GRANGER-CAUSE EFFECT ON TRADING VOLUME AND STOCK RETURN VOLATILITY: EVIDENCE FROM ACE MARKET MALAYSIA

MAZIAH BINTI HUSIN

MASTER OF SCIENCE (FINANCE)
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By:

MAZIAH BINTI HUSIN

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MAZIAH BINTI HUSIN

814273

School of Economics Finance and Banking
Collage of Business
Universiti Utara Malaysia
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LIST OF ABBREVIATIONS

R	Return
V	Volume
VAR	Vector Autoregressive
VECM	Vector Error Correction Model
VDC	Variance Decomposition
IRF	Impulse Response Function
EMH	Efficient Market Hypothesis

ABSTRACT

This study analyzes the relationship between trading volume and stock return in Malaysian ACE market for the period of August, 2009 to December, 2015. Several tests were utilized; multivariate time series regression model; Brailsford model; VAR analysis, and; Granger-cause test. The empirical result proves a significant positive contemporaneous relationship between trading volume and stock return and *vice versa*. However, trading volume has negative significant relationship with stock return volatility, thus exhibits an asymmetry relationship between the variables. VAR analysis reveals that past trading volume has explanatory power in forecasting stock return and *vice versa*. And lastly, Granger-causality test indicates a significant bi-directional relationship between trading volume and stock return. Thus, it is proven that Malaysian ACE market is contradicted with the weak-form of efficient market hypothesis.

Keywords: trading volume, stock return, vector autoregressive model, Granger-causality test, Malaysian ACE market

ABSTRAK

Kajian ini menganalisa hubungan antara jumlah dagangan dan pulangan saham di pasaran ACE Malaysia bermula dari Ogos 2009 hingga Disember 2015. Beberapa ujian telah dijalankan diantaranya ialah model regresi siri masa multivariat; model Brailsford; analisis VAR, dan; ujian sebab-akibat Granger. Hasil empirikal membuktikan terdapat hubungan semasa yang positif dan signifikan antara jumlah dagangan dan pulangan saham dan sebaliknya. Walau bagaimanapun, jumlah dagangan mempunyai hubungan negatif yang signifikan dengan turun naik pulangan saham, sekali gus mempamerkan hubungan asimetri antara pembolehubah yang terlibat. Analisis VAR mendedahkan bahawa jumlah dagangan lalu mempunyai kuasa penjelasan dalam ramalan pulangan saham dan sebaliknya. Dan yang terakhir, ujian Granger sebab-akibat menunjukkan hubungan signifikan dua hala antara jumlah dagangan dan pulangan saham. Oleh itu, objektif pertama dan kedua telah dicapai. Oleh itu, terbukti bahawa pasaran ACE Malaysia adalah bercanggah dengan teori *weak-form* mengikut hipotesis pasaran cekap.

Kata kunci: pulangan saham, jumlah dagangan, model autoregresif vektor, ujian Granger-sebab akibat, pasaran ACE Malaysia

CHAPTER ONE

INTRODUCTION

1.0 Introduction

Economists believe that eighty percent of stock markets would crash to strike in 2016 due to the slowdown in global economic, flatten in the earnings, collapse of commodities prices, and tighten in monetary policy by Federal Reserve (The Sovereign Investor, 2016, February 18). These are the critical indicators that express the stock markets in 2016 are anticipate to bearish. Rapidly growing emerging stock markets such as Malaysian stock market would be most largely impacted. Emerging stock markets associate with highly volatility stock return due to low stock market volume (Attari, Rafiq and Awan, 2012; Hseih, 2014). A study in developed versus emerging stock markets has revealed a negative relationship between predictable volume and stock return volatility in some emerging markets, which is related to the inefficiency in the markets (Girard and Biswas, 2007).

Stock price or stock return volatility refers to a drastic change (increase or decrease) in value by a given stock within a given period. The drastic change in stock price usually occurs due to an imbalance in trade volume for a particular stock. For example, a stock price will go up sharply when the stock is traded in large quantities (Mohamad and M.D Nassir, 1995), but if short selling is practiced

in sudden, the stock price then will experience a sharp decrease. On the other hand, stocks that are traded at very low volumes are subject to high volatility compared to those with higher average volumes.

There is an old Wall Street adage says "It takes volume to make prices move". Karpoff (1987) explained this adage as follows; (1) movement of volume would cause the changes in price; (2) volume is relatively heavy in bull market and light in bear market, and; (3) changes in price would cause the movement of volume. Most market practitioners and academics harmony that volume has causal effect on price and *vice versa* regardless in developed or less developed market.

In order to understand the market interactions, one must has knowledge on price-volume relationship, thus, Karpoff (1987) listed four significances of studying the price-volume relationship. First, price-volume relationship provides insight into the structure of financial markets. Second, it is crucial for event studies' researchers to draw inferences because they use a combination of price and volume data. Third, it is critical to argue over the empirical distribution or speculative prices when using price-volume relation. Lastly, price-volume relationship contributes significant implications for research into futures markets.

The first point highlighted by Karpoff (1987) implies that the price-volume relationship depends on the flow of rate of information to the market (Mohamad and M.D Nassir, 1995; Hsieh, 2014), dissemination of information, to which extent market prices convey the information, the size of the market, and the existence of short sales constraints. The arrival of good news logically will

increase the value of stock return and trading volume and on the other hand, bad news will react in contradict manner towards stock return and trading volume.

1.1 Background of Study

Analysis of market interactions particularly considering these two fundamental variables; stock price and trading volume. Stock price and trading volume are intensively used in price-volume relationship analysis and found to be correlated in many literatures (Ying, 1966; Crouch 1970(a), 1970(b); Westerfield 1977; Tauchen and Pitts, 1983; Chen and Zhou, 2001; Sabri, 2008, Al-Jafari and Tliti, 2013).

Simply put, trading volume can be defined as the number of shares transacted for a particular time period (Chen and Zhou, 2001) and believed to has predictive power for stock return volatility regardless of how volatility is being measured (Léon, 2007). Market practitioners and academics use trading volume as a technical analysis indicator in measuring the worth of market move as trading volume contains useful information about stock behavior (Hsieh, 2014; Al-Samman and Al-Jafari, 2015). Theoretically, market participants pay attention to trading volume on two conditions concerning on liquidity issues. First, illiquid market is subject to low trading volume that correlating with high stock price volatility. Second, liquid market is corresponding with low stock price volatility and high trading volume.

Stock return in simple term is interpreted as the gain or loss of shares obtained in a particular time period in term of capital gain or dividend considering the type of

an investment involved. Stock return is actually the reflection of investors' expectation on the future performance of a particular firm. Investors tend to adapt their expectations during the arrival of new information causing the stock return to move.

Meanwhile, volatility is described as the amount of uncertainty or risk about the size of variations in value of shares. It is one of the important parts in financial market developments providing an important input for portfolio management, option pricing and market regulations (Poon and Granger, 2003) and it is also unfavorably influence the operational of financial system and economic performance. Generally, higher return investment attracts investors to invest and increase the capital flow of the company, but risky investment that has higher volatile return would become less attractive to investors (Attari et al., 2012).

In relation to this study, efficient market hypothesis (EMH) suggests that current stock price reflects all security market information, publicly and privately thus, investigating the relationship between volume and return or return volatility will not help investors to obtain abnormal rate of return (Fama,1970). There are three conditions of market to be efficient proposed by EMH; (1) weak-form; (2); semi-strong-form, and; (3) strong-form. In weak-form efficiency, future stock prices past cannot be predicted using past information, meanwhile in semi-strong-form efficiency future stock prices reflect upon publicly available information and in strong-form efficiency market, stock prices adjust to the arrival of both public and private information.

Since the studies on such relation in Malaysian stock market are relatively small, this study is the first of its kind that examines the volume and return relationship in the market. After more than one decade of trading activities took place in Malaysian stock market, there is a possible chance to put into practices an investigation on the relationship between these fundamental financial variables. This study, therefore, empirically investigates the trading volume and stock return relationship in Malaysian ACE market specifically the causal effect (relationship) between the variables.

Causality test is important for better understanding of the stock markets microstructure and its implications on other markets (Darwish, 2012). Previous research in Malaysian context such as McGowan Jr. and Junaina (2011) and Lau and Go (2012) test the causal effect on futures market and found out the evidence of causality relationship from trading volume to return. Furthermore, this study explores how trading volume information is useful in making the movement of stock return and *vice versa* by applying Granger causality tests. For the purpose of this study, the average monthly data of closing stock price and traded volume for 77 individual stocks listed in Malaysian ACE market starting from August, 2009 to December, 2015 was taken.

In general, this study fills the gap created by the scarcity of previous studies that investigated the return-volume relationship on emerging stock markets such as Malaysian stock market. This study mainly has three goals. Firstly, this study investigates the nature relationship between trading volume and stock return in Malaysian ACE market. Secondly, by following Mohamad and M.D Nassir

(1995) and Al-Samman and Al-Jafari (2015) this study concludes whether the relationship between trading volume and stock return is consistent with the weak-form of the efficient market hypothesis. Efficient weak-form market hypothesis proposes that the market is efficient where past information on stock price and trading volume cannot be used in predicting future stock price thus there is no form of technical analysis can be effectively utilized to assist investors in making trading decisions. This study attempts to observe all listed companies in Malaysian ACE market but only 77 companies are selected due to some data constraint. The differences in characteristic in this stock market provide different insight on how stock return will react towards the changes of trading volume and *vice versa*. Such study has not been done in Malaysia so far.

Malaysian ACE market was formerly known as MESDAQ, it is where new, young, and potential high growth companies get listed. As at December 2015, there is a total of 109 companies listed in the market. Most of the stocks in the market are considered as *penny stock* because they are traded below MYR 1 nevertheless, market capitalization of Malaysian ACE market contributes more than thirty percent of total market capitalization of Malaysian stock market proving that Malaysian ACE market gives significant impact as a retail market for risk taker investors.

1.2 Problem Statement

Return and volume are two major pillars around which the entire stock market revolves. The statement can be interpreted as return is the evaluation of new information while volume is an indicator to which the investors disagree about this information. This is in line with Karpoff (1987) who argues that "It takes volume to make prices moves", his argument provides a comprehensive review of theoretical and empirical work together with reasons for the importance of understanding this relationship.

In relation to that, a number of studies have documented empirical and theoretical formation on the relationship between trading volume and stock return such as Ying (1966); Crouch (1970); Westerfield (1977); Rogalski (1978); Brailsford (1996); Tauchen and Pitts (1983); Karpoff (1987); Chen, Firth and Rui (2001); Lee and Rui (2002); Kamath and Wang (2006); Sabri (2008); Pathirawasam (2011); Darwish (2012) and Al-Jafari and Tliti (2013). All abovementioned studies indicated significant relationship (contemporaneous as well as dynamic) between stock return and trading volume and *vice versa*. Thereby a huge amount of evidences from prior literatures on the relationship shed light for more new researches to be taken in this area. However, the relationship is still indefinite particularly in emerging markets due to some drawbacks. The drawbacks actually could be the factor of analysis and initiate for an innovative study.

Emerging stock market like Malaysia is subject to high risk, highly expectable and high volatility compared to the developed markets (Girard and Biswas, 2007).

With a fair amount of empirical evidence on the trading volume and stock return relationship reported for developed countries, very few empirical studies have been documented from emerging markets and particularly from Malaysian stock market.

It has been observed that there are only few studies in Malaysian context that looking at the stock price/return-volume relationship. Given mixed empirical results between stock price/ return and trading volume in Malaysian context are as follows; Mohamad and M.D Nassir, (1995); Ahmed, Hassan and M.D Nassir, (2005); Shaari Mohd Nor et al., (2010); McGowan Jr. and Junaina, (2011); and Lau and Go, (2012),. Deeper empirical and dynamical research from other perspective of Malaysian stock market is needed for better understanding of the stock price/return and volume relationship.

