.0002
ΔLOP	0.0364	0.0338	1.0790	0.2819
ΔLOP (-1)	-0.0521	0.0341	-1.5264	0.1285
ΔLBT	-0.0070	0.0070	-0.9966	0.3202
ΔLCPI	-0.0115	0.0084	-1.3711	0.1719
ΔD1	0.0191	0.0156	1.2234	0.2226
ECM (-1)	-0.1475	0.0365	-4.0426	0.0001

Table 4.84 same results as seen in the long-term are observed in the short-term as well that both the positive and negative change in the ER cause no influence on the equity returns of Malaysia in the short-term.

4.10.3 Asymmetric Effect of Money Supply on Malaysia Equity Index

Table 4.85 reports the asymmetric effect of broad money Supply on the stock market. The coefficient associated with the positive change in M2 is significantly positive. On the contrary, the coefficient associated with the negative change in M2 is also significantly negative. So, this positive and negative significant unequal effect of M2 on the stock market indicates an asymmetric relationship exists between the variables in the long-term.

TABLE 4.85: Asymmetric Effect of Money Supply on Malaysia Equity Index in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LM2 (P)	1.4899	0.4035	3.6929	0.0003
LM2 (N)	2.5167	0.7686	3.2743	0.0012
LBT	-0.0576	0.0405	-1.4229	0.1563
LCPI	-0.0363	0.0519	-0.6999	0.4848
LER	-1.2423	0.6304	-1.9706	0.0502
LFDI	0.0323	0.0199	1.6256	0.1056
LFER	-0.1277	0.1991	-0.6416	0.5219
LGDP	-0.1272	0.5512	-0.2308	0.8177
LIIP	0.0576	0.0506	1.1385	0.2563
LOP	-0.2571	0.1254	-2.0504	0.0416
D1	0.1152	0.0960	1.2007	0.2313
C	8.2885	5.0306	1.6476	0.1010

Table 4.86 provides the asymmetric effect of the Money Supply (M2) on the equity returns in the shorter-run. The coefficient associated with the positive change in M2 is also significantly positive which indicates that a 1 unit raise in M2 cause the stock returns to increase by 0.25%. On the contrary, the coefficient associated with the negative change in M2 is also significantly negative which indicates that 1 unit decrease in M2 will cause a decrease in stock returns by 1.11%. This shows that in the short-term increase/decrease in M2 cause change in the stock returns. It is worth mentioning that the increase and decrease pose unequal impact on the equity returns of Malaysia. So based on the discussion, we can say there is an asymmetric relation exist amid Money Supply and equity returns based on their significance and their positive and negative signs.

TABLE 4.86: Asymmetric Influence of Money Supply on Equity Returns in Short-Run in Malaysia

Reg	Coeff	S. Err	T-Stat	Prob
ΔLM2 (P)	0.2532	0.0631	4.0148	0.0001
ΔLM2 (N)	1.1085	0.3160	3.5078	0.0006
ΔLBT	-0.0098	0.0070	-1.3895	0.1662
ΔLCPI	-0.0062	0.0087	-0.7116	0.4775
ΔLER	-0.2111	0.0909	-2.3216	0.0213
ΔLFDI	-0.0011	0.0039	-0.2906	0.7717
ΔLFER	0.2487	0.0829	2.9986	0.0031
ΔLGDP	0.2520	0.2789	0.9033	0.3674
ΔLGDP (-1)	-0.6883	0.4635	-1.4848	0.1392
ΔLGDP (-2)	0.4879	0.2494	1.9566	0.0518
ΔLIIP	0.0098	0.0095	1.0323	0.3032
ΔLOP	0.0336	0.0330	1.0200	0.3090
ΔD1	0.0196	0.0153	1.2806	0.2018
ECM (-1)	-0.1699	0.0346	-4.9165	0.0000

4.10.4 Asymmetric Effect of Oil Price on Equity Market of Malaysia

TABLE 4.87: Asymmetric Effect of Oil Price on Equity Market of Malaysia in Long-Run

