THE UNIVERSITY OF HULL

Bursa Malaysia Index Series Revision Effects on Market Microstructure

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by

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(Joint with Alcino Azevedo, Andros Gregoriou and Mark Rhodes).

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Chapter 4 was presented at the 5th PhD experience Conference at the University of Hull, April, 2014.

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Abstract

This thesis presents three interrelated empirical chapters on the Bursa Malaysia index series revisions effects on market microstructure. In the first empirical chapter, **"The Effect of Changes in the Composition of the FTSE Bursa Malaysia Indices on Stock Price and Volume"**, the effect of re-constituents of the main indices (Big Cap, Mid Cap and Small Cap) on stock price and trade volume is investigated, using a data sample which comprises information dated from the time period between 2005 and 2012. An event-study methodology is employed to evaluate the effects of stock market reactions to extraneous event. I employ short term and long term event-window analysis for abnormal returns using cumulative abnormal return (*CAR*) and Buy and Hold Abnormal Return (*BHAR*). Harris and Gurel (1986) Volume Ratio (VR) methodology is used to test for abnormal trade volume. The results provide new empirical evidence supporting several hypotheses as previously studied in the literature. Empirical evidence supporting the Price Pressure Hypotheses (PPH) is found for both additions to and deletions from the Blue Chip Index, KLCI 30. There are positive abnormal returns for stocks added to the Mid Cap Index, KLCI 70 with a persistent increase in volume in the post event-window are observed, which supports the Information Cost Liquidity Hypotheses (ICLH) and results for the deletions support the Information Hypotheses (IH). The results support the Imperfect Substitute Hypotheses in the case of stocks added to the Small Cap index.

The second empirical chapter studies **"The Effect of the FTSE Bursa Malaysia Index Series Changes on Stocks Liquidity"**. In this chapter, the effect of index revision on stock liquidity is investigated. This investigation is important particularly with regard to stocks added to the Mid Cap Index in order to assert my previous results regarding the ICLH as some researchers consider trade volume as an unsuitable liquidity proxy due to the double counting. Instead, a variety of liquidity measures are employed to capture multi-dimensional liquidity aspects. Specifically the study focuses on trading cost and price impact ratio as two different liquidity dimensions. Liquidity changes adapting Hedge and McDermott's (2003) methodology is used; a pooled time series cross-sectional

multivariate analysis of bid-ask spreads and also price impact ratios. Bid-ask spread (quoted), bid-ask spread (effective), Amihud's (2002) RtoV, Florackis et al.'s (2011) RtoTR and a new price impact ratio, the RtoTRF (free float adjusted) are employed. The study is extended by examining the investability weight change in order to identify the type of shareholders that contribute more to the liquidity improvement. Evidence that supports the ICLH for stocks added to the KLCI 70 is found which confirms the earlier investigation using trade volume. More importantly, the finding support Florackis et al.'s (2011) argument on the advantages of their price impact ratio over Amihud's (2002) liquidity ratio in terms of market capitalisation bias. Furthermore, the new liquidity measure, RtoTRF, prove to have better "encapsulation power" (at least for the Malaysian stock market) when compare to the Amihud's (2002) liquidity measure, RtoV.

The third empirical chapter investigates the effect of liquidity improvements on investment opportunities, entitled: "**Does Liquidity Increase Investment Opportunity? Evidence from the Bursa Malaysia KLCI 70**". In this chapter, the relationship between improved stock liquidity and investment opportunity is investigated in light of the firms added to the Mid Cap Index. The liquidity premium hypotheses (LPH) is examined by testing whether investment opportunities increase with stock liquidity. Tobin's Q, capital expenditures, Return on Assets (ROA) and Price Earnings (PE) ratio are used for growth opportunities and find a statistical significant increase in those depended variables after the stocks being added to the index. Amihud's (2002) RtoV, Florackis et al.'s (2011) RtoTR and the RtoTRF ratios are proxied as liquidity measures and find that the firms whose stocks were added to the KLCI 70 had a significant increase in capital expenditures and PE ratio. The findings are consistent with those of Becker-Blease and Paul (2006). Therefore, it shows that the stock liquidity improvements associated with additions to the KLCI 70 affects firm's investment decisions. For the LPH, it shows that investors demand lower returns on more liquid stocks and, which reduces the cost of capital and enhances growth opportunities.

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List of Abbreviations

ACE market	The Alternative Market of Bursa Malaysia Securities
AD	Announcement Date
BHAR	Buy Hold Abnormal Return
BLU	Best Linear Unbiased
BM	Bursa Malaysia
BMP test	Boehmer, Musumeci and Poulsen test
CAN	Consistency Asymptotic Normality
CAPM	Capital Asset Pricing Market
CAR	Cumulative Abnormal Return
CCE	Coca Cola Enterprise
CD	Effective Change Date
CE	Capital Expenditure
Debt to Assets (DTA)	Debt to Assets
DJIA	Dow Jones Industrial Average
FTSE	Financial Time Stock Exchange
GMM	Generalised Method of Moments
ICB	Industry Classification Benchmark
ICLH	Information Cost Liquidity Hypotheses
IH	Information Hypotheses
ISH	Imperfect Substitute Hypotheses
KLCI	Kuala Lumpur Composite Index
KLSE	The Kuala Lumpur Stock Exchange
KLSEB	The Kuala Lumpur Stock Exchange Bhd
LPH	Liquidity Premium Hypotheses
MBHAR	Mean Buy Hold Abnormal Return
MCAR	Mean Cumulative Abnormal Return
MESDAQ	Malaysian Exchange of Securities Dealing and Automated Quotation
M&A	Mergers and Acquisitions
MTBV	Market to Book Value of Equity (MB)
NOSH	No of Shares Outstanding
NOSHCO	Number of Shares Held by Cross Company

NOSHEM	Number of Shares Held by Employee/Family
NOSHFF	Number of Shares held by for public
NOSHGV	Number of Shares Held by Government
NOSHIC	Number of Shares Held by Investment Company
NOSHOF	Number of Shares Held by Others
NOSHPF	Number of Shares Held by Pension Fund
NOSHST	Number of Shares Held by Strategic holders
NPV	Net Present Value
OLS	Ordinary Least Square
Operating Income	Operating Income
P	Price
PA	Price Ask
PB	Price Bid
PE Ratio (PE)	Price earnings ratio
PI EMAS	Price Index EMAS
PPH	Price pressure hypotheses
Return on Assets (ROA)	Return on Assets
RtoTR	Return to Turnover
RtoTRF	Return to Turnover Float Adjusted
RtoV	Return to Volume
SEMS	Stock Exchange of Malaysia and Singapore
SEDOL ID	Stock Exchange Daily Official List Identification
SES	The Stock Exchange of Singapore
TQ	Tobin’s Q
TA	Total Assets
Vo	Volume
VR	Volume Ratio

Chapter 1: Introduction

1.1 Introduction

In 1991, Prime Minister, Mahathir Mohamad introduced vision 2020, a vision that calls for Malaysia to become a self-sufficient industrialized nation in a 29 year plan, which encompasses all aspects of life, from economic prosperity, social well-being, world class education, political stability, to psychological balance. As the Malaysian government seeks a way to transform Malaysian economy to be fully developed by 2020, amongst economic transformation programmes were to revitalise Malaysia's equity market and so enhance its capital market. Continuous initiatives like Entry Point Projects (EPP) aim to increase Bursa Malaysia's market capitalisation to RM3.9 trillion (USD 1 Trillion) by 2020 from 1 trillion in 2010, accounting for a compound growth rate (CAGR) of 15%. It also aims to improve liquidity, measured by trading velocity, from 31% of total market capitalisation to 60% in line with the regional average.[1]

This thesis provides an empirical study on the effect of the Bursa Malaysia index series revision on stock market microstructure.[2] It contributes to the existing market microstructure literature by addressing three interrelated issues: market efficiency, liquidity, and investability.[3]

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[1] Economic Transformation Programme Annual Report 2013 Pemandu, Prime Minister Department.
[2] Examples of market microstructure includes bid-ask spreads, volatility, liquidity, turnover, and asymmetric information which are the underlying mechanisms of trade in financial markets.
[3] A potential investment which takes into account the liquidity, relative strength, volatility measures, and credit. This evaluation criterion is used by Standard and Poor's.

Chapter two gives an overview of the Malaysian equity market and the ongoing changes in the indices. Chapter three studies the price and volume changes associated with index revisions in the Malaysian equity market. Chapter four investigates the effect of the index revisions on stock liquidity. Chapter five examines the effect of positive stock liquidity changes on investment growth opportunities. More specifically, the thesis examines the effects on stock price behaviour, stock liquidity and liquidity effect on investment growth, due to stock additions to the Bursa Malaysia stock indices.

This chapter explains the motivations and data of the thesis, explains the contribution of each chapter to the microstructure literature and outlines the structure of the thesis.

1.2 Motivation

While there is evidence that stock exchange index revisions in other developed markets give positive impacts, it is not known whether in a developing market like Malaysia, index restructuring would be similar, particularly on price return, liquidity and investment opportunity. The importance of price return, liquidity and investment opportunity first drew the researcher's attention at a young age, through his mother's business experience. She was a jewellery merchant specializing in diamonds, trading in the early 80's. However she decided to invest in gold trading after her diamond portfolio was severely hit by the late-80's economic recession.

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http://www.bloomberg.com/bw/stories/2008-02-15/the-iq-list-smart-stocks-with-potentialbusinessweek-business-news-stock-market-and-financial-advice

Amongst the reasons for her new investment decision were “liquidity” with price return trade-off. Gold (similar to stocks) is known to be highly liquid as compared to diamonds (similar to long term bonds) which are less liquid. Of course she had expected a lower return from her gold trading as compared to the much higher return from diamond trading (as higher liquidity is associated with lower risk, hence lower return). Her decision to trade-off her hefty diamond return for gold’s liquidity was basically to protect her business over unfavourable economic cycles, which she learned from the economic crisis. The lessons learned from the “Gold vs Diamond” story in a way provide motivation for the researcher to explore further in the light of Bursa Malaysia index revisions knowing the importance of price return, liquidity and investment opportunity.

Amongst fundamental functions of a stock market are stock pricing and liquidity provision function. These functions are only achieved optimally if the market is efficient. As is well-known, security prices are said to be efficient if the current prices reflect all the relevant information available (Fama, 1970).

Furthermore, stocks must be sufficiently traded to eliminate inefficiencies and it is the actions of investors, recognising opportunities (technically or fundamentally) and seeking to beat the market, which make markets efficient. In short, markets do not become efficient endogenously, other than through investors’ and market players’ behaviour, and also the stock exchange rules and procedures in place contribute to make markets become efficient.

To date, there is a lack of published empirical research on the microstructure effects due to index restructuring in the Malaysian securities market. The issue of market efficiency has global importance given the growth of international investors' interest towards Malaysia equities market.

In addition, this thesis attempts to fill in a gap in the empirical literature concerning market efficiency and market microstructure behaviour and its effect in the Malaysian equity market that has not been comprehensively explored in the light of Bursa Malaysia index revisions. Furthermore, an alternative liquidity measure is developed which considers the effect of free float on the stock price behaviour and trade volume as a consequence of changes in the stock indices. This new liquidity ratio proved to be a better liquidity measure than those available from the previous literature for equity markets where shares free float is relatively low, or where there are significant changes in the shares free float over time.

More specifically, the thesis investigates the effects on stock price and trade volume of the Bursa Malaysia index revisions (the first empirical chapter), tests empirically whether the index revisions of the Bursa Malaysia stock market improve stock liquidity (the second empirical chapter) and investigate the relationship between the liquidity improvements due to stock index revisions (additions) and the investment opportunity growth (the last empirical chapter).

This is the first empirical study that examines the effect of stock index revisions on the stock price and trade volume behaviour for the Bursa Malaysia equity market.

The effects of stock additions and deletions on the Malaysian stock markets have not been systematically investigated and this thesis aims to fill this gap. To date, there is relatively little literature discussing market efficiency related to price and volume associated with changes in the Bursa Malaysia index revisions. The stock market in Malaysia plays a key role in the economic development of the country. The results of this study can have relevant implications on future regulatory policy changes regarding index revisions. Note that the aim of the regulator of the Malaysian stock market when it implemented changes in the rules that govern the stock additions to and deletions from the stock indexes, as well as when it restructured the stock indexes, was to create a more transparent and healthier economic environment so as to attract more national and foreign investment. This study can be helpful to assess whether those index related changes achieve that initial goal or not.

Azevedo et al. (2014) find an abnormal stock return and stock trade volume in FTSE Bursa Malaysia KLCI 30[4]. This shows that the behaviour of the Malaysian stock market is affected by the index revisions.

The Malaysian securities market has developed relatively rapidly since its inception in 1930. In order to make the Malaysia stock market more investable, transparent, and attractive to investors, Bursa Malaysia (the Exchange of the Malaysian stock market), transformed its main benchmark index from the KLCI to the FTSE Bursa Malaysia KLCI in 2009.[5] The transformation of the index series ideally should increase the market

[4] Azevedo et al. (2014) is the first to investigate the price and volume effects on the Bursa Malaysia KLCI 30 index.
[5] http://www.bursamalaysia.com/market/products-services/indices/bursa-malaysia-index-series/

efficiency because of the transparency of the information in terms of constituents' eligibility, price availability, liquidity screening test and free float consideration.

According to the strong efficient market hypothesis, stock price and trade volume should not react to exogenous events. No abnormal return and volume will theoretically exist as market self-regulation via arbitrage will take place; the market will not allow normal investors to have abnormal return.

However, as opposed to the strong efficient market hypothesis, academic literature provides evidence that the efficient market hypothesis does not hold. For example, Harris and Gurel (1986) and Shleifer (1986) investigated changes in the Standard & Poor index and both show evidence that contradicts the efficient markets hypothesis.

On the other hand, other studies prove that not only stock price and volume are affected but also stock liquidity. For instance, Shleifer (1986), Beneish and Whaley (1996) and Hedge and McDermott (2003) find an increase in the liquidity of the added stocks in the Standard & Poor index. This evidence shows that index revisions also influence stock liquidity apart from price and volume.

Furthermore, Becker-Blease and Paul (2006) extend the works of Hedge and McDermott (2003) and Chordia (2002) studies on index additions to S&P500 in view of improved liquidity's influence on investment opportunity growth. They find a positive relation between changes in capital expenditures (as a proxy for investment opportunity) and changes in stock liquidity, indicating that stock liquidity influences corporate investment decisions.

This study is important due to the fact that it observe market microstructure effects surrounding index changes in an emerging market particularly in Malaysia context. First, by employing event studies it is possible to capture abnormal returns and abnormal volumes (if any) which could relate to market efficiency. This is an important first step in investigating other market microstructure effects like volatility and liquidity. Secondly, liquidity effects from the index revisions as evidenced in other developed markets are explored. Several liquidity measures are employed, including the new price impact ratio. In addition, the thesis assesses changes in government and employee/management's shareholding by investigating their shareholding structures. Finally, it tests whether stocks that experienced liquidity improvement (due to exogenous shock from index revision) would affect investment growth, using set of investment opportunities proxies (i.e. capital expenditure, Tobin's Q, Return on Assets and Price Earnings ratio).

1.3 Research Questions

The objectives of this study will be answered based on the following research questions (RQ):

RQ1: Do index revisions affect the short and long run market efficiency across the Bursa Malaysia index?

RQ2: Is there any liquidity improvement for stocks affected by index revisions?

RQ3: Do stocks which experience liquidity improvement influence investment opportunities?

1.4 Data

This thesis uses a dataset which comprises information from three FTSE Bursa Malaysia indices: the FTSE Bursa Malaysia KLCI 30 (KLCI 30), FTSE Bursa Malaysia KLCI 70 (KLCI 70) and FTSE Bursa Malaysia Small Cap (Small Cap). Data for event announcement date is gathered from the official announcement notes provided by the FTSE and Bursa official announcements and periodic index review notices. Stock prices, stock trade volumes, investability weights (i.e., free float) and accounting variables such as capital expenditure and Return on Assets, as well as those variable used to compute the Tobin's Q, were collected from Thomson Reuters *Datastream*. All dataset were crossed checked with Bloomberg data to ensure accuracy and validity.

In the third chapter, stock price, stock volume, price index, along with the event date (announcement date and effective change date) data are used to investigate abnormal stock price return and volume of firms added (deleted) to (from) the Bursa Malaysia index series. In the fourth chapter, price, volume, bid-ask, and free float data are used to further investigate stock liquidity effects from index revisions. Free float data among others includes number of shares own by strategic holdings (NOSHST), number of shares own by employee or family (NOSHEM),number of shares hold by government (NOSHGV) and number of shares available for public (NOSFF).

The last empirical chapter, chapter five, uses accounting data such as capital expenditure, Tobin's Q, and Return on ROA to explore investment growth among firms that experienced stock liquidity improvement. Tobin's Q and ROA are extracted from the Thomson Reuters Datastream.

1.4 Contributions

This thesis, makes a contribution to the market microstructure literature applied to the Malaysian stock market. It first contributes by empirically, evaluating the Bursa Malaysia stock market efficiency, focusing on the existence (or not) of abnormal stock return and trade volume surrounding the stock indices revisions. It provides a detailed analysis on the effect of the indices revision on the stock liquidity, for which several available liquidity measures are used and a new liquidity measure is developed which takes into account the share free float ratio. This new measure is argued to be very relevant in developing stock markets, where the number of shares available for trade is often very small. Finally, the thesis examines the effect of changes in the stock liquidity, as a result of the stock additions to from the indices, on the investment opportunities.

Most of the literature suggests that stock markets are inefficient (see, e.g., Harris and Gurel (1986), Vespro (2006), and Gregoriou (2011)). For instance, when stock encounters exogenous shock, not all information is absorbed price adjusted. In chapter three, the first investigation is to explore any abnormal return and abnormal volume (market efficiency) by employing a cross sectional event study. The chapter investigates short term and long term efficiency surrounding the event date in the Malaysian main stock market indices.

In chapter three, the results reveal that the Malaysian stock market is inefficient in the short-run when it encounters exogenous shock from index revisions exercise. However, in the long term analysis, there is evidence of efficiency for the stocks that encountered such shock. Evidence is found supporting the Price Pressure Hypothesis (PPH), for both the additions to and the deletions from the KLCI 30. It is observed that there are positive abnormal returns for the stocks added to the KCLI 70 with persistence increase in volume in the post event-window which supports Information Cost Liquidity Hypothesis (ICLH). On the other hand, it is concluded that the results regarding the stock deletions support Information hypothesis (IH) - i.e., stock prices decreases due to deletion; followed with price persistent in the post long term period. Under the IH, in efficient markets the negative information about a stock should immediately decrease its price and the information effect should be permanent.

It is also concluded that the results of this study support the ISH for stock added to the Small Cap index. It is found that stock prices increase following additions in the post-event period. This is a new finding for the Malaysian stock market. However, the longer term horizon observation suggests that the level of efficiency increases over time. This implies that more information is absorbed into the price, which eliminates abnormal returns in the long term.

The second main contribution of this thesis is the effect of the Bursa Malaysia index revision on stock liquidity.[6] Specifically, in chapter four, liquidity models proposed by Hedge and McDermott (2003) are employed. The study contributes by introducing a new price impact ratio (as a liquidity measure) as an alternative model to capture stock liquidity

[6] It investigates the stock liquidity changes after the index revision.

The econometric models used incorporate the effective spread, quoted spread and the return to volume (RtoV) price impact measure of Amihud (2002), and the Florackis et al. (2011) return to the turnover ratio (RtoTR), as well as the researcher's new liquidity ratio.

Most of the empirical results in this chapter show that the volume is higher prior to date of announcement and there is an increase in liquidity. However in the post announcement periods, the results show a decrease in volume as market maker increased bid-ask spread with a resulting in reduction in liquidity. These findings hold for the stocks added to the KLCI 30 and Small Cap index and the stock deleted from the KLCI 30 and KLCI 70.

The analysis shows the liquidity improvement for stocks that have been added to the KLCI 70. This result confirms the ICLH suggestion in the finding in chapter three (first empirical chapter). New evidence is observed of improvement of liquidity surrounding KLCI 70 addition. This new finding supports the improved liquidity hypothesis, which maintains that the expected return should increase in anticipation of a liquidity increase to reflect the liquidity premium if the market is efficient in transmitting information.

The third contribution of this thesis is that to examine the relationship between investment opportunity set and liquidity changes for stocks that experienced liquidity improvement after the index revisions (stocks added to KLCI 70).[7] Generally, the results show that there is a negative relation between changes in investment opportunity (proxies by capital expenditure and price earnings ratio) and changes in stock liquidity measures, which indicates that stock liquidity may affect corporate investment decisions. The results

[7] Tobin's Q, capital expenditure, ROA and PE ratio are employed as proxies for investments growth.

suggest that liquidity-enhancing events benefit shareholders by increasing growth opportunities.

The final contribution of this thesis is that to explore the price impact ratio to measure stocks liquidity surrounding the event period (in chapters four and five). Three interrelated liquidity measures are employed; those of Amihud (2002), Florackis et al. (2011) and the researcher's new liquidity measure based on the former two. Distinctively, the study contributes in improvising a price impact ratio construction which is based on both Amihud (2002)'s RtoV and Florackis et al. (2011)'s RtoTR price impact ratio. [8]

More specifically, investability weight (i.e., free float) is considered as a denominator component factor into the new liquidity ratio to test whether that new liquidity ratio will perform better in capturing liquidity. Strikingly, the evidence shows that the new liquidity ratio performs on par as with those of Florackis et al. (2011) and better than Amihud's (2002) price impact ratio.

[8] I term Amihud (2002) price impact "illiquidity ratio" as liquidity ratio to standardize the term throughout the thesis. I use price impact ratio or liquidity ratio interchangeably.

1.5 Overview and structure of the thesis

The thesis is organized as follows:

Chapter two describes the Malaysian equity market and the Bursa Malaysia index restructuring. This description includes the history of the market and the exchange, the partnership between the FTSE group and Bursa Malaysia and the FTSE Bursa Malaysia index series.

Chapter three studies the market efficiency associated with the changes in Malaysian stock indices. The effect of price and volume changes as a consequence of stock index revisions (additions/deletions) is examined. Both short and long term period effects are analysed for stocks added (deleted) to (from) the main three indices (the KLCI 30, KLCI 70 and Small Cap Index).

Chapter four investigates the effect of the index revisions on the stock liquidity across Bursa Malaysia main indices. This chapter examines whether stock liquidity increases (decreases) following additions (deletions) to (from) the stock index. A new liquidity ratio is tested, which developed for this study that takes into account free float factor. Free float is incorporated as a "capturing component" into the liquidity measure construction.

Chapter five examines the relationship between liquidity changes and investment opportunities, using a sample of firms whose stocks were added to KLCI 70 and which had liquidity improvements. The effect of changes in the stock liquidity on the Tobin's Q, capital expenditure movement opportunity proxies ROA and PE ratio (as proxy for investment opportunity) is specifically investigated. The "capturing power" is compared between Amihud (2002) RtoV liquidity measure, Florackis et al. (2011) RtoTR liquidity measure and the new developed liquidity measures RtoTRF.

Chapter six concludes the thesis and suggests areas for future research.

Chapter 2: Malaysian Equity Market and Bursa Malaysia Index Restructuring

2.1 Introduction

This thesis studies the effect of index revisions on the Malaysian equity market. In this chapter, the FTSE and Bursa Malaysia index restructuring stages over the last decades and review exercise in the Malaysian stock market is previewed. This chapter presents a brief introduction to the history of Malaysian stock market, the Bursa Malaysia index restructuring and reviews, index series, index methodology (ground rules) and trading system.

In 2006, Bursa Malaysia and the FTSE group, a London based market indices provider and data services firm which jointly owned by The Financial Times and the London Stock Exchange, planned a strategic index enhancement move to make the Malaysian securities market more investable and appealing globally. [9] A 'Cooperation Agreement' was signed between FTSE International and Bursa Malaysia on 12 January 2006 to develop a new set of equities indices for Malaysia. [10]

As the Malaysian government seeks way to transform Malaysian economy to be fully developed by 2020, the economic transformation programme includes revitalising Malaysia's equity market. Therefore, Bursa Malaysia became a government

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[9] FTSE group acquired Russell Investments in June 2014, FTSE and Russell Indices merged and subsequently known as FTSE Russell.
[10] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series_FAQ.pdf

transformation agent to enhance its capital market FTSE Bursa Malaysia indices are an important gauge to achieve the government's missions.

"Initiative under this EPP (Entry point Projects) aim to increase Bursa Malaysia's market capitalisation to RM3.9 trillion (USD 1 Trillion) by 2020 from 1 trillion in 2010, accounting for a compound growth rate (CAGR) of 15%. It also targets to improve liquidity, measured by trading velocity, from 31% of total market capitalisation to 60% in line with regional average" (Economic Transformation Programme Annual Report 2013 Pemandu, Prime Minister Department).

The enhancement milestones started with the indices transition which was completed on 6 July 2009 and later became known as FTSE Bursa Malaysia.[11] As part of the Bursa Malaysia's strategic plan, the main index Kuala Lumpur Composite Index (KLCI), followed by other indices have been restructured to ensure that they remain strong and healthy in measuring the Malaysian economy with expanding connection to the global economy. The Bursa Malaysia, together with its strategic index partner the FTSE group, have integrated the KLCI with internationally accepted index calculation methodology to provide a more investable, tradable and transparently managed index.[12]

Consequently, the number of constituents of the KLCI changed from 100 to 30 constituents and known as the FTSE Bursa Malaysia KLCI 30 (KLCI 30). As a result, the Malaysian stock market emerged with a set of new indices including the 'blue chip' index KLCI 30, FTSE Bursa Malaysia 70 (KLCI 70), FTSE Bursa Malaysia Small Cap (Small Cap) and FTSE Bursa Malaysia Fledgling (Fledgling).

[11] http://www.bursamalaysia.com/market/products-services/indices/bursa-malaysia-index-series/
[12] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series_FAQ.pdf

With the above reforms, some stock indices were abolished from the Malaysian securities market. The main equity Index KLCI which composed of 100 constituents, was put to rest effective on 6 July 2009 and other indices like technology index was replaced with the ACE and Fledgling index.

2.2 The Exchange: Bursa Malaysia

It is fairly important to look back on the history of the Malaysia exchange and its markets to better understand the Malaysia Stock market structure. Malaysia stock market has been .dated more than 85 years. Initiated in 1930, the private Singapore Stockbrokers Association (Singapore was under Malaysia federation until devolution from Malaysia on 9th August 1965) was the first authorised securities trading organization in Malaysia. This stock market association of was later known as the Malayan Stockbrokers' Association in 1937.[13]

Later, on 9th May, 1961, the Malayan Stock Exchange was formed and the public trading of shares began.[14]The Board system was introduced whereby two trading rooms, one in Singapore and another in Kuala Lumpur, which were linked by direct telephone lines into a single market with the same stocks and shares listed at a single set of prices on both boards.

The Stock Exchange of Malaysia was officially formed in 1964 and in the following year, with the secession of Singapore from Malaysia, the common stock exchange continued

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[13] http://www.bursamalaysia.com/corporate/about-us/corporate-history/
[14] http://www.bursamalaysia.com/corporate/about-us/corporate-history/

to function under the name, Stock Exchange of Malaysia and Singapore (SEMS). In 1973, with the termination of currency interchange ability between Malaysia and Singapore, the SEMS was separated into The Kuala Lumpur Stock Exchange Bhd (KLSEB) and The Stock Exchange of Singapore (SES).[15] Malaysian firms continued to be listed on SES and vice-versa. In 1994, KLSEB was re-named Kuala Lumpur Stock Exchange.

The Kuala Lumpur Stock Exchange (KLSE) took over the operations of KLSEB as the stock exchange. In 2004, Kuala Lumpur Stock Exchange was rebranded into Bursa Malaysia and subsequently became a public firm and demutualised exchange. Kuala Lumpur Stock Exchange (KLSE) consisted of a Main Board, a Second Board and the Malaysian Exchange of Securities Dealing and Automated Quotation (MESDAQ). Under new Bursa Malaysia, firms are listed under either the Main or ACE Markets.[16]

The main index, FTSE Bursa Malaysia KLCI 30 passed the 1,800 index point milestone in May 9 2014, and in held a total market capitalization of USD 187 billion. The market operations are divided into a Stocks Exchange, a Derivatives Exchange, an Offshore Exchange and Bond Exchange. Even though the restructuring of Bursa Malaysia covers the whole division, the focus of this thesis will be limited to Stock Exchange and its index series.

[15] http://www.bursamalaysia.com/corporate/about-us/corporate-history/
[16] http://www.bursamalaysia.com/corporate/about-us/corporate-history/

Figure 2.1 shows KLCI Price from 2004 to 2014. Price index is based on KLCI 100 prior 6 July 2009 and replaced with KLCI 30 from the date onwards.

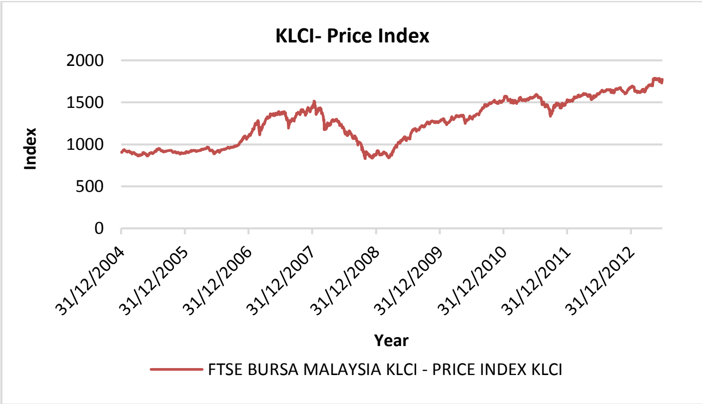

Figure 2.1: KLCI Price Index

2.3 Bursa Malaysia Partnership with FTSE

An agreement was signed between the Bursa Malaysia and the FTSE group in 2006 and the indices were launched using FTSE methodology in June 2006. The KLCI 30, together with the entire FTSE Bursa Malaysia index series, was launched in the Malaysian market on 6th July 2009. In the transition period from June 2006 to July 2009, the KLCI 100 was still used as the main referred Malaysia index.

The KLCI 100 index was considered Malaysia's institutional benchmark index since its launch in 4 April 1986. The index served as an indicator of the Malaysian equity market. As institutional investors grew increasingly sophisticated, there was a need to introduce a tradable benchmark index which was complementary to the narrowly defined requirements for equity portfolio and stimulated the creation of exchange traded funds, derivatives and other index linked products.

With the introduction of the FTSE Bursa Malaysia index series in 2009, Malaysia's indices have been placed at the forefront of the global market. The indices showcase the performance of the Malaysian equity market and sit alongside other leading Asia Pacific and international indices, including the FTSE Hang Seng of the Hong Kong, Singapore, and FTSE Japan, as some of the world's most transparent and investable equity benchmarks.

"...The Malaysian capital market registered strong growth with the benchmark index emerging as the top performing major market in ASEAN..." Husni Hanadzlah Minister of Finance II (Economics Transformation Program Annual Report 2013).

2.4 FTSE Bursa Malaysia Indices

The FTSE Bursa Malaysia indices series are closely aligned with FTSE's global suite of indices, and are recognized internationally as Malaysia's principal investable, transparent and benchmark equity indices[17].

FTSE's global indices are liquid, tradable, and easily replicable, allowing extensive use by institutional investment managers, mutual fund managers, and professional advisors. With almost USD 270 billion[18] managed to the KLCI 30, the index is regarded as Malaysia's equity benchmark.[19]

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[17] http://www.ftserussell.com/
[18] Exchange rate at USD1:MYR3.5 as at October 2015
[19] www.ftse.com/Analytics/FactSheets/Home/

The FTSE Bursa Malaysia indices are real-time, market capitalization-weighted indices that include the largest and most liquid stocks in the Malaysian market. The FTSE Bursa Malaysia EMAS index covers most of the Malaysian equity main market by capitalization with almost RYM 1.4 trillion (USD 400 billion), with constituencies that are highly liquid and tradable. Such characteristics ensure that the FTSE Bursa Malaysia is representative of the Malaysian market.

2.4.1 FTSE Bursa Malaysia Index Family

Figure 2.2 shows the structure of FTSE Bursa Malaysia index series (**Source:** Bursa Malaysia)

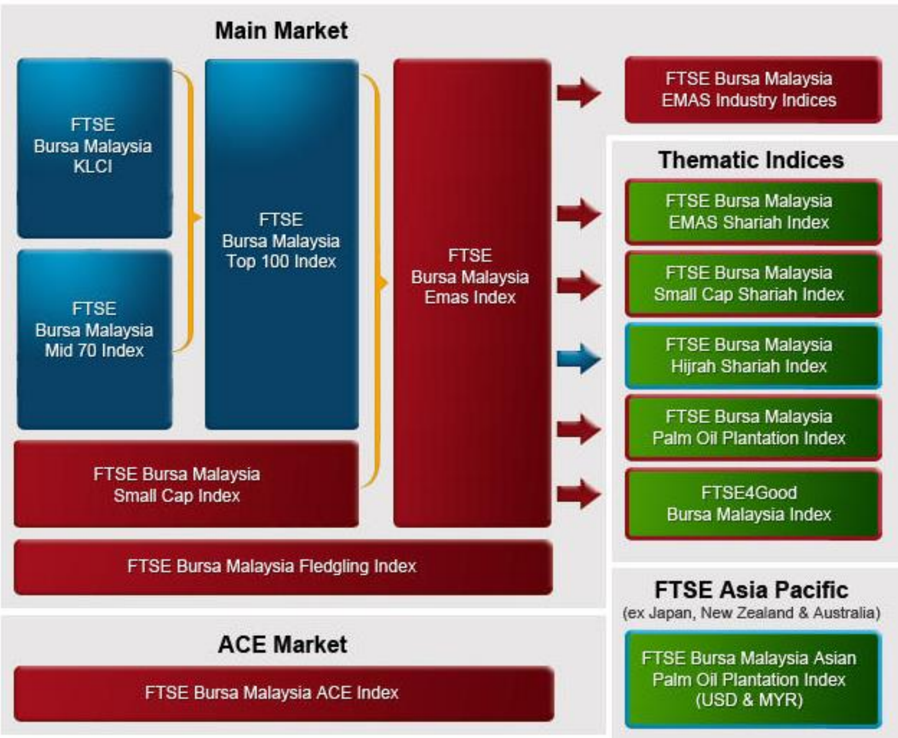

Figure 2.2: FTSE BM Index Series

The FTSE Bursa Malaysia index series includes the KLCI 30, the KLCI 70, KLCI 100, the Small Cap, the FTSE Bursa Malaysia EMAS (EMAS), FTSE Bursa Malaysia Emas industry(EMAS_I),the FTSE Bursa Malaysia Fledgling (Fledgling),the FTSE Bursa

Malaysia Shariah (Shariah), the FTSE Bursa Malaysia Small Cap Shariah (Shariah Small Cap), The FTSE Bursa Malaysia Hijrah Shariah Index (Hijrah), the FTSE Bursa Malaysia Palm Oil Plantation (CPO), the FTSE Bursa Malaysia Asian Palm Oil Plantation -USD (CPO USD), the FTSE 4Good Bursa Malaysia index (4Good), the FTSE Bursa Malaysia Asian Palm Oil Plantation MYR (CPO MYR) and the FTSE Bursa Malaysia ACE index (ACE).

This index family also comprises component indices that represent the Malaysian market capitalization order. These component indices include the Small Cap, the KLCI 70 (Middle Cap) and the KLCI 30 (Big cap). In the main market, the KLCI 30, the KLCI 70 and the Small cap make up the FTSE Bursa Malaysia EMAS index. With the allowance for the Fledgling index, all indices are float-adjusted with screening for liquidity. Table 2.4 shows FTSE Bursa Malaysia Industry Classification Benchmark (ICB) sector breakdown.

Subsequent to index restructuring in 6 July 2009, the KLCI 30 replaced the KLCI 100 index as the primary gauge for the Malaysian equity market. The KLCI 30 measures the performance of the 30 largest index-eligible stocks listed on the Bursa Malaysia by float-adjusted, market capitalization.

The KLCI 30 is considered as a representative, liquid and tradable index. It is generally considered Malaysia's dominant benchmark index. The main indices, which include big cap, mid cap and small cap, are float-adjusted, covering approximately 98% of Malaysian equity market capitalization.[20] Listed firms attach massive significance to their membership in the main FTSE Bursa Malaysia indices. Inclusion in the top index generates significant institutional interest for selected constituents. Inclusion increases widespread media, and encourages buy along with side analytical coverage.

Table 2.1 shows FTSE Bursa Malaysia Index Characteristic for the FTSE Bursa Malaysia KLCI 30, FTSE Bursa Malaysia KLCI 70 and FTSE Bursa Malaysia Small Cap. Figures are in thousands. **Source**: FTSE as at November 2015

Characteristics	FTSE Bursa Malaysia KLCI 30	FTSE Bursa Malaysia KLCI 70	FTSE Bursa Small Cap
Number of constituents	30	70	176
Full Market Cap (MYR)	990,850	296,052	100,053
Dividend Yield	3.13	2.91	2.41
% FTSE Bursa Malaysia EMAS	71.44	21.35	7.21
Average	16,232	2,153	269
Largest	57,127	10,660	1,153
Smallest	3,159	317	0
Median	13,043	1,422	203
Weight of Largest Constituents (%)	11.73	7.07	2.44

Table 2.1: FTSE BM Index Characteristics for the Main Indices

Table 2.2 shows FTSE Bursa Malaysia Index Characteristic for the FTSE Bursa Malaysia EMAS, and FTSE Bursa Malaysia Fledgling. Market cap figures are in thousands. **Source**: FTSE as at October 2015

Characteristics	FTSE Bursa Malaysia EMAS	FTSE Bursa Malaysia Fledgling
Number of constituents	273	400
Net Market Cap (MYR)	679850	22055
Dividend Yield	3.13	2.18
Constituents Sizes (Net MCAP MYR)		
Average	2490	55
Largest	56194	558
Smallest	27	1
Median	371	41
Weight of Largest Constituents (%)	8.27	2.53

[20] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series.pdf?32

Table 2.2: FTSE BM Index Characteristics for the EMAS and Fledgling

Table 2.3 shows three year correlation between FTSE Bursa Malaysia index series[21] **Source**: FTSE as at October 2015.

	FTSE Bursa Malaysia KLCI 30	FTSE Bursa Malaysia KLCI 70	FTSE Bursa Malaysia KLCI 100	FTSE Bursa Malaysia EMAS	FTSE Bursa Malaysia Small Cap	FTSE Bursa Malaysia Fledgling
FTSE Bursa Malaysia KLCI 30	1.000	0.756	0.979	0.964	0.632	0.673
FTSE Bursa Malaysia KLCI 70		1.000	0.873	0.899	0.916	0.886
FTSE Bursa Malaysia KLCI 100			1.000	0.997	0.755	0.776
FTSE Bursa Malaysia EMAS				1.00	0.804	0.819
FTSE Bursa Malaysia Small Cap					1.000	0.949
FTSE Bursa Malaysia Fledgling						1.000

Table 2.3: FTSE BM Index Series Correlation

[21] http://www.ftse.com/Analytics/FactSheets/Home/FactSheet/ProductRegions/OTHER/1/ASIA/1#

Table 2.4: shows FTSE Bursa Malaysia Industry Classification Benchmark (ICB) sector breakdown. The first column shows the ICB super sector; the second, third and fourth columns show the FTSE Bursa Malaysia Emas index, FTSE Bursa Malaysia Small Cap respectively with number of constituents, net market capitalisation in MYR and market weight in the respective sub-column. Market cap figures are in thousands MYR. **Source**: FTSE as at October 2015.

	FTSE Bursa Malaysia EMAS			FTSE Bursa Malaysia Small Cap			FTSE Bursa Fledgling		
ICB super sector	No of cons	Net Market cap (MYR)	Wgt (%)	No of cons	Net Market cap (MYR)	Wgt (%)	No of cons	Net Market cap (MYR)	Wgt (%)
Oil & Gas	24	50499	7.43	15	4762	10.08	3	146	0.66
Chemicals	4	23338	3.43	1	605	1.28	20	1196	5.42
Basic Resources	9	2993	0.44	7	911	1.93	33	1280	5.80
Construction material	33	36434	5.36	26	6569	13.91	63	3139	14.2
Industrial goods & services	48	68356	10.05	37	10644	22.54	92	5165	23.4 2
Automobiles & parts	1	5445	0.80	-	-	-	14	530	240
Food & Beverages	15	48095	7.07	9	1832	3.88	34	7828	8.29
Personal household goods	12	11714	1.72	10	2554	5.41	62	3135	14.2 2
Health care	11	33206	4.88	3	541	1.14	4	387	1.76
Retails	7	4281	0.63	3	541	1.15	10	641	2.91
Media	3	7331	1.08	1	162	0.34	5	104	0.47
Travel & leisure	13	39480	5.81	7	2522	5.34	10	1147	5.20
Telecommunications	6	81372	11.97	1	172	0.36	1	46	0.21
Utilities	7	59862	8.81	3	1318	2.79	1	40	0.18
Banks	9	155202	22.83	-	-	-	-	-	-
Insurance	6	2752	0.40	5	1511	3.20	-	-	-
Real estate	42	34740	5.11	28	6859	14.52	27	2011	9.12
Financial services	7	7050	1.04	3	888	1.88	4	848	3.85
Technology	16	7700	1.13	14	4838	10.24	17	848	3.85
Total	273	679850	100	173	47229	100	400	22055	100

Table 2.4: FTSE BM Index Series Classification

2.4.1.1 FTSE Bursa Malaysia KLCI 30

The FTSE Bursa Malaysia KLCI is Malaysia's most prominent large cap equity index. First introduced on 6 July 2009, the index comprises the 30 largest stocks listed on the Bursa Malaysia by market capitalization. The index is float-adjusted, with securities that are highly liquid and, therefore, institutionally investable. The index was adopted on 3rd July 2009, replacing the KLCI 100 as the main benchmark and trading index. It is the largest capitalization-based index in the FTSE Bursa Malaysia index family, covering more than 70% of Bursa Malaysia’s broader market capitalization (the Emas Index) with full market capitalisation of MYR 990,850,000as at November 2015.[22] The three year correlation between KLCI 30 and the broader EMAS index is 0.964.

2.4.1.2 FTSE Bursa Malaysia KLCI 70

The FTSE Bursa Malaysia KLCI 70, comprises of the next 70 firms by full market capitalisation that meet eligibility requirements of liquidity and free float screen. It is the second largest capitalization-based index in the FTSE Bursa Malaysia index family, covering almost 22% of Malaysia's broader equity market capitalization (the Emas index) with MYR 296,855,000 market capitalisation.[23] The three year correlation between KLCI 70 and the EMAS index and the KLCI 30 is 0.9 and 0.75 respectively.

2.4.1.3 FTSE Bursa Malaysia KLCI 100

The FTSE Bursa Malaysia Top 100 represents both the large cap and mid cap components of the FTSE Bursa Malaysia suite of indices and covers approximately 90% of Malaysian broader equity market capitalization (the Emas Index) with full market capital of MYR 1,286,903,000.[24] The indices are considered as the broader heavy capitalisation index. The three year correlation between KLCI 100 and the EMAS index and the KLCI 30 is 0.96 and 0.97 respectively.

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[22] http://www.ftse.com/Analytics/FactSheets/temp/01c0c39a-8ca8-47f1-9d54-491b87ab4dc3.pdf
[23] http://www.ftse.com/Analytics/FactSheets/temp/01c0c39a-8ca8-47f1-9d54-491b87ab4dc3.pdf
[24] http://www.ftse.com/Analytics/FactSheets/temp/01c0c39a-8ca8-47f1-9d54-491b87ab4dc3.pdf

2.4.1.4 FTSE Bursa Malaysia Small Cap

The FTSE Bursa Malaysia small cap represents the third largest and most liquid index-eligible stocks listed on the Bursa Malaysia by float-adjusted market capitalization. The FTSE Bursa Malaysia small cap represents approximately 8% of Malaysian equity market capitalization (the Emas Index) with MYR 47,229,000 net market capitalisation. There are around 173 constituents listed in the index. The three year correlation between the Small Cap index with the EMAS index and the KLCI 30 is 0.80 and 0.63 respectively.

2.4.1.5 FTSE Bursa Malaysia Fledgling

This index comprises the main market firms which meet stated eligibility requirements, but are not in the top 98% by full market capitalisation and are not constituents of the FTSE Bursa Malaysia EMAS Index. Around 400 constituents belong to the Fledgling index with total full market capitalisation of MYR 22,055,000 and around 3.2% of total net capitalisation over broader Emas Index.

2.4.1.6 FTSE Bursa Malaysia Emas

Covering a wide opportunity-set of index constituents, the FTSE Bursa Malaysia Emas is extensively used as a performance benchmark index. The index is highly liquid, float-adjusted and includes up to 273 of Malaysia's largest securities by float-adjusted market capitalisation.[25] The FTSE Bursa Malaysia Emas index includes the large cap, mid cap and small cap components of the FTSE Bursa Malaysia index family. The index covers

[25] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series.pdf?32

approximately 98% of Malaysian main equity market capitalization with value of MYR679, 850, 000 net market capitalisations. The three year correlation between the EMAS and the KLCI 100 is close to 1.[26]

2.4.1.7 FTSE Bursa Malaysia Emas Industry

FTSE Bursa Malaysia Emas Industry is composed of those firms within the FTSE Bursa Malaysia EMAS, but sectored according to ICB, which includes 10 industry, 19 Super sector and 39 Sector indices.[27] The index is meant to provide investors with tools for deeper analysis of the Malaysian market and the opportunity to create sector -specific finds and index-linked products. Table 2.4 describes the ICB sectors for FTSE Bursa Emas Industry.

2.5 FTSE Bursa Malaysia Index Ground Rules

In following section, the management aspects of the indices such as the index construction requirements, periodic review of the index constituents, and rules related to the stock additions to and deletions from the indices are overviewed.

2.5.1 Index Management

The FTSE Bursa Malaysia Advisory Committee governs the ongoing management of these indices to ensure they continue to meet the needs of index users. The committee is made up of senior investment professionals and finance industry experts acting

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[26] See Appendix A, figure A1 for KLCI 30 vs EMAS price index.
[27] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series.pdf?32

independently to advise on the creation of new indices, any enhancements to the methodology and to ensure that the index series evolves with any changes in the market environment.

In terms of managing the indices, the FTSE is the authority in charge of the operations related to the FTSE Bursa Malaysia Index Series. FTSE computes all the indices in real-time and keeps records of the market capitalisation for all the index constituents and the reserve firms. FTSE will make changes to the constituents and their weightings in accordance with the Ground Rules. Bursa Malaysia will coordinate with and support FTSE where necessary on changes to index and constituent data. FTSE will perform the semi-annual review of the FTSE Bursa Malaysia Index Series and will implement the resulting constituent changes as required by the Ground Rules.[28]

[28] KLSE Research (2012) FTSE Bursa Malaysia Index Series Ground Rules

2.5.2 Index Construction

In terms of eligibility, all classes of the ordinary shares in issue are eligible for inclusion in the FTSE Bursa Malaysia Index Series, subject to conforming to all other rules of eligibility, free float and liquidity.[29]

2.5.2.1 Free Float Restriction

The FTSE Bursa Malaysia Index Series constituents are adjusted for free float and weighted according to how much share capital is available for public investment. This achieves the most accurate and neutral market representation possible: meaning that only shares that can be own are included in the index. FTSE apply free float restrictions in weighted bands. This process accurately reflects how investable a firm is, without subjecting the investor to frequent rebalancing transactions associated with a more precise free float methodology.