Apart from its controversial listing issues, Malaysian ACE market is where small-cap or new start-up companies that are looking for capital boost to list their companies public. Most of them are usually do not have large and high amount of capital compared to the companies in Main market but probably have strong product and service portfolio. Thus, this study analyses the relationship of trading volume and stock return in the small-cap companies listed in the Malaysian ACE market. Is the relationship would be consistent with other emerging stock markets that portrays a total contradict evidence that contributes to the literatures? In order to do so, this study takes into account the Malaysian ACE market players in order to fill the scarcity of prior studies. Thus, the aim of this study is to investigate the

relationship between trading volume and stock return in Malaysian ACE market by using monthly data starting from August, 2009 to December, 2015.

1.3 Research Questions

Three research questions are developed in analyzing the relationship of trading volume and stock return in Malaysian ACE market. The research questions are as follows;

(1) Is there any relationship between trading volume and stock return/stock return volatility in Malaysian ACE market?

(2) Does trading volume and stock return in Malaysian ACE market has causal relationship?

(3) Is Malaysian ACE market is consistent with the weak-form of efficient market hypothesis (EMH)?

1.4 Research Objectives

This study comes in three-fold objectives.

(1) To investigate the relationship between trading volume and stock return/stock return volatility in Malaysian ACE market.

(2) To test the causal effect between trading volume and stock return in Malaysian ACE market.

(3) To conclude whether the relationship of trading volume and stock return in Malaysian ACE market is consistent with the weak-form of the efficient market hypothesis.

1.5 Significance of Study

While the empirical studies of stock price/return-volume relationship are plentiful for developed stock markets, there is relatively less empirical studies on emerging stock markets such as Malaysian stock market. Understanding this relationship will provide significant contributions for market participants, regulators as well as researchers. This study contributes in many ways notably in Malaysian stock market as this is the first attempts to test the relationship of trading volume and stock return in Malaysian ACE market. It examines the relationship by analyzing 77 listed individual stocks in Malaysian ACE market commencing from August, 2009 to December, 2015.

In general, this study fills the gap created by the scarcity of previous studies that investigated the stock price/return-volume relationship in Malaysian stock market. Only few studies documented the investigation on such relationship in Malaysian stock market and particularly focusing on futures market and others. No study has personally taken Malaysian ACE market into the investigation of stock price/return-volume relation, thus, this study examines the relationship of trading volume and stock return in Malaysian ACE market. Malaysian ACE market has been choosing in this study because of it uniquely characteristics where small-cap yet big potential growth companies are listed in the market. And also how Bursa

Malaysia plays it role in supporting Malaysian ACE market as a sponsor-driven market in order to make Bursa Malaysia becomes more attractive to investors.

Furthermore, this study utilizes econometrical techniques on the most recent data in order to derive a conclusion if there is any relationship between trading volume and stock return (Al-Jafari and Tliti, 2013) in Malaysian ACE market. In this study basic techniques such as VAR analysis and Granger causality test have been employed in order to analyze the relationship. Meanwhile the latest data were taken starting from the announcement date (August 2009) of Malaysian ACE market until December 2015.

Besides, this study also imparts inside knowledge on the relationship of trading volume and stock return to traders or investors in attracting them to invest in Malaysian ACE market as a choice of diversification in investment. Some issues on listing criteria have questioned the credibility of Malaysian ACE market as an efficient market for investors to invest. Taking an example in 2014, the fall in market capitalization amounted MYR 130 million has caused a big loss to market practitioners including the remisiers and stock brokers. Investing in this market thus become risky and less attractive for portfolio investments.

Moreover, this study essentials to the financial managers to identify factors that influencing stock pricing, because in this kind of emerging market they need to gear up the companies' policies which is in turn will improve the stability and efficiency of the market.

Last but not least, this study gives signal to economic policy makers to improve and amend the current policies. Relating to this study, Bursa Malaysia need to revise the listing requirement for companies to be listed in the Malaysian ACE market. The revamp made by Bursa Malaysia is to allow efficient access to capital and investments as well as to make Malaysian ACE market a more attractive platform for local and foreign companies. Loose practice would tear down the credibility of the market thus lead to the inefficiency of the market itself.

1.6 Scope and Limitation of Study

The scope of this study covers 77 listed companies in Malaysian ACE market. The sample period is taken from August, 2009 to December, 2015 after the announcement of the establishment of Malaysian ACE market made by Bursa Malaysia.

However, while conducting this study following drawbacks are identified thus providing a floor for researchers to fill up the drawbacks in their future researches. First, this study treats all the 77 companies and findings generally as a whole market instead of specializing them into their own sectors. This arises the query of whether the findings could hold for each sector.

Next, this study also subjects to time frame limitation as the period of study is fairly short starting from August, 2009 to December, 2015 amounting of seventy six months only. It is believed that additional time periods would strengthen the analysis (Rutledge, 1984).

Lastly, this study experienced data constraint since Bursa Malaysia reformed MESDAQ market into Malaysian ACE market in August 2009, this study failed to obtain complete data for the total of 109 companies that are listed in the market due to the unavailability data record.

1.7 Overview of Malaysian ACE Market

ACE (Access, Certainty, Efficiency) stock market was formerly known as MESDAQ (Malaysian Exchange of Securities Dealing and Automated Quotation) market/board that was launched on October 6, 1997 as a separate securities market, mostly for listing technology-based companies. The announcement of the establishment of this market on 2009 has becomes an alternative market that is devoted to emerging companies from all sectors and sizes. The listing on Malaysian ACE market is open to all companies in all business sectors without imposing conditions of record revenues, operations and profitability, while the minimum issue price of fifty cent per share was abolished. The changes made by Securities Commission (SC) and Bursa Malaysia aims to make Malaysian stock market a more attractive platform for the company from within and outside the country.

Malaysian ACE market is one way to classify the listed companies in stock market. This is because a company can list its shares on the ACE market even though the company has not been profitable. Compared to main market where any companies who want to list their shares must have a track record of profitability at least three to five years. A company that has been listed in the Malaysian ACE

market without a proven profitable record is associated with high risk. Thus, investors have to evaluate very carefully before investing in the Malaysian ACE market.

Most listed companies in the Malaysian ACE market are newly-growing company that attempt to get capital from investors. Listing will allow them to acquire the capital. Investors can also involve together with the company's business in the early growth of the company. There are several companies in the Malaysian ACE market increased remarkably well. In fact, they have been listed in the main market for their ability to generate profits.

In the past, the listing in the Malaysian ACE market must first get approval from the Securities Commission in order to evaluate the business prospects. But then, the new rules enforcement to accelerate listing was diminished the Securities Commission authority to assess the prospects of the company. However, the investment bank will provide "green light" whether the company can be listed or not. Therefore, retail investors who intend to invest in companies that are listed on the Malaysian ACE market must understand the activities and prospects of the company's business.

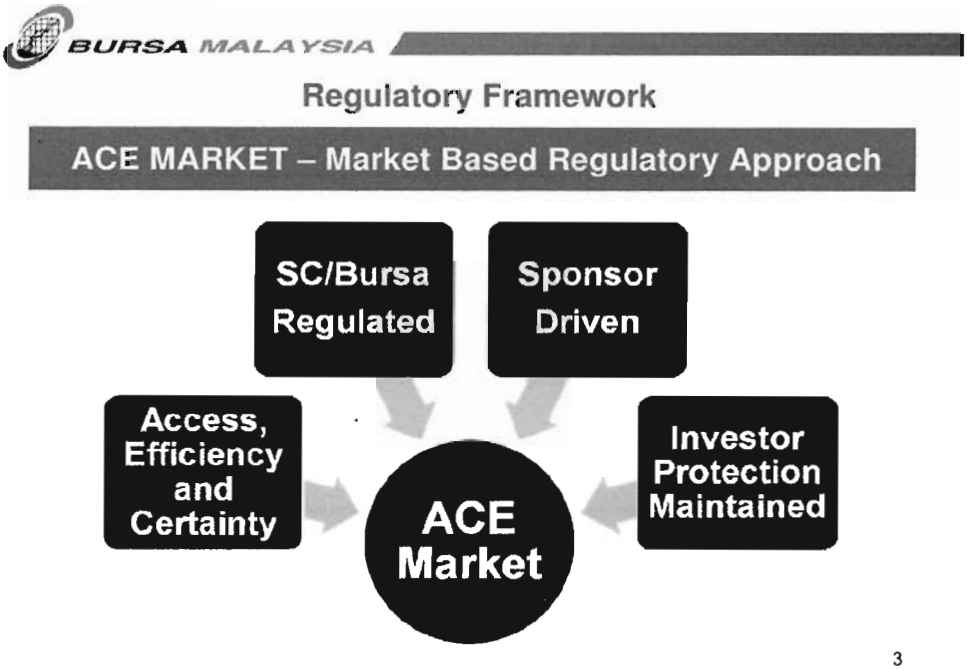

Figure 1.1:
Regulatory Framework of Malaysian ACE Market
Source: www.bursamalaysia.com

Figure 1.1 above shows the Regulatory Framework of Malaysian ACE market. The formation of the framework is mainly to provide an opportunity to companies and entrepreneurs to get listed easier with better transparency. It is associates with the objective of the establishment of Malaysian ACE market whereby the whole idea is to encourage and support innovative companies and products and at the same time to push for development and growth of the market. Therefore, there is an alternative to investors to start investing in Malaysian ACE market as a new platform of investment whereby most of the companies in the market is from SMEs (small medium enterprises) company.

1.8 Listing Requirement for Malaysian ACE Market

New, emergent and small companies usually choose to go public due to some reasons. They usually see this as an alternative source of financing (by offering IPOs) instead of taking option such as business loan from banks, which burden them with high cost and fixed terms of repayment. Moreover, they could obtain capital from new shareholders at minimal or no cost at all which contribute in cutting the administrative cost. Besides, go public could enhance image and status of the company as they are viewed to be more prestigious, establish and financially sustainable and at the same time gaining trust from the investors.

On top of that, it also enhanced the liquidity of the company since quoted securities are easily tradable & potentially trades at premium and also the quoted securities tend to be accepted by lenders as collateral. Last but not least the company is able to attract and retain quality employees and professionals since the company already has status and good image.

Thus, the establishment of Malaysian ACE market is to give opportunity to those big potential companies to grow further. According to Bursa Malaysia chief regulatory officer, Selvarany Rasiah, Bursa Malaysia enhances Malaysian ACE market rules in order to give clearer listing requirement (The Star, 2015, July 14). She also mentioned that unprofitable or low profitability and productivity companies still have chance to get listed if they full filled certain qualitative characteristics provided by Bursa Malaysia. Malaysian ACE market is seen as a potential investment and listing platform for both the investors and players, thus

the idea of this exercise was taken in order to provide greater transparency of admission criteria as well as to enrich the attractiveness and competitiveness of the Malaysian ACE market.

Figure 1.2:
Listing Criteria in Malaysian Stock Market
Source: www.smeinfo.com.my

The flow chart of listing criteria in Malaysian stock market is shown in the above Figure 1.2, meanwhile the details of the listing criteria can be referred to Appendix 1. Since this study solely considers on the Malaysian ACE market, thus only listing requirement related to the market is discussed further.

1.9 Organization of Thesis

This paper is divided into five main chapters. Chapter One sheds light on the whole idea of this study meanwhile Chapter Two reviews past literatures on the stock price/return-volume relationship in general and in Malaysian case. Chapter Three explains the research methodology proposed for this study. Chapter Four discusses the findings obtained from the analysis in previous chapter and lastly Chapter Five summarizes and concludes the major findings and suggests for recommendations for future studies.