Reg	Coeff	S. Err	T-Stat	Prob
LOP (P)	-0.2847	0.1090	-2.6125	0.0097
LOP (N)	-0.0943	0.0886	-1.0639	0.2887
LBT	-0.0316	0.0285	-1.1071	0.2696
LCPI	-0.1697	0.0545	-3.1162	0.0021
LER	-1.1061	0.3335	-3.3168	0.0011
LFDI	0.0438	0.0189	2.3150	0.0216
LFER	0.0750	0.0961	0.7807	0.4359
LGDP	0.2639	0.3600	0.7329	0.4645
LIIP	0.0598	0.0369	1.6217	0.1065
LM2	1.2030	0.2495	4.8218	0.0000
D1	0.0763	0.0661	1.1547	0.2496
C	-12.0188	3.3293	-3.6101	0.0004

In **Table 4.87** the long-term asymmetric effects of oil prices on the FTSE Bursa Malaysia stock market is observed. The coefficients related with the positive changes in the OP are significantly negative. Whereas the coefficient associated with the negative changes in the IIP is positive but insignificant that indicates that

the relationship is asymmetric in nature in the long-term. Because of this unequal impact of positive and negative change in the coefficients of oil prices on the stock market provides that there exists an asymmetric relationship exists between the variables in the longer-term. So based on the above discussion, it can be said that there exists an asymmetrical relationship between the OP and equity market in the long term.

TABLE 4.88: Asymmetric Impact of Oil Price on Equity Returns of Malaysia in Short-Run

Reg	**Coeff**	**S. Err**	**T-Stat**	**Prob**
ΔLOP (P)	-0.0677	0.0287	-2.3577	0.0194
ΔLOP (N)	0.1458	0.0491	2.9711	0.0033
ΔLOP (N)(-1)	-0.1003	0.0534	-1.8781	0.0618
ΔLBT	-0.0075	0.0069	-1.0877	0.2781
ΔLCPI	-0.0400	0.0194	-2.0616	0.0406
ΔLCPI (-1)	-0.0220	0.0340	-0.6459	0.5191
ΔLCPI (-2)	0.0453	0.0223	2.0310	0.0436
ΔLER	0.1264	0.1928	0.6554	0.5130
ΔLFDI	0.0018	0.0044	0.4090	0.6830
ΔLFER	0.3313	0.0813	4.0749	0.0001
ΔLGDP	0.3778	0.2161	1.7479	0.0820
ΔLIIP	0.0142	0.0095	1.5036	0.1343
ΔLM2	0.2862	0.0660	4.3365	0.0000
ΔD1	0.0181	0.0152	1.1974	0.2326
ECM (-1)	-0.2379	0.0381	-6.2431	0.0000

Table 4.88 reports the short-term asymmetric relationship between the prices of oil and the equity returns. The coefficient associated with the positive change is OP is negative and significant that indicates that if oil prices are raised by 1 unit the equity returns will decreased by 0.07% in the short-term. On the contrary the coefficient associated with the negative change in Oil price is significantly negative and indicates that with the unit decrease in oil prices the equity returns will be decreased by.14% in the short run.

4.10.5 Asymmetric Effect of Inflation on Equity Market of Malaysia

Table 4.89 reports the asymmetric relationship between the CPI and the equity market of Malaysia. The positive and negative change in the coefficients of CPI poses no effect on the equity index because both the coefficient of positive and negative are insignificant in nature and indicates that with the increase or decrease of CPI no effect on the stock market is observed. Finally, no long-term asymmetric relationship exist between the stock market and inflation in terms of CPI.

Table 4.89: Asymmetric Effect of Inflation on Equity Market of Malaysia in Long-Term

Reg	Coeff	S. Err	T-Stat	Prob
LCPI (P)	-0.0366	0.0569	-0.6436	0.5206
LCPI (N)	-0.0055	0.0499	-0.1104	0.9122
LBT	-0.0496	0.0371	-1.3366	0.1829
LER	-0.2004	0.2742	-0.7307	0.4658
LFDI	0.0285	0.0185	1.5412	0.1249
LFER	0.0110	0.1557	0.0709	0.9435
LGDP	-0.9835	0.4985	-1.9727	0.0500
LIIP	0.0754	0.0469	1.6092	0.1092
LM2	1.6744	0.4163	4.0221	0.0001
LOP	-0.1543	0.1149	-1.3431	0.1808
D1	0.0885	0.0882	1.0038	0.3167
C	-2.7298	2.4407	-1.1184	0.2648

The **Table 4.90** provides similar results as observed in the long-term that both the positive and negative change in the coefficients of CPI cause no influence on the equity returns of Malaysia in the short-term.