One of the contributions of this thesis is the development of a new liquidity ratio measure which considers free float. There are free float restrictions in the Malaysian stock market and these are due to i) trade investments in an index constituent either by another constituent (i.e., cross-holdings) or non-constituent firm or entity; ii) significant long term holdings by founders, their families and/or directors; iii) employee share schemes (if restricted); and iv) government holdings.

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[29] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series.pdf?179

Free float restrictions are calculated using available published information. The initial weighting of a constituent in the index will be applied according to bands. For instance, if the free float is less than or equal to 15%, the firm is ineligible to be a constituent. If the free float is greater than 15% but less than or equal to 20%, it falls under the 20% band. If greater than 20% but less than or equal to 30%, it falls within the 30% float band. If greater than 30% but less than or equal to 40%, it falls within the 40% band. If greater than 40% but less than or equal to 50%, it fall under the 50% band. If greater than 50% but less than or equal to 75%, it falls under the 75% band. Lastly if free float is greater than 75%, it falls under the 100% band.

2.5.2.2 Liquidity Screen

Stocks must be sufficiently liquid to be traded. The following conditions are used to ensure that illiquid securities are excluded: i) an accurate and reliable price must exist for use in determining the market value of a stock. A stock may be excluded from the FTSE Bursa Malaysia Index Series if an 'accurate and reliable 'price is not available, ii) the largest eligible firms ranked by full market capitalisation, comprising 98% of all firms, will be included in the FTSE Bursa Malaysia EMAS Index, iii) stocks which do not turn over at least 10% of their shares in issue, in the twelve months prior to the semi-annual review, will not be eligible for inclusion. In measuring liquidity, data on trade volume will be obtained from Bursa Malaysia.

The twice a year liquidity screen affects all indices in the FTSE Bursa Malaysia Index Series with the exception of the Fledgling index and the ACE index. Each constituent will be checked for liquidity by computation of its median daily trading per month. The median trade is computed by ranking each daily trade total and selecting the middle ranking day.

Non-constituents will not be eligible for inclusion in the index if they do not have turnover of at least 0.05% of their shares in issue based on their median daily trade per month for at least ten of the twelve months prior to the semi-annual review. On the other hand, any existing constituent which does not turn over at least 0.04% of its shares in issue based on its median daily trade per month for at least eight of the twelve months prior to the semi-annual review will be deleted.

2.5.3 Periodic Reviews

In term of periodic reviews, the FTSE Bursa Malaysia Index Series is revised twice a year on a semi-annual basis in June and December. Reviewing is based on data as at the close of business on the last working day in May and November. The semi-annual review will be implemented after the close of business on the third Friday in June and December, and only take into effect on the following Monday. [30]

In terms of responsibility and reporting, the FTSE group is in charge of conducting the semi-annual review of constituents for the FTSE Bursa Malaysia Index Series and will report to the FTSE Bursa Malaysia Index Advisory Committee any constituents to be added or deleted as part of the semi-annual review. The FTSE Bursa Malaysia Index Advisory Committee will agree whether to accept the endorsement presented to the

[30] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series.pdf?179

committee by the FTSE group. In certain circumstances, the committee will decide what other action should be taken in consequence of the outcome of the review of constituents. The FTSE group is responsible for disseminating the final outcome of the semi-annual review.

2.5.4 Rules for Addition and Deletion

The rules for stock addition and deletion at the semi-annual review are intended to provide stability in the selection of constituents of the FTSE Bursa Malaysia Index Series while ensuring that the index continues to be representative of the market by inserting or deleting those firms which have risen or fallen significantly.[31]

A firm will be added at the periodic review if it rises above the position stated in table 2.5 for the relevant index. The eligible securities are ranked by full market capitalisation. For example constituents will be added to FTSE Bursa Malaysia KLCI if raised to 25th or above and added to FTSE Bursa Malaysia Mid 70 Index if raised to 85th or above.

Table 2.5 shows periodic review position for the main index revision

Index	Added	Deleted
FTSE Bursa Malaysia KLCI 30	Risen to 25th or above	Fallen to 36th or below
FTSE Bursa Malaysia KLCI 70	Risen to 85 or above	Fallen to 116th or below

Table 2.5: Index Periodic Review Position

On the hand, a firm will be deleted from the relevant index at the periodic review if it falls below the position stated. For instance, constituents will be deleted from the FTSE

[31] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series.pdf?179

Bursa Malaysia KLCI if they fall to 36th or below and constituents will be deleted from KLCI 70 if they fall to 116th or below. Constituents deleted from the KLCI 30 at the periodic review will normally be added to the KLCI 70. On the other hand, constituents added to the KLCI 30 at the periodic review will normally be deleted from the KLCI 70. Constituents deleted from the KLCI 70 Index at the periodic review will normally be added to the Small Cap Index. Constituents added to the KLCI 70 at the periodic review will normally be deleted from the Small Cap Index

In terms of reserve lists, the FTSE group will determine the five highest-ranking non-constituents of the KLCI 30 and the ten highest-ranking non-constituents of the KLCI 70 at the time of the periodic review. The reserve list will be used in the event that one or more constituents are deleted from the KLCI 30, or KLCI 70 during the period up to the next semi-annual review.

2.5.5 Changes to Constituent Firms

In case a constituent is de-listed from Bursa Malaysia, or ceases to have a firm quotation, or is subject to a take-over or has ceased to be a viable constituent as defined by the Ground Rules, the index management team will remove such firm from the list of constituents. If the firm to be removed is a constituent of KLCI 30 or KLCI 70, the vacancy will be occupied by selecting the highest ranking stock by full market value in the reserve list as at the close of the index calculation two days prior to the deletion and related indices adjusted accordingly.[32] However, when the firm is removed from the Small Cap index, no replacement firm will be found and the vacancy will not be filled.

If the effect of a merger or complex takeover is that one constituent in the KLCI 30, or the KLCI 70 is absorbed by another constituent, the acquirer firm will remain a constituent of the appropriate index, and a vacancy will be created. This position will be filled by selecting the highest ranking security by full market value in the appropriate reserve list. However if a constituent firm in the KLCI 30, or the KLCI 70 is taken over by a non-constituent firm, the original constituent will be removed and filled by the highest-ranking non-constituent in the reserve list.

The same treatment applies to a constituent firm which splits to form two or more firms, then the resulting firms will be eligible for inclusion as index constituents in the appropriate FTSE Bursa Malaysia indices providing they are larger than the smallest constituent, based on their respective full market capitalisations.

For instance, a KLCI 30 constituent split into two firms may result in one or both of these firms remaining in the KLCI 30. Since both of these firms stay in the KLCI 30, the smallest KLCI 30 constituent will become a constituent of the KLCI 70 and the lowest ranking constituent in the KLCI 70 will, become a constituent of the Small Cap index.

[32] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series.pdf?179

2.6 Trading System

Since the implementation of computerized trading system in May 1989, Bursa Malaysia's computerized trading system has undergone several major changes. It started as a semi-automated system and was converted into fully automated trading system in October 1992. The system was enhanced in 1994 particularly in the area of broker end front trading at the stockbroking companies. By early 1995, all stockbroking companies were equipped with Bursa Malaysia's latest computerized broker end front system known as WinSCORE system. Trading on Bursa Malaysia Securities Berhad (Bursa Securities) (previously known as Kuala Lumpur Stock Exchange) is executed through stockbroking companies (SBCs). The automated trading system of the Bursa Securities comprise two major computer systems which are as follows: i) The SCORE (System on Computerised Order Routing and Execution) which is the central computer engine responsible for the matching of all trades; ii) The WinSCORE system (broker front end trading system) which is responsible for credit control management, order and trade routing as well as confirmation.

All stock broking companies are equipped with the WinSCORE system. The WinSCORE terminals are linked with the SCORE system to enable dealers to key in orders themselves and not through a central buyer. This allows a more timely execution of clients' orders and a reduction of risk exposure for the dealers and the broking firms.

A subsidiary company of the Exchange, Bursa Malaysia Securities Clearing Sdn Bhd (Bursa Clearing 'S'), (previously Securities Clearing Automated Network Services Sdn Bhd, SCANS), effects the clearing and settlement of all business done through SCORE.

This provides for efficiency in terms of delivery of stocks and shares and settlement of accounts for the investing public and members of the Exchange. Bursa Malaysia Trading system

Effective from October 2015, all buy and sell orders will be keyed in by the market participants via Participating Organisations' Order Management System (OMS) into Bursa's Automated Trading System (ATS) as per the prescribed trading Phases and Market Timing.

2.6.1 Transaction Cost

In addition to the cost of the shares bought or sold, investors in the Bursa Malaysia exchange have to pay brokers' commission, stamp duty and clearing fees. The trading cost is standardized across Bursa Malaysia indices, however, broker's commission for inter-broker and institutional investors are fully negotiable.

For retail trades where the contract value is RM100,000.00 or below, the minimum broker's commission payable is set at 0.6% of the contract value. If the contract value exceeds RM100,000.00 the minimum commission payable is calculated at 0.3% of the contract value. On the other hand, where the trade is an Intraday Trade, the minimum commission payable is calculated at 0.15% of the Contract Value.

The stamp duty is RM1.00 for every RM1000.00 (or fractional part) of the transaction value of securities (payable by both buyer and seller). The stamp duty shall be remitted to the maximum of RM 200.00.

In term of clearing fees, for novated contract[33], fee is payable at 0.03% of market value in (payable by both buyer and seller) with a maximum of RM1000.00 per contract. There is no minimum fee imposed. In term of direct business contract, 0.03% of transaction value is payable by both buyer and seller with a maximum of RM1000.00 per contract and a minimum of RM10.00.

Overall, trading cost for buying and selling stocks in the Bursa Malaysia exchange is relatively low and competitive. Brokers which are usually market makers offer a very low broker's fee to institutional investors as the market is very competitive. There is no difference in term of trading cost size for stocks in different indices as all fees are regulated by Securities commissions apart from broker's fees.

[33] A contract where traders choose to end existing contract with one party but enter a new contract with another party; replacing a party to an agreement with a new party.

2.6.2 The Role of Market Maker

The role of market maker in Bursa Malaysia stock exchange is very crucial especially in providing liquidity to the market. As liquidity plays such an important role in markets like Malaysia as quoted by Chief Executive Officer of Bursa Malaysia Berhad, Dato' Yusli Mohamed Yusoff:

"The Exchange is focussed on implementing measures that can help drive liquidity to the market. Market makers play a pivotal role in providing immediacy, orderly price movements and price discovery. For investors, the positive impact of market making is that it promotes greater investor confidence as there is liquidity." (Bursa Malaysia Media Release 11 May 2009)

It is in no doubt that market maker in Bursa Malaysia exchange play an importance role in providing liquidity to the market. Even though the regulated market maker is relatively new, only being established in 2009, brokers had been actively acted as market makers ever since the inception of the exchange.

Chapter 3: The Effect of Changes in the Composition of the FTSE Bursa Malaysia Indices on Stock Price and Volume

3.1 Introduction

It is well established in the literature that changes in the composition of stock indices are usually implemented shortly after the "announcement date" (AD). These events along with the time between the AD and the effective "change date" (CD), have provided rich information in understanding how stock prices are affected by stock index changes

A market in which prices always "fully reflect" available information is called "efficient" (see Fama (1970)). The "efficient market hypothesis" (EMH) states that security prices fully reflect all publically available information and rational investors should not react to informationless events. Several hypotheses have been tested, particularly for the US and European markets, to examine stock prices' reaction to changes in the composition of stock indices (see, for instance, Harris and Gurel (1986), Lynch and Mendenhall (1997), Hedge and McDermott (2003), Vespro (2006), Gregoriou (2011), Chan et. al (2013), Azevedo et al (2014) Alam et al., (2016) and Fernandes et al., (2016)). Bounces and reversals are inconsistent with the EMH, where it is also implicitly assumed that securities are near perfect substitutes for each other, and so the excess demand for a single security will be very elastic, and the sale or purchase of a large number of shares have no effect on share prices.

Empirical studies on the association between index changes and stock price behaviour for the Asian markets are still limited. A few have concentrated on Japanese indices, like Liu (2000) who considers the effect of changes in the Nikkei 500 on stock prices and trade volumes, and finds evidence supporting the downward sloping demand curves hypothesis. Another study by Liu (2011) explores a new explanation (volatility-explanation) for the permanent price effect of index additions for the Nikkei 225, and shows that the stock's volatility plays a significant role on the permanent price increase.

Yun and Kim (2010) study the Korean stock market and provide evidence of permanent price effect and partial return reversal. Li and Sadeghi (2009) investigate the impacts of index revisions on the return of Chinese equities and show that stock prices respond positively to index additions, and negatively to index deletions.

This study is the first attempt to provide a comprehensive analysis of the effects of change on the FTSE Bursa Malaysia index series, covering most of the index revisions over the time period of 2006 to 2012. Previous study (see Azevedo et al., 2014) was limited to the main blue chip index only, where 15 additions and 13 deletions collected from the time period of 2006 to 2012 were considered.

Modern portfolio theory has shown the importance of international portfolio diversification (see, for instance, Li and Sadeghi 2009). Developing markets are appealing options for portfolio diversification since they offer both good potential returns and opportunity to reduce risks. Earlier researches on developing markets claim that stock returns are homogeneous within each market, as the stocks move closely together. Likewise the stocks returns are heterogeneous with the external market because of the low correlation with returns in developed markets (see for instance, Hyde et al. (2007)). Consequently, investing in funds that replicate developing market equity indices is a feasible diversification option for fund managers in developed countries.

As discussed in the previous chapter, the Bursa Malaysia and the FTSE group announced in July 6, 2009, that the KLCI 100 split into two new indices, one with 30 constituents, named the FTSE Bursa Malaysia KLCI 30, and another with 70 constituents, named the FTSE Bursa Malaysia KLCI 70. Following the index restructuring, not only the main index but other indices are also affected in terms of composition and constituents changes.

The above changes, along with the fact that candidates to be added to or deleted from the respective indices, and the dates where the index change will take place, are known in advance (different, for instance, from the rules used to implementing changes in the S&P 500 where there is a list of candidates to be included but the identity of the firms is kept secret until the announcement of the change) provide an unusual opportunity to examine the effect of changes in the index composition on the stock prices.[34] These features allow us to extend the Lynch and Mendenhall (1997) test, by isolating the PPH from the ISH and testing the downward sloping demand curves hypothesis. Vespro (2006) performed this test for European stock indices.

This chapter provides new evidence supporting various hypotheses as I extend stock addition and deletion investigation across the Bursa Malaysia index series. I find evidence supporting the PPH for both additions to and deletions from the KLCI 30. I observe positive abnormal returns for stocks added to the KCLI 70 with persistent increase in volume in the post-event window which supports the ICLH. The analysis of the long-

[34] Changes in the composition of the FTSE BM indices conform to pre-specified criterion. More specifically, all classes of ordinary shares in issue are eligible for inclusion in the FTSE BM KLCI subject to conforming to all other rules of eligibility, free float and liquidity. Securities must be sufficiently liquid to be traded and accurate and reliable prices must exist for determining the market value of a firm. Inclusion in the stock index is also based on market capitalisation according to the FTSE Ground Rules.

term event-windows further strengthen my results. I also conclude that deletions from the KLCI 70 and additions to the Small Cap index result support ISH, reflecting that stock prices increase (decrease) due to addition (deletion); followed by price persistence in the post long term period.

The remaining sections of the paper are organized as follows. In section 3.2, I explain several theories and previous literature. In section 3.3, I describe the data sample and the methodology. In section 3.4, I provide my results and analyses. In section 3.5, I conclude and make suggestions for further work.

3.2 Review

In this section, I will first discuss the related theories and followed by reviews on previous literature on abnormal return and volume in the light of index revisions.

3.2.1 Theory

Research on market efficiency has marked a turning point when the efficient market hypothesis was introduced by Eugene Fama in his seminal work back in 1970. A market in which prices always “fully reflect” available information is called “efficient” (see Fama (1970)). The “efficient market hypothesis” (EMH) states that security prices fully reflect all publically available information and rational investors should not react to informationless events.

Fama (1970) argued that stock prices were representative of the total available information to the market and were fairly set by the market. Fama (1970) explained three principles hypotheses of market efficiency: the strong form tests that measure the monopolistic access (insider information) to information; the semi-strong form hypothesis that measures the adjustment to public information (non-price information); and the weak form that measures responses to information and historical price data (Fama, 1970).

3.2.1.1 Price Pressure Hypothesis

The “price-pressure hypothesis” (PPH) assumes that the long-term demand is perfectly elastic at full-information price. It holds that stock prices reverse to their ex-ante level after the index change, and recognizes that immediate information about non-information-motivated demand shifts may be costly and, consequently, the short-term demand curve may be less than perfectly elastic.

Harris and Gurel (1986), Woolridge and Ghosh (1986), Dhillon and Johnson (1991), Liu (2001), Madhavan (2003), Chen et al. (2004), Vespro (2006), Yun and Kim (2010), and Azevedo et. al (2014) among others, support the PPH.

Liu (2000) asserts that price pressure theory suggests that investors accommodating unexpected demand shifts must be paid off for the transaction costs and portfolio risks imposed on them when they agree to trade immediately what otherwise sensible investors would not. Pay off or compensation comes in the form of temporary price changes for the stocks affected. However, the demand shift does not change the point of equilibrium value for stock and price will revert to its equilibrium level after the event (Liu, 2000).

Contrarily, Scholes (1972) uses the term "price pressure" in his study to describe the effect of investor preferences (which is the terminology use for downward-sloping demand curves). On the other hand, Chen et al. (2004) refer to short-run price divergences in reaction to index additions as "short-term downward-sloping demand curve." A good survey about the hypotheses for the increase in stock prices associated with additions to the S&P 500 index is provided by Elliott et al. (2006).

In recent studies, the phrase "price pressure" is the expression most frequently used to explain the short-run effect of market liquidity constraints. I use the phrase "downward-sloping demand curves" to describe the longer run price effect due to investor preferences as explain in the next hypothesis. According to William et al. (2006), "market frictions" are able to create short-run liquidity constraints, resulting in a price pressure effect. This is especially true for big block trades as Kraus and Stoll (1972) describe the effect of a big block buy or sell order as creating a "distribution" effect due to short-run liquidity constraints which result in short-run divergences from a stock's equilibrium price.

The reason for price pressure occurrence can be derived from two sources. First, the market maker may incur a search cost to find the other side of the transaction for a large order. Second, the market maker may bear an inventory cost that causes his or her inventory to deviate from an optimum level. This leads to an attempt by the market maker to recoup the cost by moving the bid-ask spread (William, et al., 2006).

3.2.1.2 Imperfect Substitutes Hypothesis

The "imperfect substitutes hypothesis" (ISH) assumes, however, that securities are not close substitutes for each other and, therefore, the long-term demand is less than perfectly elastic, i.e. the equilibrium prices change when demand curves shift to eliminate excess demand and price reversals are not expected because the new price reflects a new equilibrium distribution of securities holders (see, for instance, Scholes (1972), Shleifer (1986), Hanaeda and Serita (2003), Bechmann (2004), Vespro (2006), and Bildik and Gülay (2008)).

According to Liu (2000), "securities are not perfect substitutes for each other; therefore, long-term demand curves for securities are downward sloping". An increase (decrease) in demand (supply) should drive up share prices given the supply for any particular security and flatten out. This is further explained by William et al. (2006), who assert that in a typical Capital Asset Pricing Market (CAPM) world, demand curves for equities are flat or horizontal, because prices mirror the market's perceptions of risk and expected return. Provided that no new information accompanies the shock, a demand or supply shock will have no impact on the stock price.

Investors can change their portfolios with near-perfect replacements or substitutes in the form of other securities or mixtures of securities. These substitutes permit an investor to occupy the same, or a similar, risk-return state space, resulting in horizontal demand curves for any individual security (William, et al., 2006). As explained by Kraus and Stoll (1972), if perfect substitutes for a stock are not available, then investor reaction to a big block trade can influence the price of an individual security, as investors will demand compensation to adjust their portfolios in the portfolio. William et al (2006) suggests that in the case of index inclusion, if there are downward-sloping demand curves for stocks, individual investors will require a price above the previous equilibrium price to induce a sell to a passive index fund. Therefore, the slope of the demand curve is a function of the availability of close substitutes.

3.2.1.3 Information Hypothesis

The “information hypothesis” (IH) states that, in efficient markets, positive (negative) information about a stock should increase (decrease) immediately its price and the information effect should be permanent. Hence, stock prices should correctly reflect the information content of indices revision and reach a new equilibrium level upon the AD. Jain (1987) and Lynch and Mendenhall (1997) provide results for the IH.

According to Mendenhall and Lynch (1996) and Liu (2000), the information hypotheses contends that “positive (negative) information about a security should increase (decrease) its price quickly and permanently if the market is efficient in transmitting the information”.

For example if a stock is added to an index, more attention will be given by the securities analyst and investors on that particular added stock. Shleifer (1986) raises the possibility that inclusion in the index may lead to closer scrutiny of the firm by analysts and investor which in turn may lead to greater institutional interest, greater trade volume, and lower bid-ask spreads.

3.2.1.4 Information Cost and Liquidity Hypothesis

The liquidity hypothesis maintains that the expected return should decrease (increase) in anticipation of a liquidity increase (decrease) to reflect the liquidity premium if the market is efficient in transmitting information. Accordingly, share price should rise (fall) in response to a liquidity rise (drop) (William, et al., 2006). Amihud and Mendelson (1986) argue that “if liquidity is valued, an increase in liquidity will outcome in lower expected returns and therefore, a positive price reaction to the addition of the stock to the Index”. According to William et al (2006) an increase in ownership by institutional investors may increase the liquidity of the stock, which would be reflected in a lower bid-ask spread.

The “information cost and liquidity hypothesis” (ICLH) asserts that adding a stock to an index leads to higher market scrutiny and information availability, and this raises the attractiveness and liquidity of the stock and has a positive effect on the stock price. Stoll (1978), Beneish and Gardner (1995), Heflin and Shaw (2000), Hedge and McDermott (2003), and Gregoriou (2011), among others, support the ICLH.

It is possible that an increase in monitoring by securities analysts and investors can be resulted from increase in institutional ownership. Increase in monitaring by analysts and investors will lead to lower information assymetry. Lower information assymetry will also result in lower bid-ask spreads. Conversely, it is also possible that increased ownership by mutual funds may cause a reduction in liquidity as institutional investors like index funds are buy-and-hold investors.

Although Shleifer (1986) does not support liquidity hypothesis, he raises the possibility that addition in the index may lead to closer scrutiny of the firm by analysts and investors. This may lead to greater interest by institutional investors, greater trade volume, and lower bid-ask spreads.

3.2.1.5 Competing Hypothesis

Other competing hypotheses on addition (deletion) of stock to(from) index are: the improved operating performance and increased investors' awareness hypotheses. However, I will only briefly eloborate on the other theories as they are complement to principal hypotheses. Nevertheless I do not discount the relevance and any importance of those hypotheses. In term of higher opeating performance hypotheses, Denis, et al. (2003), shows that inclusion in the index is associated with higher analyst estimates of after-inclusion operating performance. They also find that firms that are added to the index outperform peer firms in realized earning per share. They argue that one explanation for their results is that the expected higher operating performance reflects greater monitoring since the firm is more visible. Denis et al.'s (2003) evidence supports Dhillon and Johnson's (1991) finding that the value of bonds also increases after the firms' stocks are included in the Index.

For the increased investor awareness hypotheses, Merton (1987) theorise the possibility that investors do not have complete information about all stocks. This is because investors only invest in stocks that they are aware of. Further, some stocks are only held in a subset of investors' portfolios because they are not fully diversified. Consequently, investors who hold these stocks are over-weighted in these stocks and thus hold under-optimal portfolios. In order to encourage investors to hold the less significant known stocks, investors require higher returns in exchange for bearing the unsystematic risk.

3.2.2 Previous Literature

There are number of researches on Malaysian stock market efficiency. Early evidences of market efficiency of the Bursa Malaysia was documented by Dawson (1981), Nassir (1983), Barnes (1986) and Yong (1987). Evidence on many aspects of market efficiency of the Bursa Malaysia is compiled in Ariff et al. (1998), Annuar and Shamsher (1993), Nassir (2002) and Ismail and Isa (2008). Research by Dawson (1981) showed that Bursa Malaysia was not efficient in the semi-strong form. However, Barnes (1986) indicates that the Bursa Malaysia overall exhibited a surprisingly high degree of efficiency. In view of the thin volume and age of the Malaysian stock exchange, Ariff et al. (1998) find that five out of sixteen Asia Pacific stock exchanges have met Fama-efficient market criteria. These include Malaysia, Australia, Hong Kong, Singapore and Japan.

On the hand, recent research by Wanke et al., (2015) presents an efficiency assessment of the Malaysian Islamic banks using TOPSIS. The results reveal that variables related to cost structure have a prominent negative impact on efficiency levels, although some parsimony in equity leveraging derived from Islamic finance principles maybe helpful in achieving higher efficiency levels. Findings also indicate that the Malaysian Islamic banking market also imposes cultural and regulatory barriers to foreign banks, so that their efficiency levels are lower when compared to their national counterparts.

As research on stock exchange efficiency attracted so much attention by researchers, studies regarding Malaysian market efficiency (price and volume) are equivalently important, especially in the light of index restructuring. Extensive literature on various aspects of research on capital market efficiency can be found on both mature and emerging markets. However specific literature on index changes especially in the emerging markets, seems to be limited including research on the Malaysian stock index changes.

On the other hand, studies on market efficiency (in the light of index revisions) have been rigorously explored, especially in mature markets like the United States, European markets and Japan. Likewise, research on market efficiency in the emerging market has become increasingly important as world financial markets become more free and integrated.

Most literature available focuses on the study of price and volume effects due to index composition changes in the U.S. S&P500. There is a substantial numbers of studies on the matter with respect to European stock market indices. However, the topic has attracted less research applied to the Asian emerging markets, although there are some studies on the Japanese market (Nikkei index). Most of the studies devoted to the U.S. show the existence of a positive (negative) abnormal return on the announcement day for stocks added to (deleted from) the index.[35]

The attention of this topic raises among researchers is due to the fact that those positive (negative) abnormal returns may be a valuable information to shed light on the complex world of stock prices behaviour. Additionally, some of the findings show that there are inefficiencies in the stock market. The present literature supplies mixed results on the size and interval of the effects and gives a variety of different theoretical explanations for the findings.

The earliest studies on the association between stock price bevaviour and changes in stock indices were based on the U.S. market. Shleifer (1986) and Harris and Gurel (1986), for roughly the same time period (the former article for 1966-1983 and the latter for 1973-1983) provide evidence of a strong positive stock price reaction to the announcement of additions to the S&P 500 index. Edmister et al. (1995), examining pre–October 1989 S&P 500 data, find evidence of a permanent increase in trade volume following S&P 500 addition. In the same index, Lynch and Mendenhall (1997) show that there is positive abnormal return on the AD, which reverses only partially after the CD, providing support for the idea that there is a temporary component to the stock price increase.

The information hypotheses is supported by Dhillon and Johnson (1991), who study the option and bond returns of firms being added to the S&P 500. However, Shleifer (1986) and Harris and Gurel (1986) do not recognize the information hypotheses using indirect

[35]To name a few example, research by Scholes, (1972) Harris and Gurel (1986), Shleifer (1986), Dhillon and Johnson (1991), Liu (2000) (Dash, 2002) (Denis et al 2003) (Bechmann, 2004), (William et al 2006)

arguments. Harris and Gurel (1986) mention lack of interest by investors in discovering index changes prior to September 1976 when S&P's early notification service began even though that information was readily available. Shleifer (1986) finds that firms with lower rated debt by S&P do not have a stronger addition-day response than those with higher rated debt.

Elliott and Warr (2003), using additions of NYSE (and Nasdaq listed) firms to the S&P 500 index examine the effect of non-informative related demand shocks and show that NYSE stocks suffer less pronounced price effects than do the Nasdaq stocks on the CD and the price effect is reversed immediately, while for the Nasdaq stocks the price reverses only partially and over several days.

Shleifer's(1986) findings support the ISH and Harris and Gurel's (1986) results support the PPH. Dhillon and Johnson (1991) argued, however challenged Shleifer (1986), and Harris and Gurel's (1986) implicit assumption that stock addition to the S&P 500 index, *per se*, is informationless, and re-examined the data, for the period between 1978 and 1988, showing that stock prices do not revert to their previous return levels even 60 days after the AD. The same was true for the S&P 500, using a sample from March 1990 to April 1995.

Beneish and Whaley (1996) find a transitory liquidity effect using quoted spreads as an estimate of trade costs. Erwin & Miller (1998) find a decline in bid-ask spreads, which they attribute to increased information production, since only the stocks with no options trade maintain the decline beyond the inclusion period. They argue that firms with traded options already benefit from greater information production and thus, inclusion in the Index provides no additional information. Madhavan (2003) finds a permanent price effect related to changes in the Russell indices which he attributes to changes in liquidity as measured by increased trade volume.

There is also a rich literature examining the association between index changes and stock prices behaviour for European stock markets. Bechmann (2004) reports there is no evidence of a stock price effect at the AD of the stock KFX index change. His results support the ISH and ICLH for the French CAC 40 index, the SBF120 and the London FTSE 100 indices.

Vespro (2006) provides evidence supporting the PPH associated with index fund rebalacing, but weak or no evidence for the ISH and the liquidity hypotheses. Also for the CAC 40 index, Gregoriou (2011) examines the liquidity effects folllowing the index revision for the period between 1997 and 2001. His results suggest that there is a sustained increase (decrease) in liquidity of the added (deleted) stocks and that the improvement (reduction) in the liquidity of the stocks is due to a decrease (increase) in the direct cost of trade as oposed to a reduction (enhancement) in the asymmetric information cost of transacting.

For the FTSE 100 stock index, Gregoriou and Nguyen (2010) study the association between liquidity and investment opportunities, for a context where firms face negative exogenous liquidity shocks due to stock deletion from the index. Their findings contradict previous results which show that there is a positive relationship between stock liquidity and investment opportunities in the US equity market.

Recent research by Fernandes et al., (2016) examines the price impact of trading due to expected changes in the FTSE 100 index composition, which employs publicly-known objective criteria to determine membership. They focus on the FTSE index due to FTSE membership depends exclusively on relative market capitalization and public information, changes in the index composition are in principle devoid of information and hence should not affect prices.Their study provides a natural context to investigate anticipatory trading effects. They propose a panel-regression event study that backs out these anticipatory effects by looking at the price impact of the ex-ante probability of changing index membership status. Their findings reveal that anticipative trading explains about 40% and 23% of the cumulative abnormal returns of additions and deletions, respectively.

Table 3.1 provides a summary of the several theories available, stated above, and refers the relevant literature related with each of the theories.

Table 3.1 describes and contrasts the various theories related to stock prices and volume effects associated with changes in the composition of stock indices. In the first row are the acronyms for the “Price Pressure Hypotheses” (PPH), the “Imperfect Substitutes Hypotheses” (ISH), the “Information hypotheses” (IH), and the “Information Cost and Liquidity Hypotheses” (ICLH): In the second row are brief definitions of each hypotheses and related assumption(s): In the third row are some relevant articles which provide empirical evidence regarding each of the hypotheses.

PPH	**ISH**	**IH**	**ICLH**
Assumes that the long-term demand is perfectly elastic at full-information price –it holds if stock prices reverse to their ex-ante level after the index change, and recognizes that immediate information about non-information-motivated demand shifts may be costly and, consequently, the short-term demand curve may be less than perfectly elastic.	Assumes that securities are not close substitutes for each other and so the long term demand is less than perfectly elastic –in equilibrium prices change when demand curves shift to eliminate excess demand and price reversals are not expected because the new price reflects a new equilibrium distribution of security holders.	States that in efficient markets the positive (negative) information about a stock should increase (decrease) immediately its price and the information effect should be permanent –stock prices should correctly reflect the information content of the indices additions and deletions and reach a new equilibrium level upon the AD.	Asserts that adding a stock to an index leads to a higher market scrutiny and information available, and that this raises the attractiveness and the liquidity of the stock and has a positive effect on the price.
Harris and Gurel (1986) Dhillon and Johnson (1991) Liu (2001) Madhavan (2003) Chen et al.(2004) Vespro (2006) Bildik and Gülay (2008) Yun and Kim (2010)	Scholes (1972) Shleifer (1986) Hanaeda and Serita (2003) Bechmann (2004) Vespro (2006) Bildik and Gülay (2008)	Jain (1987) Lynch and Mendenhall (1997) Denis et al. (2003) Liu (2011)	Stoll (1978) Beneish and Gardner (1995) Heflin and Shaw (2000) Hedge and McDermott (2003) Gregoriou (2011)

Table 3.1: Theories Related to Index Revision Effects on Price and Volume

3.3 Data and Methodology

In this section, I explain the preparation process in relation to the event study methodology, and describe the data sample and methodology. I investigate the three main FTSE Bursa Malaysia index series, namely the FTSE Bursa Malaysia KLCI 30 (KLCI 30), the FTSE Bursa Malaysia KLCI 70 (KLCI 70) and the FTSE Bursa Malaysia Small Cap (Small Cap).

3.3.2 Data Sample

My dataset is composed of daily stock prices, adjusted for dividends and stock splits, and daily trade volumes for the stocks and indices, for the period between 2005 and 2013. The last index CD of the sample is December 26, 2012. However, the dataset comprises daily stock prices and daily stock and indices trade volumes until February 1, 2013. The KLCI 100 was split into two new indices, the KLCI 30 and the KLCI 70 on July 6, 2009. As a proxy for the market portfolio I use the KLCI 100, for the period before July 6, 2009, and the KLCI 70 for the period after July 6, 2009. The data about the stock prices and indices values, and respective trade volumes was collected from the *Datastream*. The information regarding the AD and the CD for the additions to and deletions from the index was collected from the Secretary of the FTSE Bursa Malaysia Advisory Committee.

My first sub-sample comprises a total of 45 additions to and deletions from the main index KLCI 30. After filtering for the mergers & acquisitions, spin-offs and the unavailability of data it dropped however to 39 revisions, with 18 additions and 15 deletions. Sample revisions for KLCI 70, a total of 225 additions to and deletions events from the index are counted. I dropped my sample to 182 events. 101 additions and 81 deletions are counted in my final sample. In my third index sampling, Small Cap; a total of 304 additions are counted in my final sample after filtering for the M&A, spin-offs and the unavailability of data

Table 3.3 below provides further details about the data sample for the KLCI 30, the KLCI 70 and the Small Cap index respectively.[36]

Table 3.2 reports the KLCI 30, KLCI 70 and Small Cap index changes between July 6, 2006 and December 26, 2012. The FTSE and Bursa Malaysia review the index semi-annually, at end of June and December. The main criteria for adding to or deleting from the index a constituent are the stock trade volume, the reliability of the stock price and the market capitalisation. The implementation of changes in the composition of the index takes place after the market closing on the third Friday of June or December of each year.

Index	**FTSE BM KLCI 30**		**FTSE BM KLCI 70**		**FTSE BM Small Cap**
Year	Additions	Deletions	Additions	Deletions	Additions
2006	2	0	13	9	52
2007	4	2	20	12	62
2008	3	3	21	18	28
2009	1	2	8	7	55
2010	2	2	9	6	58
2011	4	3	23	21	26
2012	2	3	7	8	23
Total	18	15	101	81	304

Table 3.2: Sample of Constituents

Throughout the thesis, i.e, chapter four and five, I use the same constituents revised as per table 3.2 with the extension of numbers of variables.

[36] Refer to Appendix A, Tables A1 to A5 for full list of constituents.

3.3.3 Event Study Preparation

In this sub-section, I first describe the general preparation process used to perform an event study follow by my specific preparation.[37] I follow with a description of the date(s) and event-windows and lastly I explain the filtering process.

3.3.3.1 General Preparation

Fama (1991) acknowledged the importance of event studies and semi-strong tests. Generally, I need to define the specific event that affects the firm, for instance firm events like dividend payment, mergers and acquisitions or index revisions, which may influence firm's stock price, or any other market microstructure. It is also important that I define the sample and news sources i.e. the firm affected by the event and the relevant authority that released the news. Once I have defined the event, sample and source of news, I identify the exact event date(s) and event windows, for example announcement date or effective change of a particular event window.

Afterwards, I filter and drop any confusing and overlapping sample events which may affect the independency of the sample, for instance, a firm that has been acquired (or merged) but at the same time has another major event which may affects the independence. I create an event list of all announcements for events of interest (filtered events) over a specific time period and determine the estimation method for expected return and volume calculation.

[37] I follow event study metrics UG manual for data preparation.

I choose a relatively a large sampling period, from 2006 to 2012, in order to collect as many as possible index revision events from the Bursa Malaysia index series. In this event study, my samples are broken down into three different indices; the KLCI 30, KLCI 70, and Small Cap.

3.3.3.2 Specific Preparation

Specifically, I define my events as any official public announcement from Bursa Malaysia on changes (addition or deletion) of the constituents from the FTSE Bursa Malaysia index series. For example, announcement on additions of constituents to the KLCI 30 index is defined as the official public announcement on constituents from KLCI 70 index or new constituents (fast entry) that meet the ground rules and requirements which are promoted or included to the KLCI 30. Similarly, constituents that are added to the KLCI 70 index could be either deleted from the KLCI 30 index, added from the Small Cap index or fast entry constituents.

The event should be new, unexpected information (or could be expected) to the public which may cause considerable reaction to the stock price and volume. Index revisions and revision dates are gathered from official public announcements, either from Bursa Malaysia, the FTSE group, or local newspaper sources.

I make sure to identify the exact event date of the constituents' changes due to index revisions. Normally, the first trade day on which the event became public information is considered as the event date. However, if the event was announced on a non-trade day or after the market is closed (after 5pm), I choose the next trade day as the correct event day. The data used in my event study are based on daily closing price and volume.

3.3.3.3 Date and Event-Window

In my analysis, I use two event dates: Announcement Date (AD) and effective Change Date (CD). Bursa Malaysia announces changes in the index on the trade days, and usually after the closing of the market. Hence, the price and volume for the affected constituents are the last price and volume on the next trade day.

A similar methodology is used for the effective CD of price and volume for the effected stock. I calculate the returns and volume on event windows based on information relayed to the general public when the official announcement been made (AD) and also when the effective changes take place (CD).I set my event windows to check price movements and relate them to relevant hypotheses.

Figure 3.1 illustrates the timeline for the event study, which can be categorised into four event windows; pre announcement period (AD-15, AD), announcement to change period (AD, CD), post change date period (CD, CD+15) and long-term post change date (AD+15, AD120). I set my estimation time period from AD-40 to AD-240 as a reference for the normal time period (non- event induced period).

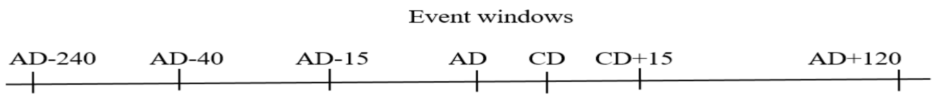


Figure 3.1: Timeline for the Event Study

Table 3.3 describes the event windows, and the possibility of detecting the relevant hypotheses describing price effects in the Bursa Malaysia index series.

AD-15, AD-1	Since the selection of shares to be revised in the FTSE BM index series are made at specific time and relies on public information, the capitalisation and liquidity requirements based on previous observation period can be computed by analysts and fund managers. Hence price movements can be anticipated.
AD	The announcement day. If there is no market anticipation, I expect price effects to follow the announcement day since announcement is made after market close. Hence I expect price movements to be taken place on the next following day.
AD, CD-1	The post announcement period allows us to check the overall market movement before change date
CD	The change day, this is effective at the opening of the market.
CD, CD+15	The post change period allows us to diagnose any price reversal or persistence.
AD-15, CD-1	Pre change period allows us to evaluate overall market movements before the change date, in case that there is market anticipation.
AD-15, CD+15	Permanent effect window allows us to spot the persistence of my results, if no market anticipation observed.
AD,CD+15	Anticipating effects window to observe any expectation over revision.
AD-7, AD-6…AD+7	Daily checks surrounding announcement period allows us to investigate on the index management tracker activity.
AD-40,AD-240	The estimation period, this is the non-event induced time period. Reference for normal period for price and volume
CD+15, ..+20..,CD+120	The longer horizon post change period to check if no permanent or price reversal detected in CD, CD+15 or/and AD, CD+15

Table 3.3: Event Windows Description

3.3.3.4 Filtering and Event List

I filter and exclude recurring events. For instance, constituents that are added to the KLCI 70 but deleted from the KLCI 30 are excluded from ‘addition sample to KLCI 70’, as they are already counted in the ‘deletion sample from KLCI 30. Otherwise, I will have overlapping sample and an inaccurate event study.

I also exclude any confounding effect events. I exclude all events that are announced together with other news that may affect price as these may have confounding effects. Some news are released together on a systematic basis as I could identify from Bursa Malaysia announcements and constituents’ press releases. I identify those types of correlated news to eliminate systematic bias. For instance, I exclude events related to deleted constituents which are announced together with other relevant information, such as the announcement of merger and acquisition, corporate spin-off, earnings news or announcements of share repurchases. In my sample, relatively new constituents (fast entries) with limited historical price and volume are also excluded from the data sample.

I create an event list of all announcements related to index revisions over a specified time period, excluding confounding and recurring events. My event list consists of more events than the constituents because in some cases there is more than one event related to the same constituent. The final event list includes the event date, the constituent’s name and a constituent identifier according to the SEDOL from Thomson Reuters Datastream.

I set my estimation period in order to calculate the expected return and the base volume. I define my estimation period for the calculation of the expected return and base volume as from 40 days to 240 days before announcement date (AD-40, AD-240).

3.3.4 Methodology

An event study is usually the first stage in a flow of analyses that aims to identify the factors of stock market reactions to extraneous events. Event studies yield as an outcome abnormal returns (ARs), which are aggregated over time to cumulative abnormal returns (CARs), then 'mean' in the case of so called sample studies over several observations of identical events to *CARs* and *MCARs,* where the 'M' stands for 'Mean'.

Event studies are usually performed to identify if the abnormal effects pertaining to individual events or samples of events are significantly different from zero, and thus not the result of pure chance. In order to identify whether samples are significantly from zero, hypotheses testing is used. The null hypotheses (*H0*) asserts that there are no abnormal returns in the event-window, while the alternative hypotheses (*H1*) implies the presence of ARs in the event-window. Formally, the testing framework is as follows:

$$H0: \mu=0 \tag{1}$$

$$H1: \mu \neq 0 \tag{2}$$

I employ short term and long term event-window analysis for abnormal returns using cumulative abnormal return (*CAR*) and Buy and Hold Abnormal Return (*BHAR*) respectively. Specifically, my hypotheses testing reads as follows:

Hypotheses 1

For the Bursa Malaysia Index series, in the short term, stock additions lead to positive effects on stock prices and trade volumes whereas stock deletions lead to negative effects on stock prices and positive effects on trade volumes (3)

Hypotheses 2

For the Bursa Malaysia Index series, in the long term, additions lead to positive price effects while deletions will lead to negative price effects (4)

In terms of volume, I focus on short-term abnormal volume only.[38]The Bursa Malaysia announces changes to index series on normal trade days. Therefore, in the methodology below, the stock price and the trade volume of the AD and CD are the closing stock prices and the trade volumes of the day.

3.3.4.1 Abnormal Return

Abnormal Returns are an important measure to evaluate the effect of an event. The overall idea of this measure is to separate the influence of the event from other overall movements of the stock market. Generally, the abnormal return of firm i and event date t is termed as the realized return minus the expected return given the absence of the event given by equation (5):

$$AR_{i,t} = R_{i,t} - E(R_{i,t}/\Omega_{i,t}) \quad (5)$$

I determine expected return (estimation return) calculation using the market return model. [39] The market return model can be viewed as a restricted market model with alpha equal to zero and beta equal to one for each stock (MacKinlay, 1997).I gather the stock price data for Bursa Malaysia index revision events, and calculate the realized prices and returns, $R_{i,t}$ for the event dates. In order to find abnormal returns, i.e., returns that can be attributed to index revision, I first need to calculate the expected return, $(R_{i,t}/\Omega_{i,,t})$ for the event date. I use index returns as my expected returns. The expected return is a theoretical return in the absence of the event.

[38] Chapter four focuses post event longer term liquidity investigation.

[39] I also use the market model (OLS) to calculate my estimation return, producing similar results produced as the market return model.

The abnormal return ($AR_{i,t}$) of stock i on the time-period t is defined as the difference between the stock i's return and the market's return (expected return) for the time-period t, according to equation (6):

$$AR_{i,t} = R_{i,t} - R_{m,t} \tag{6}$$

where, $R_{i,t}$ and $R_{m,t}$ are the stock i's return and the market's return over the time-period t, respectively. As proxy for the market's return, I use the KLCI Emas index return. [40]

In order to calculate returns $R_{i,t}$ using price data, I use the following equations:

$$R_{i,t} = \left(\frac{P_{i,t}}{P_{i,t-1}}\right) - 1 \tag{7}$$

I use price return based on continuously compounded returns (log returns) as the following equation (4):

$$R_{i,t} = \ln(1 + R_{i,t}) - \ln(P_{i,t}) - \ln(P_{i,t-1}) \tag{8}$$

Where $P_{i,t}$ and $P_{i,t-1}$ are stock price i at time t and $t-1$ respectively.

As discussed in Dissanaike and Le Fur (2003) both logarithmic and simple returns have been used extensively in event study (Hudson & Gregoriou, 2015).

[40]The broadest index in the FTSE Bursa Malaysia series. I also use the KCLI 100 index as the proxy to market return but results are indifferent as both of the indices are highly correlated.

3.3.4.2 Cumulative Abnormal Returns (CAR)

Since changes in index constituents can be predicted from the selection criteria for the Bursa Malaysia index series, I expect to observe index effects over a period ranging from AD-15 (before announcement date) to CD+15 (after the effective change). To exhibit the cumulative average total effect on prices caused by index changes, I will calculate cumulative abnormal returns (*CAR*) over different event-windows, aggregating abnormal returns across time generates the cumulative abnormal return measure with the following equation (9):

$$CAR_{i,(t1,t2)} = \sum_{t=1}^{t2} AR_{i,t} \tag{9}$$

where $CAR_{i,(t1,t2)}$ is the sum of the abnormal returns of stock *i* and time *t1* to *t2*.

The *CAR* is used to determine the extraneous effect of events such as index changes on stock prices. To measure the abnormal return over an event-window t_1,t_2, I compute the "mean cumulative abnormal returns", $MCAR_{(t1,t2)}$ as in the following equation:

$$MCAR_{i,(t1,t2)} = \frac{1}{N} \sum_{i=1}^{N} CAR_{i,(t1,t2)} \tag{10}$$

If an index addition (deletion) has a positive (negative) effect on the stock price, I should be able to observe average increased (decreased) returns, i.e. positive (negative) *MCAR* on the event-windows. The predictability of changes in index constituents leads us to believe that the effects may be spread out over a period of time around the AD and the CD. I determine the *MCAR* for several event-windows and determine *CAR* for daily windows as discussed in previous section.