1.10 Conclusion

Chapter One provides a clear picture on what is this study is all about comprising of the objective and the significance of the study. It is noted that no such study has been done before in exploring the relationship between trading volume and stock return in Malaysian ACE market.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this chapter, past literatures on trading volume and stock return/stock return volatility relationship is reviewed. It includes the relationship on the developed market versus emerging market, and also the relationship on other stock market such as futures market. For the purpose of finding the gap, this study also reviewed such relationship in the Malaysian context.

2.1 Research on Price/Return-Volume-Volatility Relationship: Prior Research and Theoretical Aspects

Trading volume and stock price/return relationship has received a remarkably huge attention by market practitioners and academics. From a theoretical and practical standpoint, trading volume and stock return are jointly and simultaneously determined by the same market dynamics, and also inextricably linked. Therefore, voluminous numbers of studies have been investigated the relationship in various perspectives and a range of analytical techniques has been employed.

Academicians unified that Granger and Morgenstern (1963) was the pioneer in developing and commencing the theoretical and model of price-volume

relationship. The history started back in 1963 when Granger and Morgenstern applied Spectral analysis to discover the relationship between price indexes and aggregate exchange trading volume on New York Stock Exchange. They used weekly and daily transaction data for the period of 1939 until 1961. From the analysis, they perceived no relation between the movement of price and volume which elaborated in details that the amount of traded stock is uncorrelated with the movement in stock price for at least in the short run (weekly and daily).

Later on, Godfrey, Granger and Morgenstern (1964) have extended the previous study by Granger and Morgenstern (1963) using the same model and they concluded that the changes in observed stock price and transacted volume are not correlated as well which in line with their previous findings.

Contrary results were discovered later by subsequent study by Ying (1966) who also employed Spectral analysis on Standard and Poor's 500 composite stocks daily closing price indexes and daily sales volume on New York Stock Exchange from January, 1957 to December, 1962. The study perceived a strong linear connection between the changes in price and volume which contributes new impact to literatures.

On the other hand, Westerfield (1977) also reached to the same conclusion that absolute value of price change is positively and linearly correlated to volume (positive correlation). He examined the distribution of stock prices changes using subordinated model of security returns on the New York Stock Exchange (NYSE) from the period of January, 1968 to September, 1969.

Rogalski (1978) examined the correlation between security prices and volume on stock and warrant data. ARMA model has been applied to test the correlation and it resulted that current price change and volume are jointly determined, his study showed that prices and volume are following the Granger criteria whereby volume causes price to change and price causes volume to change.

Tauchen and Pitts (1983) ran a research on speculative market in order to see the relationship between the variability of 90-day T-bills futures market and trading volume of Chicago Merchantile Exchange started on January 6, 1976 and ended on June 30, 1979. They derived into three conclusion whereby the dual probability distribution of price change and volume is possible to derive on speculative market. Second, price variability-volume relationship could be misled if the trading volume is strongly trended over the sample period. Third, prediction about market expansion which incorporate noise private information is valid.

Concerning on the commodity price variability and trading volume in futures market, Rutledge (1984) used Granger-Sims procedure in examining day-to-day variations of trading volume and daily price change on Chicago Board of Trade and he found significant correlations between the two variables. His findings common with Jain and Joh (1986), Grammatikos and Saunders (1986), and Admati and Pfleiderer (1988).

By using the Granger causality test to empirically inspect the relationship between total lagged price changes and volume in equity markets, Smirlock and Starks

(1985) perceived a strong positive lagged relation between absolute price changes and volume.

Karpoff (1987) reviewed past and recent research on the asymmetric price-volume relation in financial market. His study gave four contribution to the literature which were; (1) volume is positively related to the changes in price; (2) volume is completely positive linked to the changes in price *per se* in equity markets; (3) price-volume relation model is proposed, and; (4) there are several suggestions for future research.

Brailsford (1996) conducted a study on asymmetric relation and mixture of distribution hypothesis between trading volume stock market volatility on Australian market for the period of April 24, 1989 to December 31, 1993. Using GARCH model, he found strong support on the asymmetric relation model.

Investigating the emerging market of Latin America, Saatcioglu and Starks (1998) reached to a different significant point that emerging market would not present the similar price-volume relation with developed market due to different institutions and information flows. Adopting VAR analysis on monthly data of six Latin American stock market, they found trading volume changes lead to price changes (unidirectional relationship) for all markets except for Mexican market due to 1994 Peso Crisis.

As for China stock market, Lee and Rui (2000) utilized VAR analysis in order to foresee the contemporaneous as well as the causal relationship between trading volume, stock returns and returns volatility in four Chinese stock exchanges. The

segregation of their findings is as follows; (1) trading volume in US and Hong Kong market did not Granger-cause either return or volatility in China stock market; (2) three market exhibited positive response between trading volume and stock return; (3) a causal relationship between New York, Tokyo and London markets variables.

A study by Chen and Zhou (2001) detected three important issues on Chinese stock market comprises of the behavior of stock returns, volatility, and trading volume, the contemporaneous and causality of the three variables at the Shanghai and Shenzen Stock Exchange, and lastly is the linkage between these two stock markets. They applied monthly time series of stock index returns, returns volatility, and trading volume volatility as well as daily stock indices and trading volume for Shanghai stock exchange and Shenzen stock exchange. From VAR analysis, they discovered a strong autocorrelation, a strong positive contemporaneous relationship and a positive simultaneous relationship between returns and volume volatility.

A positive correlation between trading volume and stock price change were found by Chen, Firth, and Rui (2001) who examined the dynamic relation between stock returns, trading volume and volatility of stock indexes for nine national markets for the period of 1973 to 2000.They also found that returns Granger-cause volume and volume Granger-cause returns for some countries indicating the existence of bidirectional causal relationship. Volatility also persistence after contemporaneous and lagged volume effects being incorporated.

Later on, Lee and Rui (2002) investigated the dynamic relation between stock returns, trading volume and stock return volatility for New York, Tokyo and London stock markets by using VAR analysis. From the analysis, they revealed that none of the three markets indicated Granger-cause effect between trading volume and stock returns. But they found trading volume and stock return volatility are correlated in positive way in three stock markets.

Mestel, Gurgul and Majdosz (2003) utilized daily market price and trading volume series for 31 listed companies in Austrian stock market starting from June, 2000 to April, 2003 in order to investigate the empirical relationship between stock returns, returns volatility and trading volume. Driven by GARCH model, they imposed Granger causality test and found a weak contemporaneous and dynamic relationship between stock returns and trading volume. In contrast, they found a strong contemporaneous relationship between return volatility and trading volume.

Meanwhile, Al-Saad (2004) examined asymmetrical relationship between trading volume and price in Kuwaiti stock market for 10 individual stocks starting from October, 1992 to September, 1998. The individual stocks were adopted from different sectors and different size (small and large market capitalization). He found price changes and volume specified a strong asymmetrical relationship irrespective of how volume is measured.

A slight different study on volatility-volume relationship based on trade size and trade frequency was took place by Song, Tan and Wu (2005) where they

discovered that number of trades explains volume-volatility relationship better than the size of trades.

There is also another study on emerging Brazilian (Bovespa) stock market by De Madeiros and Van Doornik (2006) who attempted to evaluate the empirical relationship between stock returns, return volatility and trading volume for 57 firms in that particular stock market. Inspired by Mestel et al (2003), the researchers not only seek for contemporaneous but as well as dynamic relation between the variables. From the analysis, they initiated a strong contemporaneous and dynamic relationship between stock returns, return volatility and trading volume that implied *inter alia* which means knowledge of one variable may improve other variables forecast.

Kamath and Wang (2006) examined the relationship of daily rate of return and the trading volume in six Asian equity markets from January, 2003 to October, 2005 using Granger causality test. The results of the Granger causality tests indicated an absence of causality in either direction in those four markets.

Moosa and Jader (2006) analyzed asymmetry relationship between price and volume by using cross-sectional data for more than 100 companies on Kuwait Stock Exchange over 11 consecutive weeks. According to the study, asymmetry relationship may arise based on the principles of behavioral finance where some findings showed evidence of asymmetry relation between price and volume. It was explained in terms of the difference of in the behavior of bulls and bears and

the difference of expectation formation in rising and declining markets, both of which can be shown to produce more trading in a bear market.

Ajayi, Mehdian and Mougoue (2006) employed linear and non-linear Granger causality tests on daily closing broad market indexes and trading volume from January 4, 1982 to February 12, 1996 on 10 European stock markets. Significant unidirectional causal relations between stock return and trading volume are reported in six of the stock markets by using traditional linear test. But by using non-linear test nine of the stock markets showed significant unidirectional relations.

Meanwhile in Southeast Asian markets, Pisedtasalasai and Gunasekarage (2007) ran a causality (dynamic) test among trading volume, returns, and return volatility for Indonesia, Malaysia, the Philippines, Singapore, and Thailand equity markets of. The test detected a strong asymmetric relationship between stock returns and trading volume thus, they conclude that return is essential in foretelling its future dynamics as well as trading volume is important in forecasting its future values.

On the other hand, Girard and Biswas (2007) used daily prices and volume transactions in 49 equity markets; 22 in developed market and 27 in emerging markets in order to make a comparison on the volume-volatility relation of developed and emerging markets as well as to test the GARCH effects on such relation. Emerging markets exhibited superior response to large information shock and more sensitive towards unexpected volume. In addition, negative relation between volume-volatility is found in several emerging market which associated

with the inefficiency of the markets. And also volatility is persistently decreased when volume is decomposed into expected and unexpected component.

By using daily data on stock prices and trading volume over the period January 2, 2000 until July 29, 2005 for the regional stock exchange of the West African Economic and Monetary Union or BVRM, Léon (2007) discovered that volume has a forecasting influence for stock returns volatility regardless of the measurement of volatility used. The findings proved the inefficiency of BVRM as past trading volume information can be used to forecast current prices.

Sabri (2008) interested to examine the influence of trading volume and stock price volatility in Arab economy has conducted a study on eight Arab stock markets using monthly data from 1994 to 2006. From the analysis, both trading volume and stock price volatility increased with the concern of a recent phenomenon in the majority of the Arab stock markets. On the other hand, the volume-stock price activities are found to be significantly assimilated for all selected markets. Finally, the correlation between volume and price movement is higher in the oil Arab states than the non-oil Arab states stock markets.

A details study on the nature of price and trading volume relationship was took place by Kumar, Singh and Pandey (2009) who investigate the contemporaneous, asymmetric and dynamic relationship for 51 Indian stocks. They adopted few techniques such as Granger causality, variance decomposition (VD), impulse response function (IRF), VAR analysis and Mixture of Distribution Hypothesis (MDH). The result supported a positive and asymmetry as well as bi-directional

relation between returns and volume. In contrast, there was a weak support for dynamic relation between returns and volume. Meanwhile their MDH results were mixed.

On the other hand, a slightly different study by Eaves and Valero (2009) who used continuous auctions to find prices. The results plotted a u-shaped graph for intraday volume meanwhile a downward sloping graph for intraday volatility. It indicated the existing of positive association between contemporaneous volume and volatility in Tokyo Grain Exchange (TGE).

Price-volume relationship in emerging markets is always been given an ample attention from academicians because the relationship in developed markets is well researched. For example Mubarik and Javid (2009) examined the dynamic relationship between returns, volatility and volume in market level as well as firm level in Karachi Stock Exchange for the period of July, 1998 to October 2008. Their findings suggested that pervious day returns and volume have explanatory power in explaining current market return. There was also response relationship between return and volume however in individual stock indicated volume is associated with stronger return.

On the other side, Mahajan and Singh (2009) verified the empirical relationship between return, volatility and volume dynamic using daily data of the Sensitive Index (SENSEX) from October 1996 until March 2006 in Indian stock market. Their empirical result provided return, volatility and volume are positive and significant correlated.

Girard and Omran (2009) revealed that volatility is persistently decreased when volume is broken down into expected and unexpected components. They obtained such findings when observing the relationship between daily information flow (trading volume) and the volatility of 79 traded companies in Cairo and Alexandria Stock Exchange (CASE) using GARCH model.