TABLE 4.90: Asymmetric Influence of Inflation on Malaysia Equity Returns in Short-Run

Reg	Coeff	S. Err	T-Stat	Prob
ΔLCPI (P)	-0.0067	0.0104	-0.6478	0.5179
ΔLCPI (N)	-0.0010	0.0092	-0.1105	0.9121
ΔLBT	-0.0091	0.0070	-1.3027	0.1942
ΔLER	-0.0401	0.3135	-0.1280	0.8983
ΔLER(-1)	-0.7687	0.3250	-2.3651	0.0190
ΔLFDI	-0.0004	0.0039	-0.1024	0.9185
ΔLFER	0.2729	0.0885	3.0845	0.0023
ΔLGDP	0.3159	0.2729	1.1577	0.2484
ΔLGDP(-1)	-0.7313	0.4644	-1.5746	0.1170
ΔLGDP(-2)	0.5525	0.2520	2.1922	0.0296
ΔLIIP	0.0139	0.0097	1.4343	0.1531
ΔLM2	0.5950	0.2601	2.2876	0.0232
ΔLM2(-1)	0.6825	0.2947	2.3157	0.0216
ΔLM2(-2)	-0.2132	0.1523	-1.3998	0.1632
ΔLOP	0.0402	0.0332	1.2094	0.2280
ΔLOP(-1)	-0.0448	0.0336	-1.3343	0.1837
ΔD1	0.0163	0.0157	1.0392	0.3000
ECM (-1)	-0.1838	0.0340	-5.4005	0.0000

4.11 Discussion Regarding Impact of Macroeconomic Variables on Stock Markets of Selected Asian Countries

4.11.1 Macroeconomic Variables and Pakistan's Equity Market

ARDL model reports that there exists a long-term relationship of gross domestic product, foreign exchange reserve, rate of inflation, trade balance, and money supply with equity market of Pakistan. The significant and positive relationship is discovered between trade balance and broad money supply these results are in line with the studies of Khan and Khan (2018),Kibria et al. (2014), Naik (2013), and Mehrara (2006). On the contrary, a significant but negative effect of GDP on the stock market is observed. The relationship between stock market and FER and is significantly negative and these results are in line with the results of

Akbar et al. (2012), Umer (2016), and Sikalao-Lekobane and Lekobane (2014). Finally, CPI to KSE-100 stock market relationship is significantly negative and indicates that they are in line with the results of Epaphra (2018), Mehr-un Nisa and Nishat (2011), Sohail and Hussain (2009) and Bekhet and Mugableh (2012). Similarly, the short-term relationship reports that all the indicators except of FER that are significant in the long term remains significant in the short term as well. It is worth emphasizing that all the indicators have a significant but negative relationship except for the broad money supply that has significant and positive connection between the equity returns.

In an asymmetric context, the industrial production index doesn't exhibit any long-term asymmetric relationship between the equity returns. In the same manner in the short term asymmetric effects of IIP indicates that the coefficient associated with positive change is negative and significant after 2 lags that means that a change in the current period in the index of industrial production will be seen in the equity returns after 2 periods. One more aspect is that the relationship between these two variables is inverse in relation and reports that unit increase in IIP will lower the equity returns of KSE-100 by 0.05%. On the contrary, the coefficients associated with negative change is also positive but insignificant in nature.

In connection with the asymmetric discussion, the exchange rate poses a long-term asymmetric relationship with the equity returns. The coefficient associated with positive change is positive and significant. On the contrary, the coefficient associated with negative change is negative but insignificant this unequal effect of positive and negative change shows that there exists a symmetric relationship in the longer run and the findings are in accordance with Cuestas and Tang (2017). In connection with the discussion in short term, the coefficient associated with positive change is negative but insignificant and the coefficient associated with a negative change in the exchange rate is significantly positive that indicates that with unit decrease in the currency exchange rate the equity returns of KSE-100 returns will decrease by 2.08%.

The M2 have a longer term asymmetric relationship with the equity market. The coefficient associated with positive change is significantly positive. On the contrary coefficient associated with negative change is also significantly positive and this unequal effect of positive and negative change indicates that there exists a non-linear connection in the longer run and the results are in accordance with the study of Tiryaki et al. (2019). In connection with the discussion in short term the coefficient associated with positive change is positive but insignificant. On the contrary, the coefficient associated with negative change is a positive and significant that shows with unit decrease in money supply the equity returns will decrease by 1.47%.