3.3.4.3 Buy and Hold Abnormal Returns (*BHAR*)

A general method to analyse the long-horizon abnormal return associated with event is the method of the buy-and-hold abnormal return measure *(BHAR)*. I employ market return model to estimate the expected (normal) return of stock.

BHAR, is termed as the difference between the realized *BHAR* and the normal *BHAR* as calculated by the following equation (11):

$$BHAR_{i,(t1,t2)} = \prod_{t=t1}^{t2} (1 + AR_{i,t)} - \prod_{t=t1}^{t2} (1 + \mathrm{E(Ri,t} \left|\Omega\mathrm{i,t}\right|) \tag{11}$$

As the measure for long-term event window (CD+15, to CD120), I use ‘‘Mean Buy and Hold Returns’’, $MBHAR_{(t1,t2)}$ as in the following equation (12):

$$MBHAR_{i,(t1,t2)} = \sum_{t=1}^{t2} BHAR_{i,t} \tag{12}$$

3.3.4.4 Abnormal Trade Volume

To test for abnormal trade volume I use the Harris and Gurel (1986) methodology, through equation (13).

$$VR_{i,E} = \frac{V_{iE}}{V_{mE}} \bigg/ \frac{V_{i,e}}{V_{m,e}} \tag{13}$$

where, $V_{i,E}$ and $V_{m,E}$ are the trade volumes of stock *i* and the market on the event date *E*, respectively, and $V_{i,e}$ and $V_{m,e}$ are the average trade volumes of the stock *i* and market volume for the estimation period (AD-40, AD-240) , respectively.

The volume ratio, $VR_{i,E}$, is a standardized measure of the trade volume of stock *i* in the time period *E*, adjusted for the market variation. Its expected value is 1 if there is no change in volume during the event date *E* relative to the estimation period *e*. I average the volume ratios across the number of firms, *N*.

3.3.4.5 Significance Test

The literature on event study test statistics is abundant in terms of significance tests. In general, significance tests can be categorized into parametric and non-parametric tests. Non-parametric tests assume that individual stocks' abnormal returns are not normally distributed, whereas parametric tests rely on the normal distribution. Usually a parametric test is complemented with a non-parametric test to ensure the findings are not biased by outliers for example (see Schipper and Smith (1983)). Table 3.4 provides an overview of the different test statistics[41].

[41] Refer appendix B, Table B1 for details of different significant tests.

Table 3.4 summarise significance tests per test level.[42]

Null hypotheses tested	**Parametric tests**	**Non-parametric tests**	**Test level**
$H0:AR=0$	AR test		Individual Event
$H0:CAR=0$	Cross-Sectional Test, Time-Series Standard Deviation Test, Patell Test, Adjusted Patell Test, Standardized Cross-Sectional Test, Adjusted Standardized Cross-Sectional Test, and Skewness Corrected Test	Generalized Sign Test, Generalized Rank T Test, and Generalized Rank Z Test	Sample of Events
$H0:CAR=0$	CAR t-test		Individual Event
$H0:MCAR=0$	Cross-Sectional Test, Time-Series Standard Deviation Test, Patell Test, Adjusted Patell Test, Standardized Cross-Sectional Test, Adjusted Standardized Cross-Sectional Test, and Skewness Corrected Test	Generalized Sign Test, Generalized Rank T Test, and Generalized Rank Z Test	Sample of Events
$H0:BHAR=0$	BHAR test		Individual Event
$H0:MBHAR=0$	MBHAR Test and Skewness Corrected Test		Sample of Events

Table 3.4: Significance Test Summary

Parametric test statistics are based on the normal t-test. However, further test were developed to correct for the t-test's prediction error due to event-induced data. The most widely used tests are those developed by Patell (1976) and Boehmer, Musumeci and Poulsen (1991). Among the non-parametric tests, the rank-test of Corrado (1989), and the sign-based of Cowan (1992) are very popular.

[42] Source: Muller S (2015), Significance Tests for Event Studies.

3.3.4.5.1 Parametric Test

Statistical tests of abnormal returns are generally based on the cross sectional average of each measure. For cumulative abnormal returns the cross sectional average is commonly based on equations (10) and (12).

However to take account of the fact that the return variance may increase due to the changes in the index, for short term abnormal returns I use the standardized cross-sectional test of Boehmer et al. (1991) as in equation (14), which standardizes the abnormal returns of each stock *i* on the event day *E* by the standard deviation of the AR of the estimation period e - defined as the period between 240 days before the AD (AD-240) and 40 days before the AD (AD-40).

$$SAR_{i,E} = \frac{AR_{i,E}}{\sigma_i \sqrt{1 + \frac{1}{T_i} + \frac{(R_{m,E} - \bar{R}_{m,e})^2}{\sum_{t=1}^{T}(R_{m,t} - \bar{R}_{m,e})}}} \tag{14}$$

where, $SAR_{i,E}$ is the standardized abnormal return of stock *i* on the event date *E*; $AR_{i,E}$ is the abnormal return of stock *i* on the event date *E*; σ_i is the standard deviation of stock *i* over the estimation period *e*; T_i is the number of days used as the estimation period, *e*, for the stock *i*; $R_{m,E}$ is the market return on the event-window/date *E*; $\bar{R}_{m,e}$ is the average market return on the estimation period *e*; and $\bar{R}_{m,t}$ is the market return on day *t*.

For calculation of the *t*-statistic for the short-term period test I use equation (15):

$$t = \frac{\frac{1}{N}\sum_{i=1}^{n} SAR_{i,E}}{\sqrt{\frac{\sigma^2_{SAR_{i,E}}}{N}}} \tag{15}$$

where, N is the number of firms in the sample and $\sigma^2_{SAR_{i,E}}$ is the variance of $SAR_{i,E}$.

For testing the long-horizon abnormal returns t-statistic, given that the *MBHAR*s are positively skewed (see, e.g., Barber and Lyon (1997)), I use the Johnson (1978) skewness-adjusted t-test, which is a transformed version of the usual t-test to remove the skewness bias. The test statistic for the null hypotheses that the average *MBHAR* is equal to zero as the following equation (16):

$$T_{\textit{Skewness-Adjusted}} = \sqrt{N}\left[S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6N}\hat{\gamma}S\right] \tag{16}$$

where $$S = \frac{\overline{BHAR_{(t1,t2)}}}{\hat{\delta}_{BHAR}}, \tag{17}$$

and $$\hat{\gamma} = \frac{\sum_{i=1}^{n}\left[\overline{BHAR}_{(t1,t2)} - BHAR_{(t1,t2)}\right]^3}{N\hat{\delta}_{BHAR}} \tag{18}$$

3.3.4.5.2 Non-parametric test

I employ the rank-test of Corrado (1989), and the generalized sign test based of Cowan (1992) as a non-parametric tests in order to complement the significant t-test.

The Corrado's (1989) rank test converts *ARs* into ranks. The ranking is done for all the *ARs* of the event-window and the estimation period. Wherever the rank is tied, I use the mid-rank. In order to adjust for adjusting on missing values Corrado and Zyvney (1992) suggested a standardization of the ranks by the number of non-missing values *Mi* plus 1 as in the following equation (19):

$$K_{i,t} = \frac{rank(AR_{i,t})}{1 + M_i + L_i} \tag{19}$$

where *Li* refers to the number of non-missing (i.e., matched) returns in event window. The rank statistic for testing on a single day (*H*0:C*AR*=0) is then given by following equation:

$$T_{rank,t} = \frac{\overline{K_t} - 0.5}{S_{\overline{K}}} \tag{20}$$

where, $\overline{K_t} = \frac{1}{N_t}\sum_{i=1}^{N_t} K_{i,t}$, and N_t is the number of non-missing returns across firms,

and $S_{\overline{K}}^2 = \frac{1}{L_1 + L_2}\sum_{t=T_0}^{T_2} \frac{N_t}{N}(\overline{K_t} - 0.5)^2$

The generalised sign test proposed by Cowan (1992) is constructed on the ratio of positive *CAR*s P_0^+ over the event-window. Under the *H0* hypotheses this ratio should not deviate from the ratio of positive *CARs* over the estimation window P_{Est}^+ . Since the ratio of positive *CARs* is a binominal random variable, the follow test statistic is used:

$$t_{GS} = \frac{\rho_0^+ - \rho_{est}^+}{\sqrt{\rho_{est}^+(1-\rho_{est}^+)/N}} \tag{21}$$

I use four event-windows in my *MCAR* and *VR* analysis: the “pre-announcement period”, the period between 15 days before the AD and the AD (AD-15 to AD); the “announcement period”, the period between the AD and the CD (AD to CD), the “post-change date period”, the period between the CD and 15 days after the change date (CD to CD+15) and ‘‘surrounding AD’’ (7 days before and 7 days post announcement) to analyse the individual daily changes. I use *MBHAR* in the ‘‘post change long term period’’ (CD+15 to CD+120) to check long term price persistence or reversal.

3.4 Results

In this section I present my results in two sub sections: additions and deletions. I analyse my results in sequence starting from the KLCI 30, followed by the KLCI 70 and the Small Cap with analyses on price and volume for short-term and long-term periods.

3.4.2 Abnormal Return and Volume: Additions

3.4.1.1 KLCI 30

For the main index, the KLCI 30, result shows that for the “pre-announcement date” event-windows AD-15 to AD-1 the MCAR is equal to -0.8592 as reported in Table 3.5 and statistically significant at the 5% level. The result for the “announcement period” event window AD to CD-1, the MCAR is positive (0.663%) and statistically significant at the 10% level.

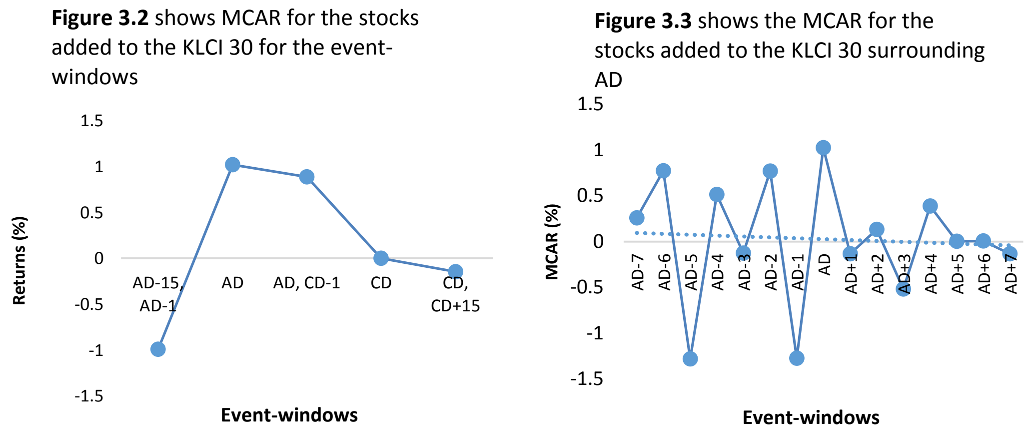
Table 3.5 reports the "mean cumulative abnormal return" (MCAR) and the "volume ratio" (VR), as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia KLCI 30 at the event-windows. The first column specifies the event-window, the second and the fourth columns report the MCAR and the VR, respectively, and the third and fifth columns provide the t-statistic for the MCAR and the VR, respectively, for the event-windows. Panel A reports the 'key diagnostic' event-window results and Panel B reports 7 days surrounding announcement date, (AD) event-window results. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

KLCI 30				
Event-window (Additions)	*MCAR* (%)	*t*-statistic	*VR*	*t*-statistic
Panel A				
AD-15, AD-1	-0.859	-2.089**	1.1637	1.5671
AD, CD-1	0.6338	1.6985*	1.2301	0.1122
AD	0.3831	0.4948	1.2283	0.48921
CD	-0.1256	-0.2805	1.7960	1.76621*
CD, CD+15	-0.1104	-1.8522*	1.2285	0.7971
AD-15, CD-1	-0.2254	-1.2988	1.1305	0.2899
AD-15, CD+15	-0.115	-1.2555	1.1986	1.2952
AD,CD+15	0.7442	0.8186	1.1586	0.8932
Panel B				
AD-7	0.2573	0.3773	1.7838	1.7512*
AD-6	0.2593	0.2963	1.6338	0.8005
AD-5	-0.7697	-2.3124**	0.9189	-0.444
AD-4	0.3851	1.4664	0.8804	-0.390
AD-3	-0.0001	-0.0829	1.1481	0.3692
AD-2	0.6414	1.7405*	1.0876	0.3350
AD-1	-1.1444	-2.1694**	0.6287	-1.8717*
AD	0.3831	0.4948	1.2283	0.48921
AD+1	0.2511	1.4125	1.3553	0.586231
AD+2	0.0045	-0.503	0.79621	-1.11891
AD+3	-0.3908	-0.6052	0.97488	-0.05729
AD+4	0.3861	1.0452	1.61713	1.52118
AD+5	-0.1256	-0.2805	0.63316	-2.45326**
AD+6	0.2625	0.3902	1.32252	0.486953
AD+7	-0.5176	-1.8227*	1.16241	0.580529

Table 3.5: Results for Stocks Added to the KLCI 30

The result for the "post-change date period" CD to CD+15, which shows negative abnormal return (-0.1104), is statistically significant at the 10% level. All the results for the *MBHAR* in the "post change long-term period" (CD+15 to CD+120) are not statistically significant.[43] For the remaining main event-windows the *MCAR* fluctuates between negative and positive values but is not significant in all cases as illustrated in figure 3.2.

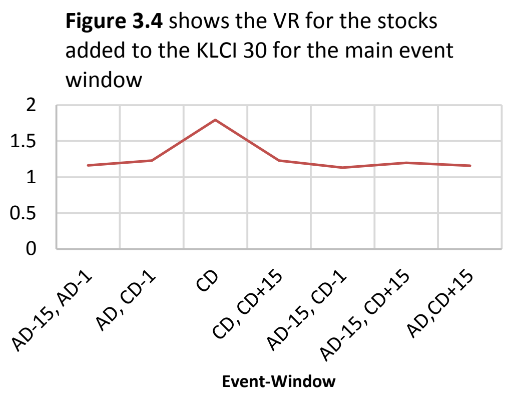
[43] Refer Appendix C, Table C6 for details result.

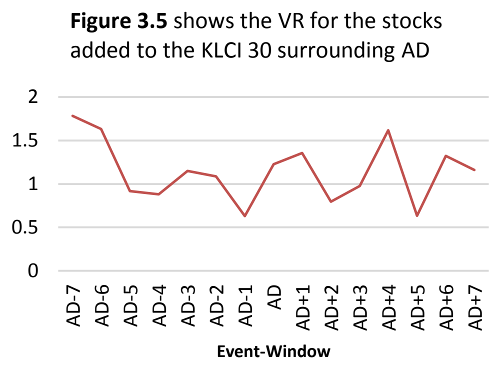


Figures 3.2 and 3.3: MCAR for Stocks Added to the KLCI 30

Results for “surrounding AD” as reported and illustrated in panel B and figure 3.3 show negative abnormal returns for AD-5 and AD-1, which are statistically significant at the 5% level. Results for AD-2, *MCAR* is positive and AD+7, abnormal return is negative with statistically significant at the 10% level.

In terms of volume ratio, the *VR* is highest at the CD (1.8) as reported in table 3.4 and illustrated in figure 3.4, with statistical significance at the 10% level. This could be interpreted as meaning that volume at change date CD, is 1.8 times higher than normal, indicating a lot of interest from market players on particular stocks that were promoted to the KLCI 30. I could not observe any statistical significant increase in *VR* for other main event windows.

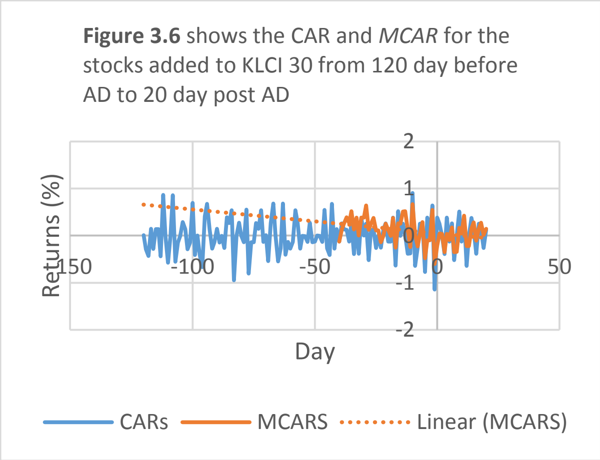


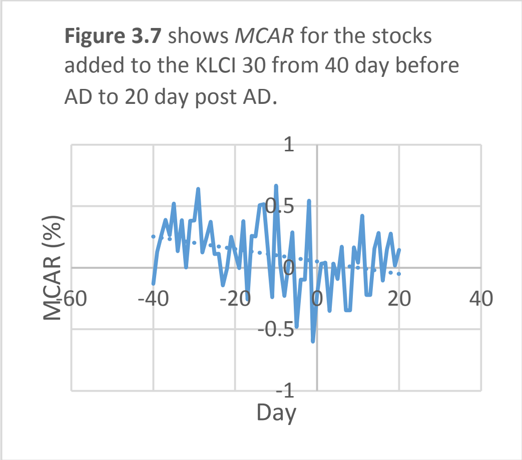


Figures 3.4 and 3.5: Volume Ratio for Stocks Added to the KLCI 30

In the results for "surrounding AD", *VR* for the event-window AD-7 (1.78) is second highest, with statistical significance at the 10% level. However, I could also observe *VR* less than 1 in event-window AD+5 (0.63), with statistically significant at the 5% level. Even though there is evidence of abnormal positive trade volume, for the other event-windows, however, it is not statistically significant. Table 3.6 reports my results for the *MCAR* and the *VR* for the event-windows for the stocks added to the KLCI 30.

My results support the PPH, and show that the stock prices gains associated with the additions (0.63% for the event-window AD to CD-1), are almost completed reversed soon after the index announcement date (-0.1% for the event-window CD to CD+15) as highlighted by the decreasing trend line shown in figures 3.6 and 3.7. Abnormal volume results also indicate interest from market players which supress the stock supplies leading to abnormal returns. However, I do not observe significant prolong increase in volume in change date post event-windows.





Figures 3.6 and 3.7: CAR and MCAR for Stocks Added to the KLCI 30

The PPH makes the assumption that the long-term demand is perfectly elastic at full-information price. It holds if stock prices revert to their ex-ante level after the index change, and recognizes that immediate information about non-information-motivated demand shifts may be costly and, consequently, the short-term demand curve may be less than perfectly elastic.

3.4.1.2 KLCI 70

Table 3.6 reports the "mean cumulative abnormal return" (*MCAR*) and the "volume ratio" (*VR*), as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia KLCI 70 at the event-windows. The first column specifies the event-window, the second and the fourth columns report the *MCAR* and the *VR*, respectively, and the third and fifth columns provide the t-statistic for the *MCAR* and the *VR*, respectively, for the event-windows. Panel A reports the 'key diagnostic' event-window results and Panel B reports 7 days surrounding announcement date, (AD) event-window results. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

FTSE BM KLCI 70				
Event-window (Additions)	*MCAR* (%)	*t*-statistic	*VR*	*t*-statistic
Panel A				
AD-15, AD-1	0.0023	0.8476	1.4596	1.5554
AD, CD-1	-0.0006	-0.0562	1.3098	1.4573
AD	-0.0009	-0.384	1.5230	1.2018
CD	0.0068	0.4834	1.3784	1.3162
CD, CD+15	0.0238	1.8036*	1.4191	1.9346*
AD-15, CD-1	0.0306	1.4753	1.3732	1.3142
AD-15, CD+15	-0.0006	-0.0562	1.3634	1.2383
AD,CD+15	0.0091	0.7515	1.4718	1.7349*
Panel B				
AD-7	0.0057	2.2412**	1.5973	1.8059*
AD-6	0.0006	-0.6943	1.2679	1.4168
AD-5	0.0006	0.2291	1.4335	1.3004
AD-4	-0.0014	-1.3773	1.5774	1.4387
AD-3	-0.0006	-0.2405	1.6317	2.2325**
AD-2	0.0011	0.0594	1.2763	1.4055
AD-1	0.0008	0.3355	1.4330	1.2882
AD	-0.0009	-0.384	1.5230	1.2018
AD+1	0.0029	1.7312*	1.0779	0.5254
AD+2	0.0001	0.1976	1.4137	1.95098*
AD+3	-0.0012	-0.4931	1.1940	0.90523
AD+4	0.0015	0.8491	1.0525	0.29951
AD+5	-0.0006	-0.0562	1.5976	1.50747
AD+6	0.0029	0.481	0.9962	-0.0196
AD+7	-0.0013	-1.4579	1.3784	1.31623

Table 3.6: Results for Stocks Added to the KLCI 70

Table 3.6 reports results for the stocks added to the KLCI 70.[44] I find no statistically significant *MCAR* results in the "pre-addition windows" apart from AD-7 where *MCAR* is positive and significant at the 5% level. Results for the event-window "post change date" CD, to CD +15 show the *MCAR* is equal to 0.238%, which is significant at the 10%

[44] Refer Appendix C, Table C2 for more details result.

statistical level. For the remaining event-windows the *MCAR* fluctuates between negative and positive values but is not significant in all cases.

Figures 3.8 and 3.9 illustrate the *MCARs* over the main event windows and surrounding AD respectively.

Figure 3.8 shows the *MCAR* for the stocks added to KLCI 70 for the main event-windows

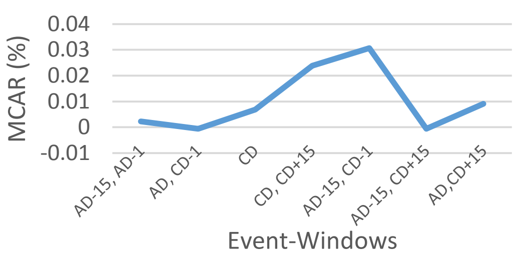


Figure 3.9 shows the MCAR for the stocks added to KLCI 70 surrounding AD.

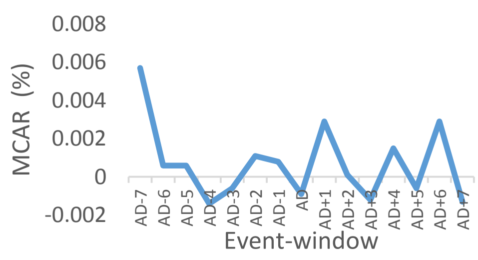


Figure 3.10 shows the CAR and MCAR for the stocks added to KLCI 70 from 240 day before AD to 20 day post AD.

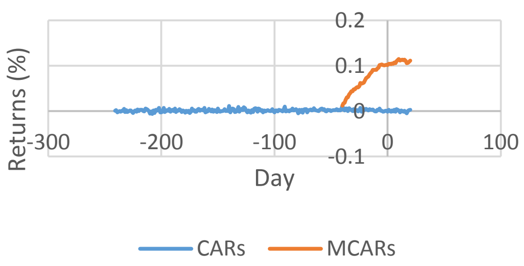
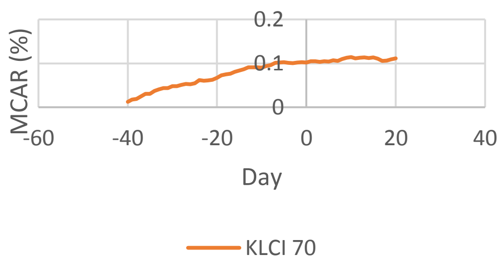


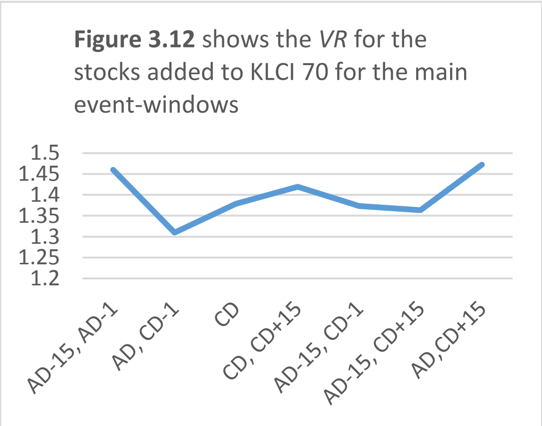
Figure 3.11 shows the MCAR for the stocks added to KLCI 70 from 40 day before AD to 20 day post AD

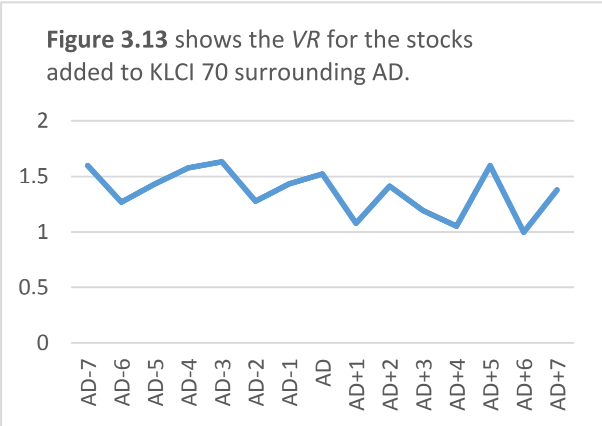


Figures 3.8 to 3.11: CAR and MCAR for Stocks Addition to the KLCI 70

Figures 3.10 and 3.11 illustrate the trend of *CAR* and *MCAR* from 240 days before AD to 40 days post event. The results show addition to the KLCI 70, has a positive effect on stock price after additions to the index. I can clearly observe the increasing *MCAR* in the figures 3.10 and 3.11.

In terms of *VR*, results for event window AD to CD+15, and CD to CD +15, the *VR* is 1.47 and 1.41 times higher than normal and statistically significant at the 10% level. *VR* for AD-3 is 1.63 and statistically significant at the 5% level. *VR* for AD-7 and AD+2 is 1.59 and 1.4 times higher than normal respectively and statistically significant at the 10% level. Even though there is evidence of abnormal positive trade volume, for all event-windows, *VR* results are not statistically significant.





Figures 3.12 and 3.13: Volume Ratio for Stocks Added to the KLCI 70

Figures 3.12 and 3.13 illustrate the VR for the main event- window and surrounding AD. As I observe volume over the main event-window and also surrounding AD are mostly above normal or equal to 1 with only event-window AD+7 showing VR equal to 1.

Table 3.7 reports the "Mean Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks added to the KLCI 70 at the event-windows. The first column specifies the event-window, the second column reports the *MBHAR*, the third columns provides the t-statistic and the fourth column provides skewness adjusted t-test for the *MBHAR*, for the event-windows. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

KLCI 70			
Event-window (Additions)	*MBHAR* (%)	*t*-statistic	*Skewness Adj*
AD+15,AD+120	-0.0038	-0.1721	-0.1674
AD+15, AD+90	0.0119	0.6408	0.6557
AD+15, AD+60	0.0256	1.7059*	1.9006*
AD+15, AD+50	0.0197	1.5513	1.6866*
AD+15, AD+40	0.01	1.1573	1.174
AD+15, AD+30	0.0056	0.8637	0.8504
AD+15, AD+20	0.0001	0.0297	0.0311
AD+15	0.0029	1.4388	1.5088

Table 3.7: Results MBHAR for Stocks Added to the KLCI 70

In the result for "long term post change period" event windows, I observe positive *MBHAR*, statistically significant at the 10% level for event windows CD+15 to CD+60 as reported in Table 3.7. I also observe positive *MBHAR* for other event windows, however they are not statistically significant.[45]

My results shows addition of stocks to the KLCI 70, has a positive effect on stock price after addition, as I can clearly observe the increasing *MCAR*. The results on *MBHAR* further strengthen my findings. On the other hand, abnormal volume results indicate interest from market players which supress the stock supplies, leading to abnormal returns. Interestingly, I observe significant prolonged increase in volume in the post event-window, which supports the ICLH. However, to further confirm this hypotheses, a further liquidity test is required. In the next chapter (chapter four), I will extend my analysis to liquidity effects on stocks addition/deletion in details.

[45] Refer Appendix C, Table C7 for more details result.

3.4.1.3 Small Cap

Table 3.8 reports the "mean cumulative abnormal return" (*MCAR*) and the "volume ratio" (*VR*), as well as the respective t-statistic, for stocks added to the Small Cap index at the event-windows. The first column specifies the event-window, the second and the fourth columns reports the *MCAR* and the *VR*, respectively, and the third and fifth columns provide the t-statistic for the *MCAR* and the *VR*, respectively, for the event-windows. Panel A reports the 'key diagnostic' event-windows results and Panel B reports 7 days surrounding announcement date, (AD) event-windows results. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

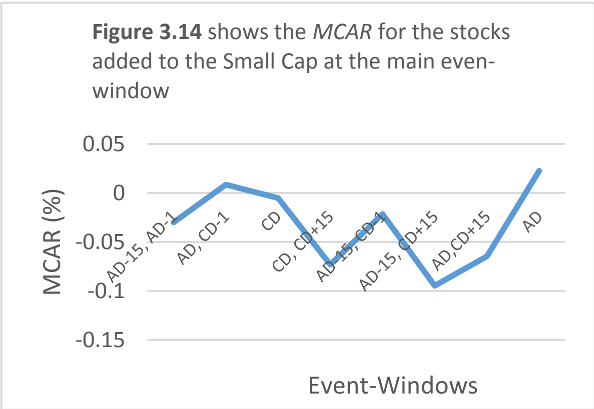
Small Cap				
Event-window (Additions)	*MCAR* (%)	*t*-statistic	*VR*	*t*-statistic
Panel A				
AD-15, AD-1	-0.0301	-1.1597	1.882	1.590
AD, CD-1	0.0084	-1.0534	1.943	1.593
AD	0.0225	0.3301	1.851	1.111
CD	-0.0053	1.1893	1.579	1.673*
CD, CD+15	-0.073	1.1596	1.381	1.171
AD-15, CD-1	-0.0216	-1.1172	1.695	1.457
AD-15, CD+15	-0.0947	0.7973	1.615	1.295
AD,CD+15	-0.0646	0.9953	1.202	0.923
Panel B				
AD-7	-0.1995	-2.8045***	1.241	1.297
AD-6	0.012	0.3015	1.159	0.799
AD-5	-0.0828	-0.8716	1.798	2.197**
AD-4	0.1079	0.9635	1.225	1.480
AD-3	0.1757	2.1778**	2.079	1.780*
AD-2	-0.1598	-1.4844	1.795	2.115**
AD-1	0.0867	0.0318	1.354	1.253
AD	0.0225	0.3301	1.851	1.111
AD+1	0.0044	0.4993	2.537	1.2005
AD+2	-0.0256	0.0298	2.098	1.9712*
AD+3	0.0542	0.5149	1.649	1.855*
AD+4	-0.047	-1.2077	1.579	1.8305*
AD+5	-0.0053	1.1893	2.724	1.283
AD+6	0.0579	0.0932	1.688	1.438
AD+7	-0.0487	-0.3607	1.462	1.720*

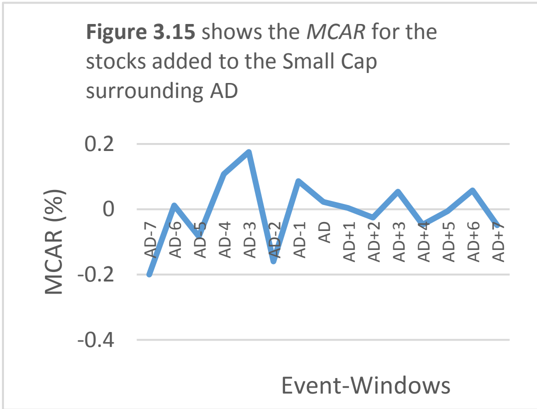
Table 3.8: Results Stocks Added to the Small Cap Index

Table 3.8 reports results for the stocks added to the Small Cap index.[46] I find no statistically significant results for abnormal return in the main event-windows as reported in panel A. Results for "surrounding AD", however shows abnormal returns for AD-7 and AD-3 where *MCAR* is -0.1995% and 0.1757%, which are significant at 1% and 5%

[46] Refer Appendix C, Table C3 for more details result

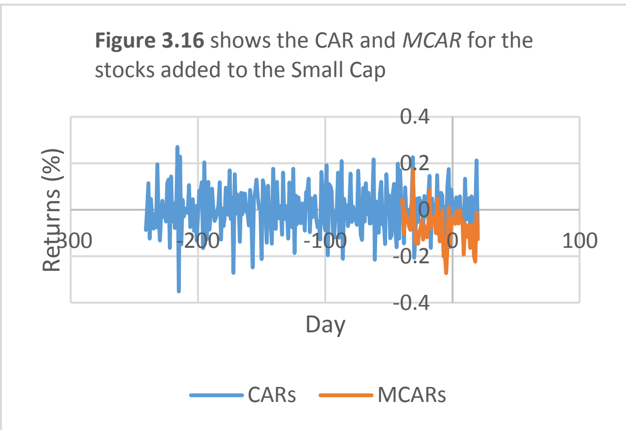
level respectively. Figures 3.14 and 3.15 show the fluctuations of *MCAR* in the main event window and surrounding AD respectively.

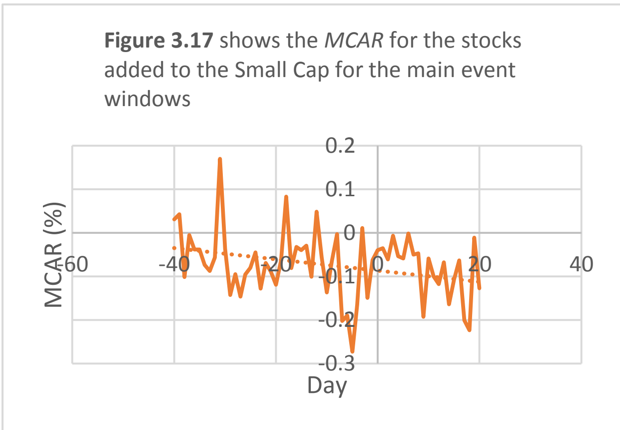




Figures 3.14 and 3.15: CAR and MCAR for Stocks Added to the Small Cap

For the remaining event-windows, the *MCAR*s fluctuate between negative and positive values but are not statistically significant in all cases. Figure 3.15 exhibits the fluctuations of the returns, both *CAR* and *MCAR* throughout the estimation and main event windows. Figure 3.16 exhibits the MCAR throughout the main event windows.





Figures 3.16 and 3.17: CAR and MCAR for Stocks Added to the Small Cap (Longer Horizon)

In terms of *VR*, results for key event- window CD, the *VR* is 1.579 times higher than normal and statistically significant at the 10% level. *VR* for surrounding pre-AD, AD-5, and AD-2 is statistically significant at the 5% level while AD-3 is 2 times higher than normal and statistically significant at the 10% level. *VR* for surrounding post-AD, AD+2, AD+3, AD+4, and AD+7 is statistically significant at the 10% level with volume higher than normal.

Table 3.9 reports the "Mean Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia Small Cap at the event-windows. The first column specifies the event-window, the second column reports the *MBHAR*, and the third columns provides the t-statistic and the fourth column provides skewness adjusted t-test for the *MBHAR*, for the event-windows. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Small Cap			
Event-window (Additions)	*MBHAR* (%)	*t*-statistic	*Skewness Adj*
AD+15,AD+120	7.9359	1.5199	2.4172**
AD+15, AD+90	3.4784	3.6231***	5.2457***
AD+15, AD+60	6.4666	2.3342**	3.9750***
AD+15, AD+50	3.8596	3.8035***	5.3511***
AD+15, AD+40	6.3629	1.7555*	2.8489***
AD+15, AD+30	4.6503	4.2810***	6.0123***
AD+15, AD+20	4.6521	4.1675***	5.8870***
AD+15	6.8862	1.7908*	2.9206***

Table 3.9: Results MBHAR for Stocks Added to the Small Cap

Results for "long-term post change periods" show positive *MBHAR* which is statistically significant for almost all event-windows.[47] For instance, *MBHAR* for AD+15 to AD+20 is 4.6% and statistically significant at the 1% level. Results for skewness Adjusted t-test are statistically significant in all event windows.

[47] Refer Appendix C, Table C8 for more details result.

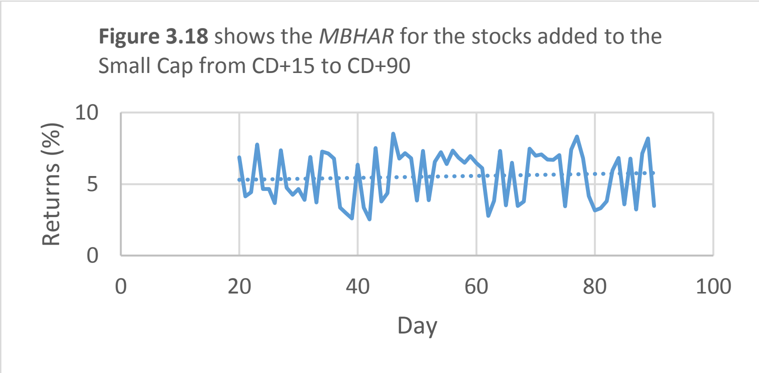


Figure 3.18: MBHAR for Stocks Added to the Small Cap

Even though I could not detect any statistically significant *MCAR* in the main event windows as reported in panel A, I can conclude that my results support ISH, reflecting that stock prices increase due to addition, specifically on AD-3, AD and AD to CD (positive abnormal return), followed by statistically significant price persistence in the post long term period CD+15 and CD +15 to CD+90. Figure 3.18 exhibits an increasing trend of *MBHAR* over "long term post change period" event-windows.

The ISH assumes that market players do not view different stocks as close substitutes where the long run demand curve slopes downward, (i.e. not perfectly elastic). In the case of exogenous shocks, if demand increases for a specific stock(s) (stocks addition), then the price must adjust upward to a new equilibrium.

3.4.2 Abnormal Return and Volume: Deletions

3.4.2.1 KLCI 30

Table 3.10 reports the "mean cumulative abnormal return" (*MCAR*) and the "volume ratio" (*VR*), as well as the respective t-statistic, for stocks deleted from the KLCI 30 at the event-windows. The first column specifies the event-window, the second and the fourth columns reports the *MCAR* and the *VR*, respectively, and the third and fifth columns provide the t-statistic for the *MCAR* and the *VR*, respectively, for the event-windows. Panel A reports the 'key diagnostic' main event-window(s) results and Panel B reports 7 days surrounding announcement date, (AD) event-window results. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

KLCI 30				
Event-window (Deletions)	*MCAR* (%)	*t*-statistic	*VR*	*t*-statistic
Panel A				
AD-15, AD-1	-0.0574	-0.3064	1.8696	2.6725***
AD, CD-1	0.1188	0.2142	1.6797	1.5511
AD	0.6065	1.6953*	1.6188	1.2202
CD	-0.4653	-1.7184*	1.7773	1.6758*
CD, CD+15	-0.559	-1.1717	1.6978	1.7141*
AD-15, CD-1	0.0614	-0.137	1.7975	2.5945**
AD-15, CD+15	-0.4977	-1.512	1.8032	2.5021**
AD,CD+15	-0.4403	-0.7676	1.7168	1.8206*
Panel B				
AD-7	0.4572	1.4679	2.4641	2.0866**
AD-6	0.1529	1.0397	1.7497	1.4312
AD-5	-0.3021	-1.2713	1.6502	1.6453
AD-4	0.2998	0.6572	2.5186	1.6069
AD-3	0.1501	0.9749	1.7576	1.4743
AD-2	-0.4644	-1.4876	2.3200	1.0529
AD-1	0.0043	0.1552	1.9331	1.3936
AD	0.6065	1.6953*	1.6188	1.2202
AD+1	-0.4665	-1.8993*	1.5200	1.5147
AD+2	-0.3087	-1.4645	1.6896	1.5300
AD+3	0.1487	0.6916	1.6333	1.6999*
AD+4	0.1388	0.1063	1.9366	1.7905*
AD+5	-0.4653	-1.7184*	1.7773	1.6758*
AD+6	0.1505	0.4374	1.8673	2.4403**
AD+7	0.1597	0.584	1.5384	1.8412*

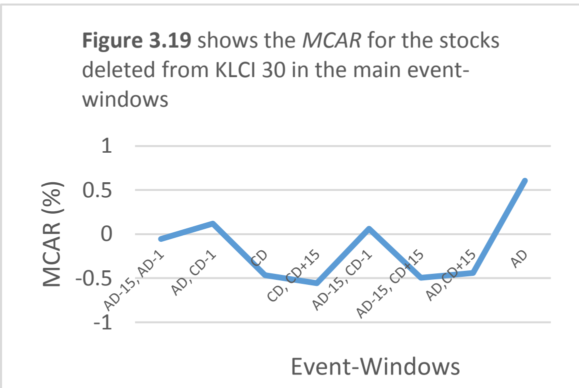
Table 3.10 Results for Stocks Deleted from the KLCI 30

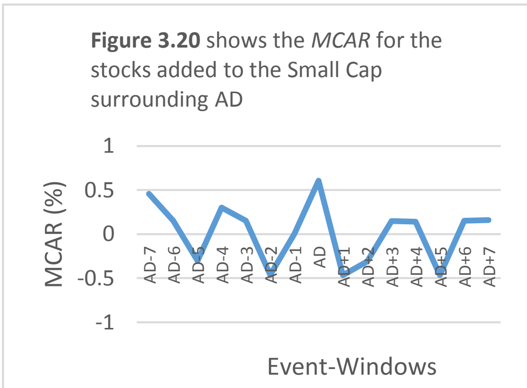
As for the results for the blue chip index, there are a few event-windows where the *MCARs* are statistically significant in the case of stock deleted from the KLCI 30.[48] More

[48] Refer Appendix C, Table C4 for more details result.

specifically, the *MCAR* for the event-windows AD and CD is equal to 0.6065% and -0.4653%, and both are statistical significance at the 10% level. Results on AD shows positive stock returns despite the "non-favourable news" of being deleted from the blue chip index. However, these returns were reversed on the CD with negative returns as fund managers started to sell their deleted stocks to track the index which supresses the price (increases supply) hence giving negative abnormal returns. A possible explanation for these scenario was that informed market players (speculators) anticipated the deletions stocks from the KLCI 30 and buy those stocks (despite non-favourable news) in order to lure noise traders. These speculators would bet noise traders to follow (herd behaviour), hence making profits in AD. However, when index fund managers started to dispose their deleted stocks from its portfolio towards the change date, over supply supresses the price hence resulting in the negative returns.

In the results for the "surrounding AD" event-windows, AD+2 and AD+5 the *MCAR* is equal to -0.4665% and -0.4653% respectively, the results are both significant at the 10% level, as illustrated in figure 3.20. These results strengthen the earlier explanations that fund managers started to dispose of their "unwanted stocks" towards the change date.

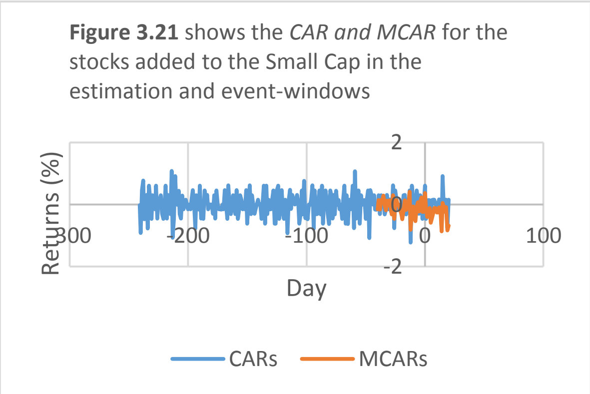




Figures 3.19 and 3.20: CAR and MCAR for Stocks Deleted from the KLCI 30

For the *VR* results, most of the results are statistically significant in the main event-windows as in panel A. For instance, for the event-windows AD-15 to AD-1, and AD-15 to CD-1 *VR* is equal to 1.86, and 1.79, respectively. The former is statistically significant at the1% level, while the latter is significant at the 5% level.

Results for "surrounding AD" also show abnormal volumes as reported in panel B. For instance, 7 days before announcement AD-7, volume is more than double, while AD+6, *VR* is 1.8 times higher than normal trade volume and both are statistically significant at the 5% level. The significant increase in volume could be attributed to the informed speculators started to buy these deleted stocks, betting to profit from noise trader herding behaviour prior to AD. Similarly the increase in volume, post AD could be attributed to increases in supply by fund managers disposing of their unwanted portfolio.



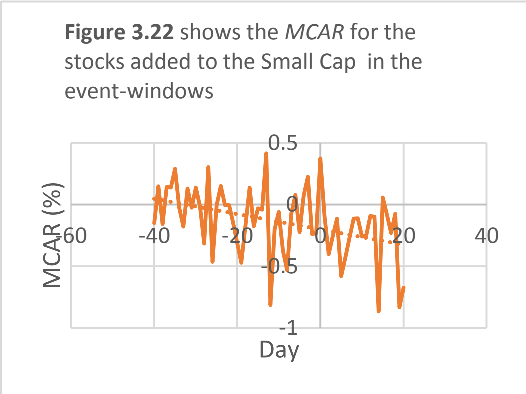


Figure 3.21 and 3.22: CAR and MCAR for Stocks Deleted from the KLCI 30 (Longer Horizon)

Figure 3.21 shows the *CAR* and *MCAR* for the estimation periods and also event period while figure 3.22 shows the decreasing trend of *MCAR* over event-windows. I observe, however, no statistical significance in terms of .price persistence in the "short-term post change period" event window. I extend my analysis using *MBHAR* in the "long-term post event-windows" to investigate abnormal returns following stocks deletion from blue chip index.

Table 3.11 reports the "Mean Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks deleted from the FTSE Bursa Malaysia KLCI 30 at the event-windows. The first column specifies the event-window, the second column report the *MBHAR*, and the third columns provide the t-statistic and the fourth column provide skewness adjusted t-test for the *MBHAR*, for the event-windows. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

KLCI 30			
Event-window (Deletions)	*MBHAR* (%)	*t*-statistic	*Skewness Adj*
AD+15,AD+120	2.8921	2.6421***	3.1035***
AD+15, AD+90	1.6228	1.7111*	2.1164**
AD+15, AD+60	15.3803	1.6647*	2.2184**
AD+15, AD+50	10.5096	1.4351	2.0959**
AD+15, AD+40	9.5579	1.5082	2.2103**
AD+15, AD+30	2.9498	2.4628**	2.817***
AD+15, AD+20	2.3586	2.0532**	2.4332**
AD+15	14.4326	1.6201	2.1346**

Table 3.11: Results MBHAR for Stocks Deleted from the KLCI 30

Results for *MBHAR* are all positive throughout all event windows.[49] For instance, *MBHAR* is statistically significant for event-windows AD+15 to AD+20 and AD+15 to AD+30 at the 5% level. *MBHAR* for AD+15 to AD+60 and AD+15 to AD+90 are both positive and statistically significant at the 10% level while AD+15 to AD+120 is statistically significant at the 1% level.