Pathirawasam (2011) evaluated the empirical relationship between trading volume and stock returns in Colombo Stock Exchange (CSE) for the year 2000 to 2008. This study found changes in trading volume is contemporary positively related with stock returns but in contrast, changes in past period trading volume and current period stock returns is negatively related.

On the other hand, Tripathy (2011) investigated the relationship between trading volume and stock returns in Indian stock market. He adopted Bivariate Regression model, VECM, VAR analysis, IRF and Johansen's cointegration test so as to examine the relationship. The results proved the presence of significant contemporaneous relationship between return volatility and trading volume thus, trading volume is associated with an increase in return volatility denoting an asymmetrical relationship between the variables.

In addition, Habib (2011) conducted a study to test the volume-volatility contemporaneous relationship using OLS and GARCH models as well as to examine the dynamic/causal relationship of volume and stock returns on Egyptian Securities Exchange (ESE). The main finding extracted from the analysis indicated that the lagged stock trading has little role to play in forecasting the

future return volatility. There was also no relation between volume and first autocorrelation of stock return and Granger causality test proved a bidirectional causal relation between volume and volatility is existed.

Investigating stock volatility-volume relationship for the pre and post period of Financial Crisis 1997 on Korean stock market by Karanasos and Kyrtsou (2011) revealed some significance points. They intended to see how the crisis effects the relation between volume and volatility. First, endogenous heteroscedasticity is interpreted meanwhile the volatility in returns is due to the heterogeneity of expectations about future prices and dividends. Second, one should consider the joint dynamic of stock returns volatility and volume instead of only focus on univariate dynamic of stock returns. Third, no causal relationship between returns and volume was detected before the 1997 crisis, but after the crisis the positive causal relationship begin to exist.

An innovative study by Oral (2012) who imported heavy tailed innovations in examining the relationship between volatility of ISE National-100 returns and the trading volume by using the GARCH and Threshold GARCH (TGARCH) models. From the analysis, trading volume is significantly contributes to the volatility, indicates strong leverage effect on volatility.

Attari et al. (2012) imposed weekly data from January, 2000 to March, 2012 of Karachi Stock Exchange (KSE-100 index) in order to test dynamic relationship between stock volatility and trading volume. GARCH test found significant positive relationship between returns and volume that depicting the rising in

volume correlated with the rising in market returns or *vice versa*. There was also the evidence of bi-directional granger causality between returns and volume but no evidence of causal relationship between changes in the aforesaid variables.

On the other side, Chandra (2012) performed a study to measure the cause and effect of causality between foreign institutional investment (FII) and S&P CNX Nifty returns in Indian stock market. He used daily data and applied the bivariate Granger-causality framework to measure how past FII flows relate to past and future returns. He found that past returns imposed the most impact on buy and sell of equities by FIIs and also there was a bidirectional causality evidence between FII flows and returns.

Darwish (2012) observed weekly data of trading volume and stock returns in Palestine Stock Exchange over the period of October 2000 to August 2010. He adopted GARCH (1,1) model and found a significant contemporaneous relationship between the two variables, indicated that future stock returns are affected by information of volume. Moreover, the bidirectional Granger causality evidence also found between volume and returns regardless how volume is measured.

By using daily market price index and trading volume and bivariate GJR-GARCH model Chuang, Liu, and Susmel (2012) investigated the contemporaneous and causal relationship between trading volume and returns (returns volatility) in ten Asian stock market simultaneously. They suggested the one-step estimation procedure which is consistent with finance theory and they revealed

contemporaneous relationship between trading volume and returns for all sample of the ten stock markets. Furthermore, a positive bidirectional causality was found between returns and trading volume in Taiwan and China stock market. They also detected a positive contemporaneous relation between trading volume and volatility for all stock markets except for Japan and Taiwan. Lastly there was also a significant asymmetry relation for all stock markets aforesaid.

Choi, Jiang, Kang and Yoon (2012) determined the relationship between trading volume and asymmetric volatility in Korean stock market over the period of January 2000 to December 2010. They measured the relation between the variables using GJR-GARCH and exponential GARCH (EGARCH) models and discovered a positive relationship between trading volume and volatility. Their findings suggested that the flow of market information is influenced by trading volume that supported the Mixture of Distribution Hypothesis (MDH).

Meanwhile, McGowan and Junaina (2012) studied the changes in Russian Trading System Index (RTSI) and trading volume from September 4, 1995 until November 8, 2011. The authors reported a statistically significant relation between the changes in RTSI and the changes in trading volume. Therefore, they concluded that the impact of volume changes on prices changes are persistent.

A study on returns-volume relation was conducted in the banking sector of Amman Stock Exchange (ASE). The authors, Al-Jafari and Tliti (2013) attempted to see how past values of one variable can improve the prediction of current and future values of another. No significant relationship between stock returns and

trading volume showed in empirical test but a there was a significant relationship between returns volatility and trading volume. Furthermore stock returns is co-integrated with trading volume in the long run equilibrium relationship (VECM). So they concluded changes in any direction of stock prices has explanatory power of upcoming trading activities. In the same context, Ananzeh, Jdaitawi and Al-Jayousi (2013) studied the empirical relationship between trading volume and return volatility for 27 individual stocks for the period of 2002 to 2012 in Amman Stock Exchange found a significant evidence is showed between trading volume and return volatility which against the MDH theories.

According to Dan, Yuan and Zhong (2013), the used of Quantile regression provides a fuller picture for the dynamic relationship among variables and helps to understand the microstructure of financial markets as well as gives implication to investors. The authors tested the dynamic relationship between return, volatility and trading volume in Chinese stock market. Significant positive and asymmetric relationship between stock returns and trading volume are existed indicating a rise or fall in volume is associated with a rise or fall in price. Besides, volatility and trading are also positively correlated implying high price volatility associated with large trading volume.

Price-volume behavior of 13 selected world's financial companies within after crisis period from 2010 to 2013 was analyzed by Heryán (2013). He intended to examine if the price volatility differs within the both samples; below and above its average trading volume. None strong significant relationship are detected between trading volume and price volatility.

Hsieh (2014) conducted a test in order to explore how information about trading volume is useful in estimating future stock return and return volatility. Thus, he has chosen daily data from seven Asian listed real estate markets; Hong Kong, Japan, Malaysia, Philippines, Singapore, Taiwan and Thailand to investigate the contemporaneous and causal relationships between stock return, return volatility and trading volume within and across these countries' markets. Contemporaneous relations exhibited a positive and strongly significant relationship in all seven markets. A little contradict evidence reported for causality relations whereby volume Granger-causes stock returns in much lesser extent than stock returns Granger-causes volume.

Additionally, Kalu O. and Chinwe (2014) explored the nature of relationship between stock returns volatility and trading volume in Nigeria using daily All-Share Index and closing trading volume of the Nigerian Stock Exchange for the period of January, 2000 to June, 2011. Analysis from GRACH (1,1) model showed that past volatility can explain the current volatility (strongly persistent) meanwhile GARCH-X (1,1) model reported a positive and Al-Samman and Al-Jafari (2015) discovered trading volume and stock return volatility relationship for 17 industrial firms listed on Muscat securities market. The study reported a significant linearly correlation between return volatility and trading volume. In addition to that, VAR analysis also endorsed the positive effect between trading volume and stock returns. Moreover, it is proven that trading volume Granger-cause stock returns using the pairwise Granger causality test.

Sun and Li (2015) put together the three finance variables; stock return, volatility and trading volume in a simultaneous equation model in order to examine the dynamic effects. These three variables are found to be interrelated. However, only volatility has positive impact contemporaneous relationship on returns. The authors also tested the variables in single equation model and found out that; (1) return and volatility indicated negative contemporary relation; (2) volatility has negative contemporaneous effect with return but has positive contemporaneous effect with volume, and; (3) volume perceived positive contemporaneous relation with volatility.

More recent, an analysis on empirical relationship between stock return and trading volume based on stock market cycles by using daily data for Jakarta Composite Index (JCI) closing price and trading volume from 2010 to 2014 was performed by Amanda, Eva and Mamduch (2016). Before they analyze the contemporaneous and dynamic relations between stock return and trading volume, they previously identify the bull and bear phases. Their findings are as follows; (1) a positive contemporaneous return–volume relationship in both bull and bear markets is existed (significant in bull markets only); (2) no evidence of asymmetry in contemporaneous relationship is found, and; (3) positive unidirectional causality relationship from stock return to trading volume is reported.

From the above past literatures, it can be concluded that price/return-volume-volatility relationships empirically existedbut vary interpretations are needed due to the broader range of institutional, organizational, structural, information flows

and timeline factors (Mohamad and M.D Nassir, 1995; Saatcioglu and Starks, 1998; Hseih, 2014).

2.2 Research on Price/Return-Volume-Volatility Relationship: Prior Research in Malaysian Context

Relationships between stock price/return, trading volume and volatility have been the subject of interests to financial academics and practitioners because of these three fundamental variables are very crucial in analysis of market interactions as suggested by Karpof (1987) that study of the price-volume relationship provides awareness into the organization of financial markets regarding the information flow process within the market specifically. In a small emerging market such as Malaysia, few studies have documented important empirical evidence on such relations.

In 1995, Mohamad and M.D Nassir ran a study to provide evidence on the relationship between changes in price and trading volume of firms listed in Kuala Lumpur Stock Exchange for the period of January, 1985 to December, 1992. They discovered that price change has strong relationship and positive correlation with trading volume. Mohamad and M.D Nassir (1995) found price changes cause volume changes but not *vice versa* and price volatility is persistently high due to large amount of volume traded. This support that KLSE is a weak-form efficient market.

A study by Ahmed, Hassan and M.D Nassir (2005) examined the volatility of returns by considering volume as a mixing variable on Malaysian Stock Exchange

during the period of January 2, 1990 to December 26, 2000. Their findings presented that GARCH (1,1) model described the best return volatility where current volatility can be explained by past volatility. On the other hand, after adding in volume as an explanatory variable in GARCH model, the result is consistent with few past studies that the persistence in volatility remains in return series even after volume is included in the model as an explanatory variable.

Shaari Mohd Nor et al (2010) investigated the dynamic relation between return, volatility and trading volume on Malaysian Stock Exchange. Empirical data used in this study consisted of the daily Kuala Lumpur Composite Index (KLCI) prices and trading volume during the period January, 1999 to September, 2007. They utilized several techniques such as Granger causality test, VAR analysis, and GARCH model and. The authors reported the presence of long memory volatility with leverage effect in the KLCI and only a unidirectional causality from volume to return and volume to volatility which is not enough to support the sequential arrival of information hypothesis (SIAH). It indicated that return has stronger role than volume in explaining volatility.

On the other side McGowan Jr. and Junaina (2011) analyzed the causality relationship between price index and trading volume for spot and next month contracts in the Malaysian stock index futures market. The study used daily data of the stock index futures (FKLI) closing price and the daily data of the stock index futures (FKLI) trading volume from December 15, 1995 to December 31, 2003. The data is divided into four detail sub-periods in order to analyze the variation in activity especially due to the 1997-1998 Asian financial crisis.

Evidence for statistically significant Granger causality test is reported for sub-period 2, during crisis period, for Spot Month Contract from volume to price. The results of VECM also showed the relationship from volume to price is statistically significant in all sub periods for both spot and next month contracts.

Last but not least, Lau and Go (2012) explored the dynamic causality between returns and trading volumes in Kuala Lumpur Options and Financial Futures Exchange (KLOFFE) futures based on the framework of AR-GARCH model. They found causal effect in mean from lag one of trading volume to return implying that significant shift in past volume may result in positive or negative shift of current price. Moreover, interaction between price and volume does not rely on the presence of information spillover because dependence causality in mean variance from volume to return has disappeared.