The prices of oil doesn't exhibit any longer-term asymmetric relationship between the equity market. On the contrary, the short-term asymmetric effect reports that the coefficient associated with positive change is negative and significant after 2 lags that means that a change in the current period in the prices of oil will be seen in the equity returns after 2 periods. Finally, It can be said that the connection between these two variables is inverse in relation and indicates with a unit increase in OP will lower the equity returns of KSE-100 by 0.44%. In contrary, the coefficient associated with negative change is also positive and significant after 2 lags. So, a decrease in oil price today will lower the equity returns of KSE-100 index by .33% after two periods.

Finally, the inflation rate have a long-run asymmetric relationship with the equity market. The coefficient associated with positive change is negative but insignificant. In contrary, the coefficient associated with negative change is positive and significant this unequal effect of positive and negative change reports that there exists a non-linear connection in the long term. In connection with the discussion in the short term, the coefficient associated with positive shock is negative but insignificant. Whereas, the coefficient associated with negative shock is negative and significant that shows that with unit decrease in the CPI cause the equity returns to increase by .11%.

4.11.2 Macroeconomic Variables and India's Stock Market

The ARDL model shows that there exists a long-term relationship of broad money supply and equity returns of BSE-500 and these findings are in accordance with Khan and Khan (2018),Kibria et al. (2014), Naik (2013), and Mehrara (2006). In the short term, the indicators that are not significant in the long term becomes significantly positive in the short term. The variables that are significant includes exchange rate, foreign exchange reserves, and the broad money supply.

In an asymmetric context, the industrial production growth rate doesn't have any long-term asymmetric relationship with the equity market. In the same manner, no short-term asymmetric influence of IIP has been observed that confirms that there is no asymmetric impact of IIP on equity returns of India.

The exchange rate doesn't exhibit any longer-term asymmetric relationship with the equity market of India. On the contrary in short term the coefficient associated with the positive change is positively significant that indicates that with unit increase in exchange rate the equity returns will increase by 1.6% and the coefficient associated with negative change in exchange rate is positively significant and indicates that with a unit decrease in the currency exchange rate the equity returns of BSE-500 will decrease by 1.3%.

The broad money supply have a long-term asymmetric relationship with the equity returns the results are in line with the results of Tiryaki et al. (2019). The coefficient associated with positive change is positive and significant. On the contrary, the coefficient associated with negative change is also positive but insignificant this unequal effect of positive and negative change shows that there exists asymmetric relationship in the longer run. In connection with the discussion in short term, the coefficient associated with positive change is positively significant and indicates that a unit increase in M2 will result in the increase of equity returns by .20%. In contrary, the coefficient associated with negative change is positively insignificant.

In connection with the discussion above the prices of oil doesn't have any longer-term asymmetric relationship with the equity returns. In the same manner in the

short-term asymmetric impact reports that the coefficient associated with positive change is significantly positive and indicates that with a unit increase in the price of oil the equity returns are increased by .07%. In contrary, the coefficient associated with negative change is positively insignificant.

Finally, the inflation rate have no long-term asymmetric relationship with the equity returns. Similarly no short-term asymmetric effects of CPI has been reported.Hence, there is no asymmetric effect of CPI on equity returns of India.

4.11.3 Macroeconomic Variables and Bangladesh Stock Market

The ARDL model reports that there exists a long-term relationship of Industrial production with the equity market of DSE Broad. The significantly negative relationship is discovered between IIP and the equity market. The results are in accordance with the results of Papapetrou (2001) and Zhao (1999) and implies that increase in stock returns does not necessary concludes higher levels of industrial production growth. In the context of the short term, the indicators that are not significant in the long term becomes positive and significant in the short term. It is worth mentioning that IIP has a significant and negative relation in the long run but have a significant positive connection in the short-term. In addition to this, the M2 has significantly positive relationship with the equity returns of Bangladesh in the short term.

The IIP have a long-term asymmetric relationship with the equity market. The coefficient associated with positive change is negative and insignificant. On the contrary, the coefficient associated with negative change is negatively significant this unequal effect of positive and negative change indicates that there exists asymmetric relationship in the long run and the results are in line with the findings of Tiryaki et al. (2019). But in case of the short-term, no asymmetric effects of IIP is reported and confirms that there is no asymmetric effect of IIP on the equity market of Bangladesh.