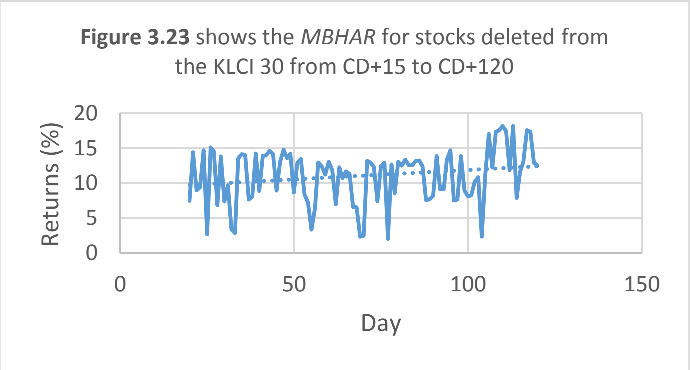


Figure 3.23: MBHAR for Stocks Deleted from the KLCI 30

[49] Refer Appendix C, Table C9 for more details result.

Coupled with *MBHAR* analysis, my results support PPH, i.e. stock prices losses due to deletion (AD-1 to AD-15 and CD) are reversed but only after AD+15 in the "longer post event-windows". The support for the PPH is reinforced by the fact that the positive returns occur in the longer event-window AD+15 to AD20 (2.35%), AD+15 to AD30 (2.9%) using *MBHAR* with both results are statistically significant at the 5% level. The largest positive *MBHAR* occurs at the event-window AD+15 to AD+60 (15.3%), and this results is statistically significant at the 10% level. Figure 3.23 illustrate the increasing trend in returns over a longer period of time.

3.4.2.2 KLCI 70

Table 3.12 reports the *MCAR* and *VR* results for the stocks deletion from the KLCI 70.[50] Results for stocks deleted from the KLCI 70 provide empirical support the IH, i.e. the stock prices losses due to deletions are permanent.

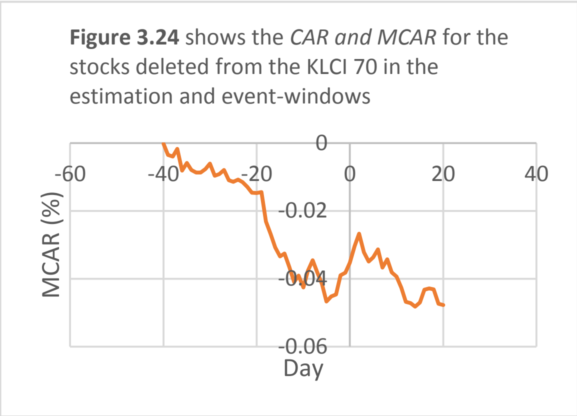
Table 3.12 reports the "mean cumulative abnormal return" (*MCAR*) and the "volume ratio" (*VR*), as well as the respective t-statistic, for stocks deleted from the FTSE Bursa Malaysia KLCI 70 at the event-windows. The first column specifies the event-window, the second and the fourth columns report the *MCAR* and the *VR*, respectively, and the third and fifth columns provide the t-statistic for the *MCAR* and the *VR*, respectively, for the event-windows. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

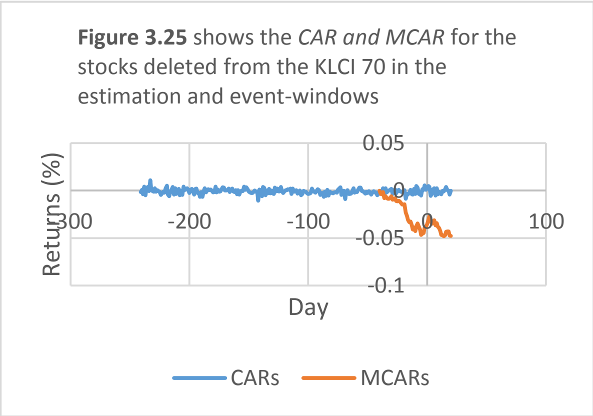
KLCI 70				
Event-window (Deletions)	*MCAR* (%)	*t*-statistic	*VR*	*t*-statistic
Panel A				
AD-15, AD-1	-0.0074	-0.5613	1.312534462	0.968585308
AD, CD-1	0.0033	1.1945	1.854470622	1.259742744
AD	0.0029	0.951	2.625973804	1.165042362
CD	0.0012	1.0989	1.135310759	0.621476584
CD, CD+15	-0.0128	-2.786***	1.327892602	0.929965118
AD-15, CD-1	-0.0041	0.1994	0.894319162	-0.696612459
AD-15, CD+15	-0.0169	-1.1361	1.721236731	1.165042362
AD,CD+15	-0.0095	-1.2791	1.657349489	1.065247
Panel B				
AD-7	-0.0035	-1.1482	1.073723959	0.32182
AD-6	-0.0035	-1.3164	0.920132038	-0.464389551
AD-5	-0.0052	-2.8179***	0.80276761	-0.973536801
AD-4	0.0015	0.0481	1.03348945	0.174247146
AD-3	0.0006	-0.2759	0.770654085	-1.184901437
AD-2	0.0056	1.7932*	2.327892602	0.929965118
AD-1	0.0008	0.4709	0.894319162	-0.696612459
AD	0.0029	0.951	2.625973804	1.165042362
AD+1	0.0049	1.8622*	2.353699724	1.58438007
AD+2	0.0037	2.506**	1.872827077	1.178539083
AD+3	-0.0055	-1.9519*	1.571470021	0.728639994
AD+4	-0.0027	-0.2054	1.134645528	0.620297715
AD+5	0.0012	1.0989	1.135310759	0.621476584
AD+6	0.0023	0.7916	0.890287973	-0.675404664
AD+7	-0.0054	-2.824***	2.500640095	1.089422146

Table 3.12: Results for Stocks Deleted from the KLCI 70

[50] Refer Appendix C, Table C5 for details result.

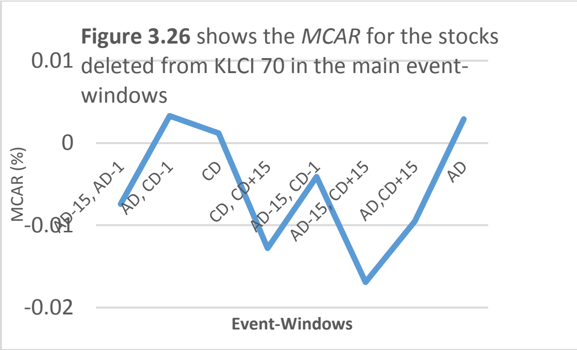
Figure 3.24 shows the *MCAR* for the stocks deleted from the KLCI 70 in the estimation and event-windows while figure 3.25 show persistent decrease in *MCAR* from the estimation period throughout the event-windows period. My results for the deletions are statistically robust.

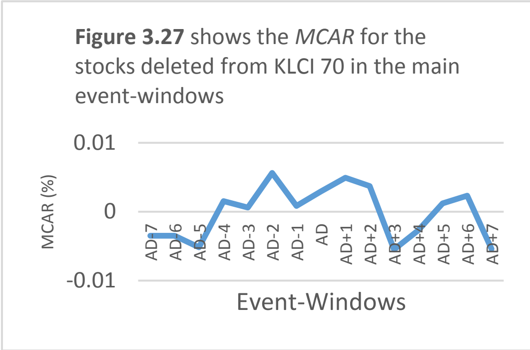




Figures 3.24 and 3.25: CAR and MCAR for Stocks Deleted from the KLCI 70 (Long Horizon)

The support for the IH is reinforced by the fact that the negative *MCAR* occurs at the event-window CD to CD+15 (-0.0128%), which is statistically significant at the 1% level. I could observe fluctuations between positive and negative abnormal returns in other key in event-windows but all are not statistically significant as reported in Panel A. Results for surrounding announcement date, AD-5 and AD+7 also shows negative *MCAR* and are statistically significant at the 1% level.





Figures 3.26 and 3.27: CAR and MCAR for Stocks Deleted from the KLCI 70

In terms of volume, I observe that most of *VR* are more than 1, with the highest on AD at 2.6 times. However none of the *VR* results are statistically significant. Similar explanations could be drawn from the stocks deleted from the big cap index as fund managers disposed of their unwanted stocks to align their portfolio and track the mid cap index which supresses the price and increases the volume.

Table 3.13 reports the "Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks deleted from the KLCI 70 at the event-windows. The first column specifies the event-window, the second column reports the *MBHAR*, and the third column provides the t-statistic and the fourth column provides skewness adjusted t-test for the *MBHAR*, for the event-windows. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

KLCI 30			
Event-window (<u>Deletions</u>)	*MBHAR* (%)	*t*-statistic	*Skewness Adj*
AD+15,AD+120	0.0192	0.8286	0.8586
AD+15, AD+90	-0.006	-0.3341	-0.3388
AD+15, AD+60	-0.0139	-1.2193	-1.2587
AD+15, AD+50	-0.0176	-2.2409**	-2.356**
AD+15, AD+40	-0.01	-1.3906	-1.3645
AD+15, AD+30	-0.0019	-0.318	-0.2958
AD+15, AD+20	-0.0002	-0.1528	-0.1347
AD+15	-0.0002	-0.1528	-0.1347

Table 3.13: Results MBHAR for Stocks Deleted from the KLCI 70

The *MBHAR* results further support the IH as I observe prolonged decrease in returns over the longer time period event-window.[51] Specifically, AD+15 to AD+50 *MBHAR* is

[51] Refer Appendix C, Table C10 for more details result.

-0.0176 and statistically significant at the 5% level. These results could be interpreted as negative information (deletion) decreases stock price, and the information effect is permanent.

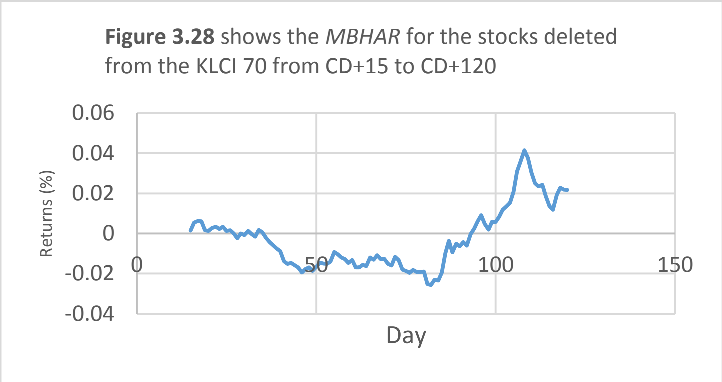


Figure 3.28: MBHAR for Stocks Deleted from the KLCI 70

Figure 3.28 illustrates the *MBHAR* movement in the post long-term period. I observe a general negative return over the longer term period up to AD + 90.

3.5 Conclusion

I investigate the effect of changes in the composition of the Bursa Malaysia index series on stock prices and trade volumes, using a data sample which comprises information from the time period between 2006 and 2012. My results provide new empirical evidence supporting several hypotheses as previously studied in the literature.

I find empirical evidence supporting the PPH for both additions to and deletions from the KLCI 30. Indeed, the changes in the stock price and trade volume of the pre-index revision period are entirely reversed after the change date. This finding is further supported with the long-term event-window(s) using *MBHAR* confirming the price reversal.

Furthermore, I observe that there are positive abnormal returns for stocks added to the KLCI 70 with a persistent increase in volume in the post event-window, which supports the ICLH. Results on long term event-windows (*MBHAR*) further strengthen my results. Abnormal volume results also indicate interest from market players which supresses the stock supplies leading to abnormal returns. On the other hand, I conclude that my results for the deletions support the IH, reflecting that stock prices decreases due to deletion, followed with price persistent in the post long term period. In efficient markets, the negative information about a stock should immediately decrease its price and the information effect should be permanent. Hence, stock prices should correctly reflect the information content of the stocks deletions and reach a new equilibrium level.

I also conclude that my results support the ISH in the case of stocks added to the Small Cap index, reflecting that stock prices increase due to additions; followed with statistically significant price persistent in the post long term period. My empirical findings can be explained by the market microstructure literature. According to Liu (2000), securities are not perfect substitutes for each other; therefore, long-term demand curves for securities are downward sloping. An increase in demand should drive up share prices given the supply for any particular security and flatten out.

I summarise my findings on the FTSE Bursa Malaysia index revisions in Table 3.14 and Table 3.15 for additions and deletions respectively.

Table 3.14 shows price and volume effects under the different theories for FTSE Bursa Malaysia index additions + indicates a positive effect, and – indicates a negative effect.

Additions		Temporary	Permanent	Theory
KLCI 30	Price	+		PPH
	Volume	+		
KLCI 70	Price		+	ICLH
	Volume		+	
Small Cap	Price		+	ISH
	Volume	+		

Table 3.14: Summary of Supporting Theories for Stocks Added to the Index

Table 3.15 shows price and volume effects under the different theories for FTSE Bursa Malaysia index deletions + indicates a positive effect, and – indicates a negative effect.

Deletions		Temporary	Permanent	Theory
KLCI 30	Price	-		PPH
	Volume	-		
KLCI 70	Price		-	IH
	Volume	+		

Table 3.15: Summary of Supporting Theory for Stocks Deleted from the Index

Volume ratio analysis is an excellent starting point to investigate volume effects from index revisions. Even though trade volume is considered a straight forward and rough proxy of liquidity, trade volume alone is insufficient to check on liquidity effect. In the next chapter (chapter four), I will specifically tackle the issue of liquidity effects from index revisions.

Chapter 4: The Effect of the FTSE Bursa Malaysia Index Series Changes on Stocks Liquidity

4.1 Introduction

In the previous chapter I explore the market efficiency related to the stock prices and trade volume in the FTSE Bursa Malaysia index revisions. I find evidence supporting the Price Pressure Hypotheses (PPH) for both the additions to and the deletions from the KLCI 30. I conclude that stocks deleted from the KLCI 70 support Imperfect Substitute Hypotheses (ISH) which is also true in the case for stock added to the Small Cap index. More importantly, I observe positive abnormal returns for the stocks added to the KCLI 70 with persistent increase in volume in the post event-window which inclines towards the Information Cost Liquidity Hypotheses (ICLH). My finding is consistent with Amihud and Mendelson (1986) who argue that an increase in liquidity leads to lower expected returns and, therefore, positive price reactions to the addition of the stock to the index.

In this chapter, I study the effect of index revision on stock liquidity. This investigation is important particularly with regard to stocks added to the KLCI 70 in order to assert my previous results regarding the ICLH. Furthermore, a stock liquidity related study for the post-event is necessary to see if there are market microstructure changes due to the index revisions.

Stock market performance indicates investors' expectations of the overall economy and could enhance foreign direct investment and economic growth. Similarly, market microstructure components like stock liquidity play an important role in attracting investors to emerging economies like Malaysia.

The “information cost and liquidity hypotheses” (ICLH) asserts that adding a stock to an index leads to higher market scrutiny and information availability, and this raises the attractiveness and liquidity of the stock and has a positive effect on the stock price. Stoll (1978), Beneish and Gardner (1995), Heflin and Shaw (2000), Hedge and McDermott (2003), and Gregoriou (2011), among others, support the ICLH. According to William et al. (2006), the Improved Liquidity Hypotheses (ILH) asserts that (in efficient markets) the expected return of a stock should decrease (increase) in anticipation of an increase (decrease) in the liquidity, and the stock price should rise (fall) if liquidity rises (drops). Also, if there are abnormal volume and liquidity the Semi-Strong form of Efficient Market Hypotheses does not hold.

On the other hand, an increase in institutional investors’ ownership tends to increase the stock liquidity, reflected in a lower bid-ask spread (William et al, 2006). This will result to increased stock monitoring by investors and analysts. Heflin and Shaw (2000) find an association between block ownership and market liquidity and suggest that both internal and external block holders contribute to liquidity reduction. For instance, if block holders are index funds, increase in stock monitoring will lead to lower information asymmetry. Lower asymmetric information will also result in lower bid-ask spread. Equally, increased ownership by mutual funds may cause a reduction in liquidity as index funds are passive investors and tend to buy and hold the stocks.

However Gregoriou (2011) argues that decrease in the direct cost of trading leads to liquidity improvement as opposed to a reduction in the asymmetric information cost of transacting. He investigates the liquidity effects of revisions to the CAC40 stock index finds evidence of a sustained increase in the liquidity of the added stocks.

Empirical studies on the association between index changes and market microstructure behaviour for the Asian markets are still limited. For instance, Liu (2000) considers the effect of changes in the Nikkei 500 on the stock prices and the trade volumes, and finds evidence supporting the downward sloping demand curves hypotheses. Li and Sadeghi (2009) investigate the impacts of index revisions on the return and liquidity of Chinese equities. In the U.S market most studies concentrate on the S&P 500 and the Dow Jones index. For instance Beneish and Gardner (1995) studied liquidity effects from changes in Dow Jones Industrial Average (DJIA).Their evidence is consistent with the ICLH explanation, which holds that investors demand a premium for higher trading costs and for holding securities that have relatively less available information.

Erwin & Miller (1998) find a decline in bid-ask spread in S&P 500 stock addition. They find that firms with non-optioned stocks benefit from information asymmetry and the change is attributed to informational efficiencies achieved via index arbitrage trading. Other authors like Hedge and McDermott (2003), find that inclusion in the S&P index reduces both actual and relative bid-ask spreads and the reduction is permanent. Similarly, Madhavan (2003) finds a permanent price effect related with changes in the Russell indices, which he attributes to changes in liquidity as measured by increased trade volume.

My study will be the first to investigate the liquidity effects from the Bursa Malaysia indices revisions.[52] I employ a variety of liquidity measures to capture multi-dimensional liquidity aspects. Specifically my study focuses on trading cost and price impact ratio as two different liquidity dimensions. I use bid-ask spread (quoted and effective) and three

[52] My previous study in Azevedo et al. (2014) documented that aggregate volume is effected by index revision but no liquidity improvement was found after the addition to the KLCI 30 which support Price Pressure Hypothesis

interrelated price impact ratio as liquidity proxies. I find new empirical evidence which supports ICLH for stocks added to from the KLCI 70 which confirms my earlier investigation on trade volume. Surprisingly, I also find stocks deleted from the same index also experienced liquidity improvement. This finding is similar to that of Li and Sadeghi (2009) who provide evidence in support of a long-term improvement in liquidity for both stock additions and stock deletions.

My finding supports Florackis et al.'s (2011) argument on the advantages of their price impact ratio, "Return to Turnover" (RtoTR) over Amihud's (2002) liquidity ratio "Return to Volume", (RtoV) in terms of market capitalisation bias. I introduce a new price impact ratio "Return on Turnover Free Float Adjusted" (RtoTRF) which has embedded "encapsulation power". I test my new generic liquidity ratio construction which is based on Kyle's (1985) lambda, Amihud (2002) and Florackis et al. (2011).

The remaining sections of the paper are organized as follows. In section 4.2, I briefly discuss related theory on stock liquidity and review the previous literature. Section 4.3 discusses the selected liquidity measures. In Section 4.4 I describe my data sample and the methodology. In section 4.5, I provide my results and analyses. In section 4.6, I conclude and make suggestions for further work.

4.2 Reviews

In this section I will review related theory followed by reviews on previous literature on liquidity in the light of index revisions.

4.2.1 Theory

"You know it when you see it, but it is hard to define" (Amihud, et al. 2013).

Liquidity and its opposite, illiquidity, are multi-dimensional and elusive concepts. A liquid security could be described by the ability to buy or sell large amounts of that security at low cost (Amihud, et. al., 2013). An example is UK Treasury bills, which can be sold in blocks of £10 million pounds immediately at the cost of a fraction of a basis point. Conversely, trading an illiquid asset is difficult, time-consuming and expensive. Illiquidity can be identified when there is huge difference between buying (bid) and selling (Ask) price. Similarly, it could be traced if trading of a large amount of a security changes its price significantly, or it is time-consuming to clear a position (to sell or buy). A good example is securitized debt obligations, which merchant banks have not been able to clear at an acceptable price for a long time.

Theoretically, liquidity is valued as buyers or investors are willing to pay lower prices, or demand higher returns, for assets that are less liquid and, therefore, more costly to trade. This contributes to a positive relationship between assets' trading costs and expected returns. Likewise, it results to an inverse relationship between trading costs and prices. In other words, as the liquidity of assets increases, their price will also increase.

It is important to reveal the effects of trading costs on the values of financial assets. For instance, if two compatible securities, stocks A and B create the same cash flows over time but stock B is less liquid, sensible buyers will offer less for illiquid stock B, which cost them extra to trade. Consequently, Stock B will have lower value and higher required expected returns.

Historically, financial economists used to overlook the liquidity issue since they assume that assets under "frictionless markets" are perfectly liquid at all times.[53] However, the importance of market liquidity stems from its association with the institutional organization of a market. As documented by Amihud and Mendelson (1988, 2005), both features (liquidity and institutional market) tend to influence each other and affect the market transactions efficiency.

In the light of stock index revisions, the stock price increase at index addition is from the improved liquidity due to the greater attention to the stock when it is promoted to the index, hence larger interest from institutional investors, which leads to greater trade volume and lower bid–ask spreads.

According to Brennan and Subrahmanyam (1995) through the addition of a stock into the index, its liquidity may improve due to a number of factors. First, it may be due to an increase in the number of analysts who follow the stock, as well as in the degree of market monitoring. Secondly, the increased visibility of the stock associated with index addition is likely to increase the flow of public information about the stock. As argued by Easley et al. (1998), these factors may well attract more uninformed (i.e., ''noise'') trade and improve the liquidity of the stock.

As I discussed in the chapter three, the liquidity hypotheses asserts that the expected return should decrease (increase) in anticipation of a liquidity increase (decrease) to reflect the liquidity premium if the market is efficient in transmitting the information.

[53] Under frictionless market trading environment imposes no costs or restraints on transactions. (Campbell , 2011).

Accordingly, share price should rise (fall) in response to a liquidity rise (drop) (see, e.g., William et al., 2006).

4.2.2 Previous Literature

In this section, I will discuss previous literature from both Asian and Emerging Markets, followed by studies in the U.S and European markets. I finally review literature on government and family members' (i.e., employees/directors) intervention in the market as well as free float effects on liquidity.

Empirical studies on the association between index changes and market microstructure behaviour for the Asian markets are still limited, and mainly devoted to the Japanese and Chinese equity markets. In the Malaysian market, to my knowledge, there is no empirical evidence that specifically investigates the liquidity effects surrounding the Bursa Malaysia index revisions.

Liu (2000) considers the effect of changes in the Nikkei 500 on stock prices and the trade volumes, using a sample of 92 additions and 86 deletions. However Liu find no liquidity effect evidence, rather the finding supports the downward sloping demand curves hypotheses. Harris and Gurel's (1986) volume ratio (VR) methodology was adopted to measure volume changes. Specifically the study indicates that in the short run, trade volume increases significantly for both added and deleted stocks. However, trade volume, decreases (increases) significantly for stocks added (deleted) in the long run. Liu (2006) investigates the price and trade volume effects associated with the revisions of the Nikkei 225, using a sample of 105 additions and 48 deletions employing the same methodology as in Liu (2000) in measuring volume effects. The evidence shows that Nikkei 225 revisions cause more price and volume changes in the short term, which supports imperfect substitute hypotheses (ISH), but have less long-term volume effect.

Li and Sadeghi (2009) investigate the impacts of index revisions on the return and liquidity of Chinese equities using a sample of 69 stocks added to or deleted from the S&P CITIC 300 index over the period from 2004 to 2007. They use two proxies to measure liquidity, the bid–ask spread and the volume of transactions. Their study provides evidence in support of a long-term improvement in liquidity for both stock additions and stock deletions. For stock addition, they find significant increase in the bid–ask spread before the event and a decline after the event, while the volume of trade show significant increases before and after the event. For deletion, they find that the trade volume increases; however they observe no significant change in the bid–ask spread. They also conclude that short-selling activities caused the volume and liquidity improvement.

On the other hand, Cheung and Roca (2013) examine the impact on returns, risk and liquidity of stocks in the Asia Pacific markets surrounding index revisions in the Dow Jones Sustainability World Index over the period 2002 to 2010. They use trade volumes and bid-ask spread as measures of liquidity. They find that index addition and index deletion stocks experience a significant decline in returns, an increase in trade volume, with no change in systematic risk and an increase in individual risk.

Chung and Chuwonganant (2014) show that market uncertainty [measured by the Chicago Board Options Exchange Market Volatility Index (VIX)] utilises a large market-wide impact on liquidity, which gives rise to co-movements in individual asset liquidity. The effect of VIX on stock liquidity is greater than the combined effects of all other common determinants of stock liquidity. They show that the uncertainty elasticity of liquidity has increased around regulatory changes in the US markets that increased the role of public traders in liquidity provision, reduced the minimum allowable price variation, weakened the affirmative obligation of NASDAQ dealers, and abolished the specialist system on the NYSE.

Recent literature by Jondeau et. al (2015) estimate a general microstructure model of the transitory and permanent impact of order flow on stock prices using high frequency data from 12 constituent stocks of the CAC40 index plus. One of their findings suggest that price of highly liquid stocks with a large proportion of sell-initiated orders tends to be more sensitive to buy trades, whereas the price of less liquid stocks with a large proportion of buy-initiated orders tends to be more sensitive to sell trades.

Most of the literature on index revisions is concentrated in the U.S and European markets. Previous studies, such as Harris and Gurel (1986), and Hedge and McDermott (2003) report liquidity increases following S&P500 index additions, while deletions appear to reduce liquidity. Beneish and Gardner (1995) find a transitory liquidity effect using quoted spreads as an estimate of trading costs surrounding index changes in the Dow Jones Industrial Average (DJIA).Their evidence is consistent with the ICLH explanation, which holds that investors demand a premium for higher trading costs and for holding securities that have relatively less available information. Beneish and Whaley (1996) find a transitory liquidity effect using quoted spreads as an estimate of trading costs in S&P 500. Erwin and Miller (1998) find a decline in bid-ask spreads, which they attribute to increased information production, since only the stocks with no options trading maintain the decline beyond the inclusion period. They argue that firms with traded options already benefit from greater information production and thus, inclusion in the Index provides no additional information.

Heflin and Shaw (2000) examine the association between block ownership and market liquidity. They investigates a sample of 259 firms trading on the New York Stock Exchange and one trading on the American Stock Exchange from 1998 to 1999. They find an association between block ownership and market liquidity and suggest that both internal and external block holders contribute to liquidity reduction. Block-holders are believed to have access to private, value-relevant information via their roles as monitors of firms' operations. They argue that firms with greater block-holder ownership, either by managers or external entities, have larger quoted spreads, effective spreads, adverse selection spread components, and smaller quoted depths.

Hedge and McDermott (2003) investigate a sample of 91 stocks added to the S&P 500 index between January 1, 1993 and October 31, 1998. They compare several measures of spread (quoted and effective), depth, and trading activity as liquidity proxies. They find that inclusion in the S&P index reduces both actual and relative bid-ask spreads and the reduction is not temporary. Madhavan (2003) finds a permanent price effect related to changes in the Russell indices, which he attributes to changes in liquidity as measured by increased trade volume. He uses a sample from 1996 to 2002 and finds a significant portion of excess return to be attributable to temporary PPH, with the remainder attributable to permanent changes in liquidity.

On the other hand, Madhavan and Ming (2003) conclude that investment managers who rebalance their portfolios to match their benchmark index (S&P 500) on or near the dates of actual index revision pay an extremely steep liquidity premium. Consequently investors and index funds trade ahead of the index revisions based on predictions of index additions and deletions, or undertake derivative transactions in the options or futures markets or use equity swaps.

In the European market, Gregoriou (2011), studies the liquidity effects of revisions to the CAC40 stock index, for as sample of 23 additions to and 20 deletions from the index over the time period 1997 to 2001. Quoted bid-ask spread, relative bid-ask spread and effective bid-ask spreads are employed as proxies to liquidity. He finds evidence of a sustained increase (decrease) in the liquidity of the added (deleted) stocks which is due to a decrease (increase) in the direct cost of trading as opposed to a reduction (enhancement) in the asymmetric information cost of transacting.

Biktimirov and Li (2014) examine market reactions to changes in the FTSE Small Cap index constituents with a sample of 672 additions and 532 deletions over the period 1998–2008. They use trade volume as measure for liquidity. They find that asymmetric price and liquidity responses between the firms that are shifted between FTSE indices and the firms that are new to FTSE indices. Specifically they find that firms promoted from a smaller-cap to a larger-cap FTSE index experience a permanent increase in stock price accompanied by improvements in liquidity. Similarly, firms demoted from a larger-cap to a smaller-cap FTSE index experience a permanent decrease in stock price accompanied by declines in liquidity.

In the emerging markets, government and family members (i.e. employees/directors) are more likely to intervene in the market as evidenced in recent literature. Bhanot and Kadapkkam (2006) study government intervention by buying stocks from Hang Seng index in August 1998 to deter speculators. They find affected stocks experienced a 24%

abnormal return during the intervention period. The abnormal returns are not reversed over the next eight weeks, refuting the hypotheses that returns are due to temporary liquidity effects. Their analysis of daily abnormal returns during the intervention period reveals that abnormal returns are related to overall intervention activity. Their finding is consistent with information effects.

Similarly, Chan et al. (2004) also study the Hong Kong government's interference in the Hong Kong stock market in 1998, when the government acquired an estimated HK$3 billion (US$0.4 billion) in shares of stocks on the Hang Seng Index (HSI) in an effort to push currency speculators out of the Hong Kong financial market. The Hong Kong government gave an assurance not to liquidate the shares for a period of time, which caused in a substantial drop in the public free float of shares in the Hong Kong stock market. Chan et al. (2004) find that the level of free float in the market had influenced market liquidity. However they conclude that no significant, positive relationship existed between the increase in the price effect and the government's holdings or the decrease in the free float.

Tavakoli et al. (2012) examine the informational content of insider trades and its value to market investors using a US dataset. Their results support the view that insider actions have positive predictive power for future returns. They conclude that senior management (directors and officers) have predictive power for future returns. Specifically director actions have predictive power for firms of all sizes, while officers only have predictive power for small firms. They also find that the signal emanating from buys is stronger than the signal emanating from sells. They note that the trading actions of directors and officers have significant effects on the trading behaviour of other groups of insiders.

Kaul et al. (2000) acknowledge a potential relationship between the public float and stock liquidity. They study the effects of the redefinition of the public float of 31 stocks on the Toronto Stock Exchange (TSE) 300 Index, which occurred on 15 November 1996, and find that the redefinition resulted in a rise in both the free-float and the index weights of the stocks. The attractiveness of the TSE 300 Index rose following the public float redefinition due to the index weights becoming more stable, making the index tracking easier. Kaul et al. (2000) detected a temporary abnormal increase in trade volume which is consistent with index rebalancing.

In recent literature, Lam et al. (2011) examine the behaviour of liquidity measures and find that a stock's free float affects the level of liquidity and the price impact responses observable in the US market. Their evidence also supports the notion that the adoption of a free float methodology was effective in reducing price distortions created by demand that was disproportionate to supply for low float stocks. They used various bid-ask spreads variables, as liquidity measures which capture the cost of trading. Rezaei and Tahernia (2013) study the relation between free float shares and share market liquidity of the Tehran stock exchange. They find a direct relationship between free float shares and the number of buyers, number of transactions and turnover ratio of shares.

Higher number of shares outstanding (NOSH) is positively related to higher market capitalisation. Stoll (2000) documents a negative relationship between market capitalization and transaction costs. One of the underlying reasons for this relationship is due to the level of liquidity provision, i.e. the higher the market capitalisation, the more likely it is that liquidity is provided. Similarly, positive association between free float shares (NOSHFF) and liquidity is expected.

4.2.3 Liquidity Proxies

In the next sub-section I will explore several liquidity measures, which are commonly used in the literature and also by practitioners. Amongst liquidity measures that are worth exploring are trade volume, share turnover, bid-ask spread, as well as Amihud (2002) and Florackis et al.'s (2011) price impact ratios. At the end of the section I will discuss on my new modified liquidity ratio derived from Kyles' (1985) lambda.

As a point of departure, I consider the properties of a liquid market. According to Kyle (1985) the liquidity properties are "resiliency", "tightness" and "depth", where the "resiliency" refers to the speed with which the prices bounce back to equilibrium following a large trade. "tightness" represents the transaction costs, i.e., bid-ask spread, and "depth" is the ability of the market to absorb a large quantity of trade without affecting significantly the market price.

On the other hand, Baker (1996), identifies three main properties of liquidity as; i) "breadth": a market is broad when there is a large volume of buying and selling orders. The spread is large when the order flow is scarce. ii) "depth": a market is deep when there are orders above and below the trading price of an asset. iii) "resiliency": a market is resilient if there are many orders in response to price changes. There is a lack of resiliency when the order flow does not adjust quickly in response to price changes. All of these properties play an important part in the estimation of the microstructure of a financial market. In fact, the convenience and availability of liquidity has significant effects both on the prices of assets, and also on the amount of competition amongst market players.

A number of measures must be considered, as no single theoretically correct and unanimously agreed (Hedge & McDermott, 2003). A number of liquidity measures have been developed, such as those of Martin (1975), Hui and Huebel (1984), Kyle (1985); Amihud, (2002), Pastor and Stambaugh (2003) and Florackis et al. (2011) to determine assets' degree of liquidity. Each liquidity measure helps in capturing and understanding a particular aspect of the stock market liquidity (Chai et al. 2010).

This study follow previous studies such as Stoll (2000), Chai et al. (2010) and Gabrielsen et al. (2011) which also aim to understand the common sources of various liquidity measure.[54] However I specifically look at seven different liquidity measures constructed from daily trading information. The measures are trade volume, share turnover, bid-ask spread (quoted and effective), the liquidity ratio from Amihud (2002), the return-to-turnover ratio from Florackis et al. (2011), and my modified price impact ratio.

4.2.3.1 Trade Volume

A straight forward and rough proxy of liquidity is represented by the trade volume. This is defined as the amount transacted between market players in buying and selling undertakings for a particular asset or for the entire market (Gabrielsen et al., 2011).

On the other hand, Becker-Blease and Paul (2006) define trade volume in monetary terms as the natural log of the mean of daily number of shares traded multiply by the closing price and they divide trade volume by two to adjust for the upward bias in volume in dealer markets.

Trade volume represents a preliminary step towards a more complete analysis of market liquidity as Blume et al. (1994) show that the trade volume produces information that

[54] Gabrielsen et al. (2011) emphasize the role of the bid-ask spread and the estimation of its components.

cannot be extracted from alternative statistics. However, some researchers consider trade volume as an unsuitable liquidity proxy due to the issue of double counting. A trade on the seller's part could also be registered as transaction on the buyer's side. Other studies like Campbell, et al. (1993), and Brennan, Chordia and Subrahmanyam (1998) use trade volume as the proxy for liquidity. On the other hand, O' Hara (2015) investigates the implications of technology changes for high frequency market microstructure and how high frequency trading affects the strategies of traders and also the markets.

4.2.3.2 Turnover Ratio

A more appropriate proxy is constructed by the ratio between trade volume and market capitalization.

The turnover ratio TR_{it} for *i* at time *t* is usually defined as follows:

$$TR_{it} = \frac{Volume_{it}}{NOSH_{it}} \tag{1}$$

where $Volume_{it}$ is the number of share units traded at time t for stock i, and $NOSH_{it}$ is the total number of share units outstanding. The proxy proposed in equation (1) is computed or a single time period, which could be a day or a month.

Frequently it is used to calculate an average over a pre-specified sample period as:

$$TR_{it} = \frac{1}{D_t} \sum_{D=1}^{D_t} TR_{it} \tag{2}$$

with a number of sub-periods D_t. Hence, in this equation, I calculate the average of the turnover ratio over a specified sample period. According to Amihud and Mandelson (1986b), turnover ratio is negatively related to the transaction costs of stocks.

Datar et al. (1998) also employ the turnover ratio as a measure for liquidity due to its simplicity and data availability. According to Amihud and Mandelson (1986b), liquidity is correlated with trading frequency. Therefore, by directly examining the turnover ratio, it is possible to use the turnover ratio as a measure for liquidity. Previous literature that employ turnover ratio as liquidity proxies is like Datar, et al. (1998), Chordia, et al (2001) and Becker-Blease and Paul (2006).

On the other hand, Becker-Blease and Paul (2006) defined turnover as “monthly number of shares traded divided by the number of shares outstanding”. In measuring the liquidity proxies, they exclude the event month and the two months surrounding the event. For example, if the event month is m, they begin measuring pre-addition liquidity in month m minus two months, and measurement of post-addition liquidity in month m plus two months.

4.2.3.3 Bid-Ask Spread (Quoted)

In the securities market, bid-ask spread is another component of trading costs apart from other costs such as direct costs like brokerage fees, transaction taxes and processing fees. Generally, the bid-ask spread is a measure of transaction costs in dealer markets like the NASDAQ. To illustrate the bid-ask market, consider this instance; a market bid is the maximum price at which a dealer is ready to buy a stock, and at which an investor aims to sell, and A market ask is the lowest price at which the dealer is prepared to sell the stock. Since the dealer sends both the bid and ask orders, the spread between these figures can be translated as the cost that the market pays for the liquidity services offered by the dealer.

Technically, the quoted bid-ask spread is defined as the difference between the highest bid price and lowest ask price for a security. For small orders, the quoted spread is a good indication of the execution cost for a trade. However, for large trade orders, it might not totally represent the cost. In my study, bid-ask spread (quoted) is defined as "the difference between bid quote and ask quote divided by the average of bid and ask".

Bid-ask spread (quoted) is an estimate of trading costs that was available in the 1980's when there were no trade by trade data available. For instance, Amihud and Mendelson (1986) and Azevedo et al. (2014) gauge stocks liquidity by the quoted bid-ask spread. They find that liquidity decreases the required return on stocks. Amihud et al. (2010) find that illiquid stocks generate higher returns.

However, Peterson and Fialkowski (1994) show that the quoted spread is a poor proxy for actual transaction costs. Besides, it has been argued that the closing price bid-ask spreads may be more easily manipulated by market makers, making them uninformative (see, e.g., Florackis et al. 2011).

4.2.3.4 Bid-Ask Spread (Effective)

The bid-ask spread (effective) is defined as twice the difference between the actual execution price and the market quote at the time of order entry. For instance, an order is entered when the quote is USD10.00 from buyer and USD10.20 from seller. The order is executed at USD10.15. The effective spread is 2(10.15 – 10.10) = USD0.10.

The bid-ask spread (effective) is superior in capturing the cost of a round-trip order by including both price movement and market impact. Price movement occurs when dealers coming in to execute orders at a better price than previously quoted and market impact occurs when spread widening due to the size of the order itself.

Previous research, such as Lee (1993) and Heflin and Shaw (2000) focuses on the bid-ask spread (effective) as a measure of liquidity. Chalmers and Kadlec (1998) use the amortized[55] effective spread as a measure of liquidity, obtained from quotes and subsequent transactions and found liquidity positively affects stock returns. Gregoriou (2011) uses effective spread and finds evidence of a sustained increase (decrease) in the liquidity of the added (deleted) stocks.

Brennan and Subrahmanyam (1996) argue that bid-ask spread is a noisy measure of liquidity, because of the high number of large amount trades that occur outside the spread and high number of small trades that occur within the spread.

Although, bid-ask spreads are relatively useful and easy to employ however, bid-ask spreads obtained at a daily frequency may be uninformative and unhelpful because they are noisy and usually refer to end-of-day transactions (see, e.g., Florackis et al. 2011). As Acharya and Pedersen (2005) argue in Florackis et al. (2011), larger bid-ask spreads are indicative of illiquidity but do not provide us with any information regarding the ‘‘depth’’ of the market and, most importantly, regarding the magnitude of price impact due to a trade.

[55] To obtain amortized spread, the spread is divided by the stock’s holding period, obtained from the turnover rate on stock.

4.2.3.5 Amihud's (2002) Price Impact Ratio (RtoV)

An interesting measure of liquidity is introduced by Amihud (2002): the liquidity ratio, which Amihud (2002) employs as a substitute for the price impact of a trade. Amihud's (2002) liquidity ratio is the average of the ratio of daily absolute return to the daily volume in dollars. Following are the Amihud (2002) RtoV price impact ratio (henceforth RtoV):

$$RtoV_{it} = \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \frac{|\mathrm{R}_{\mathrm{itd}}|}{\mathrm{V}_{\mathrm{itd}}} \tag{3}$$

where D_{it} is the number of trading days for which data are available.[56] $\mathrm{R}_{\mathrm{itd}}$, is the return on day t, and $\mathrm{V}_{\mathrm{itd}}$ is the daily volume in dollars term (in millions). The day-t impact on the price of one currency unit of volume traded is given by the ratio $|\mathrm{R}_{\mathrm{itd}}|/ \mathrm{V}_{\mathrm{itd}}$. The liquidity measure in Equation (3) is the average of the daily impacts over a given sample period. RtoV offers an understanding of the link between trade volume (in dollar) and price change.

RtoV is closely related to the Aminvest measure, which is very popular among professional investors (Khan and Baker (1993). Aminvest is approximately the inverse of the RtoV ratio, given by the sum of daily volume to the sum of the absolute return and it has been employed by Amihud et al. (1997).

The liquidity proxies developed by Amihud (2002) is one of the most extensively employed liquidity measure in the finance literature. Throughout 2009-2013, more than

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[56] I do not divide by number of available trade days in my calculation as I use daily data. If RtoV calculation is for monthly or yearly then only it is necessary to divide by number of days.

hundred papers published in the *Journal of Finance*, the *Journal of Financial Economics*, and the *Review of Financial Studies* use the Amihud (2002) measure for their empirical analyses (Gabrielsen et al, 2011).

The RtoV has two main advantages over various other liquidity measures. First, the RtoV measure has a simple structure that employs the absolute value of the daily return-to-volume ratio to encapsulate price impact. According to Florackis et al (2011), RtoV has become into very widespread for practical reasons as it is easy to calculate for long periods because volume and returns data are widely available without resorting to detailed, high quality microstructure data that are difficult to obtain for long periods.

Specifically, the ratio directly measures the impact of a (dollar) unit of trade volume on stock's return. Acharya and Pedersen, (2005) argue that the contribution of RtoV is to encapsulate the effect of trade volume on stock price movements and transform it into transaction cost. Even though RtoV ratio does not precisely measure transaction costs, it is still very beneficial and convenient as compared to traditional measures of transaction costs, such as the bid-ask spread (see, e.g., Florackis et al., 2011).

Second, the RtoV measure has a strong positive relation to expected stock return (see, e.g., Amihud (2002), Chordia et al. (2009)).[57] The positive return premium of the RtoV measure is commonly regarded as a liquidity premium that rewards or compensates for price impact or transaction cost. RtoV suggests that the larger the impact of returns, the less liquid this stock is deemed to be.

[57] A higher RtoV ratio indicates lower liquidity and higher expected returns.

RtoV also has other advantages compared to the older measures like bid-ask spreads, which describe specific aspects (transaction cost) of liquidity. First of all, it has an appropriately insightful meaning. Secondly, Cochrane (2005a) notes that RtoV also has a ‘‘price discovery’’ component because of trading activity that may be motivated by information or expectations regarding future stock price movements. In addition, RtoV is a sound empirical proxy for the theoretically sound concept of Kyle’s (1985) lambda. It is defined as “the slope from regressing absolute returns to volume over window period”.

$$\lambda = \frac{|P_{it}|}{Volume_{it}} \tag{4}$$

where, P_t is the absolute change in price of stock i at time t and $Volume_{it}$ is normally gauged as turnover or the value of shares traded. Under this measure, a highly liquid stock is one that encounters a small price change for a given level of trade volume.

4.2.3.6 Florackis et al.’s (2011) Price Impact Ratio (RtoTR)

A recent method to test liquidity is developed by Chris Florackis, Andros Gregoriou and Alexandros Kostakis. In particular, Florackis et al. (2011) propose a new price impact ratio as an alternative to the widely used Amihud (2002)’s RtoV. Despite its attractiveness and popularity, RtoV is not free of drawbacks. Florackis et al. (2011) identify the properties of RtoV from a cross-sectional asset pricing perspective, and find two major issues worthy of note. Cochrane (2005b) argues that the RtoV ratio is expected to be much higher for small capitalization stocks, leading to the conclusion that small capitalization stocks are less liquid than big capitalization stocks. Cochrane (2005a, p.5) clearly states this bias, warning researchers that use RtoV to draw conclusions that the size premium is due to illiquidity.

Hence, Florackis et al (2011) argue that RtoV is by no means comparable across stocks with different market capitalization and, therefore, carries a significant size bias. For instance, small cap stocks would show lower trade volume (in monetary terms) than big cap stocks even when both stocks show the same turnover ratio. In other words, based on the RtoV, small cap stocks are likely to be characterized as ‘‘illiquid’’ only due to their size (Florackis et al, 2011). In the cross-sectional measurement, RtoV results in a size bias because trade volume in monetary terms structurally is positively correlated with market capitalization and, therefore, it is by no means comparable across stocks with different market values.

According to Datar et al. (1998) trading frequency has become a dominant issue and it is expected to significantly affect asset pricing due to its considerable cross-sectional as well as time-series variation. As Amihud and Mandelson (1986b) state that liquidity is correlated with trading frequency. Datar et al. (1998) and Nguyen et al. (2007a) document a negative relationship, arguing that stocks with higher turnover ratio are characterized by greater trading speed and are thought to be more liquid, dictating a lower expected return as compared to stocks exhibiting low turnover ratios. Florackis et al. (2011) picked up the issue and highlighted that the RtoV ratio ignores the trading frequency aspect of liquidity. Specifically, the RtoV ratio assumes that trading frequency is similar across stocks, and hence it should not affect liquidity premium. The RtoV ratio attempts to proxy the transaction cost in a rather intuitive way; however it is uninformative with respect to the frequency at which this cost is incurred.

According to Florackis et al (2011), the RtoV aspect of liquidity is tangential to the order flow imbalance effect studied by Pastor and Stambaugh (2003). More specifically, large buy or sell orders for illiquid stocks lead to huge short-term stock price movements due to adverse selection and inventory costs that partly "bounce back" the following day as this large order shock is absorbed (Amihud and Mendelson, 1980; O'Hara, 2003).

Furthermore, Amihud (2002) states that the RtoV ratio is a measure of disagreement among investors as when investors agree about the implication of news, stock prices change with a low trade volume, while large stock price movements associated with excessive trade volume show under different perceptions.

Therefore, Florackis et al. (2011) proposed an alternative and more suitable price impact ratio defined as the average monthly ratio of daily absolute stock return to its turnover ratio (henceforth RtoTR), basically substituting the trade volume (in dollar) of a stock (in RtoV) with its turnover ratio in the denominator of RtoV ratio.

$$RtoTR_{it} = \frac{1}{D_{it}} \sum_{D=1}^{D_{it}} \left(\frac{|R_{itd}|}{TR_{itd}} \right) \qquad (5)$$

where $RtoTR_{it}$ is the return on stock i on day t, TR_{itd} is the corresponding turnover ratio, and D[58]i is the number of days with data obtainable for stock i for the period t.

According to Florackis et al. (2011), the RtoTR ratio is suitable to protect the price impact from the size effect. They argue that using the turnover ratio to calculate price impact ratios helps control not only for the importance of trading costs but also for that of trading frequency in asset pricing. Furthermore, as argue by Brown et al. (2009), the turnover ratio does not inherit a built in size-related pattern. As highlighted in Florackis et al. (2011), the role of trading frequency, which can be effectively approximated by turnover

[58] I do not divide by number of day D, in my ratio calculation as I use daily data.

ratio, is highlighted by the fundamental theoretical result of Amihud and Mendelson (1986) stating that for a risk-neutral investor with trading intensity u, the required return on security *i* is given by following equation:

$$\mathrm{E(r)}^{i} = r^{f} + u\ \frac{C^{i}}{P^{i}} \qquad (6)$$

where C^{i} denotes liquidity cost and P^{i} denotes its price for asset i. Essentially, it means that, although it is true that higher transaction costs demand higher expected returns *ceteris paribus*, it is also true that the expected returns amplify with the asset's trading frequency. Hence, the compound effect of trading frequency must be factored together and not in isolation as argued by Florackis et al. (2011).