2.3 Conclusion

Voluminous number of studies have been documented on the relationship between trading volume and stock price/return and a large range of empirical findings also have been reported, showing that the evidence on this relationship is crucial to determine the reaction of stock markets. Market practitioners mainly would give attention to this relationship as understanding this relationship would help them in many ways.

Since empirical studies based on the stock return-volume relationship on Malaysian stock market are relatively small, this study is the first of its kind on examining the price-volume-volatility relationship on Malaysian stock market.

Trading activities have been took place in more than one decade in Malaysian stock market, consequently there is a huge potential to put into practice an empirical investigation on such relation. Therefore, this study investigates the nature of the return-volume relationship in ACE market Malaysia for the period of August, 2009 to December, 2015.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter discusses the process of data collection and methodology or technique used to analyze the dataset. In order to achieve the objectives of the study, this study adopts Vector Autoregressive (VAR) model and Granger Causality Test.

3.1 Measurement of Variable

The variables use in this study is categorized into two types of variables which are dependent variable (DV) and independent variable (IV). This study attempts to investigate how trading volume and stock return react towards the changes in each variable at a given time period.

3.1.1 Dependent Variable

Since the mutual relationship is examined in this study, the average of trading volume and stock return for 77 individual companies in Malaysian ACE market is treated as the dependent variable.

3.1.2 Independent Variable

Since the mutual relationship is examined in this study, the average of stock return and trading volume for 77 individual companies in Malaysian ACE market is treated as the independent variable.

3.2 Framework and Model

This study provides two types of framework which are the theoretical and empirical framework. Theoretical framework supports the theory of a research meanwhile empirical framework acts a guideline on the methods to be used in achieving the research objectives.

3.2.1 Theoretical Framework and Model

Figure 3.1 presents the theoretical framework of the study that consists of the dependent variable and independent variable. It explains that changes in stock return (R_t) cause changes in trading volume (V_t) and *vice versa*.

Figure 3.1:
Theoretical Framework

Equation (3.1) and (3.2) show the theoretical model for the study, where, V_t and R_t are the average monthly trading volume and stock return respectively; α is a constant; β_i is the parameter, and; δ is a noise variable.

$$ln\,(V_t) = \alpha + \beta_i\, ln(R_t) + \delta_t \quad (3.1)$$

$$ln\,(R_t) = \alpha + \beta_i\, ln(V_t) + \delta_t \quad (3.2)$$

3.2.2 Empirical Framework

Figure 3.2 illustrates the empirical framework of this study. The framework is developed in order to examine if causal effect arise between trading volume and stock return in Malaysian ACE market for the given time period.

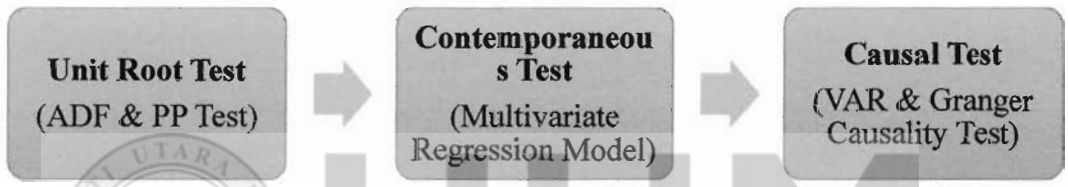

Figure 3.2:
Empirical Framework to test for Causal Relationship in Malaysian ACE Market

3.3 Hypotheses

This study tests the following hypotheses (alternative) in order to disclose the relationship between trading volume, stock return, and stock return volatility in Malaysian ACE market.

Hypothesis$_1$: There is statistical significant relationship between trading volume and stock return.

Hypothesis$_2$: There is statistical significant relationship between trading volume and stock return volatility.

Hypothesis$_3$: Stock returns Granger-cause trading volume.

Hypothesis$_4$: Trading volume Granger-cause stock return.

3.4 Data Collection Method

Data collection method describes how the data were collected and treated. For the purpose of this study, the dataset comprises of monthly closing stock price and trading volume of 77 companies listed in Malaysian ACE market starting from August, 2009 to December, 2015 which summed up a total of 5929 number of observations. The list of the 77 companies involved in this study is provided in Appendix 2.

Monthly data were choosing in this study because of the small market size, thin trading and to avoid the day-of-the-week effect (Darwish, 2012). On the other hand, monthly returns are at least approximately normally distributed or the simplifying assumption of normality is much less difficult for monthly returns than for daily returns. Some study in emerging stock markets such as Chen and Zhou (2001), Sabri (2008), Pathirawasam (2011), Al-Samman and Al-Jafari (2015) also employed monthly data in their study.

The closing stock price and trading volume for those companies were collected directly from *yahoo finance.com* as the data from the website is always a free source of raw financial and economic data as well as specialized information. Moreover, the data provided in the website are up to date and reliable.

Period after August 2009 onwards is chosen due to the merged between Main and Second boards of Bursa Malaysia and the revamp of Malaysian ACE market (formerly known as MESDAQ). Previously, MESDAQ permits for high tech and

high growth companies but the revamp allows for all types of emerging companies to be listed.

3.5 Data Analysis Techniques

This sub-topic elaborates the methods and techniques to be used in analyzing the data. In achieving the research objectives, this study utilizes the VAR analysis and Granger Causality test.

3.5.1 Descriptive Statistics Analysis

First step is to calculate monthly stock return where the stock return is defined as a natural logarithm of the first difference of monthly closing stock price as shown in Equation (3.3) below:

$$R_t = ln\left({}^{P_t}/_{P_{t-1}}\right) \quad (3.3)$$

Where, R_t is the stock return in the month *t*; P_t is the closing stock price at the end of month *t*, and; P_{t-1} is the closing stock price at the end of month *t-1*.

Trading volume is the most commonly used in literatures and has different interpretation and computation. For example, Jain and Joh (1988) and Lee and Rui (2002) measured raw value of trading volume. Saatcioglu and Starks (1998) utilized trading volume as market turnover and Chen and Zhou (2001) measured logarithm of raw volume. Thus, trading volume in this study is also utilized as natural logarithm of trading volume at time *t* as indicated in Equation (3.4). The

utilization of natural logarithm on trading volume will improve the normality (Al-Jafari and Tliti, 2013).

$$V_t = ln\,(V_t) \tag{3.4}$$

Where, V_t is the trading volume at time t. Both variables stock return and trading volume must be converted into natural logarithm for statistical reason such as to avoid heterodascasity. The variables are estimating elasticity if they are in the log form.

3.5.2 Correlation Test

Then, correlation test is proposed in this study between trading volume and stock return in order to see the correlation between them. If positive correlation is found to exist, there is also a possibility of causality to exist between the variables (Mahajan and Singh, 2009). The correlation is significant at 10% level.

3.5.3 Unit Root Test (Stationary Test)

Before testing the correlation between variables, the unit root test proposed by Dickey & Fuller (1979) is employed in order to validate whether the dataset for stock return and trading volume are stationary. According to Kalu O. and Chinwe (2014), non-stationary dataset can lead to unreliable estimation and spurious correlation. Thus, the unit root test is useful in determining the order of integration of variables.

The difference between ADF and PP test is ADF test considered lagged values in taking care the serial correlations in the error terms. Equation (3.5) presented the Augmented Dickey-Fuller (ADF) test:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \Sigma_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_\tau \quad (3.5)$$

Where, Y_t is the variable for Unit Root test; Δ is the first different operator; ε_τ is the pure white noise error; β is constant; t is time trend, and; m is lags number.

In addition, a similar test called Phillips-Perron (PP) test was also used to test for unit root. Philips-Perron (PP) test was introduced by Phillips and Perron (1988) applied nonparametric statistical methods to take care of the serial correlation in the error terms with adding lagged different terms. The PP-test formula is as follows;

$$\Delta Y_t = \alpha Y_{t-1} + \beta X_t + \varepsilon_\tau \quad (3.6)$$

Where, Y_t is the variable for Unit Root test and; X_t is the optional exogenous regressed variable. Null hypothesis indicates that Y_t has unit root test (non-stationary) whereas alternative hypothesis indicates Y_t does not has unit root and the significance level is at 1% level.

$$H_0: \alpha = 0 \; and \; H_1: \alpha > 0$$

3.5.4 Determination of Optimal Lags Length (*k*)

Lagged values of the dependent and independent variable will be included when employing the regression test in the time series data. Moreover, an essential

element in the specification of VAR model is the determination of the lags length and it is important because the estimation of VAR used lags length differs from a true lag length, it showed an inconsistent result with variance decomposition and impulse response function from the VAR.

In this study, the optimal lags length is determined by using Akaike Information Criterion (AIC) or Schwarz information criterion (SC). The lower the AIC or SC value, the better the model. Equation (3.7) and (3.8) explain the AIC and SIC.

$$AIC = e^{2k/n} \frac{\Sigma \hat{u}2i}{n} = e^{2k/n} \frac{RSS}{n} \tag{3.7}$$

$$SIC = n^{k/n} \frac{\Sigma \hat{u}2}{n} = n^{k/n} \frac{RSS}{n} \tag{3.8}$$

Where, k is the number of regressor; n is the number of observations, and; $2k/n$ and k/n is a penalty factor in AIC and SIC respectively.

3.5.5 Contemporaneous Test (Regression Analysis - Ordinary Least Square (OLS) Method)

The purpose of conducting the regression analysis using Ordinary Least Square Method is to test the contemporaneous as well as the lagged relationship between stock return and trading volume. Adopting Lee and Rui (2001) multivariate regression model, the relationship between trading volume and stock return is computed in the following formulas:

$$V_t = \alpha_0 + \alpha_1 R_t + \alpha_2 R_{t-1} + \alpha_3 V_{t-1} + \mu_t \tag{3.9}$$

$$R_t = \beta_0 + \beta_1 V_t + \beta_2 V_{t-1} + \beta_3 R_{t-1} + \varepsilon_t \quad (3.10)$$

Where, R_t, *and* V_t is the average stock return and trading volume at time *t*; β_i, *and* α_i is the model parameters (i = 0, …, 3), and; ε_t *and* μ_t is the noise variables. Equation (3.9) and (3.10) represent Model (1) and (2) respectively.

Fluctuation of stock price or stock return refers to a drastic change (increase or decrease) in value by a given stock within a given period. The drastic change in stock price or stock return usually occurs due to an imbalance in trade volume for a particular stock. For example, price fluctuation tends to increase with high trading volume. As a measurement of volatility, there are several measures proposed by past literatures. For example, Karpoff (1987) used absolute value of first difference, Rutledge (1979) used absolute log change from one trading day to the next, and Tauchen and Pitts (1983) used square of the first difference of future prices. Thus, this study follows Rutledge (1979) by using the definition of:

$$R_t = lnR_t - lnR_{t-1} \quad (3.11)$$

Where, R_t is the monthly stock return for month *t*, and; $R_{t-1}$is the previous monthly return at month *t-1*. Next, this study extends the model proposed by Brailsford (1996) in assessing the relationship between trading volume and stock return volatility. Equation (3.12) provides the formula:

$$V_t = \alpha_0 + \beta_1 V_{t-1} + \beta_2 V_{t-2} + \alpha_1 R_t^2 + \alpha_2 D_t R_t^2 + \varepsilon_t \quad (3.12)$$

Where, D_t is the dummy variable (D_t= 0 when $R_t < 0$, D_t = 1 when $R_t \geq 0$); α_1 is the parameter that measures the stock return volatility and trading volume

relationship, and; α_2 is the parameter that measures the degree of asymmetry relationship. Equation (3.12) represents Model (3).

3.5.6 Causality (Dynamic) Test

Causality test is important in examining the existence of causal relationship between two variables (Chandra, 2012). This study imports bivariate VAR model of p form and Granger-causality test.