The exchange rate doesn't have any long-term asymmetric relationship with the equity markets of Bangladesh. Similarly , no short-term asymmetric effect of exchange rate is reported and confirms that there is no asymmetric impact of the exchange rate on the equity returns of Bangladesh.

The M2 doesn't have any longer-term asymmetric relationship with the equity market of Bangladesh. In connection with the discussion in short term, the coefficient associated with the positive change is positively significant and indicates that unit increase in money supply will result in the increase of equity returns by .92%. On the contrary, the coefficient associated with negative change is positively insignificant.

The prices of oil doesn't exhibit any longer-term asymmetric relationship with the equity index. In the short-term no asymmetric effects of prices of oil have been reported and confirms that there is no asymmetric impact of prices of oil on the equity returns of Bangladesh.

Finally, CPI doesn't have any long-term asymmetric relationship with the equity index. In the same manner, no short-term asymmetric effects of CPI is discovered and confirms that there is no asymmetric effect of CPI on equity returns of Bangladesh.

4.11.4 Macroeconomic Variables and Stock Market of Indonesia

The ARDL model reports no long-term relationship of macroeconomic indicators on the Jakarta Stock Exchange (JKSE) these results are in line with the study outcomes of Gurloveleen and Bhatia (2015), Barbic and Jurkic (2011), and (Poon and Taylor, 1991). In connection with the discussion in the short-term GDP, foreign exchange reserves, exchange rate, CPI, and oil prices have significant relationship with the JKSE. The GDP and CPI have significantly negative relationship with the equity returns, whereas FER, ER, and oil prices have significantly positive relationship with the equity returns of Jakarta.

The industrial production index doesn't have any longer-term asymmetric relationship with the Jakarta equity index. In the same manner, no short-term asymmetric effects of IIP has been discovered and confirms that there is no asymmetric effect of IIP on the equity returns of Jakarta.

The exchange rate doesn't exhibit any long-term asymmetric relation with the equity market. The short-term asymmetric impact of ER indicates that the coefficient associated with positive change is positive and significant and indicates that with a unit increase in ER will result in the increase of equity returns by .51% but after 1 period there is a decrease in equity returns by .52% for the unit increase in exchange rate today. On the contrary, the coefficient associated with the negative change is significantly positive and indicates that with a unit decrease in exchange rate the equity returns will decrease by .80%.

The money supply doesn't have any long-term relationship with the Jakarta equity market. In the same manner, no short-term asymmetric effects of the money supply is reported and confirms that there is no asymmetric effect of M2 on equity returns of Jakarta.

The prices of oil doesn't have any longer-term asymmetric relation with the Jakarta equity index. In the same manner, no short-term asymmetric impact of OP is discovered and confirms that there is no asymmetric influence of oil prices on the equity returns of Jakarta.

Finally, the CPI doesn't have any long-term asymmetric relation with the equity market of Jakarta. In the short-term asymmetrical effects of the consumer price index indicates that the coefficient associated with the positive change is negatively significant after 1 lag and indicates that a unit increase in CPI in the current period will cause the Jakarta equity returns to be decreased by .12% after one period. On the contrary, the coefficient associated with the negative change is negatively significant and indicates that with a unit decrease in CPI the Jakarta equity returns will decreased by .09%.

4.11.5 Macroeconomic Variables and Stock Market of Malaysia

The ARDL model reports that there exists a long-term relationship of gross domestic product and broad money supply on the Kuala Lumpur Composite Index (KLCI). The significantly negative relationship is discovered with domestic gross product and KLCI. Whereas a significant and positive relationship is found between M2 and KLCI. The results are in line with the results of Khan and Khan (2018),Kibria et al. (2014), Naik (2013), and Mehrara (2006). In connection to the discussion in the short-term, two more indicators that are not significant in the long run becomes significant in the short term that includes foreign exchange reserves and exchange rate. It is worth mentioning that GDP is significantly negative in the long run, but becomes significantly positive in the short run. Finally, the FER have a significantly positive relationship with the equity returns of KLCI, whereas the exchange rate has a significantly negative connection with the equity returns.

In an asymmetric context, the industrial production growth rate doesn't have any long-term asymmetric relationship with the KLCI equity returns. Similarly, no short-term asymmetric impact of IIP is discovered and confirms that there is no asymmetric effect of IIP on equity returns of KLCI.