In recent years, the trading activity has increased due to the participation of institutional investors who own significant levels of stock. As argued by Bogle (2005) and French, (2008) these institutional investors take actions characterized by short-termism and short holding horizons. Furthermore, transaction costs have been cut down due to technological advancements and implementation of effective microstructure mechanisms in organized exchanges (see Chordia et al. (2001); and French, (2008) for instance).

As a result, RtoTR is perceived to be a more comprehensive price impact ratio that clearly takes into account the impact of trading frequency on required premium as of the greatest importance because stocks actually demonstrate a substantial cross-sectional variability in their turnover ratios**.** Furthermore, Florackis et al. (2011) argue that their ratio provides an alternative to the amortized spread of Chalmers and Kadlec (1998), which also attempts to measure the combined effect of trading frequency and transaction costs. Chalmers and Kadlec (1998), provide strong evidence in favour of this combined effect in determining premia, since amortized spreads are found to be more strongly priced as compared to unamortized spreads. In particular, their analysis confirms that stocks with similar spreads exhibit vastly different turnover ratios, so the spread alone cannot be a fully informative proxy for liquidity.

According to Florackis et al. (2011), the main shortcoming of Chalmers and Kadlec's (1998) measure is that it requires data on bid and ask prices. As a result, it inherits the problems such as manipulation bid-ask spreads by market maker, quality of data and the difficulty in acquiring informative quotes at a daily frequency.

4.2.3.7 Free-Float Adjusted Price Impact Ratio (RtoTRF)

In this sub-section I introduce a new price impact ratio which considers the free float factor. As argued by Lam et al. (2011), the adoption of a free float methodology was effective in reducing price distortions created by demand that was disproportionate to supply for low float stocks. The concerns over free float are not only that investors in firms with a smaller free float are at risk because it will mean that they can exercise little control over the firm, but also a liquidity concern. Higher free float stocks have a positive relationship with liquidity because it is easier to trade with abundance of supply.

Florackis et al. (2011) proposed an alternative, more suitable, price impact ratio defined as the average monthly ratio of daily absolute stock return to its turnover ratio, which is basically substituting the trade volume (in dollars) of a stock with the turnover ratio in the denominator of Amihud (2002)'s ratio as described previously.

In this chapter, I propose a modification of Florackis et al. (2011)'s RtoTR in order to increase the "encapsulation power" of the price impact, by factoring in the public free-float component. I define "encapsulation power" as the "ability of the ratio to precisely measure the cross-sectional variability stock turnover ratio". My proposed price impact ratio is defined as follows:

$$RtoTRF_{it} = \frac{1}{D_{it}} \sum_{D=1}^{D_{it}} \left(\frac{|R_{itd}|}{TRF_{itd}} \right) \tag{7}$$

where $RtoTRF_{it}$ is the return on stock i on day t, TRF_{itd} is the corresponding turnover ratio adjusted with public free float factor, and Di is the number of days with data obtainable for stock i for the period of the pre and post addition measurement periods. [59]

If I observe, both Florackis et al. (2011)'s RtoTR and RtoTRF are identical, apart from the denominator component. In my ratio, I adjust the turnover ratio of Florackis by considering the public free float factor. This denominator's improvement is constructed by trade volume over multiplication of number of shares outstanding and public free-float factor (i.e., NOSFF) or simply I could derive the adjusted turnover rate by Vo/NOSFF in *Datastream*. This adjusted turnover ratio, I argue gives more encapsulation power to the new liquidity measure. This adjustment on stock turnover ratio approximates the stock's trading frequency in a more precise way.

As I discussed above, the appealing characteristics of RtoTR; firstly, is data is easily available in the public domain, so the RtoTRF inherits the simplicity and data availability that also characterizes the RtoV ratio. Secondly it is also free of any size bias as the RtoTRF ratio enjoys the same benefits as RtoTR, as explained earlier. Further, RtoTRF

[59] I do not divide by number of days (Di) as my data is based on daily frequency.

does not inherit a built-in size-related pattern which differentiates it from Amihud (2002)'s RtoV. Hence, the RtoTRF and also RtoTR ratio are more appropriate to protect the price impact from the size effect.

As argued by Florackis et al. (2011), the significant benefit of using the turnover ratio to calculate price impact ratios is that it helps control for the importance for trading frequency on asset pricing. In my ratio, I also takes into account the impact of trading frequency on expected return required premium because different stocks demonstrate a substantial variability in their turnover ratios as I previously discussed**.**

More importantly, RtoTRF takes into account the public free float (NOSFF) as another part of the ratio's denominator, which is appealing in terms of encapsulating not only size bias and trading frequency but also the "real supply" of shares available to the public. There is evidence in the literature that, the public free float methodology is effective in reducing price distortions created by demand that is disproportionate to supply for low float stocks.

Turnover ratio alone does not gives a real picture of the number of shares traded. As previously defined in Equation (1), it is calculated as number of shares traded divided by the number of shares outstanding. The problem with using turnover ratio alone as the denominator of a price impact ratio, is that it does not refine the real supply of stocks, but rather the number of shares outstanding and number of shares outstanding is not necessarily equal to the real supply of stocks available to the public.

If all the shares are available for trading, the RtoTRF ratio does not exists. However, very often, there are shares which are not are available for public trading. As reported in the Financial Times, there were concerns in the UK in October 2012 that there could be an easing up of rules for firms listed on the London Stock Exchange. The UK government was proposing that the requirements of 25 per cent free float would be reduced to as little as 10 per cent for fast-growing technology companies. This reduction in the stocks supply might unfavourably affect stocks' liquidity. My proposed price impact ratio performs at par with the ratio of Florackis et al.'s (2011) RtoTR when applied in firms fully adopting the free float methodology, as the turnover ratio will be the same.

On the basis of Florackis et al.'s (2011) RtoTR ratio is computed, this might result in a smaller turnover ratio as the turnover ratio may over estimate the number of shares available for the public (in the case where the number of shares outstanding are not fully available for trade). Consequently, a smaller turnover ratio leads to a higher price impact ratio, which leads to a less accuracy of the liquidity measurement.

Consider the illustration of Coca-Cola Enterprises (CCE), with a free-float factor of 0.50, CCE had about 24.7 million (50 percent) shares outstanding, which were either not readily available for buying and selling by investors or were taken outside the active market by strategic shareholders. Considering the total shares outstanding alone will lead to a relatively smaller turnover ratio, hence leading to larger price impact ratio. This may signal a less refined and misleading price impact ratio. For example CCE had $3.26 million shares traded on June 18 2004, the turnover ratio is simply 0.066 ($3.26/$49.4) if calculated as proportion of shares traded ($3.26 million) to number of total shares outstanding ($49.4 million). However, the number of shares available for trading on that particular day was only half, so the ratio was effectively 0.132 ($3.26/$24.7).

If CCE's price return on June 18 was $0.10, using the RtoTR ratio would equal 1.51 ($0.10/0.066), as opposed to the smaller RtoTRF ratio of 0.757 ($0.10/0.132). The RtoTR ratio is more than twice the RtoTRF ratio, due to the smaller denominator. As I discussed earlier in the theory section, illiquidity could be traced if trading of a big amount of a security changes its price significantly. In this illustration, I may conclude CCE's stock to be less liquid as the price to volume impact is larger under RtoTR as compares to the RtoTRF, where CCE's price to volume impact is lower.

Again considering the UK government's proposal of a reduction in the free float requirements to 10 per cent for fast-growing technology firms, this reduction in supply might not only affects stocks' volume and liquidity but also the Florackis et al.'s (2011) RtoTR price impact ratio. As I discussed, a small denominator will over-estimate the RtoTR ratio which might lead to the conclusion of illiquidity, while factoring in the free float have tremendous impact on the RtoTRF, leading to the opposite conclusion.

4.3 Data and Methodology

4.3.1 Data Sample

In terms data sample, I use the same data samples from the previous chapter three. However I extend my dataset by including free-float data types, and spreads data, to the existing dataset of daily stock prices, adjusted for dividends and stock splits, daily trade volumes for the stocks and indices, for the period between 2005 and 2012. The data about the stock prices and indices values, and respective trade volumes, and the free-float data types was collected from Thomson Reuters *Datastream*.

Table 4.1 reports free-float data types, where the first column specifies the types of shareholdings, the second column is the respective abbreviation for shareholding types and the last column describes the respective terminology.

Types	Abbreviations	Terminology
Government Held Shares	NOSHGV	The percentage of strategic holdings (of 5% or more) held by the government or by government related institution:
Employee Held Share	NOSHEM	The percentage of strategic holdings (of 5% or more) held by employees, or those with a substantial position in the firm's shares that leads to a relevant voting power at annual general meeting (typically family members).
Cross Holdings Shares	NOSHCO	The percentage of strategic holdings (of 5% or more) held by one firm in another
Pension Fund Held Shares	NOSHPF	the percentage of strategic holdings (of 5% or more) held by endowment funds or pension funds
Investment Firm Share	NOSHIC	The percentage of strategic holdings (of 5% or more) held by investment banks or institution (excluding hedge funds) seeking a long term ret
Other Holdings Shares	NOSHOF	The percentage of strategic holdings (of 5% or more) outside one of the above types
Total Strategic Share Holdings	NOSHST	Represents the percentage of firm's share outstanding (of 5% or more) that is not available to ordinary investors, computed as the summation of the NOSHGV, NOSHEM, NOSHCO, NOSHPF, NOSHIC and NOSHOF; NOSHFF is the percentage of total shares in issue available to ordinary investors.

Table 4.1: Free Float Datatypes

The information regarding the Announcement Date (AD) and the Change Date (CD) for the additions to and deletions from the index was collected from the Secretary of the

FTSE BM Advisory Committee. My sample is composed of 3 indices; the KLCI 30, KLCI 70 and Small Cap index. Table 3.2 and Table A1 in Appendix A provides further details about the data sample for KLCI 30, KLCI 70 and Small Cap indices.

4.3.2 Methodology

The analysis of the aggregate trade volume in the previous chapter three does not provide sufficient information to infer whether the changes in the trade volumes are due to liquidity changes or information-motivated. In order to test market liquidity changes, liquidity must be tested with several proxy measures, due to its multi-dimensional aspects. For instance, Hedge and McDermott (2003) measure liquidity using three liquidity proxies: quoted bid and ask spread, effective bid-ask spread and depth, whereas Gregoriou (2011) uses quoted, relative and effective bid and ask spreads to measure liquidity.

I test the liquidity changes adapting Hedge and McDermott's (2003) methodology, a pooled time series cross-sectional multivariate analysis of bid-ask spreads and also price impact ratios. More specifically, I use the bid-ask spread (quoted), bid-ask spread (effective) Amihud's (2002) RtoV ratio, Florackis et al.'s (2011) RtoTR and my RtoTRF as measures of liquidity.

This enables us to examine whether the market liquidity of stocks increases (decreases) following additions to (deletion from) the FTSE Bursa Malaysia index series, controlling for the average daily trade volume, the average daily closing stock price and the daily volatility of the stock return, through the following log-linear specification where the regression coefficients provide estimates of the elasticity. I estimate pooled cross-sectional time series using ordinary least square regression with cross-sectional heteroscedasticity and first order auto-correlation. I follow the methodology as outlined in Greene (2012).

4.3.2.1 Regression Model: Liquidity Changes

My regression model is as follows:

$$\log\ Liq_{i,t} = B_0 + \delta_0 D\_KLCI_t + \beta_1 \log \text{Vol}_{i,t} + \delta_1 \log Vol_{i,t} D\_KLCI_t + \beta_2 \log \Pr ice_{i,t} + ... \\ ... + \beta_3 \log StdDev_{i,t} + \varepsilon_i \tag{8}$$

where, for the stock addition/deletion i=(1,2,….N) , with t =(1,2), where t =1 represents the period between CD-45 and CD-15 (before the index change) and t=2 the period between CD+15 and CD+45 (after the index change); $\log Liq_{i,t}$ is the dependent variable, represented by either the "LogSpread (Quoted)", the "LogSpread (Effective)" as proxies for trading cost. I use the "return to volume" (RtoV), the "return to the turnover ratio" (RtoTR) ratios and "return to the turnover ratio float adjusted" (RtoTRF) as proxies for the price impact ratio.

LogSpread (Quoted) is the natural logarithm of the stock bid-ask spread quoted, and is defined as the difference between bid quote and ask quote divided by the average of bid and ask. LogSpread (Effective) is the natural logarithm of the stock bid-ask spread effective transacted and is calculated as twice the difference between the actual execution price and the market quote at the time of order entry. RtoV, RtoTR and RtoTRF are defined for the Equations (3), (5), and (7), respectively.

As independent variables, I use $\log \Pr ice_{i,t}$, $\log \text{Vol}_{i,t}$ and $\log StdDev_{i,t}$ which represent, respectively, the natural logarithm of the stock i's daily closing price, daily trade volume in shares and daily return volatility, for the time period t; D_KLCI_t is a dummy variable which takes the value of "1" for the period after the index change and "0" otherwise.

Under the log-linear specification of Equation (8), the regression coefficients provide estimates of elasticities. In my analysis, I are mainly concerned with the change in the dummy variable, δ_0 and the change in the slope of trade volume as a result of compositional change, δ_1. In term of relationship between liquidity proxies and trade volume, if the proportion of noise trading rises after a stock is added to the index, then I assume market makers to be less sensitive to order flow, hence I expect market makers to reduce the spread on average. Similarly, if noise traders are responsive to the news, the proportion of trade volume will increase and consequently will lower the price impact ratio on average.

In terms of the relationship between my liquidity proxies and stock price and volatility, it is well established in the literature that the bid-ask spread rises with return volatility and falls with stock price. On the other hand, the price impact ratio increases with stock price and volatility (see, e.g., Hedge McDermott, 2003, Gregoriou et al. 2005). In short, I expect a negative relationship between my dependant variables and trade volume, and a positive association with volatility and trade price.

4.3.2.2 Regression Model: The Investability Weight Change

I test changes of the different types of free float shareholding percentages of affected stocks before and after revisions. Prior to parametric investigation, I first test using paired two sample means to determine free float percentages before and after an event. I hypothesise the null as the mean of pairwise differences equal to zero.

I use the following event windows in my free float AD-120, AD-1 to CD, CD+120; AD-30, AD-1 to CD, CD+30; AD-15, AD-1 to CD, CD+15; and AD-7, AD-1 to CD, CD+7.

Similar to Equation (5), I re-estimate the model specification as follows:

$$\begin{aligned}\log Liq_{i,t} = B_0 + B_1 \log Vol_{i,t} + D_1 \log Vol_{i,t} D\_KLCI + B_2 \log Price_{i,t} + B_3 \log StdDev_{i,t} + B_4 NOSHGV_{i,t} D\_KLCI + \ldots \\ \ldots + B_5 NOSHEM_{i,t} D\_KLCI + B_6 NOSHST_{i,t} D\_KLCI + B_7 NOSHFF_{i,t} D\_KLCI + \varepsilon_i\end{aligned} \quad (9)$$

where, for the stock addition/deletion i=(1,2,….N) , with t =(1,2), where t =1 represents the period between CD-45 and CD-15 (before the index change) and t=2 the period between CD+15 and CD+45. The dependent variable(s), represented by the same liquidity proxies as described earlier, as are the independent variables. However, I control for four types of free float shareholding percentages (NOSHGV, NOSHEM, NOSHST and NOSHFF).

My free float data types include: "Government Held Shares" (NOSHGV), i.e. the percentage of strategic holdings (of 5% or more) held by the government or by government related institution; "Employee Held Share" (NOSHEM), i.e. the percentage of strategic holdings (of 5% or more) held by employees, or those with a substantial position in the firm that leads to a relevant voting power at the annual general meeting (typically family members).

"Total Strategic Share Holdings" (NOSHST) represents the percentage of firm's share outstanding (of 5% or more) that is not available to ordinary investors, computed as the sum of the NOSHGV, NOSHEM, NOSHCO, NOSHPF, NOSHIC and NOSHOF; NOSHFF is the percentage of total shares in issue available to ordinary investors.

"Cross Holdings Shares" (NOSHCO), i.e. the percentage of strategic holdings (of 5% or more) held by one firm in another; "Pension Fund Held Shares" (NOSHPF), i.e. the percentage of strategic holdings (of 5% or more) held by endowment funds or pension funds; "Investment Firm Share" (NOSHIC), i.e. the percentage of strategic holdings (of

5% or more) held by investment banks or institution (excluding hedge funds) seeking a long term return; “Other Holdings Shares” (NOSHOF), i.e. the percentage of strategic holdings (of 5% or more) outside one of the above categories.

4.3.2.3 Heteroscedasticity

The most common concern in pool, cross-sectional data is Heteroscedasticity. It is well known that financial time series data is often conditionally heteroskedastic, meaning that ordinary least square estimators are consistent, but inefficient.[60] However, I could still use the Ordinary Least Square (OLS) estimators by finding Heteroscedasticity-robust estimators of the variances (Kaufman, 2013). In fact, the existence of heteroskedastic errors would not change the “central position” of the OLS line (unbiasedness).

A simple test based on OLS is required to preliminary determine whether conditional Heteroscedasticity exists. I employ White (1980) test based on the hypotheses where I specify the null H_0: no heteroscedasticity and alternative hypotheses, H_A: there is heteroscedasticity.

In order to implement the test I first estimate the coefficients using the OLS and keep squared residuals. I regress all squared residuals on all variables and obtain R^2. I reject the null hypotheses if R^2 is too large. If the R^2 of this residual regression is high, then I could explain the behaviour of the squared residuals, providing evidence that they are not constant (see, Green 2012).

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[60] $\hat{B}$ (OLS estimator) is not the minimum variance estimate (inefficient) hence biased. Inefficient variance estimator makes standard t and F tests invalid.

In case I detect existence of Heteroscedasticity in the regression model, I keep the OLS estimators but replace its old variance with White's (1980) consistent estimators as proposed by Kaufman (2013). I follow a more popular practice by retaining OLS and substitute its variance estimator (as the original variance is biased under Heteroscedasticity) by White's (1980) consistent estimators, which does not require any assumptions on structure of variance. In order to deal with Heteroscedasticity, I do not need the assumption of structure of variance (Homoskedasticity assumption) to show that OLS estimators are unbiased (BLU) under the finite sample properties and consistency under the asymptotic properties (CAN). The most important is how to fix OLS standard errors.

While I am concerned about Heteroscedasticity problem, I maintain the assumption of no autocorrelation. Heteroscedasticity is assumed to arise when the variance of the unobservable error u, conditional on independent variables, is not constant. As shown in the equation below, the variance of disturbance i, u_i, is not constant across observations but not correlated with u_j:

$$E(uu') = \begin{bmatrix} E(u_1u_1) & E(u_1u_2) & E(u_1u_n) \\ E(u_2u_1) & E(u_2u_2) & E(u_2u_n) \\ E(u_nu_1) & E(u_nu_2) & E(u_nu_n) \end{bmatrix} = \begin{bmatrix} \sigma_1^2 & 0 & 0 \\ 0 & \delta_2{}^2 & 0 \\ 0 & 0 & \delta_n{}^2 \end{bmatrix} = \Sigma \qquad (10)$$

or

$$E(uu') = \sigma^2 \begin{bmatrix} \sigma_1^2/\sigma^2 & 0 & 0 \\ 0 & \delta_2^{\ 2}/\sigma^2 & 0 \\ & & \\ 0 & 0 & \delta_n^{\ 2}/\sigma^2 \end{bmatrix} = \sigma^2\Omega \qquad (11)$$

In Equation (11), Homoscedasticity, $\Omega = I$. The sample variance of OLS estimator under the Heteroscedasticity is:

$$\begin{aligned} Var(\hat{\beta}) &= Var\left[\beta + (X'X)^{-1}X'u\right] \\ &= E\left[(X'X)^{-1}X'uu'X(X'X)^{-1}\right] \\ &= (X'X)^{-1}X'E(uu')X(X'X)^{-1} \\ &= \sigma^2(X'X)^{-1}X'(X'X)^{-1} \end{aligned} \qquad (12)$$

In the presence of Heteroscedasticity, the conventionally estimated covariance matrix for the least square estimator $\sigma^2(X'X)^{-1}$ is inappropriate and would be biased (Greene, 2012). The appropriate covariance matrix is $\sigma^2(X'X)^{-1}(X'\Omega X)(X'X)^{-1}$. According to Greene (2012) it is unlikely these two estimators would coincide, so the usual estimators of the standard errors are likely to be erroneous.

Since Σ is unknown (as I are unsure of the precise nature of Heteroscedasticity and most of the time it is true), appropriate statistics can be obtained by estimating Σ empirically.

$$\hat{\Sigma} = \begin{bmatrix} \hat{u}_1^2 & 0 & 0 \\ 0 & \hat{u}_2^{\ 2} & 0 \\ & & \\ 0 & 0 & \hat{u}_n^{\ 2} \end{bmatrix} \qquad (13)$$

Thus by using the estimated Σ, I have

$$X'\hat{\Sigma}X = X'\begin{bmatrix} \hat{u}_1^2 & 0 & & 0 \\ 0 & \hat{u}_2^{\,2} & & 0 \\ & & & \\ 0 & 0 & & \hat{u}_n^{\,2} \end{bmatrix}X. \tag{14}$$

Therefore I could estimate the variances of OLS estimators and standard errors by using $\hat{\Sigma}$:

$$Var(\hat{\beta}) = (X'X)^{-1}\left(X'\hat{\Sigma}X\right)(X'X)^{-1}. \tag{15}$$

Standard errors based on this method are termed as robust standard errors or White-Huber standard errors. [61] This method is reliable empirically and has advantage of not imposing any assumptions on the structure of Heteroscedasticity.

4.3.2.4 Serial Correlation

Fama and Macbeth (1973) suggest that the error terms are likely to be correlated over time and that using pooled regression could violate the OLS assumptions. Serial correlation occurrence is more common in time series data, even though it is not necessarily true (see, e.g., Fama and Macbeth, 1973).To test for any serial correlation I use Arellano-Bond (1991) test for zero autocorrelation in first-differenced errors. It is quite general in its applicability to be applied to linear Generalised Method of Moments (GMM) regressions in general, but also to OLS regressions. It is appropriate for both time-series and cross-section time-series regressions (Roodman, 2009).[62]

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[61] I use command “regress y x1, x2,.. xN, robust” in STATA
[62] http://fmwww.bc.edu/repec/bocode/a/abar.ado

I employ Arellano-Bond (1991) test based on the hypotheses where I specify the null as H_0: no autocorrelation and the alternative hypotheses, H_A: there is autocorrelation (Kaufman , 2013). [63] In order to solve the problem of serial correlation, a model for the error terms AR(1) need to be constructed. I could estimate the parameters of the model and figure out the standard errors. Suppose that under the model for the error terms AR(1)

$$u_t = \rho . u_{t-1} + \varepsilon_t \tag{16}$$

where ε_t is white noise with $E(\varepsilon_t)$ =0, and -1< ρ <1.

Under the properties of the AR(1), ε_t white noise will be correlated with current and lagged values of ε_t; but not future values (Greene, 2012). The following model is called AR(1) for the simple reason that there is 1 autoregressive term.

$$\begin{aligned} u_t &= \rho u_{t-1} + \varepsilon_t \\ &= \rho^2 u_{t-2} + \rho \varepsilon_{t-1} + \varepsilon_t \\ &= \rho^k u_{t-k} + \rho^{k-1} + \varepsilon_{t-(k-1)} + \ldots + \varepsilon_t \\ &= \sum_{j=0}^{\infty} \rho^j \varepsilon_{t-j} \end{aligned} \tag{17}$$

But then,

$$\begin{aligned} E(u_t) &= E\left(\sum_{j=0}^{\infty} \rho^j \varepsilon_{t-j} \right) \\ &= \sum_{j=0}^{\infty} \rho^j E(\varepsilon_{t-j}) \\ &= 0 \end{aligned} \tag{18}$$

[63] In STATA I use estat abond, artest(1) to test for zero autocorrelation in first-differenced error

and,

$$
\begin{aligned}
Var(u_t) &= Var\left(\sum_{j=0}^{\infty} \rho^j \varepsilon_{t-j}\right) \\
&= \sum_{j=0}^{\infty} \rho^{2j} Var(\varepsilon_{t-j}) \\
&= \mathrm{var}(\varepsilon_t) \sum_{j=0}^{\infty} \rho^{2j} \\
&= \frac{Var(\varepsilon_t)}{1-\rho^2}
\end{aligned}
\tag{19}
$$

Under these conditions, the model is "covariance stationary" for the reason that:

$$
\begin{aligned}
&Cov(u_t, u_{t+1}) = Cov(u_t, \rho u_t + \varepsilon_{t+1}) \\
&= \rho Var(u_t) \\
\\
&Cov(u_t, u_{t+2}) = Cov(u_t, \rho u_{t+1} + \varepsilon_{t+2}) \\
&= Cov(u_t, \rho(\rho u_t + \varepsilon_{t+1}) + \varepsilon_{t+2} \\
&= \rho^2 Var(u_t)
\end{aligned}
\tag{20}
$$

In general

$$
Cov(u_t, u_{t+h}) = \rho^h Var(u_t) \tag{21}
$$

This turns out to solve the problem of the variance described above.

On the other hand, I could solve the problem the error terms that are correlated by employing Newey-West's (1987) autocorrelation consistent covariance estimator. This procedure is simple and relatively easy to implement. Under this procedure:

$$
Var(\hat{\beta}_1) = \frac{1}{T} \sum_{l=1}^{L} \sum_{t=l+1}^{T} W_e u_t u_{t-e} (\tilde{X}_t \tilde{X}'_{t-l} - \tilde{X}_t - l\tilde{X}_t \tag{22}
$$

where

$$\begin{aligned} W_e &= \frac{e}{L+1} \\ \tilde{X}_t &= X_t - \overline{X} \end{aligned} \tag{23}$$

Newey and West (1987) show that for some L I can approximate. However there is a final problem to be solved where I must determine in advance how large L is to be. Greene (2012) proposes to specify $L \approx T^{\frac{1}{4}}$.[64]

Alternatively, I could employ the "cluster" command in STATA which is simple and easy to command.[65] In this procedure I assume that $Corr(u_{it}, u_{j\tau}) = 0$ whenever $j \neq i$ for any t and τ. The advantage of this procedure is that I do not need to make any assumption about $Corr(u_{it}, u_{j\tau}) = 0$ and also no assumption on $Var(u_{it})$, hence it is also "heteroscedasticity robust".

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[64] In STATA I command as : newey Y X, lag(L)
[65] In STATA I regress y x, cluster(idcode)

4.4 Results

In this section, I present the results of the stocks that experienced index additions to and deletion from Bursa Malaysia index series. I first analyse the results for stock additions and follow with the results for stock deletions from the index.

4.4.1 Additions

Results for stocks added to the FTSE Bursa Malaysia index series shows mixed results. I finds no liquidity improvement for stocks added to the KLCI 30 and the Small Cap index. All my liquidity proxies shows no improvement in liquidity as measured by quoted spread, effective spread, RtoV, RtoTR and RtoTRF. However, result for the KLCI 70 shows improvement in liquidity for stocks added to the index.

4.4.1.1 KLCI 30

The information provided in Table 4.2 shows my results for the effect of additions to the FTSE Bursa Malaysia KLCI 30 on the stock liquidity. I adopt Hedge McDermott (2006) for the pooled cross-sectional time series regression analysis, considering the cross-sectional heteroscedasticity and the first order auto-correlation. The information in the last row specifies the goodness fit of my model, i.e., the R^2.

Table 4.2 reports my results for the stock additions to the KLCI 30 index using the ordinary least square regression based on Equation (8):

$$\log\ Liq_{i,t} = B_0 + \delta_0 D\_KLCI_t + \beta_1 \log \mathrm{Vol}_{i,t} + \delta_1 \log Vol_{i,t} D\_KLCI_t + \beta_2 \log \mathrm{Pr}\, ice_{i,t} + ...$$
$$... + \beta_3 \log StdDev_{i,t} + \varepsilon_i$$

where *Log* $Liq_{i,t}$ represents the dependent variables: $LogSpread_{i,t}$*(quoted)*, $LogSpread_{i,t}$*(effective)*, $RtoV_{i,t}$, $RtoTR_{i,t}$, and $TRF_{i,t}$, with *i* and *t* standing for stock and time, respectively, where $i \in (1, 2, \ldots, 18)$ and $t \in (1, 2)$, with *t=1* representing the time-period between CD-45 and CD-15, and *t=2* representing the time-period between CD+15 and CD+45. $LogPrice_{i,t}$, $LogVol_{i,t}$ and $LogStdDev_{i,t}$ are independent variables that represent the natural logarithm of the closing price, trade volume and volatility of stock *i* on day *t*, respectively. "Const." is the regression interception, $D\_KLCI_{i,t}$ is a dummy variable that takes the value of "1" for the time-period after the index change and "0" otherwise, and $logVol.D\_KLCI_{i,t}$ represents the product of the $D\_KLCI_{i,t}$ dummy by $logVol_{i,t}$. T-statistics, adjusted for heteroscedasticity and first order auto-correlation, are in parentheses ( ). R^2 represents the adjusted R squares. The results are significant at 1%, 5% and 10%, if identified by the superscripts ***, ** and *, respectively.

Additions: KLCI 30	***Dependant Variables***				
Independent Variables	Log spread (quoted)	Log spread (effective)	RtoV	RtoTR	RtoTRF
Const.	-3.519 (-22.21)***	-5.246 (-6.406)***	3.770 (5.043)***	27.21 (6.952)***	14.073 (7.571)***
D_KLCI	0.526 (4.393)***	2.273 (3.422)***	0.697 (1.43)	3.358 (0.6703)	4.155 (2.589)***
LogVol	0.0011 (0.009)	0.193 (2.678)***	-0.711 (-9.96)**	-3.242 (-7.19)***	-1.242 (-6.317)***
LogVol,D_ KLCI	-0.064 (-3.91)***	-0.2926 (-3.247)***	-0.097 (-1.453)	-0.420 (-0.633)	-0.537 (-2.463)***
LogPrice	-0.161 (-4.95)***	0.4813 (2.472)**	-0.580 (-4.36.)***	-1.012 (-1.029)	-2.860 (-6.872)***
LogStdDev	0.2616 (9.31)***	0.2708 (2.738)***	-0.173 (-2.916)***	0.0155 (0.985)	0.0449 (6.525)***
R^2[66]	0.126	0.1282	0.1503	0.1207	0.1721

Table 4.2: OLS Results for Stocks Added to the KLCI 30

The above results show that the coefficient of the LogVol for the LogSpread (Effective) variables is statistically significant. The coefficients of the log LogVol are negative and statistically significant for the RtoV, RtoTR and RtoTRF liquidity variables. For instance, if the trade volume increases by 1%, the RtoTR and RtoTRF variables decrease by 3.2%

[66] R^2 only matters if the goal of analyses is to make predictions. In my investigation, I only interested in making a statement that one variable affects another. Therefore, focus should be on the t-statistic on the variable concerned.

and 1.2%, respectively (liquidity increases), while effective spread increase by 2.27% (liquidity decrease) for the pre-addition time-period.

I observe the signs of the coefficients of the Log Spread (quoted) and Log Spread (Effective) variables are both positive, although statistically significant for the former variable only. The sign of the above coefficients is unexpected and might be caused by the interference of the market makers who deliberately, increased the bid-ask spread as they anticipate the stock addition prior to the announcement news.

I also find that the coefficients of the LogPrice and LogStdDev (return volatility) variables are statistically significant for all liquidity measures, except for the RtoV measure. For instance, I find that an increase of 1% in the stock price leads to a decrease of 2.86% in the RtoTRF liquidity measure.

To understand this result I should look carefully at the liquidity measure (see Equation (6)) from which I can see that it decreases if, within a given time period, there is a larger percentage increase change in the trade volume as compared to the stock price – note that the "turnover ratio adjusted with free float" variable is in the denominator of the RtoTRF liquidity measure. Also, if the LogStdDev increases by 1%, the LogSpread (Quoted) and LogSpread (Effective) variables increase by 0.26% and 0.27%, respectively.

In this analysis, I are mainly concerned with the change in the dummy variable, δ_0 and the change in the slope of trade volume as a result of compositional change, δ_1. More specifically, these coefficients provide us with information about stock liquidity changes and trade volume changes (sensitivity) after the addition of the stock to the index, respectively.

My results show that δ_0 increases for the LogSpread (Quoted) and LogSpread (Effective) variables, and the RtoTRF liquidity ratio. I control for the variations in the stock price, trade volume and standard deviation of the stock return. Accordingly, I conclude that the stock liquidity, if measured by the LogSpread (Quoted), LogSpread (Effective) and RtoTRF, decreases after the stock addition to the KLCI 30. More specifically, the δ_0 is positive and statistically significant at 1% level for the LogSpread (Quoted), LogSpread (Effective) and RtoTRF. I conclude, therefore, that the stock liquidity, when measured by the above variables, decreases after the addition of the stock to the index. The coefficient δ_0 is also positive for the RtoV and RtoTR liquidity ratios, although not statistically significant.

If the proportion of noise trading rises after a stock is added to the index, then I assume market makers to be less sensitive to order flow; therefore, I would expect market makers to reduce the spread on average. Similarly, if noise traders are sensitive to the news, the proportion of trade volume will increase and consequently will lower the price impact ratio on average.

I find negative and significant δ_1 for the dependant variables LogSpread (quoted), LogSpread (effective) and RtoTRF of -0.064, -0.2926 and -0.537 respectively at the 1% statistical significance level. For instance, a one percent increase in the mean trade volume (logVolume) is associated with an increase of 0.193% in the average *LogSpread (effective)* in the pre-additions period. The sensitivity changes of the *LogSpread (effective)*, decrease from 0.193% to -0.104% (0.193%-0.2926%) for a 1% increase in mean trade volume in the post-addition period. Also, a one percent increase in mean trade volume (logVolume) is associated with a decrease of 1.242 % in the average *RtoTRF* in the pre-additions period. The sensitivity change of average *RtoTRF* decreases by a margin from -1.242% to -

1.779%, for a 1% increase in mean trade volume in the post-addition period. These results show that LogSpread (Effective) and *RtoTRF* are less sensitive to order flow after stocks are added to an index.

These results are consistent with the argument that bid-ask spread, price impact ratio and trade price are less sensitive to order flow after stocks are added to an index (see, e.g., Hedge McDermott 2003, Gregoriou 2011). Overall, I conclude that market makers increase bid-ask spread as a result of the news, and this reduction in liquidity causes trade volumes to decrease in the post index revision period. The increase in bid-ask spreads makes added stocks more costly to trade, resulting in the price reversal as also evidenced from my previous chapter.

4.4.1.2 KLCI 70

In this sub-section, I analyse stocks liquidity changes for constituents added to the KLCI 70.

Table 4.3 reports my results for the stock additions to the KLCI 70 index using the ordinary least square regression based on Equation (8):

$$\log\ Liq_{i,t} = B_0 + \delta_0 D\_KLCI_t + \beta_1 \log \mathrm{Vol}_{i,t} + \delta_1 \log Vol_{i,t} D\_KLCI_t + \beta_2 \log \Pr ice_{i,t} + ...$$
$$... + \beta_3 \log StdDev_{i,t} + \varepsilon_i$$

where *Log* $Liq_{i,t}$ represents the dependent variables: $LogSpread_{i,t}$*(quoted)*, $LogSpread_{i,t}$*(effective)*, $RtoV_{i,t}$, $RtoTR_{i,t}$, and $TRF_{i,t}$, with *i* and *t* standing for stock and time, respectively, where $i \in (1, 2, \ldots, 101)$ and $t \in (1, 2)$, with *t=1* representing the time-period between CD-45 and CD-15, and *t=2* representing the time-period between CD+15 and CD+45. $LogPrice_{i,t}$, $LogVol_{i,t}$ and $LogStdDev_{i,t}$ are independent variables that represent the natural logarithm of the closing price, trade volume and volatility of stock *i* on day *t*, respectively. "Const." is the regression interception, $D\_KLCI_{i,t}$ is a dummy variable that takes the value of "1" for the time-period after the index change and "0" otherwise, and $logVol.D\_KLCI_{i,t}$ represents the product of the $D\_KLCI_{i,t}$ dummy by $logVol_{i,t}$. T-statistics, adjusted for heteroscedasticity and first order auto-correlation, are in parentheses ( ). R^2 represents the adjusted R squares. The results are significant at 1%, 5% and 10%, if identified by the superscripts ***, ** and *, respectively.

Additions – KLCI 70	*Dependant Variables*				
Independent Variables	Log spread (quoted)	Log spread (effective)	RtoV	RtoTR	RtoTRF
Const.	-4.749 (-20.64)***	-6.184 (-21.91)***	31.22 (10.13)***	28.72 (22.11)***	22.89 (20.39)***
D_KLCI	0.335 (1.67)*	0.203 (0.59)	5.15 (2.11)**	-4.7 (-3.07) ***	-4.834 (-3.57)***
logVol	-0.07 (-3.15)***	0.0346 (0.89)	-4.05 (-12.33)***	-3.73 (-20.95)***	-3.03104 (-19.30)***
logVolD_ KLCI	-0.043 (-1.43)	-0.020 (0.69)	-0.66 (-1.77)*	0.739193 (3.18)***	0.784012 (3.81)***
log Price	0.115 (2.531)**	0.992 (12.36)***	-4.81 (-8.55)***	-2.593 (-7.52)***	-2.51577 (-8.46)***
logStdDev	0.021 (0.486)	-0.020 (-0.88)	-0.06 (0.83)	-0.00193 (-0.393)	0.016104 (3.87)***
R^2	0.08144	0.02191	0.05103	0.08238	0.07759

Table 4.3: OLS Results for Stocks Added to the KLCI 70

My results show that the coefficients for LogVol are negative and statistically significant for the LogSpread (quoted), RtoV, RtoTR, and RtoTRF variables. The coefficient estimate of the LogSpread (effective) is negative although not statistically significant. The LogPrice coefficients are negative for the RtoV, RtoTR, and RtoTRF, and positive for the LogSpread (quoted) and LogSpread (effective), and statistically significant for all cases.

More specifically, I find that an increase of 1% in trade volume leads to a decrease of 0.07% in the LogSpread (quoted), a decrease of 3.73% in the RtoTR and 3% in the RtoTRF for the pre-addition time period. Also, an increase of 1% in the stock price leads to a decrease of 4.81% in the RtoV, 2.5% in the RtoTR and 2.5% in the RtoTRF for the time period before the stock addition. RtoTRF is the only liquidity measure that shows significant increase in LogStdDev, at the 1% significant level, i.e., an increase of 1% in the return volatility is associated with expected increase by a proportion of 0.016% in RtoTRF.

However, I are more concerned with the change in the dummy variable, δ_0 and the change in the slope of interaction trade volume, $\delta_{1.}$ I provide evidence of a negative and significant dummy variable (δ_0) RtoTR and RtoTRF at the 1% level. On the other hand, I provide evidence of a positive and significant dummy variable (δ_0) RtoV at the 10% level. This signifies that RtoV indicates liquidity decrease after the post-additions period, while contrarily RtoTR and RtoTRF measure otherwise (improved liquidity).

The reason underlying the different signs between these two related measures is due to the denominator of both RtoTR and RtoTRF, which encapsulate the stocks' cross-sectional variability in turnover ratio and are not size biased.

Results for the dummy variable (δ_0) LogSpread (Quoted), are positive and significant at the 10% level, which suggests that market makers increased bid-ask spreads as a result of the news and that this reduction in liquidity causes trade volumes to decrease in the post index addition period.

Furthermore, I find a negative and statistically significant coefficient, δ_1, for dependant variables for RtoV, which shows that the sensitivity changes for trade volume decreases on average from -4.05% to -4.71% for 1% increase in trade volume for RtoV on post-additions. On the other hand, I find a positive and statistically significant, at the 1% level, coefficient (δ_1), for dependant variables for RtoTR and RtoTRF. For example, the sensitivity change for trade volume increases on average from -3.73% to -3% for 1% increase in mean trade volume for RtoTR in the post-additions index, after controlling for the impact of share prices and return volatility.

The results specifically show improvement in liquidity with sensitivity decrease for mid-cap stocks that were added to the index as captured by RtoTR and RtoTRF liquidity measures. These results strengthen and confirm my previous investigation (chapter three) on volume ratio VR, which supports the ICLH. The coefficient estimates associated with the LogVolD_KLCI, for both RtoTR and RtoTRF, indicate that noise traders are less sensitive to news following index additions and increase the trade volume on average. On the other hand, the significant positive coefficient for the dummy variable RtoV indicates that the Amihud (2002) ratio suggests the added stocks are illiquid in the post listing as opposed to RtoTR and RtoTRF, which find an opposite result.

This evidence supports Florackis et al.'s (2011) argument which states that the Amihud's (2002) price impact ratio has less encapsulation power in capturing liquidity due to the size bias - i.e., smaller cap stocks are bound to exhibit lower trade volume (in a monetary terms) than big cap stocks, forcing to the conclusion that they are illiquid which might not be true. This finding is key to support Florackis et al.'s (2011) argument in favour of the advantages of their price impact ratio. However, the results are not robust across all four measures of liquidity but interestingly show contradiction between two different liquidity measures. The contradictory results between dummy variable (δ_0) for RtoTR and RtoTRF with RtoV can be explained by the denominator features of both liquidity measures, where RtoTR and RtoTRF have the advantages of capturing the size effect of stock capitalisation and stocks' cross sectional variability in turnover ratio, which is evidenced in the case for KLCI 70.

4.4.1.3 Small Cap

I next analyse for stocks added to the Small Cap index. It is interesting to know the effects for small capitalisation stocks that experience promotion in terms of analysing various price impact ratios as evidenced in my previous findings.

Table 4.4: reports my results for the stock additions to the Small Cap index using the ordinary least square regression based on Equation (8):

$$\log\ Liq_{i,t} = B_0 + \delta_0 D\_KLCI_t + \beta_1 \log \mathrm{Vol}_{i,t} + \delta_1 \log Vol_{i,t} D\_\ KLCI_t + \beta_2 \log \Pr ice_{i,t} + ...$$
$$... + \beta_3 \log StdDev_{i,t} + \varepsilon_i$$

where *Log* $Liq_{i,t}$ represents the dependent variables: $LogSpread_{i,t}$*(quoted)*, $LogSpread_{i,t}$*(effective)*, $RtoV_{i,t}$, $RtoTR_{i,t}$, and $TRF_{i,t}$, with *i* and *t* standing for stock and time, respectively, where $i \in$ (1, 2, …,334) and $t \in$ (1, 2), with *t=1* representing the time-period between CD-45 and CD-15, and *t=2* representing the time-period between CD+15 and CD+45. $LogPrice_{i,t}$, $LogVol_{i,t}$ and $LogStdDev_{i,t}$ are independent variables that represent the natural logarithm of the closing price, trade volume and volatility of stock *i* on day *t*, respectively. "Const." is the regression interception, $D\_KLCI_{i,t}$ is a dummy variable that takes the value of "1" for the time-period after the index change and "0" otherwise, and $logVol.D\_KLCI_{i,t}$ represents the product of the $D\_KLCI_{i,t}$ dummy by $logVol_{i,t}$. T-statistics, adjusted for heteroscedasticity and first order auto-correlation, are in parentheses ( ). R^2 represents the adjusted R squares. The results are significant at 1%, 5% and 10%, if identified by the superscripts ***, ** and *, respectively.

Additions - Small Cap	*Dependant Variables*				
Independent Variables	LogSpread (quoted)	LogSpread (effective)	RtoV	RtoTR	RtoTRF (New Ratio)
Const.	-2.794 (-69.48)***	-4.1915 (-63.98)***	22.9 (8.83)***	20.11 (30.04)***	15.843 (26.595)***
D_KLCI	0.0619 (1.98)**	0.359 (4.187)***	7.865 (3.96)***	1.975 (2.422)**	2.46 (5.61)***
LogVol	-0.1253 (-27.401)***	-0.1257 (-10.85)***	-2.635 (-8.35)**	-3.15 (-28.298)***	-2.459 (24.93)***
LogVol_ KLCI	-0.00528 (-0.954)	-0.0499 (-3.26)***	-1.285 (-3.649)***	-0.281 (-1.97)**	-0.1845 (2.171)**
log Price	-0.3483 (-42.965)***	0.4455 (19.47)***	-4.1105 (-7.30)***	-2.634 (-13.03)***	-2.077 (-11.583)***
LogStdDev	0.2216 (25.15)***	-0.0052 (1.02)	0.6286 (2.189)**	0.0169 (6.31)***	0.154 (7.28)***
$\boldsymbol{R^2}$	0.0571	0.0439	0.1396	0.1269	0.1088

Table 4.4: OLS Results for Stocks Deleted from the Small Cap

The coefficient estimates of log LogVol, LogPrice and LogStdDev have mixed signs and are significant for all liquidity measures in the pre-additions period. I expect bid-ask spread to increase with return volatility and decrease with stock price, and trade volume and price impact ratios (e.g. RtoV, and RtoTR) to decrease with trade volume and increases with price and volatility. For instance, when trade volume increases by 1%, LogSpread (quoted) decreases by 0.1253%; an increase of 1% in LogPrice leads to increase in LogSpread (quoted) by 0.348%. As another example, when volume increases by 1%, RtoV and RtoTR decrease by 2.635 % and 3.15% respectively.

As I are more interested in the change in the dummy variable δ_0, and the slope of interaction trade volume, $\delta_{1,}$I show empirical evidence of a positive and significant dummy variable (δ_0) for both LogSpread (quoted) and LogSpread (effective) at 5% and 1% level, respectively. RtoV, RtoTR and RtoTRF are positive and significant at 1% and 5% and 1% respectively. This shows that there is a decrease in liquidity on average by 7.86%, 1.975% and 2.46% for RtoV, RtoTR and RtoTRF respectively in the post-additions index after controlling for the impact of trade volume, share prices and return volatility.

Overall, the results show that there is a reduction in the liquidity for small capitalisation stocks that are added to the index, captured by all liquidity measures. This could be interpreted as meaning that stocks sustained lower liquidity after being added to the Small Cap, which supports the PPH as in my previous analysis on the blue chip index. Furthermore, I find a strong positive significant variable coefficient, δ_1, for dependant variables, for LogSpread (effective), RtoV, RtoTR and RtoTRF. For instance, a one percent increase in mean trade volume (logVolume) is associated with a decrease at the margin of 0.126% in the average LogSpread (effective), in the pre-additions period. The sensitivity of the average LogSpread (effective), drops marginally from -0.126% to -1.309% (-0.1257 to -0.0499) for a 1% increase in mean trade volume in the post-addition period.

Similarly, the sensitivity of average RtoV decreases from -2.635% to -3.915% for δ_1, for a 1% increase in mean trade volume. As another example, a 1% increase in the mean trade volume (LogVolume) is associated with a decrease of 2.459% in the average RtoTRF in the pre-additions period. The sensitivity of average RtoTRF drops marginally from -2.459% to -2.643%, for a 1% increase in mean trade volume in the post-addition period.