3.5.6.1 Vector Autoregressive (VAR) Analysis

Vector autoregressive (VAR) model is one of an econometric model that used to capture the linear interdependencies among multiple time series. The model has been widely adopted in researches as it is proven to be useful especially in describing and forecasting the dynamic behavior of economic and financial time series. Since the variables in this study are proved to be stationary at the level, short-run relationship is estimates to exist hence the computation of cointegration is not needed. It suggests that the series should be modeled using VAR model rather than VECM as VECM offers the possibility to apply VAR model to integrated multivariate time series analysis such as this study. It also being considers as most successful, flexible and easy model (Al-Samman and Al-Jafari, 2015).

Particularly, this VAR model wants to describe and forecast the behavior stock return and trading volume by adopting the bivariate VAR model of p form. This bivariate VAR model of p form actually examines the dual relationship between

the variables and this model has been used by large number or literature including Chen et al. (2001) is presented in Equation (3.13) and (3.14) below.

$$R_t = \mu_R + \sum_{i=1}^{p} \alpha_i R_{t-i} + \sum_{j=1}^{p} \beta_j V_{t-i} + \varepsilon_t \quad (3.13)$$

$$V_t = \mu_V + \sum_{i=1}^{p} \alpha_i V_{t-i} + \sum_{i=1}^{p} \beta_j R_{t-i} + \varepsilon_t \quad (3.14)$$

The above model indicates if β_j coefficient found to be statistically significant, it implying that past stock return and past trading volume improve the forecasting of future stock return and future trading volume. Meanwhile null hypothesis states that $\beta_j = 0$ for all lagged values (i). To test the null hypothesis, F test (see Equation 3.15) is required and if $\beta_j \neq 0$, then trading volume causes stock return (alternative hypothesis). If both parameter β_j and δ_j are significant, then it can be proved that there is bi-directional causal relation between stock return and trading volume. The appropriate p is determined using the Akaike and the Schwartz information criteria.

$$F = \frac{SSE_0 - SSE}{SSE} \cdot \frac{N - 2p - 1}{p} \quad (3.15)$$

Where, SSE_0 is the sum of squared residuals of the restricted regression (i.e $\beta_1 = \ldots = \beta_p = 0$); SSE is the sum of squared residuals of unrestricted regression, and; N is the number of observations.

3.5.6.2 Pairwise Granger Causality Test

In order to get better picture on how trading volume influencing stock return and *vice versa*, this study exercises Pairwise Granger causality test. Clive Granger (1969) proposed this causality test in order to determine whether one variable is useful in forecasting another variable. He pointed out that past value of one variable is able to predict future value of another variable, consequently the causality relation is determined.

For the purpose of this study, the causal test investigates whether the past information of trading volume is useful in improving the forecasting of stock return and *vice versa* because Granger causality between two variables can be in either single or both direction consequently. Testing for causality is important for better understanding the microstructure of stock markets and the implications on other markets such as options market (De Medeiros and Van Doornik, 2006).

3.5.7 Variance Decomposition (VDC)

Two short-run dynamic analyses, Variance Decomposition (VDC) and Impulse Response Function (IRF) are running for drawing inferences for further analysis into the degree of co integration between the variables.

Variance decomposition is an estimation of proportion of the movement of n-step ahead forecast error variance of a variable in VAR system that is attributable to its own shock and that of another variable in the system. It is utilized to decomposing variation in an endogenous variable into the component of shocks in

the VAR system. Thus, it contains crucial information about the relative importance of each random innovation to the variation in the VAR system.

3.5.8 Impulse Response Function (IRF)

Impulse response function meanwhile traces the impulse response in an endogenous variable to of the shock of another variable in the VAR system. Shocks probably comes from a number of lag length (k) chosen. If more number of lags used on an observations it will cause a degree of freedom and existence of multi co-linearity, but if less number of lags used it will lead to the specification error. So, the maximum number of lags is important.

Given the VAR system model as in the Equation (3.16) and (3.17) below, a shock is applied to each variables to see its effect on the whole VAR system. Changes in υ_1 and υ_2 will bring changes in trading volume as well as to lagged stock return and lagged trading volume during the next period. Assuming all variables are endogenous variables. Where, υ_1 and υ_2 are the error term.

$$V_t = \beta_1 + \beta_2 R_{t-i} + \beta_3 V_{t-i} + \upsilon_1 \quad (3.16)$$

$$R_t = \beta_4 + \beta_5 V_{t-i} + \beta_6 R_{t-i} + \upsilon_2 \quad (3.17)$$

If there is one standard deviation shock in υ_1 and υ_2, in what manner the variables are reacting to each other.

3.6 Conclusion

Various methods including econometrical techniques have been utilized to analyze the data as well as to achieve the research objectives. The results and findings from the analysis will be discussed in Chapter Four.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

This chapter discusses the results from the analysis that has been conducted in previous chapter in examining the relationship between trading volume and stock return in Malaysian ACE market. It comprises of the descriptive statistics analysis, correlation result, number of lags determination, empirical results (unit root test result, regression result, VAR analysis, Granger causality result, variance decomposition and impulse response function result).

4.1 Descriptive Statistics Analysis

The descriptive statistics results of stock return and trading volume of Malaysian ACE market are presented above in Table 4.1. It includes the mean, median, maximum and minimum value, standard deviation, skewness, kurtosis and Jarque-Bera (JB) test of normality (see Figure 4.2 and Figure 4.3).

Positive and small stock return's mean of 0.5994% is associates with less volatility (see Figure 4.1) of the series (consistent with low standard deviation; 18.9239%). The wide gap between maximum and minimum value (max; 1.634131, min; -1.597243) of stock return indicates that there is a high variability in stock return changes in the Malaysian ACE market.

Meanwhile stock return portrays a positive skewness of 0.320613 indicating a right tail of distribution which interpreting that the data are fairly asymmetry. Kurtosis value is 12.69336 which is greater than 3, showing that it is a leptokurtic distribution, sharper than a normal distribution, with values concentrated around the mean and thicker tails. Furthermore, significant Jarque-Bera (JB) value (23313.19) explains the deviation of normal distribution thus rejecting the null hypothesis.

On the other side, trading volume reports high standard deviation of 224.922% which relates to high mean of 1266.256% indicating highly volatility in trading volume series (see Figure 4.1). Moreover, trading volume is left skewed (negative value of -0.303815) indicating the left tail is long relative to the right tail and kurtosis value is slightly higher than 3 implying that volume series have fat tails than a normal distribution. It is consistent with Jarque- Bera (JB) test that shows the data is not normally distributed since both the skewness and kurtosis are not equal to zero. Thus, these two series reject null hypothesis that the series is normally distributed.

In conclusion, the descriptive statistics analysis reveals much more volatility in trading volume compared to stock return. The result proves that stock return is not normal with leptokurtic curves which in fact consistent with mixture of distributions (MDH) model but trading volume is closer to normality with high volatility. Even though both data series have been translated into log form, the normality is still cannot be achieved. Thus, raw data may be more appropriate to use in the descriptive statistics analysis.

Referring to Figure 4.1, all companies in Malaysian ACE market has higher volatility in trading volume series than stock return series implying that smaller companies have larger stock price/return volatility (Song et al., 2005).

Table 4.1:
Summary of Descriptive Statistics of Stock Return and Trading Volume in Malaysian ACE Market for the period of August, 2009 to December, 2015

	Stock Return	Trading Volume
Mean	0.005994	12.66256
Median	0.000000	12.64948
Max. value	1.634131	18.82861
Min. value	-1.597243	0.000000
Std. Deviation	0.189239	2.249220
Skewness	0.320613	-0.303815
Kurtosis	12.69336	3.281611
Jarque-Bera (JB)	23313.19	110.0180
Probability	0.000000	0.000000

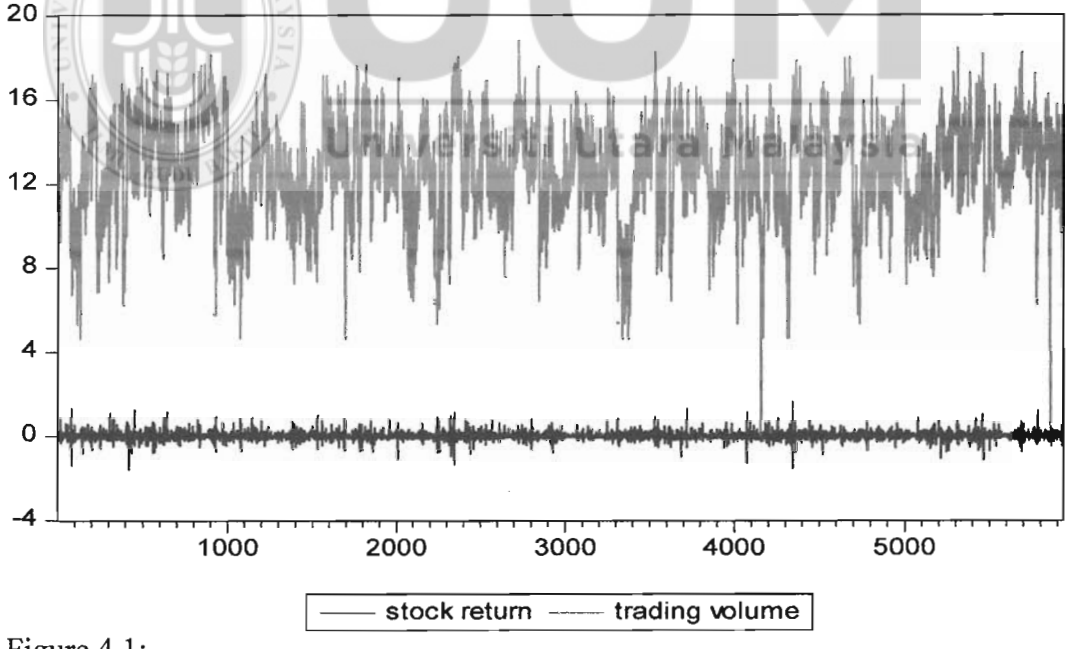

Figure 4.1:
The Movement of Stock Return and Trading Volume in Malaysian ACE Market for the period of August, 2009 to December, 2015
Source: finance.yahoo.com

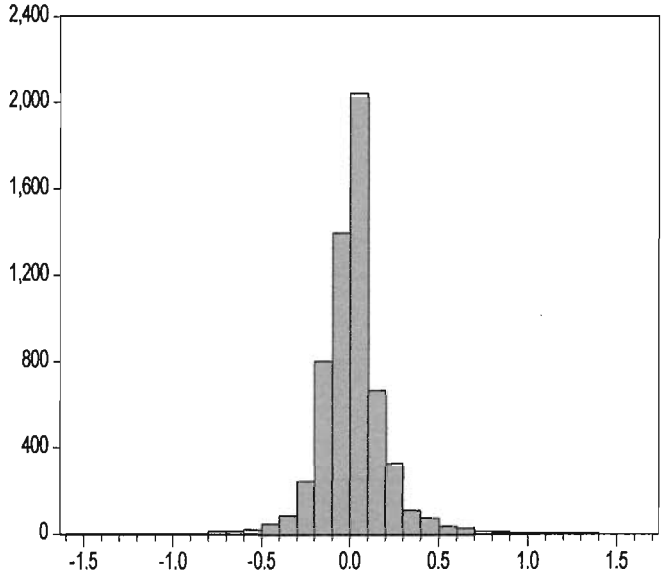

Figure 4.2:
Normality Distribution for Stock Return in Malaysian ACE Market for the period of August, 2009 to December, 2015
Source: finance.yahoo.com

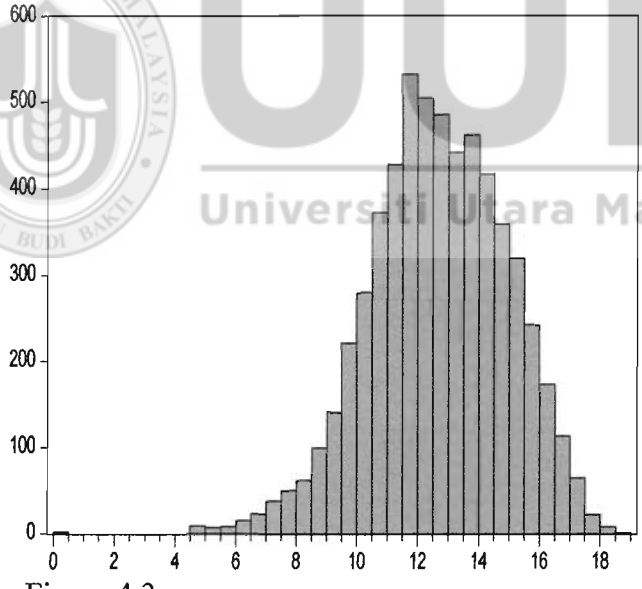

Figure 4.3:
Normality Distribution for Trading Volume of Malaysian ACE Market for the period of August, 2009 to December, 2015
Source: finance.yahoo.com

4.2 Correlation Result

Table 4.2 discusses the correlation between stock return and trading volume in Malaysian ACE market for the given period. It clearly shows that stock return and trading volume are positively correlated at 0.070123%. This weak correlation suggests that the forecast of one variable cannot be improved by the knowledge of the other variable. However, to investigate in depth the relationship between stock return and trading volume in Malaysian ACE market, this study suggests for further analysis.