The exchange rate doesn't exhibit any long-term asymmetric relationship with the equity market of KLCI. There is no short-term asymmetric effects of exchange rate is discovered and confirms that there is no asymmetric effect of ER on equity returns of KLCI.

The M2 has a long-term asymmetric relationship with the equity index of KLCI. The coefficient associated with positive change is positively significant. On the contrary, the coefficient associated with negative change is also positive and significant this unequal effect of positive and negative change indicates that there exists a asymmetric relationship in the longer-run. Similar results are reported by Tiryaki et al. (2019). In connection with the discussion above, the coefficients associated with the positive change is positive and significant and indicates that

with a unit increase in the money supply the KLCI will increase by .25% in the short-term. On the contrary, the coefficient associated with the negative change are positively significant and indicates that with a unit decrease in the M2 the equity returns will decrease by 1.11% in the short-term.

The prices of oil have a long-term asymmetric relationship with the equity market of KLCI. The coefficient associated with the positive change is negative and significant. On the contrary, the coefficient associated with negative change is positively insignificant this unequal effect of positive and negative change indicates that there exists a asymmetric relationship in the longer run the results are in line with the results of Dhaoui et al. (2018). In connection with the discussion in the short term, the coefficient associated with positive change is negative and significant and indicates that with a unit increase in prices of oil will cause the KLCI to decrease by .07%. In contrary, the coefficient associated with negative change is positive and significant and shows that with a unit decrease in prices of oil the equity returns will decrease by .14%.

Finally, the inflation rate doesn't have any long-term asymmetric relationship with the KLCI equity market. Similarly, no short-term asymmetric effects of CPI is discovered and confirms that there is no asymmetric impact of CPI on the equity returns of KLCI.

Table 4.91: Comparison of ARDL and NARDL Model-Long Run

Coeff	ARDL	NARDL(+)	NARDL(-)	Coeff	ARDL	NARDL(+)	NARDL(-)
		Pakistan				**India**	
LM2	+*	+*	+*	**LM2**	+*	+*	+
LIIP	+	+	-	**LIIP**	-	+	-
LER	-	+*	+	**LER**	-	+	-
LCPI	-*	-	-*	**LCPI**	-	+	-
LOP	+	-	-	**LOP**	+	+	+
		Bangladesh				**Indonesia**	
LM2	+	+	+	**LM2**	-	-	-
LIIP	-*	-	-*	**LIIP**	-	+	-
LER	+	+	+	**LER**	-	+	-
LCPI	-	-	-	**LCPI**	-	-	-
LOP	+	+	+	**LOP**	-	+	-
		Malaysia					
LM2	+*	+*	+*				
LIIP	+	+	+				
LER	-	-	-				
LCPI	-	-	-				
LOP	-	-*	-				

Table 4.92: Comparision of ARDL and NARDL Model-Short Run

Coeff	ARDL	NARDL(+)	NARDL(-)	Coeff	ARDL	NARDL(+)	NARDL(-)
		Pakistan				**India**	
LM2	+*	+	+*	**LM2**	+*	+*	+
LIIP	-	-*	-	**LIIP**	-	+	-
LER	-	-	+*	**LER**	+*	+*	+*
LCPI	-*	-	-*	**LCPI**	-	+	-
LOP	+	-*	+*	**LOP**	+	+*	+
		Bangladesh				**Indonesia**	
LM2	+*	+*	+	**LM2**	-	-	+
LIIP	+*	+	+	**LIIP**	+	+	-
LER	+	+	+	**LER**	+*	+*	+*
LCPI	-	-	-	**LCPI**	-*	-*	-*
LOP	+	+	+	**LOP**	+*	+	-
		Malaysia					
LM2	+*	+*	+*				
LIIP	+	+	+				
LER	-*	-	+				
LCPI	-	-	-				
LOP	+	-*	+*				

Chapter 5

Summary and Conclusion

5.1 Conclusion

The present research purpose is to see the influence of major macroeconomic indicators of South Asian and Southeast Asian countries on their respective equity market returns. The countries included for analysis comprise of Pakistan, India, Bangladesh, Indonesia, and Malaysia.

The analysis is conducted for the time period of 18 years starting from January 2000 to June 2018. The major indicators used in the study include GDP, rate of inflation, foreign direct investment, foreign exchange reserves, trade balance, prices of oil, Industrial production index, exchange rate, broad money supply, and equity index.