My multivariate analysis also suggests that there is a general decrease in the market liquidity. Yet, this decrease in the sensitivity of the effective spread to aggregate trade volume suggests that the market makers' reduce bid-ask spreads due to proportion of noise-trade increases after the index additions of stocks. Similarly, the marginal changes of sensitivity of the price impact ratios (RtoV RtoTR and RtoTRF) to aggregate trade volume suggest that the proportion of noise-trade increases after the index additions of stocks.

4.4.2 Deletions

In this sub-section, I analyse the effect of stock deletions from the KLCI 30 and KLCI 70 indices on liquidity.

4.4.2.1 KLCI 30

Table 4.6 reports my findings for the log-linear pooled cross-sectional multivariate regression analysis for the stock deletions from the main big cap index, the KLCI 30.

Table 4.5: reports my results for the stock deletions from the KLCI 30 index using the ordinary least square regression based on Equation (8):

$$\log\ Liq_{i,t} = B_0 + \delta_0 D\_KLCI_t + \beta_1 \log \mathrm{Vol}_{i,t} + \delta_1 \log Vol_{i,t} D\_KLCI_t + \beta_2 \log \mathrm{Pr}\,ice_{i,t} + ...$$
$$... + \beta_3 \log StdDev_{i,t} + \varepsilon_i$$

where *Log* $Liq_{i,t}$ represents the dependent variables: $LogSpread_{i,t}$*(quoted)*, $LogSpread_{i,t}$*(effective)*, $RtoV_{i,t}$, $RtoTR_{i,t}$, and $TRF_{i,t}$, with *i* and *t* standing for stock and time, respectively, where $i \in (1, 2, \ldots, 15)$ and $t \in (1, 2)$, with *t=1* representing the time-period between CD-45 and CD-15, and *t=2* representing the time-period between CD+15 and CD+45. $LogPrice_{i,t}$, $LogVol_{i,t}$ and $LogStdDev_{i,t}$ are independent variables that represent the natural logarithm of the closing price, trade volume and volatility of stock *i* on day *t*, respectively. "Const." is the regression interception, $D\_KLCI_{i,t}$ is a dummy variable that takes the value of "1" for the time-period after the index change and "0" otherwise, and $logVol.D\_KLCI_{i,t}$ represents the product of the $D\_KLCI_{i,t}$ dummy by $logVol_{i,t}$. T-statistics, adjusted for heteroscedasticity and first order auto-correlation, are in parentheses ( ). R^2 represents the adjusted R squares. The results are significant at 1%, 5% and 10%, if identified by the superscripts ***, ** and *, respectively.

Deletions KLCI 30	***Dependant Variables***				
Independent Variables	log spread (Quoted)	log spread (Effective)	RtoV	RtoTR	RtoTRF
Const.	-4.259 (-23.89)	-3.922 (-7.63)***	3.8306 (12.14)***	12.61 (9.25)***	5.493 (9.195)***
D_KLCI	0.242 (1.703)*	0.274 (0.661)	-2.161 (-1.076)	2.333 (1.89)*	0.1143 (0.1953)
LogVol	-0.051332 (-3.11)***	-0.051737 (-1.11)	-3.751 (-12.32)***	-1.422 (-8.55)***	-0.5601 (-8.011)***
LogVolD_KLCI	-0.033 (-1.67)*	-0.051 (-0.893)	0.233 (0.832)	-0.322 (-1.89)**	-0.0238 (-0.294)
Log Price	-0.207 (-7.68)***	0.631 (6.38)***	-0.4437 (-10.74)***	-0.696 (-3.0523)***	-0.7177 (-6.47)***
LogStdDev	0.0450 (1.629)	0.134 (2.5)**	0.0159 (0.5823)	0.0206 (2.27)**	0.0538 (9.918)***
R^2	0.0733	0.0831	0.1435	0.1238	0.1038

Table 4.5: OLS Results for Stocks Deleted from the KLCI 30

The coefficient estimates of log LogVol, LogPrice and LogStdDev have mixed signs and are statistically significant for most liquidity measures. I expect price impact ratios to decrease with trade volume and increase with price and return volatility. On the other hand, bid-ask spread increases with return volatility and decreases with stock price and trade volume. For instance, when trade volume increase by 1%, average RtoV and RtoTR as expected decrease by 3.75% and 1.422%, respectively in the pre-deletions period. Also, when trade price increases by 1%, LogSpread (Quoted) decreases by 0.207%, and when LogStdDev increases by 1%, RtoTRF increases by 0.00538%.

I provide evidence of a positive and statistically significant, at 10% level, dummy variable, δ_0, for LogSpread (Quoted), and RtoTR. The statistically significance of the δ_0 shows that as a result of stocks deletion from the index, the LogSpread (Quoted) increases on average by 0.242% in the post-deletions period, after controlling for the impact of trade volume, share prices and return volatility. This means that market makers widen the bid-ask spread as a result of the news reducing the liquidity which lead trade volumes to decrease in the post index revision period.

The statistical significance of δ_0 shows that as a result of index deletions, the RtoTR, increased by 2.3% in the post-deletions period showing that stocks deleted from the blue chip index decreased in liquidity. Indeed, market makers may take the opportunity to increase bid-ask spreads as a result of the news and this reduction in liquidity causes trade volumes to decrease in the post index revision period.

I also find a negative and statistically significant coefficient $\delta_{1,}$ for dependant variables LogSpread (Quoted), and RtoTR. For instance, a 1% increase in average trade volume (LogVol) is associated with a decrease 0.0746% in the average in the LogSpread (Quoted), for the pre-deletion period. However, this decrease is only 0.0843% (-0.0513%-0.033%) in the post-deletion period.

These results show that bid-ask spreads are less sensitive to order flow after stocks are deleted from the KLCI 30. Similarly, the sensitivity of average RtoTR decreased from -1.422% to -1.744% for a 1% increase in mean trade volume. The decreased sensitivity of RtoTR to aggregate trade volume suggests that the proportion of noise-trading decreases after the index deletions of stocks. The effective bid-ask spread measure is insignificant for both δ_0 and δ_1. This suggests that liquidity for trades occurring within the bid and ask quotes remains unchanged as a result of firms being excluded from the index.

4.4.2.2 KLCI 70

I next analyse for stocks deleted from the KLCI 70. Table 4.6 below provides my results for the log-linear pooled cross-sectional multivariate regression analysis.

Table 4.6 reports my results from the regression Equation (8) for the stock deletions from the KLCI 70 index as follow:

$$\log\ Liq_{i,t} = B_0 + \delta_0 D\_KLCI_t + \beta_1 \log \mathrm{Vol}_{i,t} + \delta_1 \log Vol_{i,t} D\_KLCI_t + \beta_2 \log \Pr ice_{i,t} + \ldots$$
$$\ldots + \beta_3 \log StdDev_{i,t} + \varepsilon_i$$

for stock i=(1,2…81) with t=(1,2), where t=1 represents the period between CD-45 and CD-15 (before the index change) and t=2 the period between CD+15 and CD+45 (after the index change). *Log* $Liq_{i,t}$ is the dependent variable, represented by either the "quoted spread" ($LogSpread_{i,t}$), the "effective spread" ($LogSpread_{i,t}$), "Return to volume" (*RtoV*) and the "return to the turnover ratio" (*RtoTR*) ratios as proxies for the MYR depth. Independent variables $LogPrice_{i,t}$, $LogVol_{i,t}$ and $LogStdDev_{i,t}$ which represent the natural logarithm of the stock *i*'s daily closing price, daily trade volume in shares and daily return volatility respectively. D_KLCI_t is a dummy variable that takes the value of "1" for the period after the index change and "0" otherwise. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Deletions KLCI 70	*Dependant Variables*				
Independent Variables	log spread (Quoted)	log spread (Effective)	RtoV	RtoTR	RtoTRF
Const.	-2.943 (-56.12)***	-4.25 (-15.71)***	10.39 (13.484)***	35.71 (25.52)***	26.84 (22.57)***
D_KLCI	-0.0646 (1.59)	0.193 (0.89)	-9.86 (-1.87)*	-9.245 (-6.11)***	-9.66 (-7.63)***
Log Vol	-0.104 (-19.26)***	0.323 (1.127)	-0.106 (12.41)***	-5.122 (-24.40)***	-3.786 (-21.39)***
LogVolD_KLCI	0.0125 (1.749)*	-0.035 (-0.933)	-1.46 (-1.57)*	1.489 (5.67)***	1.567 (7.123)***
LogPrice	-0.283 (30.13)***	0.515 (8.24)***	-0.0156 (-12.11)***	-3.239 (-9.44)***	-3.515 (-12.21)***
LogStdDev	0.215 (22.81)***	0.246 (5.27)***	1.95 (2.57)***	0.0028 (0.60)	0.0126 (2.072)**
R^2	0.0956	0.0941	0.09563	0.0917	0.0798

Table 4.6: OLS Results for Stocks Deleted from the KLCI 70

The coefficient estimates of log LogVol, LogPrice and LogStdDev are significant for dependents' LogSpread (Quoted), RtoV, RtoTR and RtoTRF. For instance, when volume and price increases by 1%, the coefficients estimates for the RtoV, RtoTR and RtoTRF decrease by 0.106%, 5.122% and 3.79%, respectively, in the pre-deletions period. Surprisingly, the LogSpread (Quoted) decreases by 0.104%. When volatility increases by

1%, the LogSpread (Quoted) increases by 0.215%. Also, when trade price increases by 1%, the RtoV decreased by 0.0156% and volatility increases by 1.95%.

More importantly, I provide evidence of a negative and statistically significant coefficient $\delta_{0,}$ for the RtoTR, RtoV and RtoTRF. The statistically significance of δ_0 shows that as a result of stocks deletions from the index, their RtoV, RtoTR and RtoTRF decrease on average by 9.8%, 9.2% and 9.6%. This means that the deleted stocks still experienced higher liquidity in the post deletion period.

I find statistically significant results for the coefficient $\delta_{1,}$ for the LogSpread (Quotes). The statistically significance of δ_1 shows that the LogSpread (Quotes) decreases from -0.104% to -0.0915 when there is a 1% increase in trade volume. I find that the coefficient δ_1 for RtoV, RtoTR RtoTRF are all positive and statistically significant at 1% level. For instance, the RtoTR increases in average from -5.12% to -3.63% for a 1% increase in the average trade volume.

However, the coefficient δ_1 for RtoV decreases from -1.06 to -2.52% for a 1% increase in the trade volume, for the post index deletion period.

4.4.3 Investability Weight Change

I extend my analysis by including free-float components to further analyse the type of shareholders that may contribute to liquidity improvement. I are only interested in examining stocks which experienced liquidity improvement as a result of index revisions.[67]

This allows us to examine the liquidity changes following additions to (deletion from) the KLCI 70 controlling for four types of free float shareholding percentages (NOSHGV, NOSHEM, NOSHST and NOSHFF) as well as for the daily volatility of the stock return, the average daily trading volume and the average daily closing stock price.

I re-analyse using Equation (9) by adding free float variables into the model. I test the liquidity changes by adapting the Hedge and McDermott (2003) methodology, described in the previous section.

[67] Refer Appendix C, Tables C11 to C16 for investability weight changes results of the KLCI 30 and Small Cap index.

4.4.3.1 KLCI 70 -Additions

Table 4.7 reports for the stock added to the KLCI 70 index, the paired two sample means for the free float percentage of the "Government Held Shareholding" (NOSHGV), "Employee Held Shareholdings" (NOSHEM), sum of the "Government Held Shareholding" and the "Employee Held Shareholdings" (NOSHGV+ NOSHEM), and "Total Strategic Holding" (NOSHST), as well as the respective t-statistic, for several event windows. The first column specifies the event windows, the second, fourth, sixth, eighth and tenth columns report the results for the NOSHGV, NOSHEM, NOSHGV+NOSHEM, NOSHT, and NOSHFF respectively, and the third, fifth, seventh, ninth and eleventh columns provide the respective t-statistic. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Additions - FTSE Bursa Malaysia KLCI70										
Event-window	NOSHGV %	*t*-stat	NOSHEM (%)	*t*-stat	NOSHGV +NOSHEM (%)	t-stat	NOSHST (%)	t-stat	NOSHFF (%)	t-stat
AD-120,AD-1 to	0.274	-1.35	2.006	-0.733	2.281	-1.275	22.39	-2.7***	77.60	2.709***
CD,CD+120	0.783		2.066		2.850		27.08		72.91	
AD-30,AD-1 to	0.351	-1.33	2.065	-0.912	2.416	-1.481	23.33	-1.9*	76.66	1.929*
CD,CD+30	0.805		2.100		2.905		26.44		73.55	
AD-15,AD-1 to	0.476	-1.36	2.084	-0.753	2.561	-1.476	23.77	-2.03**	76.22	2.028**
CD,CD+15	0.818		2.093		2.911		26.20		73.790	
AD-7,AD-1 to	0.732	-1.15	2.127	NA	2.860	-1.152	24.83	0.048	75.166	-0.0489
CD,CD+7	0.793		2.103		2.896		25.39		74.604	

Table 4.7: Paired Two Sample Means Results for Stocks Added to the KLCI 70

My results show that the changes in the government holding percentage (NOSHGV) and employee holding percentage (NOSHEM) are not statistically significant for all the event windows; the change in the sum of the government and the family or employee holdings percentage (NOSHGV+NOSHEM) is also not statistically significant.

Conversely, the change in the percentage of the free float held by strategic holders (NOSHST) and the change in percentage of the public free float (NOSHFF) are statistically significant at the 1% level for the event-windows AD-120,AD-1 to CD,CD+120, and statistically significant at the 10% level for the event windows AD-30,AD-1 to CD,CD+30 while in the event windows AD-15,AD-1 to CD,CD+15 they are statistically significant at the 5% level. None of the above free float percentage changes are statistically significant for the event-window AD-7, AD-1 to CD, CD+7.

Generally, I could describe that on average, strategic and also public holders are the two main classes of stockholders that change their average percentage holding before and after an event.

However, the univariate analysis is insufficient to conclude that those two groups move their stocks portfolio, and hence affect stock liquidity. Therefore, I investigate, using parametric regression analysis, to determine the relationship between various liquidity measures and several shareholdings' categories.

Table 4.8 reports my results for the stock additions to the KLCI 70 based on the equation (9) below:

$$\log Liq_{i,t} = B_0 + B_1 \log Vol_{i,t} + D_1 \log Vol_{i,t} D\_KLCI + B_2 \log Price_{i,t} + B_3 \log StdDev_{i,t} + B_4 NOSHGV_{i,t} D\_KLCI + ...$$
$$... + B_5 NOSHEM_{i,t} D\_KLCI + B_6 NOSHST_{i,t} D\_KLCI + B_7 NOSHFF_{i,t} D\_KLCI + \varepsilon_i$$

In the first column are the independent variables, where, "const." is the regression interception, D_KLCI_t is a dummy variable that takes the value of "1" for the period after the index change and "0" otherwise; $\log Vol_{i,t}$, $\log Price_{i,t}$, and $\log StdDev_{i,t}$ are, respectively, the natural logarithm of the stock i's average daily closing price, average daily trade volume in shares and daily return volatility, for the time period t; $LogVolD\_KLCI$ is the natural logarithm of the product of the stock added traded volume by the dummy variable D_KLCI_t; NOSHGVD_ KLCI, NOSHEMD_ KLCI, NOSHSTD_ KLCI and NOSHFFD_ KLCI are, the product of, respectively, the percentage of the "government held share", "employee held share", "strategic held share" and "publicly available shares" by the dummy variable D_KLCI_t. In the second row, from the second to the fifth columns, are the regression dependent variables, where $LogSpread$ (quoted) is the natural logarithm of the stock bid-ask spread quoted, $LogSpread$ (effective) is the natural logarithm of the stock bid-ask spread effective transacted, $RtoV$, $RtoTR$ and RtoTRF are the return to trade and return to volume ratios defined for the equations (3), (5), and (7) respectively. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Additions KLCI 70	***Dependant Variables***				
Independent Variables	Log spread (quoted)	Log spread (effective)	RtoV	RtoTR	RtoTRF
Const.	-4.605 (-23.84)***	-6.352 (-22.9)***	31.83 (9.98)***	30.0 (22.187)***	23.2 20.62***
LogVol	-0.0073 (-0.356)	0.086 (2.259**)	-4.32 (-12.615)***	-3.958 (-21.032)***	-3.064 (-19.4)***
LogVolD_ KLCI	-0.0224 (-0.874)	-0.0046 (-0.090)	-0.528 (-1.33)	0.895 (3.70297)***	0.772 3.755***
LogPrice	0.106 (2.784)***	0.944 (12.054)***	-4.99 (-8.55)***	-2.66 (-7.436)***	-2.587 (-8.63)***
LogStdDev	0.1132 (3.133)***	-0.0076 (-0.323)	-0.14 (-0.494)	-0.0034 (-0.689)	0.0143 3.443***
NOSHGVD_ KLCI	0.0131 (1.328)	0.0105 (0.533)	0.0915 (0.613)	0.0854 (0.946)	0.0714 0.922
NOSHEMD_ KLCI	0.0075 (1.242)	0.0012 (0.103)	-0.139 (-1.519)	-0.093 (-1.67)	-0.0794 (-1.67)
NOSHSTD_ KLCI	0.0012 (0.676)	0.0038 (1.010)	0.0122 (0.425)	-0.062 (-3.5)***	-0.0693 (-4.5)***
NOSHFFD_ KLCI	0.0027 (1.587)	0.0007 (0.218)	0.0591 (2.306)**	-0.050 (-3.13)***	-0.0371 (-2.69)***
R^2	0.048	0.0820	0.0872	0.074	0.0917

Table 4.8: Investability Weight Change OLS Results for Stocks Added to the KLCI 70

Table 4.8 provides my results for the log-linear pooled cross-sectional multivariate regression analysis, for stock additions. Under the log-linear specification of Equation (9), the regression coefficients provide estimates for the elasticities. In this analyse, I are mainly interested on the change of slope in the government held shares (NOSHGV) B_4, employee held shares (NOSHEM) B_5 , strategic holding (NOSHST) slope changes, B_6 and the change in the slope of free float holding (NOSHFF), B_7 .

I find the coefficient B_5 is negative and statistically significant at the 5% level for the *RtoTR* and *RtoTRF*, but not statistically significant for the other liquidity measures. Similarly, the strategic holding slope change coefficient, B_6 is negative and statistically significant for *RtoTR* and *RtoTRF* liquidity measures at the 1% level. The coefficients B_7 is positive and statistically significant for the *RtoTR* and *RtoTRF*.

This results suggest that strategic holders and the public provide liquidity, when I employ RtoTR and RtoTRF as liquidity measures.

4.4.3.2 KLCI 70-Deletions

Table 4.9 reports for the stock deleted from the KLCI 70, the paired two sample means for free float percentage of the "Government Held Shareholding" (NOSHGV), "Employee Held Shareholdings" (NOSHEM), sum of the NOSHGV and the NOSHEM and "Total Strategic Holding" (NOSHST), as well as the respective t-statistic, for several event windows. The first column specifies the event window, the second, fourth, sixth, eighth and tenth columns report the coefficients for the NOSHGV, NOSHEM, NOSHGV+NOSHEM, NOSHT and NOSHFF variables, respectively, and the third, fifth, seventh, ninth and eleventh columns provide the t-statistic for each variable and event window. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Deletions – KLCI 70										
Event-window	NOSH GV %	*t*-stat	NOSHEM (%)	*t*-stat	NOSHGV +NOSHEM (%)	t-stat	NOSH ST %	t-stat	NOSH FF%	t-stat
AD-120,AD-1 to	2.246	-2.67***	0.916	-1.49	3.162	-3.13***	28.59	-2.28**	71.40	2.28**
CD,CD+120	2.725		1.065		3.791		31.89		68.10	
AD-30,AD-1 to	2.520	-1.56*	0.987	-1	3.508	-1.87*	29.69	-0.75	70.235	0.756
CD,CD+30	2.667		1.055		3.722		30.34		69.654	
AD-15,AD-1 to	2.6	-1.61*	0.9875	-1	3.5875	-1.87*	29.765	-1.08	70.235	1.086
CD,CD+15	2.683		1.036		3.720		30.144		69.855	
AD-7,AD-1 to	2.628	-1.420	0.9875	-1	3.616	1.736*	29.775	0.3955	70.225	-0.395
CD,CD+7	2.645		0.998		3.643		29.714		70.285	

Table 4.9: Paired Two Sample Means Results for Stocks Deleted from the KLCI 70

My results show that the change in the government holding percentage (NOSHGV) is statistically significant at the 1% level for event window AD-120, AD-1 to CD, CD+120. The results for event windows AD-30, AD-1 to CD, CD+30; and AD-15, AD-1 to CD, CD+15, are statistically different at the 10% level.

The change in the family or employee holdings (NOSHEM), however, is not statistically significant. Nevertheless, the sum of the government and the family or employee holdings (NOSHGV+NOSHEM) is statistically significant for all the event-windows; the changes in the total strategic holdings (NOSHST) and public holding is statistically significant at the 1% level for event windows AD-120, AD-1 to CD,CD+120.

Table 4.10 reports my results for the stock deleted from the KLCI 70 based on the equation (9):

$$\log Liq_{i,t} = B_0 + B_1 \log Vol_{i,t} + D_1 \log Vol_{i,t} D\_KLCI + B_2 \log Price_{i,t} + B_3 \log StdDev_{i,t} + B_4 NOSHGV_{i,t} D\_KLCI + ...$$
$$... + B_5 NOSHEM_{i,t} D\_KLCI + B_6 NOSHST_{i,t} D\_KLCI + B_7 NOSHFF_{i,t} D\_KLCI + \varepsilon_i$$

In the first column are the independent variables, where, "const." is the regression interception, D_KLCI_t is a dummy variable that takes the value of "1" for the period after the index change and "0" otherwise; $\log Vol_{i,t}$, $\log Price_{i,t}$, and $\log StdDev_{i,t}$ are, respectively, the natural logarithm of the stock i's average daily closing price, average daily trade volume in shares and daily return volatility, for the time period t; $LogVolD\_KLCI$ is the natural logarithm of the product of the stock added traded volume by the dummy variable D_KLCI_t; NOSHGVD_ KLCI, NOSHEMD_ KLCI, NOSHSTD_ KLCI and NOSHFFD_ KLCI are, the product of, respectively, the percentage of the "government held share", "employee held share", "strategic held share" and "publicly available shares" by the dummy variable D_KLCI_t. In the second row, from the second to the fifth columns, are the regression dependent variables, where $LogSpread$ (quoted) is the natural logarithm of the stock bid-ask spread quoted, $LogSpread$ (effective) is the natural logarithm of the stock bid-ask spread effective transacted, *RtoV* , *RtoTR* and RtoTRF are the return to trade and return to volume ratios defined for the equations (3), (5), and (7) respectively. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Deletions KLCI 70	***Dependant Variables***				
Independent Variables	log spread (quoted)	log spread (effective)	RtoV	RtoTR	RtoTRF
Const.	-3.014	-4.286	102.085	36.097	27.034
	(-56.864)***	(-15.405)***	(12.85)**	(25.07)***	22.53***
logVol	-0.100	0.040	-10.94	-5.165	-3.810
	(-18.254)***	(1.368)	(-12.52)***	(-24.1)***	(-21.4)***
logVolD_ KLCI	0.000	-0.041	1.368	1.632	1.490
	(0.049)	(-1.038)	(1.423)	(5.96)***	(6.54)***
log Price	-0.261	0.524	-15.82	-3.314	-3.485
	(-26.59)***	(7.943)***	(-11.69)***	(-9.19)***	(-11.56)***
logStdDev	0.211	0.253	1.644	0.002	0.009
	(22.285)***	(5.333)***	(2.12)**	(0.520)	(1.479)
NOSHGVD_ KLCI	0.003	0.005	-0.127	0.079	-0.002
	(1.902)*	(0.631)	(-0.634)	(1.430)	(-0.044)
NOSHEMD_ KLCI	0.004	0.022	-0.589	-0.114	-0.136
	(1.855)*	(1.747)*	(-1.90)*	(-1.352)	(-1.918)*
NOSHSTD_ KLCI	-0.002	0.002	-0.0718	-0.101	-0.105
	(-4.974)***	(0.607)	(-1.877)*	(-5.88)***	(-7.36)***
NOSHFFD_ KLCI	0.001	0.002	-0.0718	-0.102	-0.084
	(1.878)*	(0.862)	(-1.217)	(-5.96)***	(-5.895)***
R^2	0.216	0.2948	0.1575	0.1906	0.1836

Table 4.10: Investability Weight Change OLS Results for Stocks Deleted from the KLCI 70

I find positive statistically significant coefficients B_4, for the government shareholding (NOSHGV) for the variable LogSpread (quoted) at the 10% level after the post-deletion period. On the other hand, I find significant coefficients B_5 for employee shareholding (NOSHEM) across all liquidity measures apart from RtoTR at the 10% significance level.

I also find a negative and significant coefficient for the NOSHST B_6, for liquidity measure LogSpread (quoted), RtoV, RtoTR and RtoTRF. The coefficient for public available shares B_7 is also significant for LogSpread (quoted) RtoTR and RtoTRF.

The results suggest that when I use the quoted bid-ask spread, strategic holders appear to provide liquidity to the market. When I use RtoV and RtoTRF as liquidity measures, strategic holder and the general public appear to provide the liquidity. Overall, I conclude that liquidity is generally provided by the public and strategic shareholders.

4.5 Conclusions

This chapter focused on the changes in stock liquidity of the Malaysian market due to stock index revisions. I find new empirical evidence of liquidity improvements for stocks added to and deleted from the Mid Cap index, KLCI 70.

I use different liquidity measures to capture multi-dimensional liquidity aspects. First my finding support Florackis et al.'s (2011) argument on the advantages of their price impact ratio over Amihud's (2002) liquidity ratio in terms of market capitalisation bias. Furthermore, I developed a new (modified) liquidity measure, RtoTRF, which prove to have better "encapsulation power" (at least for the Malaysian stock market) if compare to the Amihud's (2002) liquidity measure, RtoV. Specifically when I compared the coefficient sign between RtoV and RtoTRF, as those two measures by construction are identical, apart from the free-float factor that is introduced in the latter. This could be explained by the denominator's improvement which interact turnover ratio and free-float factor.

As empirical studies on the association between index changes and market microstructures behaviour for the Asian markets are still limited this chapter provides a relevant contribution to the literature. First, I use a very extensive sample collected from the Malaysian stock market which includes revisions in three different indices. Second, I improved the current methodology used to study stock liquidity by improving the liquidity measure of Florackis et al (2011). Third, my results are very interesting in the since that I found new empirical evidence of stock liquidity improvements after deletions from and additions to stock index based on various liquidity measures. Fourth, I developed a new liquidity measure, the *RtoTRF*, which proved to have better "encapsulation power" when applied to Malaysian stock market. Fifth, I study the effect of changes in the percentages of the government's and the employees' shareholdings on the stock liquidity changes before and after stocks being added to or deleted from a stock index, for before and after the stock revision event.

The liquidity effects in the index revisions of the FTSE Bursa Malaysia series could result in changes in firms' investment opportunity. The cost of firms' borrowing may alter due to the changes in stock liquidity resulting from index revisions. Chapter five focuses on the investment opportunity of firms after I found evidence on liquidity improvement on stocks added to the KLCI 70.

Chapter 5: Does Liquidity Increase Investment Opportunity? Evidence from the Bursa Malaysia KLCI 70

5.1 Introduction

In the previous empirical chapter, I discovered liquidity improvement for stocks revisions in the mid-cap index. Amihud and Mendelson (1986) state that if liquidity is valued, an increase in liquidity will results in lower expected returns, and cost of capital and is positively related to firm value. In this chapter, I investigate the relationship between improved liquidity and investment opportunity in the light of firms added to the FTSE Bursa Malaysia KLCI 70.

High stock liquidity plays an important role in attracting investors by giving easy accessibility to buy and sell stocks in the market. In Malaysia, where the economy depends significantly on the stock market performance in order to attract foreign investment and to sustain economic growth, the lack of market liquidity can have huge adverse effects on economic performance, as evidenced by the 1998 Asian financial crisis. Therefore, the Malaysian government, via the Economic Planning Programme (EPP), has undertaken a transformation in order to ensure the liquidity of the Malaysian stock market and, therefore, attract investors worldwide.

"Initiatives under this EPP aim to increase Bursa Malaysia's market capitalisation to RM3.9 trillion by 2020 from 1 trillion in 2010, accounting for a compound growth rate (CAGR) of 15%. It also targets to improve liquidity, measured by trade velocity, from 31% of total market capitalisation to 60% in line with regional average" (*EPP1: Revitalising Malaysia's Equity Markets, Economic Transformation Programme Repot 2013).*

To transform the Malaysian economy in order to achieve the vision 2020, the economic transformation programme includes measures aimed at revitalising the Malaysian equity market by enhancing the market liquidity. Bursa Malaysia, therefore, has become an economic transformation agent of the capital markets, and the FTSE Bursa Malaysia indices are an important gauge of achievement of the government's objectives.

In this chapter, I explore the liquidity premium hypothesis (LPH) from a different point of view. Myers (1977) claims that the firm value is comprised of both the value of assets in place and the value of investment growth opportunities. If the required equity return is lowered, the cost of capital decreases as a result of the increase in stocks' liquidity. Therefore, I might expect, at the margin, a growth in the investment opportunity set (Becker-Blease and Paul, 2006). [68] I study whether investment opportunities increase with the stock liquidity, considering three interrelated price impact ratios (Amihud's (2002) price impact ratio, Florackis et al.'s (2011) price impact ratio and my new price impact ratio), and examine the implications of the liquidity premium hypotheses (LPH) for the investment opportunities. I also perform some sensitivity analysis regarding the employed liquidity measures.

My data sample comprises information on firms which were added to the FTSE Bursa Malaysia KLCI 70 (KLCI 70) between June 2006 and December 2012. This sample is appropriate for testing the association between stock liquidity and investment opportunities for two main reasons: (i) according to the results provided in chapter four, firms added to the stock index experience a significant permanent increase in their stock

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[68] The universe of choices as to investments available to an individual or corporation (Financial Glossary. 2011. Campbell R. Harvey).

liquidity; after the addition; And (ii) increase in stock liquidity is exogenous to the firms given that they do not fully control the timing and the process of addition to the KLCI 70. Note that the FTSE Bursa Malaysia selects the index constituents based on public information, which includes information on the market capitalization, industry grouping, and liquidity, free-float and price reliability.[69] Hence, this analysis is free of bias from unobservable firm characteristics that determine an endogenous decision of the firm managers to enhance stock liquidity.

My findings are consistent with those of Becker-Blease and Paul (2006). I show that the stock liquidity improvements associated with additions to the KLCI 70 affects the firm's investment decisions. Consistent with the LPH, I show that investors demand lower returns on more liquid stocks and, which reduces the cost of capital and enhances growth opportunities. More specifically, I test the hypotheses that an increase in the stock liquidity increases the investment opportunities. I use the Tobin's Q, and capital expenditures, as the main proxies for growth opportunities and find a statistical significant increase in those depended variables after to the stocks being added to the index.

Consistent with my hypotheses (increase in the stock liquidity increases the investment opportunities), these changes in investment opportunity sets are positively related to changes in stock liquidity, after controlling for changes in financing variables, market to book, and firm size. I also find a similar relationship between stock liquidity and growth opportunities when I use two alternative measures for growth expectations: the return on assets (ROA) and the price to earnings ratio (PE).

[69] http://www.ftse.com/products/downloads/FTSE_Bursa_Malaysia_Index_Series.pdf

I show that my new liquidity ratio performs better, or at least on a par, in terms of measuring price impact, when compared with Amihud's (2002) liquidity ratio and/or Florackis et al.'s (2011) liquidity ratio. This claim is true when I employ Tobin's Q and ROA as proxies for the investment growth. My results suggest that different price impact ratios capture stock liquidity differently in relation to the investment growth proxies.[70] This suggests that price impact ratios which measure liquidity do consider more than just return per dollar volume or return to turnover ratio.

This chapter contributes to the large body of literature on stock liquidity and investment opportunity in several ways. Firstly, in the Malaysian equity market, to my knowledge, there is no empirical study that specifically investigates the relationship between stock liquidity and the investment opportunities as a consequence of index revisions.

Secondly, I use three price impact ratios as liquidity measures in association with the investment opportunity growth variable (i.e., Tobin's Q, capital expenditures, PE ratio and ROA). I measure first the stock liquidity using Amihud's (2002) RtoV and Florackis et al.'s (2011) RtoTR ratios. I also study whether allowing for the presence of the free float component into the Florackis et al.'s (2011) RtoTR provides better insights from the new price impact ratio RtoTRF. Indeed, I investigate the price impact ratio in terms of "capturing power" as those three different ratios are similar in term of measuring price changes to volume impact. The only difference in those ratios are the variables used in the denominator, where Amihud (2002) uses volume in dollar term, Florackis et al. (2011) uses turnover ratio, and my ratio uses free-float adjusted turnover ratio.

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[70] Even though the three price impact ratio are similar in construction, each measures liquidity

Thirdly, I provide further insights on how the transaction cost in a firm's trading environment can constrain its investment opportunities. My evidence strengthens the suggestions of Amihud and Mendelson (1988) that firm managers should be responsive to and seek to increase stock liquidity while pursuing the shareholder wealth maximization aim.

The remainder of this chapter is organized as follows. Section 5.2 describes liquidity premium theory and related previous literature and empirical findings on liquidity and investment opportunities. Section 5.3 introduces my data sample and methodology. Section 5.4 presents my results and analysis the main findings. Section 5.5 concludes.

5.2 Literature Review

In this section I start by presenting a theoretical discussion on liquidity premium and then show some evidence from the stock liquidity literature, specifically that related to the Malaysia stock market. Furthermore, I review several related empirical works on stock liquidity and investment opportunity.

5.2.1 Liquidity Premium Theory

The liquidity premium theory states that assets which are relatively less marketable (i.e., less liquid) are expected to have a higher liquidity premium. For instance, the holders of long-term bonds (less liquid) expect a liquidity premium (an additional yield for accepting lower liquidity). Finance theory suggests that liquidity is a cost factor in the expected asset returns. This is because investors require a compensation for the future expected trading difficulties.

For such contexts, Amihud and Mendelson (1986, 1988) argue that increases in stock liquidity are positively related to firm value, since the assets in place are discounted at a lower cost of capital if liquidity improves. It is, however, hard to test this theory because it is not easy to observe the expected returns. Numerous works have tried to study this issue using the average of realized returns as alternative proxy for the expected returns, and some of the results which were reported are consistent with theoretical predictions (Becker-Blease & Paul, 2006).

Myers (1977) argues that firm value is comprised of both the assets value and the investment growth opportunities value. Accordingly, if the required stock return and cost of capital decrease as a consequence of changes in the stock liquidity, one should expect that, at least, a growth in the investment opportunity set.

5.2.2 Stock Liquidity Review in Malaysia

There are very limited stock liquidity studies undertaken on the Malaysian market especially on stock liquidity and investment opportunity in Malaysia context.

Closely related research includes, Ramlee and Ali's (2012) study of the association between liquidity and return on the concentrated ownership in the corporations due to government ownership. Their results, based on a sample time period between 1998 to 2008 show that liquidity explains the market-adjusted long-term return of stocks and the government shareholdings in the stocks moderates positively the relation between the liquidity and the long-term return. More specifically, their study finds a negative liquidity premium, which shows that more liquid assets are compensated by higher returns.

Ali-Ahmed (2009) finds that level of liquidity contributes in explaining the expected stock return in Malaysia capital market. He uses trade volume as a proxy for liquidity on monthly samples over a period 1995 to 2005 to examine the liquidity effect on stock expected returns. His findings indicate that level of liquidity does matter in explaining the expected stock returns in Malaysian capital market.

Other studies like Engku-Chik (2006) and Abdul Rahim and Mohd Nor (2006) provide evidence of a positive relation between liquidity and stock returns for a sample period from January 1994 to December 2003. Engku-Chik (2006) shows that liquidity as proxied by turnover ratio and turnover liquidity ratio is positively related to stock returns.

5.2.3 Liquidity and Investment Opportunity

One of the most significant components that investors look for in a financial market is liquidity. From a finance and economic viewpoint, liquidity is defined as the ability to buy and sell assets easily (O'Hara, 1995) or to transform assets into cash swiftly with little price movement. In general, it is defined as the ability to trade large quantities quickly at a low cost with little price impact (Liu, 2006; and Gregoriou and Nguyen, 2010). The definition generally categorises four areas of liquidity, specifically, trade quantity, trading speed, transaction cost, and price impact. Conversely, illiquidity is termed as the lack of continuous trading which is demonstrated by the level of mismatch between available buyers and sellers at a given point in time (Demsetz, 1968).

The effect of liquidity on investment opportunity has been the subject of interest for both academics and practitioners. The explanation for the positive relationship between equity returns and trading costs stems from the market microstructure theoretical literature (see among others, Fisher, (1994); Marquering and Verbeek, (1999); Gregoriou and Ionnidis, (2007).

The explanation for the positive association between stock returns and trade costs originates from the market microstructure theoretical literature. Amihud and Mendelson (1986b, 1988) argue that increases in stock liquidity will be positively related to market capitalization, as firm assets are discounted at a lower cost of capital when stock market liquidity rises.

Finance theory suggests that liquidity is a cost factor in expected asset returns because investors insist on a reward for expected trading difficulty (Becker-Blease and Paul, 2006) Amihud and Mendelson (1986b, 1988) argue that rises in stock liquidity will be positively transmitted to firm value, because assets in place are reduced at a lower cost of capital when stock liquidity picks up. Myers (1977) argues that firm value consists of two components; current assets and valuable investment opportunities. One would expect, if required returns of equity rise (fall), the cost of capital would increase (decrease; hence there would be a reduction (enhancement) in the investment opportunity set.

Earlier research on the relationship between investment opportunities and liquidity, for instance Becker-Blease and Paul (2006), suggest that liquidity is positively related to investment opportunities. Amongst other related literature, Butler, et al. (2005) find that on investment banking fees for seasoned equity offers are lower for firms with greater stock liquidity. Banerjee, et al. (2007) suggest that firms with lower stock liquidity are more likely to pay dividends. On the other hand, Lipson and Mortal (2004), and Lesmond, et al. (2003) find that stock liquidity interacts with debt policy.

In another closely related studies, Pilotte (1992) examines growth opportunities and the stock price response to new financing using a sample of firms announcing an equity, debt or convertible offering between 1963 and 1984. Pilotte (1992) uses market value of equity, sales, research and development, Tobin's Q, capital expenditure and price earning as proxies for firm's growth. He finds a negative relationship between measures of firm's growth and price returns for most firms announcing equity issues.

More related research like Gregoriou and Nguyen (2010) examine the empirical relationship between the investment opportunity set and stock liquidity in a sample of firms experiencing a negative exogenous liquidity shock (represented by firms deleted from the FTSE 100 stock index) over the time period from 1997 to 2007. Gregoriou and Nguyen (2010) applied econometric methodology using the system GMM estimator developed by Blundell and Bond (1998) to account possible endogeneity liquidity shock. They find no statistical significant association between stock liquidity and investment opportunities. Their findings contradict the existence of a positive relation between liquidity and investment opportunities as reported for the US equity markets. According to Gregoriou and Nguyen (2010), their result in the London Stock Exchange suggests that deletion from a major stock index does not influence firms investment decisions because there is no significant change in the cost of capital due to the automatic exchange system.

Becker-Blease and Paul (2006) study the empirical association between stock liquidity and investment opportunities. They investigate the relationship in the context of additions to the S&P 500 stock index, over the time period between 1980 and 2000. They employ a standard parametric test to study the relationship between liquidity and investment opportunity. According to their results, index revisions give an exogenous liquidity shock because firms are picked up on general public information, including market value, industry clustering and fundamental analysis. They also find that the rise in liquidity and the reduction in the cost of capital as a result of the index revisions, lead to an enhancement of the investment opportunities. Their empirical findings suggest that exogenous events which boost liquidity benefit investors by increasing the group of positive net present value projects accessible for a firm to invest in.

Denis (1994) examines the relation between the market reaction to equity offerings and alternative measures of the profitability of the issuing firm's growth opportunities. His sample, from 1997 to 1999, displays a positive relation between announcement period and several measures of growth opportunities for small and higher growth firms. For the remainder of the sample firms, he finds no association between the estimated profitability of new investment and the market reaction to announced equity offerings. Denis (1994) suggests that investment opportunities play a minor role in explaining the cross-sectional distribution of equity offering announcement effects.

Most recent literature, Mezouz et al. (2015) investigates the impact of FTSE100 index revisions on firms' systematic liquidity risk and the cost of equity capital. They show that index membership enhances all aspects of liquidity, whereas stocks that leave the index exhibit no significant liquidity change. They also show that the liquidity risk premium and the cost of equity capital declines significantly after additions, but do not exhibit any significant change following deletions. The control sample analysis indicates that observed decline in liquidity premium and the cost of equity capital is not driven by factors other than index revisions. They argue that since liquidity is priced, an increase in liquidity will result in lower expected returns. Furthermore, the asymmetric impact of additions and deletions on stock liquidity and cost of capital is consistent with the view that the benefits of index membership are permanent.

5.3 Data and Methodology

In this section, I describe the data and methodology to empirically measure how stock liquidity affects investment opportunity. First, I overview my data sample. Further, I explain my primary parametric regression analysis method between the stock liquidity and the investment opportunity set in the empirical model. Subsequently, I extend using a semi-parametric estimation method to encapsulate endogeneity and joint determination between the stock liquidity and the investment opportunity set in the empirical model.

Generally, the null hypothesis (H0) asserts that increase in stock liquidity will not affect capital investment following index additions, while the alternative hypothesis (H1) implies that stock liquidity affects capital investment. I theorise that, if liquidity is a valued factor in equity returns, corporate managers will see an increased set of feasible investments following a liquidity enhancing shock and increase capital investment intensity.

5.3.1 Data

All accounting and market data was collected from the Thomson Reuters *Datastream*. For a firm to be eligible for my study, it has to be both pre-tested in the event-study and liquidity analysis (chapters three and four respectively) in terms of existence of liquidity improvement due to index revisions. The sample of firms added to the FTSE Bursa Malaysia KLCI 70 was proved to experience stock liquidity improvement (chapter four) hence included for my analysis. Data for the additions to KLCI 70 list over the time period of 2003–2014 were obtained from Thomson Reuters *Datastream*. [71]

My final dataset consists of 101 stock additions to the index satisfying the following criteria: i) the firm was not involved in a merger or acquisitions immediately preceding the additions date; ii) the constituent has available historical data on the Bursa Malaysia for a period of 3 years before and after the revision date; iii) I exclude the added firms that were deleted from the upper index (KLCI 30) during my sample period. This criterion ensures that I are picking up exogenous positive liquidity shocks (as opposed to endogenous shock where corporate managers may intentionally move the stocks).

Table 5.1 reports the KLCI 70 index additions between July 6, 2006 and December 26, 2012.

Stocks Added to the KLCI 70		
Year	**No of Firms**	**% of Firms**
2006	11	10.9
2007	21	20.8
2008	21	20.8
2009	8	7.9
2010	10	9.9
2011	22	21.8
2012	8	7.9
Total	101	100

Table 5.1: Sample Size for Stocks Added to the KLCI 70

5.3.2 Methodology

In this sub-section, I first justify the use of the two proxies for investment opportunities employed: the capital expenditure and Tobin's Q. Furthermore, I describe Ordinary Least

[71] The full list of all the stocks added to the KLCI 70 can be seen in appendix A, Table A2.

Square (OLS) regression analysis method as a primary estimation method between the stock liquidity and the investment opportunity set in the empirical model.

5.3.2.1 Proxies for Investment Opportunities

In order to empirically study the effect of stock liquidity on investment opportunities, I need to use a proxy for the profitability of new investment (see, e.g., Denis, 1994). Numerous proxies have been employed to capture the investment effects in the literature. According to Denis (1994), investment opportunities proxies can be categorized into ex-ante and ex-post measures of growth opportunities. Ex-ante proxies include, for instance, the ratio of market value to book value, Tobin's Q, return on assets, dividend yield, ratio of research and development expenditures to sales, and return on equity. On the other hand, a number of ex-post measures of growth can be used as proxies for growth opportunities. Pilotte (1992) claims that, under rational expectations, actual subsequent growth should be a good proxy for growth that was anticipated at the time of the equity offering announcement. For instance, net operating income, sales, annual growth rates in total assets, equity value, and the average ratio of capital expenditures to total assets subsequent to the sample offerings are alternative measures of growth opportunities. Similarly, actual capital expenditures should be a good proxy for anticipated investment.

In order to determine whether firms increase their investment due to positive changes in stock liquidity, I use a set of proxy variables for the investment growth. First I use the Tobin’s Q and capital expenditure as two proxies for investment opportunity in order to determine whether investment opportunities are enhanced by positive changes in stock liquidity, using a dataset that comprises information on the constituents added to the

KLCI 70. I also consider two other alternative proxies for investment growth opportunity, such as the return on assets (ROA), and the price earnings ratio (PE).

5.3.2.1.1 The Tobin's Q

Tobin's Q is one of the most commonly used proxies for investment opportunities (see, among others, Dierkens (1991), Pilotte (1992), and Smith and Watts (1992) and Denis 1994)). The disparity of market value from book value or from replacement value will depend on the profitability of both the firm's assets in place and its expected investment opportunities (Denis, 1994).

Tobin's Q ratio provides information on how well a firm's investments pay off. A value larger than 1 indicates that a firm's investments have been profitable. According to Denis (1994), with scale-expanding investments and decreasing marginal returns on capital, if new investment opportunities are expected to be profitable then the firm's assets in place must also be profitable and Tobin's Q will be above 1. Conversely, if the profitability of the firms' assets in place is low, its investment opportunities will also be expected to earn a low rate of return and Tobin's Q will be below 1.

Tobin's Q variable is defined as follows:

$$TQ = \frac{\text{Market value of assets}}{\text{Replacement value of assets}} \qquad (1)$$

or

$$TQ = \frac{(\text{Equity Market value} + \text{liabilities market value})}{(\text{equity book value} + \text{liabilities book value})} \qquad (2)$$

I generate Tobin's Q from Thomson Reuters *Datastream* using following formula:

DPL#((X(WC08001) + X(WC03351)) / (X(WC03501) + X(WC03351)),6) (3)

where X denotes firm i, WC08001 denotes annual market capitalization , MV denotes market value, WC03351 denotes total liabilities and WC03501 denotes common stock book value.

5.3.2.1.2 Capital Expenditure

Capital expenditures signify managerial attempts to take advantage of current investment opportunities by expanding the firm's capital spending on viable projects. If there is an increase in the investment opportunity that I cannot observe, then I expect this would lead to an increase in the capital expenditures, as observed by Becker-Blease and Paul (2006).

According to Becker-Blease and Paul (2006), if capital expenditure is employed as proxy for growth opportunities, it may need more than one year for growth of capital expenditure to be realized, so I define the time period for three-year change in capital expenditures as the average of the three fiscal years following addition minus the average for the three fiscal years before addition.

Following Denis (1994), Pilotte (1992), Becker-Blease and Paul (2006) as well as Gregoriou and Nguyen (2010), I use changes in capital expenditures as a proxy for changes in investment opportunities.