Table 4.2:
Correlation between Stock Return and Trading Volume

	Stock Return	Trading Volume
Stock Return	1.000000	0.070123*
Trading Volume	0.070123*	1.000000

*Note: * significant at 10% level*

4.3 Optimal Lags Length (*k*) Determination

Table 4.3 reports the estimation of optimal lag length using VAR lag order selection criteria, specifically using the Akaike information criterion (AIC) and Schwarz information criterion (SC). Number of stars (*) in lagged indicate on how many numbers of lagged best to be used in the study.

Based on these two criteria, lag 5 is the optimal lag length as the AIC and SC value is the lowest value (the lower the value, the better the model).

Table 4.3:
VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-9704.577	NA	0.126096	3.605043	3.607491	3.605897
1	-8337.999	2371.635	0.076019	3.098978	3.106322	3.101543
2	-7763.836	1147.259	0.061511	2.887219	2.899459	2.891493
3	-7522.909	481.2285	0.056330	2.799223	2.816360	2.805207
4	7375.773	293.7805	0.053413	2.746062	2.768095	2.753755
5	-7269.809	211.4943	0.051429	2.708193*	2.735121*	2.717595

** indicates lag order selected by the criterion*
AIC: Akaike information criterion
SC: Schwarz information criterion

4.4 Empirical Findings

This section discusses the empirical findings which cover the stationary test result, regression result, causality result, variance decomposition and impulse response function result.

4.4.1 Unit Root Test (Stationary Test)

This study employs Unit Root Test proposed by Dickey & Fuller (1979), and Phillips & Perron (1988) in order to measure the existence of stationary in dataset. Null hypothesis indicates *y* has unit root meaning the variables is stationary. The results are presented in Table 4.4 and Table 4.5 as follows.

By using ADF test, Table 4.4 shows that both P-value of stock return and trading volume are statistically significant at 0.0000 meaning the variables are stationary. On the other hand, this study also employs PP test in order to make up the shortcomings of ADF test. Results from PP test in Table 4.5 also suggest that stock return and trading volume do not has unit root (stationary) evidence.

According to ADF and PP test, null hypothesis is rejected because the dataset does not has unit root (stationary) indicating trading volume and stock return is integrated at the level. In addition to that, short-run relationship is anticipated to raise thus no incorporation of co integration relationship is expected to exist between the variables. This condition suggests for further analysis of the relationship using VAR analysis.

Table 4.4:
ADF-Fisher Unit Root Test

		At level			
		With intercept		With intercept and trend	
		Statistic	P-value	Statistic	P-value
Stock Return	ADF-Fisher Chi-square	1678.81	0.0000*	1.447.57	0.0000*
	ADF-Fisher Choi Z-stat	-35.8680	0.0000*	-32.5168	0.0000*
Trading Volume	ADF-Fisher Chi-square	382.020	0.0000*	374.810	0.0000*
	ADF-Fisher Choi Z-stat	-10.4075	0.0000*	-10.0139	0.0000*

*Note: * significant at 1% level*

Table 4.5:
Phillips-Perron Fisher Unit Root Test

		At level			
		With intercept		With intercept and trend	
		Statistic	P-value	Statistic	P-value
Stock Return	PP-Fisher Chi-square	1800.01	0.0000*	2047.85	0.0000*
	PP-Fisher Choi Z-stat	-37.3918	0.0000*	-40.3133	0.0000*
Trading Volume	PP-Fisher Chi-square	819.228	0.0000*	927.389	0.0000*
	PP-Fisher Choi Z-stat	-21.0784	0.0000*	-23.3100	0.0000*

*Note: * significant at 1% level*

4.4.2 Contemporaneous Relationship

The regression results present the contemporaneous relationship between trading volume and stock return in Malaysian ACE market. The results were categorized into three sections; (1) relationship between trading volume and stock return; (2) relationship between stock return and trading volume, and; (3) relationship between trading volume and stock return volatility.

4.4.2.1 Relationship between Trading Volume and Stock Return

Table 4.6:
Regression Result for Model (1)

	Coefficient	t-stats	P-value	F-stats	Adjusted R^2
R_t	1.585378	16.02650	0.0000*	3840.057*	0.660533
R_{t-1}	0.495493	6.234273	0.0000*		
V_{t-1}	0.798554	106.2616	0.0000*		
C	2.553870	26.55473	0.0000*		

*Notes; * significant at 1% level*

Table 4.6 presents the relationship between trading volume and stock return as illustrated in Model (1). The Model (1) analyzed the relationship between trading volume, stock return, past trading volume and past stock return.

It shows that current trading volume (V_t) has positive and statistically significant contemporaneous relationship with current stock return (R_t) and lagged return (R_{t-1}) at 1% level. The findings suggest that the changes in current and past stock return will affect the changes in trading volume or in other word, stock return (current and past) contains useful information about trading volume behavior. This findings corroborate past studies by Ying (1966), Tauchen and Pitts (1983),

Rutledge (1984), Smirlock and Starks (1985), Jain and Joh (1988), Chen et al. (2001), Al-Saad (2004), Kamath (2008), and Hseih (2014).

On the other hand, current trading volume (V_t) also has strong positive relationship with past trading volume (V_{t-1}) implying that past trading volume can explain current trading volume and the relationship is strongly persistent.

The regression model is significant at 1% level and the adjusted R-squared is relatively higher at 0.660533 indicating that 66.0533% total variation in trading volume is explained by this model. Thus, this study accepts Hypothesis$_1$ that there is no statistical significant relationship between trading volume and stock return.

4.4.2.2 Relationship between Stock Return and Trading Volume

Table 4.7:
Regression Result for Model (2)

	Coefficient	t-stats	P-value	F-stats	Adjusted R^2
V_t	0.026246	16.02650	0.0000*	120.1521*	0.056952
V_{t-1}	-0.025204	-15.59465	0.0000*		
R_{t-1}	-0.098360	-9.662311	0.0000*		
C	-0.007562	-0.577702	0.5635		

*Notes; * significant at 1% level*

Model (2) analyzed the relationship between stock return, trading volume, past trading volume and past stock return. Table 4.7 reports the evidence of positive and strong contemporaneous relationship between current stock return (R_t) and current trading volume (V_t) at 1% level. The result is in line with past findings by Tauchen and Pitts (1983), Chen et al. (2001), Kamath and Wang (2006), and Attari et al. (2012) implying that rising in trading volume goes with rising in stock return.

On the other hand, lagged trading volume (V_{t-1}) shows negative significant relationship with current stock return (R_t) at 1% level indicating an increase in past trading volume associates with a decrease in stock return. Besides, the result also justify that past stock return (R_{t-1}) can explain current stock return (R_t) in strongly negative relationship.

The regression model used in this test is also significant at 1% level even though the adjusted R-squared is very small at 5.6952% only thus, this study accepts Hypothesis$_1$ that there is no statistical significant relationship between stock return and trading volume.

4.4.2.3 Relationship between Trading Volume and Stock Return Volatility

Table 4.8:
Regression Result for Model (3)

	Coefficient	t-stats	P-value	F-stats	Adjusted R^2
V_{t-1}	0.603709	49.34882	0.0000*	3053.079*	0.673551
V_{t-2}	0.244957	20.10370	0.0000*		
${R_t}^2$	-0.107877	-1.663590	0.0962**		
${DR_t}^2$	0.414403	10.11470	0.0000*		
C	1.706828	16.63425	0.0000*		

*Notes; * and ** significant at 1% and 10% level respectively*

Model (3) tested the relationship between trading volume and stock return volatility as well as the asymmetry relationship between the two variables. From Table 4.8, it presents that trading volume (V_t) indicates negative significant relationship with stock return volatility (R_t^2) at 10% level which explains that

Malaysian ACE market is inefficient whereby an increase in stock return volatility is associated with the decrease in trading volume.

Meanwhile dummy stock return volatility (DR_t^2) reports positive and significant relationship with trading volume (V_t) which clarifies the existence of strong asymmetry in contemporaneous relationship between the variables. This finding is supported by Braislford (1996), Pisedtasalasai and Gunasekarage (2007) and Dan, Yuan and Zhong (2013) indicating a decrease or increase in trading volume is associated with the decrease or increase in stock return. The result justifies the arrival of good news will increase the stock return volatility thus increase the trading volume but the information bad news will reduce stock return volatility as well as reducing the trading volume.

The model is found to be significance at 1% level with adjusted R-squared of 67.3551% which explained that the variation of trading volume is relatively higher proved by the model.

Thus, Hypothesis$_2$ is accepted that there is no statistical relationship between stock return volatility and trading volume.

To conclude, the three model developed in examining the contemporaneous relationship between trading volume, stock return, and stock return volatility resulting in this following ways;

(1) There is a statistically significant positive contemporaneous relationship between trading volume and stock return;

(2) There is also a positive and significant contemporaneous relationship between stock return and trading volume;

(3) The contemporaneous relationship between stock return and trading volume is jointly and simultaneously because the parameter in Model (1) and Model (2) are both significant which mean R depends on V and V depends on R;

(4) Trading volume and stock return volatility exhibits a significant negative relationship proving the market is inefficient, and;

(5) Significant asymmetry relation is proved to exist between trading volume and stock return.

4.4.3 Causality (Dynamic) Relationship

Causal or dynamic test aims to examine the existence of causal relationship between two variables (Chandra, 2012). This study employed two type of causal test which are bivariate VAR model and Granger-causality test.

4.4.3.1 Vector Autoregressive Analysis (VAR)

From Table 4.9, it clearly shows that the elasticity of lagged trading volume to stock return is significantly strong at 5% level. It explains that stock return is reacting negatively to the changes in past trading volume proving that past trading volume has predictive power in predicting future stock return. The VAR model is also significant at 1% level with adjusted R-squared of 49.5788%.

Similarly, the influence of lagged stock return to trading volume is significant for all lagged period at 1% and 5% respectively implying that previous month stock return have explanatory power to forecast the movement of future trading volume.

The model proposed is significant at 1% level and the adjusted R-squared is 18.2923%.

To sum up, both variables trading volume and stock return implied *inter alia* which means the knowledge of one variable may improve the forecast of other variable.

In order to obtain clear picture on the causal relationship between stock return and trading volume, Granger causality test has been performed afterwards.