The methodology applied includes auto-regressive distributive lags(ARDL) for checking the linear or symmetric influence and Non-linear auto-regressive distributive lags (NARDL) for exploring the nonlinear or asymmetric influence of macroeconomic indicators on the equity returns.

The asymmetric perspective is investigated to observe any non-linear connection between macroeconomic indicators and the equity returns in order to avoid the loss of any link which is not visible in the conventional linear settings. The macroeconomic indicators used in the asymmetric testing are selected with respect to the frequency of dissemination of the indicators i.e. monthly. The indicators chosen

includes inflation in terms of CPI, Industrial production growth rate, exchange rate, broad money supply, and oil prices.

The impact of macroeconomic variables on stock market is higher in case of Pakistan and they can be forecasted on the basis of historical data of money supply, inflation rate, trade balance, gross domestic product, and foreign exchange reserves. These variables are also found significant except of foreign exchange reserves in short run.

In case of India only money supply have a significantly positive long term relationship with stock market of India. In short term money supply, exchange rate, and foreign exchange reserves have a significant positive impact on stock returns of India.

For Bangladesh only index of industrial production have a significantly negative impact on stock market of Bangladesh in long term. Whereas, money supply and balance of trade have a significantly positive relationship with the equity returns in the short run.

In case of Indonesia no long term impact is reported. However, exchange rate, inflation rate rate, and gross domestic product have a significant relationship with the equity returns in the short run. Where inflation rate and gross domestic product have a significant negative relationship with the stock returns and exchange rate have a significant positive relationship with the equity returns of Indonesia.

Finally, broad money supply and gross domestic product have a long term relationship with the stock market of Malaysia where money supply have a significantly positive relationship with the stock market and GDP have a significantly negative relationship with the stock market in the long term. In short run along with money supply and gross domestic product the foreign exchange rate is also found significant. All the relationships in short term are significantly positive.

5.2 Implications and Policy Recommendation

5.2.1 Implications and Policy Recommendation Pakistan

The money supply, inflation rate, trade balance, gross domestic product, and foreign exchange reserves are found significantly influencing the Pakistani market in the long term. whereas, money supply, inflation rate, trade balance, and gross domestic product have a short term relationship with the equity returns of Pakistan. Therefore, stakeholders should consider these points before making a decision.

- There is a long term relationship of money supply with stock market. This behavior is consistent in rising and falling of money supply. So, the policy makers should be vigilant regarding devising their monetary policy. The money supply growth rate increases the returns in short term. However, this effect is found significant in case of negative growth rate. So, the investors should be careful that the impact of rise and fall of money supply is not same.

- There is a long term relationship of CPI with stock index, This behavior is significant in case of falling CPI. So, the policy makers should be vigilant regarding devising their monetary policy. In short run inflation rate decreases the equity returns of Pakistan. However, this effect is found significant in case of negative growth rate where increase in inflation rate causes the returns to decrease. So, the investors should be careful that the impact of inflation rate rise and fall is not same.

- There is a long term relationship of trade balance with the stock market. The stock returns deceases as the trade balance increases in the short term. So, the policy makers should be vigilant in devising their monetary policy and at the same time investors should be careful regarding increase in trade balance.

- Gross domestic product reports a long term relationship with the stock index. So, the policy makers should be vigilant regarding devising their monetary policy. Whereas, increase in gross domestic product decreases the stock returns in short term. So, the investors should be careful regarding GDP while making decision.

- There is a long term relationship of foreign exchange reserves with the stock market. So, the policy makers should be more vigilant regarding devising their monetary policy. On the contrary, no short term impact is observed.

5.2.2 Implications and Policy Recommendation India

Money supply has a long term relationship with the stock index of India. Whereas, money supply, exchange rate, and foreign exchange reserves have a short term relationship with the equity returns of India. Therefore, stakeholders should consider these points before making decision.

- There is a long term relationship of money supply with the stock market. This behavior is consistent with the rising of money supply. Therefore, the policy makers should be vigilant regarding devising their monetary policy. The increase in money supply growth rate increases the stock returns in short term. However, this effect is found significant in case of positive growth rate. So, the investors should be careful that the impact of rise and fall in money supply is not same.

- There is no long term relationship of exchange rate with the stock market of India. However, increase in exchange rate increases the stock returns of India in short term. This significant effect remains persistent in the negative and positive change in exchange rates. In short term the results reports that the impact is non linear in nature and the investors should also look at the asymmetric context of the exchange rate.