5.3.2.1.3 Alternative Proxies for Investment Opportunities

I consider two alternative proxies for investment opportunities: return on assets (ROA), and price earnings ratio (PE). Contrary to the capital expenditures, these proxies reflect expectations rather than realizations. To test whether they are also increasing in stock liquidity, I perform additional analyses of changes in these variables on changes in stock liquidity.

The first alternative proxy for investment opportunity is the ROA. Investors generally expect that higher ROA means higher expected growth of stock prices. Conversely, lower ROA means lower expected stock price growth. The second alternative for investment opportunity is PE. Usually, higher PE indicates that investors expect higher earnings in the future. Thus, higher ROA and PE are positively associated with higher investment growth opportunities.

5.3.2.2 Price Impact Ratio

I examine the liquidity premium hypotheses from a price impact point of view. In order to test market liquidity changes, they must be tested with several liquidity proxy measures. More specifically, I examine whether investment opportunities increase if stocks liquidity increases (price impact ratio decreases), and as a consequence offer a comparatively unexplored suggestion of the liquidity premium hypotheses in Malaysia’s stock market in specific.

I construct proxies for stock market liquidity by employing three interrelated price impact ratios; the Amihud (2002) ,and Florackis et al. (2011) price impact ratios, and my (Chapter four) ratio which considers the free float factor.

5.3.2.2.1 Amihud's (2002) Price Impact Ratio

The first is the liquidity ratio by Amihud (2002), employs as a substitute for the price impact of a trade. The Amihud (2002) liquidity ratio is the average of the ratio of daily absolute return to the daily volume in dollars.

$$RtoV_{it} = \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \frac{\left|\mathrm{R}_{\mathrm{itd}}\right|}{\mathrm{V}_{\mathrm{itd}}} \tag{4}$$

where D_{it} is the number of days for which data are available (the number of days with data obtainable for stock i for the period of the pre and post addition measurement periods), R_{itd}, is the return on day t, and V_{itd} is the daily volume in dollars term. The day-t impact on the price of one currency unit of volume traded is given by the ratio $|R_{itd}|/ V_{itd}$.

The liquidity measure in Equation (4) is the average of the daily return to volume impacts over a given sample period. Amihud's (2002) liquidity measure offers an understanding of the link between trade volume and price change.

5.3.2.2.2 Florackis et al.'s (2011) Price Impact Ratio

Second method adopted to test the liquidity premium hypotheses in the equity markets is based on the improved Amihud's (2002) price impact ratio developed by Florackis, Gregoriou and Kostakis (Florackis et al., 2011; Azevedo et al., 2014). In particular, Florackis et al. (2011) improved liquidity ratio proposes a new price impact ratio as an alternative to the widely used Amihud's (2002) RtoV.

Florackis et al. (2011) argue that Amihud's (2002) RtoV is by no means comparable across stocks with different market capitalisation and, therefore, carries a significant size bias as initially spotted by Cochrane (2005).

Therefore, Florackis et al. (2011) proposed an alternative, more suitable, price impact ratio defined as the average monthly ratio of daily absolute stock return to its turnover ratio (henceforth RtoTR), basically substituting the trade volume of a stock (in RtoV) with its turnover ratio in the denominator of Amihud's (2002) ratio.

$$RtoTR_{it} = \frac{1}{D_{it}} \sum_{D=1}^{D_{it}} \left(\frac{|R_{itd}|}{TR_{itd}} \right) \tag{5}$$

where $RtoTR_{it}$ is the return on stock i on day t, TR_{itd} is the corresponding turnover ratio, and Di is the number of days with data obtainable for stock i for the period t.

5.3.2.2.3 Free Float Adjusted Price Impact Ratio

Florackis et al. (2011) proposed an alternative, more suitable, price impact ratio defined as the average monthly ratio of daily absolute stock return to its turnover ratio, RtoTR, which basically substituting the trade volume of a stock (in RtoV) with its turnover ratio in the denominator of Amihud (2002) ratio as described previously.

I improve Florackis et al.'s (2011) RtoTR, by incorporating the public free-float component, which increases the encapsulation power of the price impact.

$$RtoTRF_{it} = \frac{1}{D_{it}} \sum_{D=1}^{D_{it}} \left(\frac{|R_{itd}|}{TRF_{itd}} \right) \tag{6}$$

where $RtoTRF_{it}$ is the return on stock i on day t, TRF_{itd} is the corresponding turnover ratio adjusted with the public free float factor, and Di is the number of days with data obtainable for stock i for the period of the pre and post addition measurement periods.

5.3.2.3 Regression Models

I employ the simplest form of estimating alpha and beta using ordinary least squares regression. The first step in my analysis is to regress a set of explanatory variables on the main investment opportunity proxies (Tobin's Q and Capital Expenditure).

My regression models are as follows:

$$InvOp_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i \quad (8)$$

or specifically,

$$TQ_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i \quad (9)$$

$$CE_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i \quad (10)$$

where $InvOp_i$ describes the dependant variable represented by Tobin's Q (TQ_i) and capital expenditure (CE_i) in Equations 9 and 10, respectively; *i* denotes the cross-section of firms added to the KLCI 70 index (*i*=1... N); β_0 describes an intercept or constant measures the value where the regression line crosses the y-axis; $\beta_{1,..6}$ denotes coefficient or slope, and measures the steepness of the regression line; Liq_i describes the explanatory variable for liquidity proxies (RtoV, RtoTR and RtoTRF) in observation *i*; OI_i refers to the independent variable for operating income; Lev_i denotes leverage (long term debt/total assets); MB_i describes market to book value of equity; $Cash_i$ and $Size_i$ describes cash and total asset respectively; lastly e_i describes the random error component of the linear relationship between explanatory variables and dependant variable.

In addition to the main proxies, I models two alternatives investment of investment opportunity using ROA and PE as follows:

$$ROA_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i \tag{11}$$

$$PE_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i \tag{12}$$

where ROA is return on assets and PE is price to earnings ratio in equation 11 and 12 respectively; *i* denotes the cross-section of firms added to the KLCI 70 index (*i*=1... N); β_0 describes an intercept or constant that measures the value where the regression line crosses the y-axis; $\beta_{1,..6}$ denotes coefficient or slope, and measures the steepness of the regression line; Liq_i describe the explanatory variable for liquidity proxies (RtoV, RtoTR and RtoTRF) in observation *i*; OI_i refers to the independent variable for operating income; Lev_i denotes leverage (long term debt/total assets); MB_i describes market to book value of equity; $Cash_i$ and $Size_i$ describes cash and total asset respectively; lastly e_{it} describe the random error component of the linear relationship between explanatory variables and dependent variable.

Similar to Becker-Blease and Paul (2006) and Gregoriou and Nguyen (2010), I use a three-year event window for changes in investment opportunity proxies following index addition, since growth opportunities may take up to three years to be realized (Becker-Blease and Paul 2006, and Gregoriou and Nguyen, 2010). For instance, CE represents the natural logarithm of the three year change in annual capital expenditure as the average of the three fiscal years following additions minus the average for the three years before. I adopt the same methodology to determine Tobin's Q.

I include OI_i as the natural logarithm of operating income in the year subsequent to addition minus the year preceding additions to explain if operating income influence investment opportunity financing. Lev_i defined as the long term debt over total assets in the year subsequent to addition minus the year preceding additions. I expect operating income or/and leverage has a positive association with the investment opportunity set if corporate managers increase a firm's investment opportunity.

MB_i defined as market to book equity in the year subsequent to addition minus the year preceding addition is an additional explanatory variables to control for their likely effect on changes in Tobin's Q and capital expenditure; It is generally agreed that high market-to-book denotes a high-growth (value) stock, and low market-to-book denotes a low-growth stock. Thus, an increase in market-to book is consistent with an increase in growth opportunities.

$Cash_i$ and firm $Size_i$ are defined as the natural logarithm of cash and total assets respectively in the year subsequent to addition minus the year preceding additions. All variables apart from book to market to book equity are expressed as natural logarithms.

5.4 Results

In this section I provide my results and analysis. I first describe summary statistics and correlation coefficients among the variables used in my regressions models. Later, I present my regression results in the sub sections.

Table 5.2 describe the summary statistic (mean and standard deviation,) for the variables used in my regression models, where dependant variables includes *CE*, *TQ*, *ROA* and *PE* which denotes capital expenditure, *Tobin's Q*, *ROA*, *Return on Equity* and *Price to Earnings* ratio respectively. Control variables includes *OI*, *Lev*, *MB Cash* and *Size* which denotes operating income, leverage (total debt/total assets), market to book value, cash and size (total asset) respectively. Variable for liquidity measures includes *RtoV*, *RtoTR* and *RtoTRF* which denotes the price impact ratio of Amihud (2002), Florackis et al. (2012) and my new price impact ratio.

Variable	Mean	Std. Dev.
CE	0.4397714	1.395634
TQ	0.1331206	0.5806075
ROA	0.6878138	5.655977
PE ratio	-4.739922	19.26118
OI	32806.24	157382.3
Lev	-0.0014935	0.0623785
MB	0.3566939	0.7566593
Cash	7996.766	125424
Size	1287315	6341477
Liquidity measure		
RtoV	0.2143927	38.61928
RtoTR	4.245494	31.53351
RtoTRF	3.967761	31.32163

Table 5.2: Summary Statistic for the Regression Variables

Table 5.2 shows mean, standard deviation, minimum and maximum for the variables employed in my regression models. I focus mainly on the results for the liquidity measures. The average liquidity measure for RtoV, RtoTR and RtoTRF is 0.124, 4.24 and 3.96, respectively. I show that the difference between the mean for the Florackis et al. (2011) liquidity ratio, RtoTR, and my (new) liquidity ratio is very small. This is happens because the average public free float factor for stocks added to the KLCI 70 is about 0.75.

Table 5.3 shows the correlation coefficients among the variables used in my regression models, where ***,**, and* indicate the correlations is significant at the 1%, 5% and 10% level respectively.

	CE	TQ	ROA	PE	RtoV	RtoTR	RtoTRF	OI	Lev	MB	Cash	Size
CE	1											
TQ	-0.0002	1										
ROA	0.0004	-0.0419	1									
PE	-0.0862	0.1119***	-0.3478***	1								
RtoV	-0.1163***	0.0407	0.1135***	-0.0859**	1							
RtoTR	-0.0716**	-0.0232	0.1169***	-0.1569***	0.9310***	1						
RtoTRF	-0.0719**	-0.0310	0.1189***	-0.1631***	0.9302***	0.9935***	1					
OI	-0.0562*	-0.0614	0.0096*	-0.0602*	-0.0626*	-0.0645*	-0.0643*	1				
Lev	-0.0695**	-0.0559*	-0.101	-0.1547***	0.0688**	0.0638*	0.0551*	0.1675***	1			
MB	0.1535***	0.0452	-0.0185	0.0206	-0.1756***	-0.1539***	-0.1537***	0.1046***	-0.1106***	1		
Cash	0.2125***	0.0393	0.0018	-0.1058***	-0.0285	-0.0041	0.0443	0.2898***	-0.0377	0.1049	1	
Size	-0.003	-0.0375	-0.0168	0.0405	-0.0072	-0.0314	-0.0385	0.7725***	0.1590***	-0.0403**	0.0954***	1

Table 5.3: Correlation Coefficients for the Regression Variables

Table 5.3 shows the correlation matrix for the variables employed in my regression analysis. The signs are as expected for most of the variables, even though I have some unexpected signs. For instance, sign for the correlation between Tobin's Q (dependent variable) and RtoV (liquidity measure) is positive. On the other hand, the coefficients for the RtoTR and RtoTRF ratios are negative. Also, the correlation coefficients between the regression variables are mostly high at the 1% statistical significance level. Higher correlation amongst liquidity measures, RtoV, RtoTR and RtoTRF are expected as those measures share similar components. Nevertheless those liquidity measures are not tested in the same regression model and tested individually in different models.

5.4.1 Results: Tobin's Q

Table 5.4 reports results for the cross-section of firms added to the KLCI 70 based on the regression Equation (9): $TQ_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i$ .The sample consists of firms added to the FTSE Bursa Malaysia KLCI 70 between June 2006 and December 2012. Where *i* denotes the cross section of firms added to index (*i*=1... N); β_0 describes intercept measures the value where the regression line crosses the y-axis; $\beta_{1,..,6}$ denotes coefficient or slope, and measures the steepness of the regression line; The dependent variable, *TQ* , represents the 3 year change in annual Tobin's Q as the average of the three fiscal years following additions minus the average for the 3 years before addition. I construct three models for stock liquidity proxies, namely, the liquidity ratio established by Amihud (2002) RtoV, liquidity ratio by Florackis et al. (2010) RtoTR, and my liquidity ratio, RtoTRF. Change in liquidity ratio is the change in the difference for one year period following index addition compared to the one year period before index addition, excluding the event month and the two months surrounding it. OI_i refers to the independent variable for operating income; Lev_i denotes leverage (long term debt/total assets); MB_i describes market to book value of equity; $Cash_i$ and $Size_i$ describes cash and total asset respectively; lastly *ei* describes the random error component of the linear relationship between explanatory variables and dependent variable. The results are identified by the superscripts ***, ** and * if significant at 1%, 5% and 10%, respectively.

	Model 1 (RtoV)		Model 2 (RtoTR)		Model 3 (RtoTRF)	
Constant	0.121	7.02**	0.125	7.11***	0.128	7.19***
Liq	0.000	1.75	-0.000	-0.94	-0.000	-1.44
OI	-4.52e-07	-4.28***	-4.76e-07	-4.46 ***	-4.80e-07	-4.50**
Lev	-0.366	-1.57	-0.328	-1.43	-0.323	-1.41
MB	0.044	1.58	0.0365	1.30	0.0283	1.25
Cash	2.91e-07	3.68***	2.98e-07	3.71***	3.07e-07	3.75***
Size	5.50e-09	3.10***	5.76e-09	3.20***	5.76e-09	3.20***
Adjusted R^2	0.145		0.127		0.132	

Table 5.4: Regression Results: Tobin's Q

Table 5.4 contains coefficient estimates for three-year change in Tobin’s Q on one-year change in stock liquidity. I estimate a model for each of the three liquidity proxies: the RtoV in Model (1), RtoTR in Model (2), and RtoTRF in Model (3). The information in the last row specifies the goodness fit of my model, Adjusted R^2.

In all three models, two proxies for stock liquidity have coefficients in the predicted direction. Specifically in Model (2) and (3), an increase by 1% in RtoTR and RtoTRF (negative sign indicates liquidity improvement) is associated with increase by 0.00036% and 0.0005739% respectively in Tobin’s Q. However those results are not statistically significant. On the other hand model 1 (RtoV) indicates illiquidity (positive sign), where an increase by 1% in RtoV is associated with 0.000724% increase in Tobin’s Q. The result is statistically significant at the 10% level.

In terms of control variables, my results show that there is a statistically significant negative coefficient for the change in operating income, for all models, which suggests that a unit positive change in operating income is associated with marginal decrease in the investment growth. All results are statistically significant at 1% statistical level. Also, the leverage coefficients (long term debt to total asset) are negatively related to capital expenditures for all three models.

I do not observe any statistically significant coefficient for the market to book, for any of the models, even though the sign of the coefficients are positive. My results for the Cash and Size show that the coefficients are positive and statistically significant for all models. This suggests, therefore, that cash and size are positively related to Tobin’s Q.

It is interesting to note that the prediction signs between Tobin’s Q and RtoTR (Model 2) and between Tobin’s Q and RtoTRF (Model 2) are both negative. On the other hand, the association between Tobin's Q and RtoV (model 3) is positive. This different signs, would indicate that RtoV would give inaccurate liquidity measurement due to the size bias as spotted by Cochrane (2005).

5.4.2 Capital Expenditure

Table 5.5 reports results for the cross-section of firms added to the KLCI 70 based on the regression Equation (10) $CE_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i$ .The sample consists of firms added to the FTSE Bursa Malaysia KLCI 70 between June 2006 and December 2012. Where *i* denotes the cross section of firms added to index (*i*=1... N); β_0 describes intercept measures the value where the regression line crosses the y-axis; $\beta_{1,..,6}$ denotes coefficient or slope, and measures the steepness of the regression line; The dependent variable, *CE* , represents the 3 year change in annual *Capital expenditure* as the average of the three fiscal years following additions minus the average for the 3 years before addition. I construct three models for the three proxies for stock market liquidity, namely, the liquidity ratio established by Amihud (2002) RtoV, liquidity ratio by Florackis et al. (2010) RtoTR, and my liquidity ratio, RtoTRF. Change in liquidity Ratio is the change in the difference for one year period following index addition compared to the one year period before index addition, excluding the event month and the two months surrounding it. I include OI_i refer to the independent variable for operating income; Lev_i denotes leverage (long term debt/total assets); MB_i describes market to book value of equity; $Cash_i$ and $Size_i$ describes cash and total asset respectively; lastly *ei* describes the random error component of the linear relationship between explanatory variables and dependant variable. The results are identified by the superscripts ***, ** and * if significant at 1%, 5% and 10%, respectively.

	Model 1 (RtoV)		Model 2 (RtoTR)		Model 3 (RtoTRF)	
Constant	0.346	6.69***	0.351	6.62***	0.355	6.77***
Liq	-0.004	-2.26**	-0.026	-3.65***	-0.003	-4.42**
OI	-3.02e-06	-4.74***	6.35e-07	-4.68***	-2.99e-06	-4.70***
Lev	-0.384	-0.77	0.497	-0.89	-0.431	-0.86
MB	0.279	6.40**	0.044	6.67***	0.288	6.65 ***
Cash	2.99e-06	6.51***	4.63e-07	6.47***	3.04e-06	6.56***
Size	5.34e-08	4.41***	1.21e-08	4.33***	5.23e-08	4.33***
Adjusted R^2	0.111		0.105		0.106	

Table 5.5: Regression Results: Capital Expenditure

Table 5.5 contains regression coefficient estimates for the relation between changes in capital expenditure (CE) and changes in stock liquidity. I estimate a model for each of the three liquidity proxies as described above: Similar to Becker-Blease and Paul (2006), I find an association between changes in capital expenditure and liquidity improvement for stocks added to the KLCI 70.

My results for capital expenditure, as a measure of firms' investment opportunity show that all investment opportunity proxies have significant coefficients in the predicted direction for stock liquidity. Changes in capital expenditures are negatively related to all liquidity ratios. Furthermore, the coefficient estimates indicate that, *ceteris paribus*, a 1% improvement in liquidity is associated with an increase in capital expenditures of 0.0036% in the RtoV ratio, an increase of 0.026% in the RtoTR ratio, and an increase of 0.003% in the RtoTRF ratio.

The results for the control variables *MB* and *Size* indicate significant positive coefficients on change in market-to-book value and firm size in all three models, suggesting that a unit increase in market-to-book value and firm size is associated with marginal increase in capital expenditure respectively. Contrarily the results for *OI* coefficients indicate significant negative coefficient on change in operating income in all three models, suggesting that a unit increase in operating income is associated with marginal decrease in capital expenditure.

The results provided in table 5.5 are consistent with the theory which states that managers react to enhancements in stock liquidity by increasing capital investments.

5.4.3 Return on Assets

Table 5.6: reports results for the cross-section of firms added to the KLCI 70 based on the regression Equation (11): $ROA_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i$ The sample consists of firms added to the FTSE Bursa Malaysia KLCI 70 between June 2006 and December 2012. Where *i* denotes the cross section of firms added to index (i=1... N); β_0 describes intercept measures the value where the regression line crosses the y-axis; $\beta_{1,..,6}$ denotes coefficient or slope, and measures the steepness of the regression line; The dependent variable, *ROA* , represents the 3 year change in annual *ROA* as the average of the three fiscal years following additions minus the average for the 3 years before addition. I construct three models for the three proxies for stock market liquidity namely, the liquidity ratio established by Amihud (2002) RtoV, liquidity ratio by Florackis et al. (2010) RtoTR, and my liquidity ratio, RtoTRF. Change in liquidity Ratio is the change in the difference for one year period following index addition compared to the one year period before index addition, excluding the event month and the two months surrounding it. I include OI_i refer to the independent variable for operating income; Lev_i denotes leverage (long term debt/total assets); MB_i describes market to book value of equity; $Cash_i$ and $Size_i$ describes cash and total asset respectively; lastly *ei* describes the random error component of the linear relationship between explanatory variables and dependant variable. The results are identified by the superscripts ***, ** and * if significant at 1%, 5% and 10%, respectively.

	Model 1 (RtoV)		Model 2 (RtoTR)		Model 3 (RtoTRF)	
Constant	0.699	3.46***	0.379	3.51***	0.365	3.51***
Liq	0.018	2.82***	0.022	2.81**	0.022	2.81***
OI	3.76e-06	3.04***	3.65e-06	3.04***	3.71e-06	3.04***
Lev	-10.689	-3.10***	-10.703	-3.08***	-10.658	-3.08***
MB	-0.163	-1.80 *	-0.1034	-1.90*	-0.1688	-1.85*
Cash	8.10E-07	1.94*	-1.00e-06	-1.95*	-1.31e-06	-2.37***
Size	-2.36E-07	-3.09***	-6.36e-08	-3.07 ***	-6.33e-08	-3.06***
R^2	0.0286		0.0291		0.0295	

Table 5.6: Regression Results: Return on Assets

Table 5.6 shows regression coefficient estimates for change in ROA on change in stock liquidity. Results for ROA as a measure of investment opportunity have negative signs and significant coefficients in all three models. Changes in ROA increase with liquidity ratio, indicating no improvement in terms of liquidity.

The coefficient estimates indicate that, holding other variables constant, a 1% increase in liquidity ratio (decrease in liquidity) is associated with increase in ROA by 0.018 % in RtoV. Similarly, a 1% increase in liquidity ratio is associated with increase in ROA by 0.002 % in RtoTR and RtoTRF.

The results indicate a significant positive coefficient on change in operating income, and leverage coefficients are negatively related to ROA in all three models. I observe negative *MB* coefficients, statistically significant at the 10% level in all three models. Lastly, my results indicate a significant negative coefficient on change in cash, suggesting size decreases with ROA.

5.4.4 Price Earning

Table 5.7 reports OLS results for the cross-section of firms added to the FTSE Bursa Malaysia KLCI 70 based on the regression Equation (12):

$$PE_i = \beta_0 + \beta_1 Liq_i + \beta_2 OI_i + \beta_3 Lev_i + \beta_4 MB_i + \beta_5 Cash_i + \beta_6 Size_i + e_i$$

The sample consists of firms added to the FTSE Bursa Malaysia KLCI 70 between June 2006 and December 2012. Where *i* denotes the cross section of firms added to index (*i*=1... N); β_0 describes intercept measures the value where the regression line crosses the y-axis; $\beta_{1,..,6}$ denotes coefficient or slope, and measures the steepness of the regression line; The dependent variable, *PE* , represents the 3 year change in annual *PE* as the average of the three fiscal years following additions minus the average for the 3 years before addition. I construct three models for the three proxies for stock market liquidity namely, the liquidity ratio established by Amihud (2002) RtoV, liquidity ratio by Florackis et al. (2010) RtoTR, and my liquidity ratio, RtoTRF. Change in liquidity ratio is the change in the difference for one year period following index addition compared to the one year period before index addition, excluding the event month and the two months surrounding it. I include OI_i refer to the independent variable for operating income; Lev_i denotes leverage (long term debt/total assets); MB_i describes market to book value of equity; $Cash_i$ and $Size_i$ describes cash and total asset respectively; lastly *ei* describes the random error component of the linear relationship between explanatory variables and dependant variable. The results are identified by the superscripts ***, ** and * if significant at 1%, 5% and 10%, respectively.

	Model 1(RtoV)		Model 2(RtoTR)		Model 3(RtoTRF)	
Constant	-5.036	-8.50***	-4.557	-7.61	-4.565	-7.62***
Liq	-0.041	-2.09**	-0.0919	-3.70 ***	-.0942	-3.73***
OI	-0.000	-3.38***	-0.000	-3.46***	-0.000	-3.51***
Lev	-47.105	-2.60***	-45.832	-2.48**	-46.014	-2.49***
MB	0.662	1.30	0.450	0.90	0.4222	0.84
Cash	-0.000	-4.62***	-0.000	-4.80***	-0.000	-4.28***
Size	6.58e-07	5.44***	6.48e-07	5.40***	6.47e-07	5.40***
Adjusted R^2	0.06		0.0754		0.0760	

Table 5.7: Regression Results: Price Earning

Table 5.7 presents regression coefficient estimates for change in *PE* on change in stock liquidity. The results for *PE* as a proxy for investment opportunity show all three model have significant coefficients in the predicted direction. In other words, change in *PE* decreases with all liquidity ratio. Specifically, the coefficient estimates indicate that, *ceteris paribus*, a 1% improvement in liquidity is associated with increase in *PE* by 0.04 %, 0.091% and 0.094% in model 1, model 2 and model 3 respectively.

The results indicate a significant negative coefficient on change in operating income and also change in leverage in association with *PE* in all three models. One possible explanation for this negative relationship is that corporate managers refinance firms' asset using short term to medium term debt to take advantage of the lower cost of capital due to liquidity improvement.

I observe positive statistically significant size (total assets) coefficients in all models at the 1% level. While Cash coefficients indicate negative significant results for all three models, suggesting that cash decreases with PE.

5.6 Conclusion

I examine the liquidity premium hypotheses by testing whether investment opportunities increase with stock liquidity. Amihud and Mendelson (1986) show that improvements in the stock liquidity decreases the firm's cost of capital. Becker-Blease and Paul (2006) argue that stock liquidity improvement increases not only the assets' value (see also, Amihud and Mendelson (1988)) but also the firms' investment opportunities. The explanation behind this proposition is based on the argument that lower cost of capital turn the Net Present Value (NPV) of some investment projects positive, enhancing investments.

I employ Amihud's (2002) RtoV, Florackis et al.'s (2011) RtoTR and my RtoTRF ratios as liquidity measures. I find that stocks added to the KLCI 70 lead to a significant increase in capital expenditures and PE ratio. These changes in investment opportunity are positively related to changes in stock liquidity. My findings are in line with those of Becker-Blease and Paul (2006) and support the research hypotheses which states that growth opportunities increase with stock liquidity. I also use Tobin's Q and ROA as proxies for investment growth, nevertheless, I do not find any empirical evidence supporting the above hypotheses.

The relationship between investment opportunities and the price impact ratio is negative, indicating liquidity improvement. Specifically, I find that the Florackis et al.'s (2011) RtoTR and my RtoTRF ratios perform better as a liquidity measure than the Amihud's (2002) RtoV. This is particularly true when I use Tobin's Q as investment opportunity measure. Amihud's (2002) RtoV provides a positive sign, indicating illiquidity (i.e. there is no stock liquidity improvement), whereas Florackis et al.'s (2011) RtoTR and RtoTRF show otherwise.

Overall, my results support the view that an increase in stock liquidity enhances investment opportunity. I provide additional evidence from the Malaysian stock market regarding the benefits of having a liquid stock market and firms' stock being sufficiently liquid. I conclude that stock liquidity is important to corporate managers and shareholders because the trading environment of a stock influences corporate investment decisions.

Chapter 6: Conclusion

6.1 Summary

In 1991, the Prime Minister Mahathir Mohamed, set a target for Malaysia to be a developed economy by the year 2020. He outlined nine strategic challenges that Malaysia must overcome to achieve Vision 2020 and amongst them was to achieve an economy that is fully competitive, dynamic, robust and resilient. Nevertheless, Malaysia experienced a number of economic downturns, including recession in 1985 and East Asian financial turmoil in 1997.

Therefore it is important for an emerging country like Malaysia to transform its economy to achieve the targeted Vision 2020. The government's economic transformation programme includes revitalising Malaysia's stock market. Bursa Malaysia became an agent to enhance the Malaysian capital market, especially in transforming its main stock indices to be recognized internationally as Malaysia's principal investable, transparent and benchmark equity indices.

With the recent transformation in the Bursa Malaysia index series, an empirical investigation about the effects of this exercise is necessary to give valuable information to market participants, policy makers and researchers. Moreover, there is little published evidence concerning market microstructure effects of the Malaysian stock market when firms encounter exogenous shock from index revision announcement. Thus, this thesis presents an empirical study on the index revisions, covering interrelated issues of market efficiency, liquidity premium and investability.

Chapter two gives an overview of the Malaysia equity market and its index restructuring and reviews exercise. This is important in order to have a better understanding of and insight into the Malaysian stock market. Particularly it presents a brief introduction to the history of the Malaysia stock market, Bursa Malaysia index restructuring and reviews, the index series and index ground rules.

Chapter three contributes to the literature from the perspective of informational market efficiency. More specifically, it discusses the short and the long run market efficiency across the KLCI 30, KLCI 70 and Small Cap index, over the time period of 2006 to 2012. It employs a standard event study methodology which captures abnormal returns and trade volumes and relate them with market efficiency. Following the literature, different event-windows are used in order to observe the short run index effects on price and volume over a period ranging from AD-15 (before announcement date) to CD+15 (after the effective change). This chapter adopted the conventional mean cumulative abnormal returns (*MCAR*) method over different event-windows, to assess abnormal return (market efficiency) in short run. The general method of the buy-and-hold abnormal return measure *(BHAR)* is used to analyse the long-horizon abnormal return associated with the event. A market return model is employed to estimate the expected (normal) return of stock. To test for abnormal trade volume Harris and Gurel's (1986) volume/ratio methodology is applied.

The results suggest that the market is inefficient in the short-run but efficient in the long-run when firms encounter exogenous shock from index revision announcement. There is evidence supporting the Price Pressure Hypotheses (PPH) for both the additions to and the deletions from KLCI 30. Interestingly, it is observed that there are positive abnormal returns for the stocks added to the KCLI 70 with persistent increase in volume in the post-event window which incline towards the Information Cost Liquidity Hypotheses (ICLH) which with the results on long term event-windows (*MBHAR*) further strengthen these findings. On the other hand, it is concluded that results for stock deletions from the KLCI 70 result support the Imperfect Substitute Hypotheses (ISH) reflecting that stock prices decrease due to deletion; followed with price persistence in the post long term period. Results for stocks added to the Small Cap index also support the ISH.

Chapter four extended the previous investigation towards the effects of index revision on stock liquidity. Different liquidity measures are employed to capture multi-dimensional liquidity aspects. A new modified liquidity measure (price impact ratio) is introduced which takes into account the free float factor. New evidence of liquidity improvement surrounding the KLCI 70 addition is observed. The new finding confirms the ICLH suggestion which maintains that the expected return should decrease in anticipation of a liquidity increase to reflect the liquidity premium if the market is efficient in transmitting the information. Further, the findings support Florackis et al.'s (2011) argument on the advantages of their price impact ratio over Amihud's (2002) RtoV in terms of market capitalization bias. Moreover, the new liquidity measure *RtoTRF* is empirically proven to have better 'encapsulation power' when compared to Amihud's(2002) *RtoV* and Florackis et al.'s (2011) *RtoTR* measure, specifically when comparison is made between *RtoTR* and *RtoTRF,* as those two measures by construction are identical, apart from the free-float factor introduced in the latter.

Chapter five examines the changes in the investment growth opportunities as a result of stock liquidity improvement, using a sample which comprises information on the stocks added to the KLCI 70. It tests whether investment opportunities increase with stock liquidity. The hypotheses is tested that an increase in stock liquidity increases the feasible investment opportunity set using Tobin's Q, capital expenditures, ROA and PE as the proxies for growth opportunities. Specifically, the three interrelated price impact ratios (as in chapter four) are re-employed, a relatively unexplored implication of the liquidity premium hypotheses is provided and also the sensitivity of liquidity measure (price impact ratio).

Coherent with the research hypotheses, changes in investment opportunity sets are positively related to changes in stock liquidity, controlling for changes in financing variable, market to book, and size. Similar relations are found between stock liquidity and growth opportunities when two alternative measures of growth expectations are used; return on assets (ROA) and price to earnings ratio (PE).

This shown that Florackis et al.'s (2011) price impact ratio and my liquidity ratio better captures price impact when compared with Amihud's (2002) ratio. This assertion is true when the Tobin's Q is employed as a proxy for the investment growth. The results suggest that different price impact ratios capture the stock liquidity differently and for each case the liquidity may relate differently with the investment growth proxies.

6.2 Economic Significance

As the Malaysian government seeks ways to transform the Malaysian economy to be fully developed by 2020, part of the economic transformation programme was to revitalise Malaysia's equity market and so enhances its capital market. While there is anecdotal evidence that stock exchange index revisions in other developed markets have given positive economic impacts, now it is evidenced that Bursa Malaysia's index restructuring has given similar impacts particularly of economic significance. Initiatives like the Entry Point Projects (EPP) by the Malaysian government aimed to increase Bursa Malaysia's market capitalisation to RM3.9 trillion (USD 1 Trillion) by 2020 from 1 trillion in 2010, accounting for a compound growth rate (CAGR) of 15%.

Strikingly, the Malaysian capital market grew to RM2.76 trillion as at 2014, equivalent to 2.6 times the size of the Malaysian economy, and remained resilient in an environment of global uncertainties, according to the Securities Commission Malaysia (SC).[72] Fund management continued to be the fastest-growing market segment with assets under management surpassing the 600-billion ringgit milestone for the first time to reach RM630 billion (+7.1%) by end of 2014. This growth undoubtedly partly contributed by the Bursa Malaysia's index restructuring under EPP in order to make the Malaysia stock market more investable, transparent, and attractive to investors and consequently to the Malaysian economy as a whole.

6.3 Managerial Implications

In chapter 4, a new liquidity measure, the RtoTRF was introduced, which proved to have better "encapsulation power" when applied to Malaysian stock market. This new measure not only proved better than Amihud's (2002) RtoV and Florackis et al.'s (2011) RtoTR in terms of taking into account market capitalisation and free float but also is an alternative measure to the Aminvest ratio which is commonly used by professionals investors, regulators and stock exchanges. Managerial decisions could be altered if RtoTRF is considered as an alternative measure.

[72] Securities Commissions Press release, 5 March 2015

In chapter 5, the liquidity premium hypotheses was examined by testing whether investment opportunities increase with stock liquidity. Becker-Blease and Paul (2006) contend that stock liquidity improvement increases not only assets' value but also firms' investment opportunities. The explanation behind this proposition is based on the argument that a lower cost of capital turns the Net Present Value (NPV) of some investment projects positive, enhancing investment. It is concluded that stock liquidity is important to corporate managers and shareholders because the trading environment of a stock influences corporate investment decisions. This was based on the results of this study which support the view that an increase in stock liquidity enhances investment opportunities as evidenced for stocks added to the mid-cap index.

6.4 Limitations and Future Research

This thesis focuses on the effect of market microstructural changes surrounding index revisions in the Malaysian stock market. Specifically, it investigates stocks added (deleted) to (from) three main indices; KLCI 30, KLCI 70 and Small Cap without considering other indices like Fledgling, ACE, Shariah, CPO and other indices that belong to Bursa Malaysia. The inclusion of Fledglings and ACE indices would allow further investigation on smaller capital and fast growing companies.

It would be interesting to investigate the market efficiency and liquidity effects on stocks which experience investability weight changes (increase or decrease of free float weighting). It is proven that the free-float factor is an important factor affecting liquidity. Furthermore, with recent developments in the Bursa Malaysia index series, especially after adopting the FTSE index methodology, a study about the relationship between investability weight changes and the liquidity effect is particularly important. Issues such as the short-run return, long-run return, relationship between liquidity and free float, and price volatility could be considered. Moreover, there is little empirical evidence in the extant literature with respect to the relationship between investability weight change and market microstructure effects.

The evaluation of liquidity measures comparing Florackis et al.'s (2011) RtoTR and the free-float adjusted RtoTRF liquidity measure introduced in this study shows little difference between them, and they have not been robustly tested in other markets (both emerging and developed markets). This raises the question whether RtoTR and RtoTRF may have an encapsulation power component (better in capturing liquidity changes) when applied in different markets, especially emerging ones.

Future research is encouraged to address the issue, to find whether the RtoTR and RtoTRF contains a sensitivity component (as they are not sized biased and are float adjusted). This would be especially interesting for future attempt to measure liquidity involving fast-growing technology firms (which by default are low in public free-float). Finally, it would be useful to assess whether these two liquidity measures could predict a liquidity crisis using other markets such as the corporate bond market, and to test the new liquidity ratio in other developing markets where public free float can be an issue.

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Appendix

Appendix A

Table A1 shows the data variables structure for the relevant chapters. Chapter three and chapter four use the same data set with the extension of new set of free float data set together with bid-ask data. Chapter five uses the same data set as previous two chapters with the extension of an accounting data set including Tobin's Q, capital expenditure, return on asset, PE Ratio as proxies for investment opportunity along with variables like book to market value of equity, debt to assets, operating income, cash, and total assets. All data are gathered from the Datastream apart from announcement date and effective change date, where information are obtained from FTSE groups and Bursa Malaysia.

Data	**Data Variables**	**Chapter 3 (Empirical Chapter I)**	**Chapter 4 (Empirical Chapter II)**	**Chapter 5 (Empirical Chapter III)**
Announcement Date	AD	X	x	x
Effective Change Date	CD	X		
Price	P	X	x	x
Volume	Vo	X	x	x
Price Index	PI EMAS	X		
Bid	PB		x	
Ask	PA		x	
Strategic Number of Shares	NOSHST		x	
Free Float Employee/Family Held	NOSHEM		x	
Free Float Government Held	NOSHGV		x	
No of shares outstanding	NOSH		x	x
Free Float available for public	NOSHFF		x	x
Capital Expenditure	WC04601			x
Market to Book Value of Equity (MB)	MTBV			x
Total Assets (TA)	WC02999			x
Debt to Assets (DTA)	WC03255 /WC02999			x
PE Ratio (PE)	PE			x
Operating Income (OI)	WC01250			x
Cash	WC02003			x
Return on Assets (ROA)	DPL#((X(WC01250))/(X(WC02999)),6)			x
Tobin's Q (TQ)	DPL#((X(WC08001) + X(WC03351)) / (X(WC03501) + X(WC03351)),6			x

Table 1.1: Data Structure

List of Constituents

Table A1: shows list of stocks added to the KLCI 30 with SEDOL ID, announcement date and effective change date (CD)

No	SEDOL ID	Constituents	AD	CD
1	6602938	Eon Capital	06/07/2006	12/07/2006
2	6695938	Petronas Dagangan	31/10/2006	08/11/2006
3	6556682	Malaysia Airline System	12/06/2007	18/06/2007
4	6359881	GAMUDA	18/06/2007	27/06/2007
5	6910824	UMW HOLDINGS	12/10/2007	18/10/2007

6	6030409	PARKSON HOLDINGS BHD	18/12/2007	24/12/2007
7	6436450	HONG LEONG FINANCIAL	21/05/2008	26/05/2010
8	UKB02JY46	KNM Group Bhd	13/06/2008	23/06/2008
9	6698120	Astro All Asia Networks PLC	11/12/2008	22/12/2008
10	6629335	Nestle Malaysia	10/12/2009	21/12/2009
11	6556682	Malaysian Airline System	10/06/2010	21/06/2010
12	6359881	GAMUDA	14/09/2010	20/09/2010
13	UKB3W5NN7	Malaysia Marine and Heavy Engineering	09/06/2011	20/06/2011
14	UKB03J9L7	AirAsia	08/12/2011	19/11/2011
15	UKB3FKMY3	UEM LAND HOLDINGS	08/12/2011	13/12/2011
16	UKB3YX6Q3	Bumi Armada	08/12/2011	19/11/2011
17	UKB7W5GK3	Astro Malaysia Holdings	13/12/2012	24/12/2012
18	UKB8L1DR5	Felda Global Ventures Holdings	13/12/2012	24/12/2012

Table A2: shows list of stocks added to the KLCI 70 with SEDOL ID, announcement date and effective change date (CD)

No	SEDOL ID	Constituents	AD	CD
1	6480112	KFC Holdings	06/07/2006	12//07/2006
2	UKB02JY46	KNM Group	31/10/2006	08/11/2006
3	6543101	MNRB HOLDINGS	15/11/2006	23/11/2006
4	6609627	MULTIPURPOSE HOLDINGS	30/11/2006	05/12/2006
5	6084622	BATU KAWAN BHD	12/12/2006	18/12/2006
6	6189806	CHEMICAL COMPANY OF MALAYSIA BHD	12/12/2006	18/12/2006
7	6336538	TIME DOTCOM BHD	12/12/2006	18/12/2006
8	6497628	KULIM (M) BHD	12/12/2006	18/12/2006
9	6498933	KUMPULAN GUTHRIE BHD	12/12/2006	18/12/2006
10	6556648	MMC CORPORATION BHD	12/12/2006	18/12/2006
11	6629335	NESTLE (M) BHD	12/12/2006	18/12/2006
12	6771429	WTK HOLDINGS BHD	12/12/2006	18/12/2006
13	6917148	UNITED PLANTATIONS BHD	12/12/2006	18/12/2006
14	6518648	LINGUI	21/03/2007	23/03/2007
15	UKB00MRS2	DIALOG GROUP	09/05/2007	14/05/2007
16	6557867	Malaysian Resources	12/06/2007	18/06/2007
17	6819095	Sunway City	12/06/2007	18/06/2007
18	UKB1DNFN0	E & O Property Development	12/06/2007	18/06/2007
19	UKB1TSHV1	SINO HUA AN INTERNATIONAL	18/06/2007	25/06/2007
20	UKB00LVX2	SAPURACREST PETROLEUM	22/06/2007	02/07/2007
21	UKB1L72X3	KENCANA PETROLEUM	02/07/2007	09/07/2007
22	UKBBP6LY0	WCT ENGINEERING	04/10/2007	09/10/2007
23	6044370	ANN JOO RESOURCES	12/10/2007	18/10/2007
24	6535465	WAH SEONG	12/10/2007	18/10/2007
25	6862709	SUNRISE	12/10/2007	18/10/2007
26	6089360	GUOCOLAND (MALAYSIA) BHD	18/12/2007	24/12/2007
27	6297743	HAP SENG CONSOLIDATED BHD	18/12/2007	24/12/2007
28	6661434	ORIENTAL HOLDINGS BHD	18/12/2007	24/12/2007
29	6791870	BOUSTEAD HEAVY INDUSTRIES CORP BHD	18/12/2007	24/12/2007
30	UKB0RY9Y1	BERJAYA LAND BHD	18/12/2007	24/12/2007
31	UKB0W1VM9	BERJAYA CORPORATION BHD	18/12/2007	24/12/2007
32	UKB11M0Q7	TRADEWINDS PLANTATION BHD	18/12/2007	24/12/2007
33	6720926	IJM PLANTATION	24/12/2007	27/12/2007
34	6592921	LION INDUSTRY	22/05/2008	30/05/2008
35	6500678	NCB HOLDINGS	28/05/2008	02/06/2008
36	6044370	ANN JOO Resources BHD	13/06/2008	23/06/2008
37	6548731	Kinsteel Bhd	13/06/2008	23/06/2008
38	6794062	Boustead Properties Bhd	13/06/2008	23/06/2008
39	6900814	Tradewinds Malaysia Bhd	13/06/2008	23/06/2008
40	UKB28VNR6	Hap Seng Plantations Holdings Bhd	13/06/2008	23/06/2008
41	UKB2R8CT3	Media Chinese International Ltd	13/06/2008	23/06/2008
42	6005991	UEM BUIDERS	07/08/2008	12/08/2008
43	UKB09FGC9	CARLSBERG	22/10/2008	30/10/2008
44	6024996	Amway (Malaysia) Hldgs	11/12/2008	22/12/2008
45	6256948	MTD Infraperdana Bhd	11/12/2008	22/12/2008
46	6479994	JT International Bhd	11/12/2008	22/12/2008
47	6534600	VADS Bhd	11/12/2008	22/12/2008
48	6794040	Selangor Properties Bhd	11/12/2008	22/12/2008
49	6909888	UBG BHD	11/12/2008	22/12/2008
50	6965909	POS Malaysia BHD	11/12/2008	22/12/2008
51	UKB0JVKJ2	Starhill Real Estate Investment Trust	11/12/2008	22/12/2008
52	UKB1YYNJ4	Mah Sing Group BHD	11/12/2008	22/12/2008
53	6770556	SARAWAK OIL PALMS	17/12/2008	23/12/2008
54	6436308	HONG LEONG INDUSTRIES	19/12/2008	21/12/2008
55	6871125	TAN CHONG MOTOR	28/01/2009	06/02/2009
56	6303316	IJM LAND BHD	23/04/2009	28/04/2009

57	UKB3FKMY3	UEM Land Holdings Bhd	11/06/2009	22/06/2009
58	6100379	BIMB HOLDINGS	08/12/2009	11/12/2009
59	6493585	KPJ Healthcare	10/12/2009	21/12/2009
60	UKB00G234	QL Resources	10/12/2009	21/12/2009
61	UKB012521	Mudajaya Group	10/12/2009	21/12/2009
62	UKB2QPJK5	Hartalega Holdings	10/12/2009	21/12/2009
63	6436450	SUPERMAX CORP	21/05/2010	26/05/2010
64	6500678	NCB Holdings	10/06/2010	21/06/2010
65	UKB62JK51	JCY International	10/06/2010	21/06/2010
66	UKB3X17H6	TA GLOBAL	14/09/2010	20/09/2010
67	6336538	TIME DOT COM	27/10/2010	02/11/2010
68	6573335	MTD CAPITAL	03/12/2010	09/12/2010
69	6917148	United Plantations	09/12/2010	20/12/2010
70	UKB3W5NN7	Malaysia Marine And Heavy Engineering Holdings	09/12/2010	20/12/2010
71	UKB62QFR9	Sunway Real Estate Invt Trust	09/12/2010	20/12/2010
72	6900814	TRADEWINDS	15/03/2011	18/03/2011
73	6506007	Krisassets Holdings	09/06/2011	20/06/2011
74	6556789	Malaysia Building Society	09/06/2011	20/06/2011
75	6629335	Nestle (M)	09/06/2011	20/06/2011
76	6825531	Jaya Tiasa Holdings	09/06/2011	20/06/2011
77	UKB11M0Q7	Tradewinds Plantation	09/06/2011	20/06/2011
78	UKB3RZ1Q1	CAPITALMALLS	28/07/2011	02/08/2011
79	6770556	SARAWAK OIL PALMS	06/09/2011	09/09/2011
80	6015611	Padiberas Nasional	08/12/2011	19/12/2011
81	6183499	Ta Ann Holdings	08/12/2011	19/12/2011
82	6468754	Eastern & Oriental	08/12/2011	19/12/2011
83	6592921	LION INDUSTRY	08/12/2011	13/11/2011
84	6868815	SEG International	08/12/2011	19/12/2011
85	6872032	TA Enterprise	08/12/2011	19/12/2011
86	UKB00LVN2	QSR Brands	08/12/2011	19/12/2011
87	UKB053CZ2	TSH Resources	08/12/2011	19/12/2011
88	UKB0DD1H9	Kossan Rubber	08/12/2011	19/12/2011
89	UKB11FKB1	Rimbunan Sawit	08/12/2011	19/12/2011
90	UKB13JSP1	TH Plantations	08/12/2011	19/12/2011
91	UKB142NG5	Dayang Enterprise Holdings	08/12/2011	19/12/2011
92	UKB40GYF8	MSM Malaysia Holdings	08/12/2011	19/12/2011
93	UKB41LHL9	UOA Development	08/12/2011	19/12/2011
94	UKB62JK51	JCY International	08/12/2011	19/12/2011
95	6904021	TDM	24/04/2012	27/04/2012
96	6609597	MULPHA INTERNATIONAL	14/05/2012	17/05/2012
97	UKB29H4P8	AEON Credit Service (M)	07/06/2012	18/06/2012
98	UKB738MG9	China Stationery Limited	07/06/2012	18/06/2012
99	UKB79YDV3	Pavilion Real Estate Inv Trust	07/06/2012	18/06/2012
100	UKB89JCF2	IGB Real Estate Investment Trust	13/12/2012	24/12/2012
101	UKB8FL1M2	Gas Malaysia	13/12/2012	24/12/2012

Table A3: shows list of stocks added to the Small Cap index with SEDOL ID, announcement date and effective change date (CD).