Table 4.9:
Vector Autoregressive Estimates

	D(Stock Return)	D(Trading Volume)
D(Stock Return(-1))	-0.949141 [-69.9864]	0.921247 [10.3828]*
D(Stock Return(-2))	-0.748354 [-40.4508]	1.120889 [9.26058]**
D(Stock Return(-3))	-0.541204 [-27.0705]	0.849596 [6.49536]**
D(Stock Return(-4))	-0.350385 [-18.8852]	0.553800 [4.56232]**
D(Stock Return(-5))	-0.174331 [-12.9263]	0.432813 [4.90518]**
D(Trading Volume(-1))	-0.009253 [-4.42007]**	-0.448773 [-32.7649]
D(Trading Volume(-2))	-0.013311 [-5.90818]**	-0.277547 [-18.8298]
D(Trading Volume(-3))	-0.012514 [-5.55548]**	-0.210497 [-14.2831]
D(Trading Volume(-4))	-0.014589 [-6.64040]**	-0.103264 [-7.18414]
D(Trading Volume(-5))	-0.006741 [-3.38943]**	-0.109786 [-8.43756]
C	0.002370 [0.86746]	0.055138 [3.44094]
R-Squared	0.496715	0.184425
Adjusted R-Squared	0.495788	0.182923
F-Statistic	525.4079*	103.4057*

*Notes: * and ** significant at 1% and 5% level respectively*

4.4.3.2 Pairwise Granger Causality Test

Pairwise Granger causality test has been performed in order to examine the causal effect between stock return and trading volume in Malaysian ACE market. In Table 4.10 it is clearly shown that trading volume Granger-cause stock return and stock return Granger-cause trading volume at 1% significance level. This means the causality between trading volume and stock return occurs in both direction (bidirectional relationship) where stock return contains important information for trading volume and *vice versa*. This findings support past studies by Rogalski (1978), Hiemstra and Jones (1994) Habib (2011), Attari et al. (2012), and Darwish (2012).

Thus, this study accept Hypothesis$_3$ and Hypothesis$_4$ verifying that the bidirectional Granger causality evidence is derived between trading volume and stock return regardless of how trading volume is measured. The findings also propose that short-run forecast of current or lagged stock return can be improved by the knowledge of recent trading volume information and *vice versa*.

Table 4.10:
Pairwise Granger Causality Test at Lags 5

Null Hypothesis	F-stats	P-value
TRADING VOLUME does not Granger Cause STOCK RETURN	3.37457	0.0048*
STOCK RETURN does not Granger Cause TRADING VOLUME	28.5272	0.0000*

*Note: * significant at 1% level*

4.5 Variance Decomposition (VDC) and Impulse Response Function (IRF)

The purpose of conducting variance decomposition (VDC) analysis is to analyze which part of variable shocks is explain by other. Impulse response function (IRF) indicates the shock impact of one variable that transmitted to other endogenous variable (current of future) through the VAR structure.

4.5.1 Variance Decomposition (VDC)

Table 4.11 exhibits the variance decomposition of stock return and trading volume for 10 months. The result shows that the variability of stock return explained by its own past changes, providing a strong evidence to support the argument that stock return's movement are determined by its own shocks rather than the shocks to trading volume. In short run time period, taking month 3 as an example, shock to stock return accounts for 99.94% variation of the fluctuation in stock return (own shown) and shock to trading volume can only cause 0.05% of the fluctuation in stock return. Meanwhile in long run time period (month 10), own shock contributes 99.8409% and shock to sock return accounts for 0.1590%.

As for trading volume variability, shock to stock return reports an increasing role whereby at month 1 trading volume was explained by its own shocks by 91.48443% and 8.515569% by stock return. Up to month 10, stock return contribution in explaining the variability of trading volume increased up to 1% to 16.8654%. To conclude, this analysis give insight that past shock stock return may be useful in predicting future trading volume. (see Appendix 3).

Table 4.11:
Variance Decomposition of Stock Return and Trading Volume

	% of movement in Stock Return explains by the shocks to		% of movement in Trading Volume explains by the shocks to	
Period	Stock Return	Trading Volume	Stock Return	Trading Volume
1	100.0000	0.000000	8.515569	91.48443
2	99.97213	0.027872	13.89295	86.10705
3	99.94906	0.050943	15.84475	84.15525
4	99.93602	0.063983	16.20613	83.79387
5	99.93138	0.068625	16.58743	83.41257
6	99.89111	0.108885	16.48514	83.51486
7	99.87560	0.124404	16.57553	83.42447
8	99.86258	0.137419	16.70397	83.29603
9	99.85051	0.149488	16.79071	83.20929
10	99.84097	0.159028	16.86541	83.13459

4.5.2 Impulse Response Function (IRF)

Impulse response function is a shock to a VAR system where it identifies the responsiveness of the dependent variable (endogenous variable) in the VAR system when a shock is put to the error term such as v_1 and v_2 in the equation. A unit shock is applied to each variable to see the effect on the VAR system.

It has been observed in Table 4.12 that a stock return response to one standard error of trading volume shock is relatively small and negative in values in most cases. Contradicting to the earlier finding, a trading volume response to one standard error of stock return shock is positively with higher values for the 10 months period.

Meanwhile, response of stock return to one standard error shock in stock return is sharply decreased from month 1 to month 2, but then gradually increased in small values and eventually remain at 0.0000 value at month 10. Trading volume

response to one standard error shock in trading volume shows positive variation in the 10 months period. (see Appendix 4).

Table 4.12:
Impulse Response Function of Stock Return and Trading Volume

	response of Stock Return		response of Trading Volume	
Period	Stock Return	Trading Volume	Stock Return	Trading Volume
1	0.183105	0.000000	0.338620	1.109888
2	-0.028151	-0.003093	0.381439	0.616919
3	-0.001721	-0.002815	0.290459	0.466283
4	-0.002446	-0.002118	0.217264	0.442244
5	-0.006683	-0.001275	0.211056	0.410411
6	-0.006188	-0.003729	0.187525	0.440990
7	0.000570	-0.002314	0.188546	0.404135
8	-0.001135	-0.002119	0.179895	0.371290
9	-0.000687	-0.002041	0.167395	0.349548
10	-0.000596	-0.001815	0.157936	0.328616

4.6 Conclusion

A weak correlation is found between the variables suggesting that causal effect may exist between the variables. As a result, regression analysis has been performed and mixed results are obtained from the analysis. Positive significant contemporaneous relationship is found to exist between trading volume, stock return and past stock return. Meanwhile positive significant relationship only established between stock return and trading volume whereas past volume has negative significant relationship with stock return. Furthermore, stock return volatility and trading volume indicated negative significant relationship thus proving a positive asymmetry relation in contemporary relationship is existed.

For causality test, VAR analysis and Granger-cause test proved that past trading volume has predictive power in predicting future stock return and *vice versa* which revealed a bi-directional relationship between the variables.

Thus, Malaysian ACE market is categorized as an inefficient stock market as past information can be utilized to forecast future value of stock price/return and trading volume. The findings from this study do not follow the pre-condition of weak-form efficient market hypothesis (Fama, 1970).

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.0 Introduction

In this last chapter, the study summarizes and concludes the significant findings found in the analysis as well as presents the implication and limitation of the study and proposes for some useful recommendations for future research.

5.1 Summary of Study

Studying the stock price/return-volume relationship has long been used by market practitioners in order to understand the market reactions as well as to gain excess return in their investment as highlighted by Karpoff (1987).

It has been observed that past studies investigate the stock price/return-volume relationship in various aspects such as empirical relation, asymmetrical relation, and causal/dynamic relation. However this study focuses on investigating the empirical as well as the causal relationship in emerging stock market of Malaysia. On top of that, this study also investigate the causal relation between stock return and trading volume in order to see how stock return and trading volume react to each other movement and *vice versa*.

Therefore this study examines the relationship between stock return and trading volume in Malaysian ACE market for the period of August, 2009 to December,

2015. Malaysian ACE market is seen as a platform for new, young and high potential growth companies to get listed. By getting listed, they could boost their liquidity, enhance their standard as well as gain more trust from investors. The existence of Malaysian ACE market on the other hand provides opportunity for beginner investors who want to trade in small amount of investment. Even though ACE stock is considers as *penny stock*, but it gives substantial return to investors.

Findings from the study concludes that there is a strong significant positive contemporaneous relationship between stock return and trading volume, meanwhile there is a significant negative contemporaneous relationship between stock return and past period trading volume. In addition, there is a positive significant relationship between trading volume and stock return for current and past period stock return. The contemporaneous relationship between stock return and trading volume conclude to be jointly and simultaneously because the parameter in Model (1) and (2) is significant at 1% level respectively which mean R depends on V and V depends on R.

Moreover, trading volume and stock return volatility exhibits a significant negative relationship, and asymmetry relation is proved to exist between trading volume and stock return indicating that trading volume is affected by the arrival information of news. Increasing in stock return volatility due to the arrival of good news and it correlates with the increasing in trading volume. In contrast, information on bad news reducing stock return volatility as well as reducing the trading volume.

VAR analysis also reports that past trading volume has predictive power on predicting future stock return and *vice versa*. Granger-cause test found a bi-directional relationship between stock return and trading volume at 1% significant level respectively. The findings in VAR and Granger test are consistent with the earlier findings of contemporaneous relationship.

5.2 Implication of Study

The findings from this study demonstrates few vital implications to market participants and researchers. Firstly, investors may apply the findings from this study in their investment making decision as this study has explained how Malaysian ACE market is reacted. Investing in high risk stock market such as Malaysian ACE market is found to be attracted to risk taker investors.

Secondly, this study essentials to the financial managers to identify factors that influencing stock pricing, because in this kind of emerging market they need to gear up the companies' policies which is in turn will improve the stability and efficiency of the market.

In addition to that, economic policy makers such as Bursa Malaysia need to revise the listing requirement for companies to be listed in the Malaysian ACE market. The revamp made by Bursa Malaysia is to allow efficient access to capital and investments as well as to make Malaysian ACE market a more attractive platform for local and foreign companies. Loose practice would tear down the credibility of the market thus lead to the inefficiency of the market itself.

And lastly, future researchers may use this study as a reference for future studies by adding more values in order to obtain deeper understanding on this stock market behavior.

5.3 Recommendation for Future Study

Since this study is the first ever study conducted an investigation of return-volume relationship on Malaysian ACE market, there is a number of limitations that need to be accounted for. It is suggested for future research to extend this study in several ways. Firstly, a similar study could be carried out for a longer time horizon such as for 20 to 30 years in order to enhance the study yet scrutinize the outcomes.

Secondly, future research should use all listed companies in Malaysian ACE market and categorize the companies into their own sector therefore the nature of each sector relationship can be specifically examined.

Thirdly, future research may consider to use the average of high low price for the day instead of taking closing stock price of the market which may not be able to reflect the true significant movement in particular stock market.

Lastly, new measures could be introduced in future research such as the level of gross domestic product (GDP), interest rate level, as well as exchange rate and inflation rate.

5.4 Conclusion

This study sought to determine the relationship between stock return and trading volume of 77 listed firm in Malaysian ACE market. For this purpose, monthly closing stock price and trading volume data have been used as a proxy of information arrival for the period of August, 2009 to December, 2015. Various model have been applied such as multivariate time series model and Brailsford model to test the contemporaneous relation as well as VAR analysis and Granger-cause test to test the causal relation, and variance decomposition as well as impulse response function to examine the shocks.

Mixed findings are documented in this study. Contemporaneous relation is found to exist between stock return and trading volume and *vice versa* in positive way but negative relationship is reported between stock return volatility and trading volume.

The main point here is this study has achieved its research objectives whereby the evidence of significant contemporaneous relationship and significant bi-directional relationship between stock return and trading volume are found. Lastly, this study concludes that the precondition of Malaysian ACE market to be efficient in weak-form is not met (third objective) because the stock market reflects all security market information including the historical stock price/return and trading volume. The result is consistent with Al-Samman and Al-Jafari (2015) but contradict with Mohamed and M.D Nassir (1995).

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