- Finally, there is no long term relationship of foreign exchange reserves with the stock index of India. On the contrary, a positive short term impact is

observed where the increase in FER will increases the stock returns of India. So, the investors should be careful regarding increase in foreign exchange reserves while making decision.

5.2.3 Implications and Policy Recommendation Bangladesh

The index of industrial production has a long term relationship with stock market. Whereas, money supply and trade balance have a short term relationship with the stock returns of Bangladesh. Therefore, stakeholders should consider these points before making decision.

- There is a long term relationship of industrial production with the stock market of Bangladesh. This behavior is consistent with the fall of index of industrial production. Therefore, the policy makers should be vigilant regarding devising their monetary policy. However, there is no short term impact of industrial production is reported. The long term effect is not linear and stakeholders should also focus on asymmetric context.
- There is no long term effect of money supply on stock index of Bangladesh. However, money supply has a positive and significant relationship with the stock returns. So, the investors should be careful regarding the rise and fall of money supply. On the contrary, no asymmetric impact is observed.
- There is no long term effect of trade balance on the stock market of Bangladesh. The increase in trade balance increases the stock returns of Bangladesh in short term. Therefore, the investors should be careful regarding the increase and decrease of trade balance. There is no asymmetric behavior is reported.

5.2.4 Implications and Policy Recommendation Indonesia

There is no long term relationship of macroeconomic variables with the stock market of Indonesia. However, exchange rate, inflation rate, and gross domestic product have a short term relationship with the stock returns of Indonesia. Therefore, stakeholders should consider these points before making decision.

- The increase in exchange rate increases the stock returns in short term. This behavior is consistent with the positive and negative change in the exchange rate. Therefore, stakeholders should be careful regarding the increase and decrease in exchange rate and at the same time also consider the asymmetric context while making decision.

- Increase in inflation rate decrease the stock returns in short term. This behavior is also persistent in positive and negative inflation growth rate. So, the investors should be careful regarding the rise and fall of inflation rate and at the same time observe non linear context while making decision in short term.

- The increase in gross domestic product decrease the stock returns in short term. So, the investors should be vigilant regarding the increase and decrease in GDP.

5.2.5 Implications and Policy Recommendation Malaysia

The money supply and gross domestic product reports a long term relationship with the stock market of Malaysia. Whereas, money supply, gross domestic product, and foreign exchange reserves reports a short term relationship with the stock returns on Malaysia. Therefore, stakeholders should consider these points before making decision.

- There is a long term relationship of money supply with the stock market is reported. This behavior is consistent with the rising and falling of money supply. So, the policy makers should be more vigilant regarding devising their monetary policy. The money supply growth rate increases the stock returns in short run. This behavior is also significant in positive and negative money supply growth rate. Therefore, the investors should be careful that the impact of rise and fall of money supply is not same. The stakeholders should considers the asymmetric context before making decision.

- There is an inverse long term relationship of gross domestic product with the stock market of Malaysia. So, the policy makers should be vigilant regarding devising their monetary policy. However, increase in gross domestic product will increases the stock returns in short term. So, the investors should be careful while making decisions.

- Finally, there is no long term effect of foreign exchange reserve is reported. On the contrary, increase in foreign exchange reserve will increase the stock returns of Malaysia in short run. Therefore, the investors should be vigilant regarding foreign exchange reserve while making decision.

The money supply remains significant in all selected Asian countries except Indonesia. Whereas, inflation rate, trade balance, gross domestic product, and foreign exchange reserves remains significant in Pakistan's stock market. In case of India exchange rate and foreign exchange reserves are found significant. In Bangladesh after money supply only industrial production index is found significant. In case of Indonesia only short term impact is reported and the variables that are found significant includes exchange rate, inflation rate, oil prices, GDP, and foreign exchange reserves. Finally, gross domestic product, exchange rate, and foreign exchange reserves are reported significant in case of Malaysia.

5.3 Direction for Future Research

The asymmetric relationship provides evidence that further research is required in this domain because macroeconomic indicators of the selected countries reports to have asymmetric effect on the equity markets. Secondly inclusion of more indicators is required to get further generalization of results. Finally conduct a comparative analysis for developed and under developed countries to observe how macroeconomic indicators behave and effect the stock markets of these countries.

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