No	SEDOL ID	Constituents	AD	CD
1	6143084	MBf HOLDINGS BHD	12/12/2006	18/12/2006
2	6153362	AHMAD ZAKI RESOURCES BHD	12/12/2006	18/12/2006
3	6182861	CAHYA MATA SARAWAK BHD	12/12/2006	18/12/2006
4	6242301	CYCLE & CARRIAGE BINTANG BHD	12/12/2006	18/12/2006
5	6308173	ENG TEKNOLOGI HOLDINGS BHD	12/12/2006	18/12/2006
6	6310985	FABER GROUP BHD	12/12/2006	18/12/2006
7	6321590	ESSO MALAYSIA BHD	12/12/2006	18/12/2006
8	6331931	FAR EAST HOLDINGS BHD	12/12/2006	18/12/2006
9	6339247	KARAMBUNAI CORP BHD	12/12/2006	18/12/2006
10	6381356	TEBRAU TEGUH BHD	12/12/2006	18/12/2006
11	6399111	GUTHRIE ROPEL BHD	12/12/2006	18/12/2006
12	6433019	KSL HOLDINGS BHD	12/12/2006	18/12/2006
13	6478816	JERNEH ASIA BHD	12/12/2006	18/12/2006
14	6479994	JT INTERNATIONAL BHD	12/12/2006	18/12/2006
15	6486615	K & N KENANGA HOLDINGS BHD	12/12/2006	18/12/2006
16	6495633	KLUANG RUBBER CO (M) BHD	12/12/2006	18/12/2006
17	6502005	KONSORTIUM LOGISTIK BHD	12/12/2006	18/12/2006
18	6506007	KRISASSETS HOLDINGS BHD	12/12/2006	18/12/2006
19	6518648	LINGUI DEVELOPMENT BHD	12/12/2006	18/12/2006
20	6548731	KINSTEEL BHD	12/12/2006	18/12/2006
21	6556585	MALAYAN FLOUR MILLS BHD	12/12/2006	18/12/2006
22	6556789	MALAYSIA BUILDING SOCIETY BHD	12/12/2006	18/12/2006
23	6559573	MAMEE-DOUBLE DECKER (M) BHD	12/12/2006	18/12/2006
24	6573335	MTD CAPITAL BHD	12/12/2006	18/12/2006
25	6603362	NTPM HOLDINGS BHD	12/12/2006	18/12/2006
26	6716055	LEWEKO RESOURCES BHD	12/12/2006	18/12/2006
27	6770556	SARAWAK OIL PALMS BHD	12/12/2006	18/12/2006
28	6791427	SALCON BHD	12/12/2006	18/12/2006
29	6801519	SHANGRI-LA HOTELS (M) BHD	12/12/2006	18/12/2006
30	6812328	COSWAY CORPORATION BHD	12/12/2006	18/12/2006
31	6856865	SUBUR TIASA HOLDINGS BHD	12/12/2006	18/12/2006
32	6860684	SUNGEI BAGAN RUBBER CO (M) BHD	12/12/2006	18/12/2006
33	6904021	TDM BHD	12/12/2006	18/12/2006
34	6914451	UTUSAN MELAYU (M) BHD	12/12/2006	18/12/2006
35	6989200	HLG CAPITAL BHD	12/12/2006	18/12/2006
36	UKB00LVN2	QSR BRANDS BHD	12/12/2006	18/12/2006
37	UKB012W31	RCE CAPITAL BHD	12/12/2006	18/12/2006
38	UKB01J599	METACORP BHD	12/12/2006	18/12/2006
39	UKB036QH3	JAVA INCORPORATED BHD	12/12/2006	18/12/2006
40	UKB03GWH5	COASTAL CONTRACTS BHD	12/12/2006	18/12/2006
41	UKB05F2W5	ACOUSTECH BHD	12/12/2006	18/12/2006
42	UKB09MBH0	TANJUNG OFFSHORE BHD	12/12/2006	18/12/2006

43	UKB0DQSM2	TALIWORKS CORPORATION BHD	12/12/2006	18/12/2006
44	UKB0S5CY4	BERJAYA CAPITAL BHD	12/12/2006	18/12/2006
45	UKB11FKB1	RIMBUNAN SAWIT BHD	12/12/2006	18/12/2006
46	UKB11M0Q7	TRADEWINDS PLANTATION BHD	12/12/2006	18/12/2006
47	UKB11YC23	TOWER REAL ESTATE INVESTMENT TRUST	12/12/2006	18/12/2006
48	UKB13JSP1	TH PLANTATIONS BHD	12/12/2006	18/12/2006
49	UKB19CNZ9	ALAM MARITIM RESOURCES BHD	12/12/2006	18/12/2006
50	UKB1G2H05	SWEE JOO BHD	12/12/2006	18/12/2006
51	UKB1G3BD9	PUTRAJAYA PERDANA BHD	12/12/2006	18/12/2006
52	UKB1LYZG8	HOVID BHD	12/12/2006	18/12/2006
53	6417176	Cepatwawasan Group	12/06/2007	18/06/2007
54	UKB1L72X3	Kencana Petroleum	12/06/2007	18/06/2007
55	UKB1W2P83	Bonia Corp	12/06/2007	18/06/2007
56	6024996	AMWAY (M) HOLDINGS BHD	18/12/2007	24/12/2007
57	6045470	APOLLO FOOD HOLDINGS BHD	18/12/2007	24/12/2007
58	6069061	TAHPS GROUP BHD	18/12/2007	24/12/2007
59	6100379	BIMB HOLDINGS BHD	18/12/2007	24/12/2007
60	6110668	BOLTON BHD	18/12/2007	24/12/2007
61	6117551	KUMPULAN HARTANAH SELANGOR BHD	18/12/2007	24/12/2007
62	6137311	MANULIFE INSURANCE (M) BHD	18/12/2007	24/12/2007
63	6175407	WHITE HORSE BHD	18/12/2007	24/12/2007
64	6228163	COUNTRY HEIGHTS HOLDINGS BHD	18/12/2007	24/12/2007
65	6258739	GOLDEN PLUS HOLDINGS BHD	18/12/2007	24/12/2007
66	6364131	NEXNEWS BHD	18/12/2007	24/12/2007
67	6365491	LAND & GENERAL BHD	18/12/2007	24/12/2007
68	6371658	GLENEALY PLANTATIONS (M) BHD	18/12/2007	24/12/2007
69	6389651	ENCORP BHD	18/12/2007	24/12/2007
70	6407122	HAI-O ENTERPRISE BHD	18/12/2007	24/12/2007
71	6474137	DIJAYA CORPORATION BHD	18/12/2007	24/12/2007
72	6490456	DAMANSARA REALTY BHD	18/12/2007	24/12/2007
73	6492333	PAN MALAYSIA CAPITAL BHD	18/12/2007	24/12/2007
74	6498717	KRETAM HOLDINGS BHD	18/12/2007	24/12/2007
75	6500678	NCB HOLDINGS BHD	18/12/2007	24/12/2007
76	6513568	LADANG PERBADANAN - FIMA BHD	18/12/2007	24/12/2007
77	6520579	MUTIARA GOODYEAR DEVELOPMENT BHD	18/12/2007	24/12/2007
78	6534592	TRC SYNERGY BHD	18/12/2007	24/12/2007
79	6536510	LOH & LOH CORPORATION BHD	18/12/2007	24/12/2007
80	6552282	MALAYSIA SMELTING CORPORATION BHD	18/12/2007	24/12/2007
81	6628150	NEGRI SEMBILAN OIL PALMS BHD	18/12/2007	24/12/2007
82	6666592	WIJAYA BARU GLOBAL BHD	18/12/2007	24/12/2007
83	6668781	PAN MALAYSIAN INDUSTRIES BHD	18/12/2007	24/12/2007
84	6692768	EQUINE CAPITAL BHD	18/12/2007	24/12/2007
85	6729053	LCL CORPORATION BHD	18/12/2007	24/12/2007
86	6731371	RELIANCE PACIFIC BHD	18/12/2007	24/12/2007
87	6787590	SHL CONSOLIDATED BHD	18/12/2007	24/12/2007

88	6794017	SELANGOR DREDGING BHD	18/12/2007	24/12/2007
89	6794062	BOUSTEAD PROPERTIES BHD	18/12/2007	24/12/2007
90	6808123	SYARIKAT TAKAFUL MALAYSIA BHD	18/12/2007	24/12/2007
91	6824260	SOUTHERN ACIDS (M) BHD	18/12/2007	24/12/2007
92	6870230	AMDB BHD	18/12/2007	24/12/2007
93	6874544	GOLDIS BHD	18/12/2007	24/12/2007
94	6900814	TRADEWINDS (M) BHD	18/12/2007	24/12/2007
95	6914428	UAC BHD	18/12/2007	24/12/2007
96	6916598	UNITED MALAYAN LAND BHD	18/12/2007	24/12/2007
97	6916684	UNITED MALACCA BHD	18/12/2007	24/12/2007
98	6981466	WORLDWIDE HOLDINGS BHD	18/12/2007	24/12/2007
99	UKB01QKV7	CCM DUOPHARMA BIOTECH BHD	18/12/2007	24/12/2007
100	UKB05DWZ2	D & O VENTURES BHD	18/12/2007	24/12/2007
101	UKB05KKM6	A & M REALTY BHD	18/12/2007	24/12/2007
102	UKB064DY0	MALAYSIA STEEL WORKS (KL)BHD	18/12/2007	24/12/2007
103	UKB06K0B4	ALIRAN IHSAN RESOURCES BHD	18/12/2007	24/12/2007
104	UKB0984J1	GREEN PACKET BHD	18/12/2007	24/12/2007
105	UKB0B7W58	INDUSTRIAL CONCRETE PRODUCTS BHD	18/12/2007	24/12/2007
106	UKB0CGYN6	CNI HOLDINGS BHD	18/12/2007	24/12/2007
107	UKB188WD9	FAVELLE FAVCO BHD	18/12/2007	24/12/2007
108	UKB1BL6J9	AL-'AQAR KPJ REIT	18/12/2007	24/12/2007
109	UKB1M32W9	QUILL CAPITA TRUST	18/12/2007	24/12/2007
110	UKB1RM6F2	PANTECH GROUP HOLDINGS BHD	18/12/2007	24/12/2007
111	UKB1V7KX9	MYCOM BHD	18/12/2007	24/12/2007
112	UKB1Y9MF8	DELEUM BHD	18/12/2007	24/12/2007
113	UKB2369M3	PETRA ENERGY BHD	18/12/2007	24/12/2007
114	UKB23WT10	SARAWAK PLANTATION BHD	18/12/2007	24/12/2007
115	6422534	Hexagon Holdings BHD	13/06/2008	23/06/2008
116	6507204	Supportive International Holdings BHD	13/06/2008	23/06/2008
117	6731036	Dreamgate Corp Bhd	13/06/2008	23/06/2008
118	UKB03FFT5	Progressive Impact Corp Bhd	13/06/2008	23/06/2008
119	UKB03HJ88	JobStreet Corp Bhd	13/06/2008	23/06/2008
120	UKB142NG5	Dayang Enterprise Holdings Bhd	13/06/2008	23/06/2008
121	UKB29H4P8	Aeon Credit Service M Bhd	13/06/2008	23/06/2008
122	UKB2QPJK5	Hartalega Holdings Bhd	13/06/2008	23/06/2008
123	6010973	Ajinomoto Malaysia Bhd	11/12/2008	22/12/2008
124	6191157	Chin Teck Plantations BHD	11/12/2008	22/12/2008
125	6202963	Warisan TC Holdings Bhd	11/12/2008	22/12/2008
126	6380825	Grand Central Enterprises Bhd	11/12/2008	22/12/2008
127	6493488	KKB Engineering BHD	11/12/2008	22/12/2008
128	6534451	Engtex Group Bhd	11/12/2008	22/12/2008
129	6534644	Atis Corp Bhd	11/12/2008	22/12/2008
130	6552464	Allianz Malaysia Bhd	11/12/2008	22/12/2008
131	6609230	Muda Holdings Bhd	11/12/2008	22/12/2008
132	6772325	Saag Consolidated M Bhd	11/12/2008	22/12/2008

133	6868592	Kurnia Setia BHD	11/12/2008	22/12/2008
134	6904504	M3nergy Bhd	11/12/2008	22/12/2008
135	UKB197XV0	Wellcall Holdings Bhd	11/12/2008	22/12/2008
136	UKB1KKH50	Hektar Real Estate Investment Trust	11/12/2008	22/12/2008
137	UKB1LB9J0	AmFirst Real Estate Investment Trust	11/12/2008	22/12/2008
138	UKB1QSFL0	Al-Hadharah Boustead REIT	11/12/2008	22/12/2008
139	UKB1WD8F4	Zhulian Corp Bhd	11/12/2008	22/12/2008
140	UKB3B1WB7	Perwaja Holdings Bhd	11/12/2008	22/12/2008
141	UKB3BPBW3	Sealink International Bhd	11/12/2008	22/12/2008
142	UKB6ZS981	Metrod Malaysia BHD	11/12/2008	22/12/2008
143	6095969	Fajarbaru Builder Group Bhd	11/06/2009	03/08/2009
144	6098452	Scomi Engineering BHD	11/06/2009	03/08/2009
145	6457570	Tanah Emas Corp BHD	11/06/2009	03/08/2009
146	6506580	Latexx Partners BHD	11/06/2009	03/08/2009
147	6567929	Eden Inc Bhd	11/06/2009	03/08/2009
148	6573175	Formis Resources Bhd	11/06/2009	03/08/2009
149	6696726	Lion Forest Industries BHD	11/06/2009	03/08/2009
150	6742715	Rapid Synergy BHD	11/06/2009	03/08/2009
151	UKB05R232	Ramunia Holdings Bhd	11/06/2009	03/08/2009
152	UKB0LSTW7	TMC Life Sciences Bhd	11/06/2009	22/06/2009
153	6038210	Atlan Holdings	10/12/2009	21/12/2009
154	6045470	Apollo Food Holdings	10/12/2009	21/12/2009
155	6110668	Bolton	10/12/2009	21/12/2009
156	6130923	Brem Holding	10/12/2009	21/12/2009
157	6137311	Manulife Holdings	10/12/2009	21/12/2009
158	6143084	MBF Holdings	10/12/2009	21/12/2009
159	6202792	APM Automotive Holdings	10/12/2009	21/12/2009
160	6232777	Crescendo Corp	10/12/2009	21/12/2009
161	6252195	Daibochi Plastic & Packaging	10/12/2009	21/12/2009
162	6296900	Hup Seng Industries	10/12/2009	21/12/2009
163	6361875	Integrax	10/12/2009	21/12/2009
164	6363763	Century Logistics Holdings	10/12/2009	21/12/2009
165	6381970	GUH Holdings	10/12/2009	21/12/2009
166	6474773	Johan Holdings	10/12/2009	21/12/2009
167	6478816	Jerneh Asia	10/12/2009	21/12/2009
168	6490092	George Kent Malaysia	10/12/2009	21/12/2009
169	6506007	KrisAssets Holdings	10/12/2009	21/12/2009
170	6507204	Supportive International Holdings	10/12/2009	21/12/2009
171	6534945	Three-A Resources	10/12/2009	21/12/2009
172	6543101	MNRB Holdings	10/12/2009	21/12/2009
173	6559573	Mamee Double Decker	10/12/2009	21/12/2009
174	6575740	Mega First Corp	10/12/2009	21/12/2009
175	6579678	Metro Kajang Holdings	10/12/2009	21/12/2009
176	6603362	NTPM Holdings	10/12/2009	21/12/2009
177	6670236	Paramount Corp	10/12/2009	21/12/2009

178	6674904	Protasco	10/12/2009	21/12/2009
179	6742469	Riverview Rubber Estates	10/12/2009	21/12/2009
180	6759254	Rubberex Corp	10/12/2009	21/12/2009
181	6989200	HLG Capital	10/12/2009	21/12/2009
182	UKB01S2P1	Perisai Petroleum Teknologi	10/12/2009	21/12/2009
183	UKB01WHW5	HIL Industries	10/12/2009	21/12/2009
184	UKB03XKB6	DFZ Capital	10/12/2009	21/12/2009
185	UKB05Q488	Kurnia Asia	10/12/2009	21/12/2009
186	UKB09YCC8	Notion VTEC	10/12/2009	21/12/2009
187	UKB0CMD04	Daya Materials	10/12/2009	21/12/2009
188	UKB16TVC6	Adventa	10/12/2009	21/12/2009
189	UKB18TLC4	Frontken Corp	10/12/2009	21/12/2009
190	UKB1KL2D6	My EG Services	10/12/2009	21/12/2009
191	UKB1LJQ04	Amanahraya Real Estate Investment Trust	10/12/2009	21/12/2009
192	UKB1V74R1	Olympia Industries	10/12/2009	21/12/2009
193	UKB1VZ5G1	Scientex	10/12/2009	21/12/2009
194	UKB1XFDH6	Natural Bio Resources	10/12/2009	21/12/2009
195	UKB2NPQ18	Key Asic	10/12/2009	21/12/2009
196	UKB3PXLK1	XingQuan International Sports Holdings Ltd	10/12/2009	21/12/2009
197	UKB42P5K5	Multi Sports Holdings Ltd	10/12/2009	21/12/2009
198	6113429	VS Industry	10/06/2010	21/06/2010
199	6159906	C.I. Holdings	10/06/2010	21/06/2010
200	6173683	Harrisons Hldgs	10/06/2010	21/06/2010
201	6214106	Perusahaan Sadur Timah Malay	10/06/2010	21/06/2010
202	6248826	Apex Healthcare	10/06/2010	21/06/2010
203	6264996	Pie Industrial	10/06/2010	21/06/2010
204	6289160	Dutch Lady Milk Industries	10/06/2010	21/06/2010
205	6290924	Delloyd Ventures	10/06/2010	21/06/2010
206	6348395	Formosa Prosonic	10/06/2010	21/06/2010
207	6364302	General Corp	10/06/2010	21/06/2010
208	6428877	Hirotako Hldgs	10/06/2010	21/06/2010
209	6436308	Hong Leong Industries	10/06/2010	21/06/2010
210	6474137	Dijaya Corp	10/06/2010	21/06/2010
211	6486712	Keck Seng Malaysia	10/06/2010	21/06/2010
212	6525790	Magna Prima	10/06/2010	21/06/2010
213	6534644	Atis Corp	10/06/2010	21/06/2010
214	6550327	MBM Resources	10/06/2010	21/06/2010
215	6573335	MTD Capital	10/06/2010	21/06/2010
216	6583486	Fima Corp	10/06/2010	21/06/2010
217	6620015	MWE Holdings	10/06/2010	21/06/2010
218	6794017	Selangor Dredging	10/06/2010	21/06/2010
219	6856865	Subur Tiasa Holdings	10/06/2010	21/06/2010
220	6868815	SEG International	10/06/2010	21/06/2010
221	6987442	Yee Lee Corp	10/06/2010	21/06/2010
222	UKB01QKV7	CCM Duopharma Biotech	10/06/2010	21/06/2010

223	UKB03HJ88	JobStreet Corp	10/06/2010	21/06/2010
224	UKB05DWZ2	D&O Ventures	10/06/2010	21/06/2010
225	UKB05F1C8	Cocoaland Holdings	10/06/2010	21/06/2010
226	UKB05KKM6	A&M Realty	10/06/2010	21/06/2010
227	UKB06K0B4	Aliran Ihsan Resources	10/06/2010	21/06/2010
228	UKB0DQSM2	Taliworks Corp	10/06/2010	21/06/2010
229	UKB0VY4Z3	UOA Real Estate Investment Trust	10/06/2010	21/06/2010
230	UKB123VH7	ETI Tech	10/06/2010	21/06/2010
231	UKB1W2P83	Bonia Corp	10/06/2010	21/06/2010
232	UKB23WT10	Sarawak Plantation	10/06/2010	21/06/2010
233	UKB2Q1KT9	SLP Resources	10/06/2010	21/06/2010
234	UKB3X17H6	TA Global	10/06/2010	21/06/2010
235	6047465	Asia File Corporation	09/12/2010	20/12/2010
236	6089360	Guocoland (Malaysia)	09/12/2010	20/12/2010
237	6358598	Malton	09/12/2010	20/12/2010
238	6378596	Gopeng	09/12/2010	20/12/2010
239	6379652	Goh Ban Huat	09/12/2010	20/12/2010
240	6479585	TSM Global	09/12/2010	20/12/2010
241	6526027	Silver Bird Group	09/12/2010	20/12/2010
242	6693589	KYM Holdings	09/12/2010	20/12/2010
243	6794040	Selangor Properties	09/12/2010	20/12/2010
244	6824260	Southern Acids (M)	09/12/2010	20/12/2010
245	6874704	Tasek Corporation	09/12/2010	20/12/2010
246	6986223	Yeo Hiap Seng (M)	09/12/2010	20/12/2010
247	UKB0742L9	Guan Chong	09/12/2010	20/12/2010
248	UKB1XL5X4	Help International Corporation	09/12/2010	20/12/2010
249	UKB3P45R9	Masterskill Education Group	09/12/2010	20/12/2010
250	UKB3RZ1Q1	Capitamalls Malaysia Trust	09/12/2010	20/12/2010
251	UKB3ZB1D8	Ivory Properties Group	09/12/2010	20/12/2010
252	UKB42SX77	Berjaya Retail	09/12/2010	20/12/2010
253	UKB4N1F35	K-Star Sports Limited	09/12/2010	20/12/2010
254	UKB56H333	Shin Yang Shipping Corp	09/12/2010	20/12/2010
255	UKB60JFL4	Kimlun Corporation	09/12/2010	20/12/2010
256	6015611	Padiberas Nasional	09/06/2011	20/06/2011
257	6130923	Brem Holdings	09/06/2011	20/06/2011
258	6175407	White Horse	09/06/2011	20/06/2011
259	6183499	Ta Ann Holdings	09/06/2011	20/06/2011
260	6228163	Country Heights Holdings	09/06/2011	20/06/2011
261	6299910	Ho Wah Genting	09/06/2011	20/06/2011
262	6410391	Pacificmas	09/06/2011	20/06/2011
263	6449179	Hwang-Dbs (M)	09/06/2011	20/06/2011
264	6475806	Sinotop Holdings	09/06/2011	20/06/2011
265	6504283	Kwantas Corporation	09/06/2011	20/06/2011
266	6599074	Mitrajaya Holdings	09/06/2011	20/06/2011
267	6692326	Pls Plantations	09/06/2011	20/06/2011

268	6770556	Sarawak Oil Palms	09/06/2011	20/06/2011
269	UKB053CZ2	Tsh Resources	09/06/2011	20/06/2011
270	UKB0KLDR0	Vitrox Corporation	09/06/2011	20/06/2011
271	UKB1C3ZB9	Fitters Diversified	09/06/2011	20/06/2011
272	UKB1LJQ04	Amanahraya Reits	09/06/2011	20/06/2011
273	UKB3SQ4Z3	Century Software Holdings	09/06/2011	20/06/2011
274	UKB3ZH2K0	Cypark Resources	09/06/2011	20/06/2011
275	UKB4RLHP7	Sozo Global Limited	09/06/2011	20/06/2011
276	UKB590KC7	China Ouhua Winery Hldgs Ltd	09/06/2011	20/06/2011
277	UKB65MJQ1	Benalec Holdings	09/06/2011	20/06/2011
278	6449425	Meda Inc	08/12/2011	19/12/2011
279	UKB3X8MB6	Sarawak Cable	08/12/2011	19/12/2011
280	UKB5VN637	Hibiscus Petroleum	08/12/2011	19/12/2011
281	UKB607KN5	Oldtown	08/12/2011	19/12/2011
282	6312033	Mhc Plantations	07/06/2012	18/06/2012
283	6548719	Hua Yang	07/06/2012	18/06/2012
284	6556585	Malayan Flour Mills	07/06/2012	18/06/2012
285	6677215	Pacific & Orient	07/06/2012	18/06/2012
286	6693266	Pintaras Jaya	07/06/2012	18/06/2012
287	6892160	Naim Indah Corp	07/06/2012	18/06/2012
288	6986223	Yeo Hiap Seng (M)	07/06/2012	18/06/2012
289	6986717	Yinson Holdings	07/06/2012	18/06/2012
290	UKB03DHR1	SKP Resources	07/06/2012	18/06/2012
291	UKB56H333	Shin Yang Shipping Corp	07/06/2012	18/06/2012
292	UKB6ZRLP9	Sentoria Group	07/06/2012	18/06/2012
293	6081593	Scomi Marine	13/12/2012	24/12/2012
294	6180865	Pharmaniaga	13/12/2012	24/12/2012
295	6791870	Boustead Heavy Industries Corp	13/12/2012	24/12/2012
296	UKB00NYQ2	Globetronics Technology	13/12/2012	24/12/2012
297	UKB0CSZR3	Can-One	13/12/2012	24/12/2012
298	UKB1WD8F4	Zhulian Corporation	13/12/2012	24/12/2012
299	UKB1XFDH6	Power Root	13/12/2012	24/12/2012
300	UKB1Y9MF8	Deleum	13/12/2012	24/12/2012
301	UKB58PZN9	Berjaya Food	13/12/2012	24/12/2012
302	UKB6WFG06	Prestariang	13/12/2012	24/12/2012
303	UKB7RKJT3	Gabungan Aqrs	13/12/2012	24/12/2012
304	UKB8F0GN5	Globaltec Formation	13/12/2012	24/12/2012

Table A4: shows list of stocks deleted from the KLCI 30 with SEDOL ID, announcement date and effective change date (CD).

No	SEDOL ID	Constituents	AD	CD
1	6602938	EON Capital	12/06/2007	18/06/2007
2	6698120	ASTRO ALL ASIA NETWORKS PLC	18/12/2007	24/12/2007
3	6436450	HONG LEONG FINANCIAL	16/04/2008	23/04/2008
4	6359881	Gamuda Bhd	13/06/2008	23/06/2008
5	UKB02JY46	KNM Group Bhd	11/12/2008	22/12/2008
6	6556682	MALAYSIAN AIRLINES SYSTEM	11/11/2009	20/11/2009
7	6030409	Parkson Holdings	10/12/2009	21/12/2009
8	6629335	Nestle (Malaysia)	10/06/2010	21/06/2010
9	6331566	BERJAYA TOTO	19/11/2010	29/11/2010
10	6556682	Malaysian Airline System	09/06/2011	20/06/2011
11	6359881	Gamuda	08/12/2011	19/11/2011
12	6557997	MISC	08/12/2011	19/11/2011
13	6556648	MMC	25/07/2012	01/08/2012
14	UKB03J9L7	AirAsia	13/12/2012	24/12/2012
15	UKB3W5NN7	Malaysia Marine and Heavy Engineering Holdings	13/12/2012	24/12/2012

Table A5: shows list of stocks deleted from the KLCI 70 with SEDOL ID, announcement date and effective change date (CD).

No	SEDOL ID	Constituents	AD	CD
1	6024996	AMWAY (M) HOLDINGS BHD	12/12/2006	18/12/2006
2	6081593	SCOMI MARINE BHD	12/12/2006	18/12/2006
3	6543101	MNRB HOLDINGS BHD	12/12/2006	18/12/2006
4	6680116	MK LAND HOLDINGS BHD	12/12/2006	18/12/2006
5	6691464	NAIM CENDERA HOLDINGS BHD	12/12/2006	18/12/2006
6	6794040	SELANGOR PROPERTIES BHD	12/12/2006	18/12/2006
7	6871125	TAN CHONG MOTOR HOLDINGS BHD	12/12/2006	18/12/2006
8	UKB039VT9	SIN CHEW MEDIA CORPORATION BHD	12/12/2006	18/12/2006
9	UKB0JVKJ2	STARHILL REAL ESTATE INVESTMENT TRUST	12/12/2006	18/12/2006
10	6256948	MTD Infraperdana	12/06/2007	18/06/2007
11	6410391	Pacificmas	12/06/2007	18/06/2007
12	6556682	Malaysia Airline System	12/06/2007	18/06/2007
13	UKB00PSW2	Uchi Technology	12/06/2007	18/06/2007
14	6005991	UEM BUILDERS BHD	18/12/2007	24/12/2007
15	6044370	ANN JOO RESOURCES BHD	18/12/2007	24/12/2007
16	6189806	CHEMICAL COMPANY OF MALAYSIA BHD	18/12/2007	24/12/2007
17	6518648	LINGUI DEVELOPMENT BHD	18/12/2007	24/12/2007
18	6771429	WTK HOLDINGS BHD	18/12/2007	24/12/2007
19	6905477	TRANSMILE GROUP BHD	18/12/2007	24/12/2007
20	UKB09FGC9	CARLSBERG BREWERY MALAYSIA BHD	18/12/2007	24/12/2007
21	UKB1TSHV1	SINO HUA-AN INTERNATIONAL BHD	18/12/2007	24/12/2007
22	6909888	UBG BHD	16/04/2008	23/04/2008
23	6089360	GuocoLand Malaysia Bhd	13/06/2008	23/06/2008
24	6192859	Lion Diversified Holdings BHD	13/06/2008	23/06/2008
25	6336538	Time DotCom Bhd	13/06/2008	23/06/2008
26	6862709	Sunrise BHD	13/06/2008	23/06/2008
27	6965909	POS Malaysia BHD	13/06/2008	23/06/2008
28	UKB00PKJ3	Scomi Group Bhd	13/06/2008	23/06/2008
29	UKB02JY46	KNM Group Bhd	13/06/2008	23/06/2008
30	6436308	Hong Leong Industries Bhd	11/12/2008	22/12/2008
31	6522672	LPI Capital Bhd	11/12/2008	22/12/2008
32	6548731	Kinsteel Bhd	11/12/2008	22/12/2008
33	6592921	Lion Industries Corp Bhd	11/12/2008	22/12/2008
34	6609597	Mulpha International Bhd	11/12/2008	22/12/2008
35	6629335	Nestle Malaysia Bhd	11/12/2008	22/12/2008
36	6698120	Astro All Asia Networks PLC	11/12/2008	22/12/2008
37	6904690	Zelan Bhd	11/12/2008	22/12/2008
38	UKB05Q488	Kurnia Asia Bhd	11/12/2008	22/12/2008
39	UKB0RY9Y1	Berjaya Land Bhd	11/12/2008	22/12/2008
40	6183499	Ta Ann Holdings Bhd	11/06/2009	22/06/2009
41	6900814	TRADEWINDS	11/11/2009	20/11/2009
42	6500678	NCB Holdings	10/12/2009	21/12/2009
43	6661434	Oriental Holdings	10/12/2009	21/12/2009
44	6770556	Sarawak Oil Palms	10/12/2009	21/12/2009
45	6794040	Selangor Properties	10/12/2009	21/12/2009

46	6917148	United Plantations	10/12/2009	21/12/2009
47	6556682	Malaysian Airline System	10/06/2010	21/06/2010
48	UKB11M0Q7	Tradewinds Plantation	10/06/2010	21/06/2010
49	6791870	BOUSTEAD HEAVY INDUSTRIES	19/11/2010	29/11/2010
50	6024996	Amway (Malaysia) Holdings	09/12/2010	20/12/2010
51	UKB0JVKJ2	Starhill Real Estate Investment Trust	09/12/2010	20/12/2010
52	UKB1SC1H8	Puncak Niaga Holdings	09/12/2010	20/12/2010
53	6084622	Batu Kawan	09/06/2011	20/06/2011
54	6556693	Malaysian Pacific Industries	09/06/2011	20/06/2011
55	6803504	Shell Refining Co (F.O.M.)	09/06/2011	20/06/2011
56	6872032	Ta Enterprise	09/06/2011	20/06/2011
57	UKB3W5NN7	Malaysia Marine and Heavy Engineering	09/06/2011	20/06/2011
58	UKB62JK51	JCY International	09/06/2011	20/06/2011
59	6345697	Bintulu Port Holdings	08/12/2011	19/12/2011
60	6397803	Guinness Anchor	08/12/2011	19/12/2011
61	6479994	JT International	08/12/2011	19/12/2011
62	6500678	NCB Holdings	08/12/2011	19/12/2011
63	6505491	Lingkaran Trans Kota Holdings	08/12/2011	19/12/2011
64	6506007	KrisAssets Holdings	08/12/2011	19/12/2011
65	6506160	Aeon CO. (M)	08/12/2011	19/12/2011
66	6629335	Nestle (Malaysia)	08/12/2011	19/12/2011
67	6825531	Jaya Tiasa Hldgs	08/12/2011	19/12/2011
68	6841571	Star Publications Malaysia	08/12/2011	19/12/2011
69	6917148	United Plantations	08/12/2011	19/12/2011
70	UKB01GQT7	YTL Cement	08/12/2011	19/12/2011
71	UKB03J9L7	AirAsia	08/12/2011	19/12/2011
72	UKB3RZ1Q1	Capitamalls Malaysia Trust	08/12/2011	19/12/2011
73	UKB62QFR9	Sunway Real Estate Investment Trust	08/12/2011	19/12/2011
74	6009454	Affin Holdings	07/06/2012	18/06/2012
75	6535465	Wah Seong	07/06/2012	18/06/2012
76	UKB02JY46	KNM Group	07/06/2012	18/06/2012
77	6592921	LION INDUSTRIES	25/07/2012	01/08/2012
78	6044370	Ann Joo Resource	13/12/2012	24/12/2012
79	6555946	Fraser & Neave Holdings	13/12/2012	24/12/2012
80	6871125	Tan Chong Motor Holdings	13/12/2012	24/12/2012
81	6872032	TA Enterprise	13/12/2012	24/12/2012

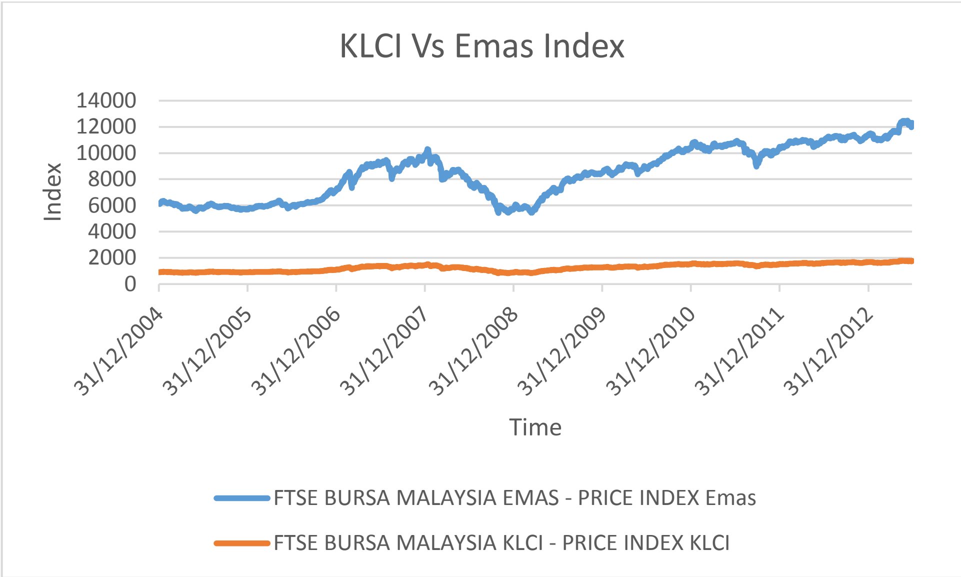

Figure A1: Daily Stock Price Index for FTSE Bursa Malaysia KLCI vs EMAS index

Appendix B

Table B1: Summary Overview of Main Test Statistics[73]

#	Name [synonym]	Key Reference	Strengths	Weaknesses
1	T test		• Simplicity	• Prone to cross-sectional correlation and volatility changes.
2	Cross-Sectional Test			
3	Time-Series Standard Deviation Test			
4	Patell Test	Patell (1976)	• Immune to the way in which ARs are distributed across the (cumulated) event window.	• Prone to cross-sectional correlation and event-induced volatility.
5	Adjusted Patell Test	Kolari and Pynnönen (2010)	• Same as Patell • Immune to cross-sectional correlation	
6	Standardized Cross-Sectional Test	Boehmer, Musumeci and Poulsen (1991)	• Immune to the way in which ARs are distributed across the (cumulated) event window. • Accounts for event-induced volatility. • Accounts for serial correlation.	• Prone to cross-sectional correlation.
7	Adjusted Standardized Cross-Section Test	Kolari and Pynnönen (2010)	Adjusted StdCSect Z	• Accounts additional for cross-correlation.
8	Skewness Corrected Test	Hall (1992)	Skewness Corrected T	• Corrects the test statisitcs for skewed distributions.
9	Jackknife Test	Giaccotto and Sfiridis (1996)	Jackknife T	

[73]Muller S. (2015) "Significance Tests for Event Studies".

Nonparametric Tests				
10	Corrado Rank Test	Corrado and Zivney (1992)		• Loses power for longer CARs (e.g., [-10,10]).
11	Generalized Rank Test	Kolari and Pynnönen (2011)	Accounts for • cross-correlation of returns, • returns serial correlation • and event-induced volatility.	
12	Generalized Rank Test	Kolari and Pynnönen (2011)		
13	Sign Test	Cowan (1992)	• Accounts for skewness in security returns.	• Poor performance for longer event windows
14	Cowan Generalized Sign Test	Cowan (1992)		
15	Wilcoxon signed-rank Test	Wilcoxon (1945)	• Considers that both the sign and the magnitude of ARs are important.	

Parametric Test Statistics

T test

Test statistics for single stocks in each time point t . The Null is: $H0$:ARi,t=0,

$$t_{AR_t} = \sqrt{N}\,\frac{AR_t}{S_{AR_t}}, \tag{1}$$

where S_{ARi} is the standard deviation of the abnormal returns in the estimation window,

$$S^2{}_{AR_t} = \frac{1}{M_i - 2}\sum_{t=T_0}^{T_1}(AR_{i,t})^2, \tag{2}$$

Second, I provide t statistics of the cumulative abnormal returns for each stock. The t statistic and the Null $H0$:$CARi$=0 is defined as:

$$t_{CAR} = \frac{CAR_i}{S_{CAR}}, \tag{3}$$

where

$$S^2{}_{CAR} = L_2 S^2{}_{AR_{i,}}, \tag{4}$$

T test Cross Sectional (Time Series)

A simple test for testing $H_0 : CAR =$ is given by

$$t_{CAR_t} = \sqrt{N}\,\frac{CAR_t}{S_{CAR_t}}, \tag{5}$$

where S_{CARt} is the standard deviation across firms at time t:

$$S^2{}_{CAR_t} = \frac{1}{N-1}\sum_{i=1}^{N}(AR_{i,t} - CAR_{i,t})^2, \tag{6}$$

Test statistic for testing $H_0 : MCAR =$ is given by

$$t_{MCAR_t} = \sqrt{N}\,\frac{MCAR_t}{S_{MCAR_t}}, \tag{7}$$

where S_{MCARt} is the standard deviation of the mean cumulative abnormal returns

$$S^2{}_{MCAR_t} = \frac{1}{N-1}\sum_{i=1}^{N}(CAR_{i,t} - MCAR_{i,t})^2, \tag{8}$$

The time-series standard deviation test employs the whole sample for variance estimation. According to this formula, the time-series dependence test does not take into account unequal variances across observations. The variance estimation is as follow:

$$S^2{}_{MCAR_t} = \frac{1}{M-2}\sum_{t=T_0}^{T_1}(CAR_t - MCAR_{i,t})^2, \tag{10}$$

Where T_0, T_1 is the estimation window and

$$MCAR = \frac{1}{M}\sum_{t=T_0}^{T_1} CAR_t, \tag{11}$$

Test statistic for testing $H_0 : CAR_t = 0$ is given by

$$t_{CAR_t} = \sqrt{N}\,\frac{CAR_t}{S_{CAR}}, \tag{12}$$

Test statistic for testing $H_0 : MCAR_t = 0$ is given by

$$t_{MCAR_t} = \frac{MCAR_t}{\sqrt{T_2 - T}_1 S_{CAR}}, \tag{13}$$

BMP test

This standardized cross-sectional method which is robust to the variance induced by the event. Test statistics on day t, ($H0$:CAR=0) in the event-window is given by:

$$z_{BMP_t} = \frac{MSAR_t}{\sqrt{N} S_{MSAR_t}}, \tag{14}$$

with $MSAR_t$ defined with standard deviation

$$S^2{}_{MSAR_t} = \frac{1}{N-1}\sum_{t=1}^{N}(SAR_{i,t} - \frac{1}{N}\sum_{t=1}^{N} SAR_{i,t})^2, \tag{15}$$

Test statistic for testing H_0:$MSCAR$=0 is given by:

$$z_{BMP_t} = \sqrt{N}\,\frac{MSCAR_t}{S_{MSCAR_t}}, \tag{16}$$

where *MSCAR* is the averaged standardized cumulated abnormal returns across the N firms, with standard deviation.

$$S^2{}_{MSCAR_t} = \frac{1}{N-1}\sum_{i=1}^{N}(SCAR_t - MSCAR)^2, \tag{17}$$

where

$$MSCAR = \frac{1}{N}\sum_{i=1}^{N} SCAR_i \tag{18}$$

Corrado Rank Test

The non-parametric rank test suggested by Corrado (1989) tests the null hypothesis that the average abnormal return is equal to zero (H_0:AR=0).

$$K_{i,t} = Rank(AR_{i,t}) \tag{19}$$

Tied ranks are solved by the technique of middle ranks (see Corrado (1989)). Corrado and Zivney (1992) suggest a consistent transformation of ranks in order to adjust for any missing values:

$$U_{i,t} = \frac{K_{i,t}}{1+M_i} \tag{20}$$

where M_i is the number of non-missing returns for each price.

The test statistic is defined as:

$$T_{Corrado} = \frac{1}{N}\sum_{i=1}^{N}(U_{i,t} - 0.5 / S(U), \tag{21}$$

The estimated standard deviation is defined as:

$$S(U) = \sqrt{\frac{1}{L_{1+L_2}}\sum_{t}\left[\frac{1}{N_t}\sum_{i=1}^{N_t}(U_{i,t} - 0.5)\right]^2} \tag{22}$$

where N_t is the number of non-missing returns..

Cowan Generalized Sign Test

Under the Null Hypothesis of no abnormal returns, the number of stocks with positive abnormal cumulative returns (CAR) is expected to be in line with the fraction $\hat{P}$ of positive CAR from the estimation period. When the number of positive CAR is significantly higher than the number expected from the estimated fraction, it is suggested to reject the Null Hypothesis.

The fraction $\hat{P}$ is estimated as:

$$\hat{p} = \frac{1}{N}\sum_{i=1}^{N}\frac{1}{L_1}\sum_{t=T_0}^{T_1}\vartheta_{i,t}, \tag{23}$$

where $\vartheta_{i,t}$ is 1 if the sign is positive and 0 otherwise. The Generalized sign test statistic (H_0:$MCAR$=0) is:

$$z_{gsign} = \frac{(w - N\hat{p})}{\sqrt{N\hat{p}(1-\hat{p})}}, \tag{24}$$

where w is the number of stocks with positive cumulative abnormal returns during the event period. For the test statistic, a normal approximation of the binomial distribution with the parameters $\hat{P}$ and N, is used.

Appendix C

Table C1 reports the "Mean Cumulative Abnormal Return" (*MCAR)* as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia KLCI 30 at the event-windows. The first column specifies the event-window, the second column reports the *MCAR*, the third column provides the number of firms with positive or negative returns, the fourth column provides t-test for time series with probability value in the fifth column. Sixth column provides Boehmer et al t-test with t-statistic with probability value in the seventh column. The eight column provides Corrado Rank test with probability value in ninth column and tenth column provides Cowan generalised sign test with probability values in eleventh column.

Event-Windows	MCAR	Pos:Neg	t-test time series	Prob.	t-test cross sectional	Prob.	Boehmer et. al	Prob.	Corrado Rank	Prob.	Sign Test	Prob.
AD-15, AD-1	-0.8592	10:08	-0.5696	0.5689	-1.8664	0.062	-2.089	0.0367	0.9094	0.3631	0	1
AD, CD-1	0.6338	10:08	0.7278	0.4667	1.2979	0.1943	1.4355	0.1512	0.0356	0.9716	0	1
CD	-0.1256	08:10	-0.3226	0.747	-0.2307	0.8175	-0.2805	0.7791	-0.4825	0.6294	-0.9487	0.3428
CD, CD+15	0.1104	08:10	0.0709	0.9435	0.2788	0.7804	-0.5522	0.5808	-1.2077	0.2272	-0.9487	0.3428
AD-15, CD-1	-0.2254	11:07	-0.1294	0.897	-1.2608	0.2074	-1.2988	0.194	0.8053	0.4206	0.4743	0.6353
AD-15, CD+15	-0.115	10:08	-0.0492	0.9608	-0.3331	0.7391	-1.2555	0.2093	-0.2049	0.8377	0	1
AD,CD+15	0.7442	09:09	0.417	0.6767	1.4167	0.1566	0.8186	0.413	-1.0368	0.2998	-0.4743	0.6353
AD-7	0.2573	12:06	0.6607	0.5088	0.5703	0.5684	0.3773	0.706	1.0641	0.2873	0.9487	0.3428
AD-6	0.2593	10:08	0.6658	0.5055	0.5736	0.5662	0.2963	0.767	0.747	0.4551	0	1
AD-5	-0.7697	05:13	-1.9763	0.0481	-2.3905	0.0168	-2.3124	0.0208	-2.1121	0.0347	-2.3717	0.0177
AD-4	0.3851	11:07	0.9889	0.3227	1.0055	0.3146	1.4664	0.1425	1.2915	0.1965	0.4743	0.6353
AD-3	-0.0001	13:05	-0.0002	0.9998	-0.0002	0.9998	-0.0829	0.934	0.4853	0.6274	1.423	0.1547
AD-2	0.6414	12:06	1.647	0.0996	1.7684	0.077	1.7405	0.0818	1.2614	0.2072	0.9487	0.3428
AD-1	-1.1444	07:11	-2.9384	0.0033	-2.0176	0.0436	-2.1694	0.0301	-0.98	0.3271	-1.423	0.1547
AD	0.383	05:13	0.9836	0.3253	0.6412	0.5214	0.4948	0.6208	-1.5821	0.1136	-2.3717	0.0177
AD+1	0.2511	12:06	0.6448	0.5191	0.6852	0.4932	1.4125	0.1578	1.1827	0.2369	0.9487	0.3428
AD+2	0.0045	12:06	0.0116	0.9907	0.0109	0.9913	-0.503	0.615	0.7464	0.4554	0.9487	0.3428
AD+3	-0.3908	05:13	-1.0036	0.3156	-0.6906	0.4898	-0.6052	0.545	-1.5406	0.1234	-2.3717	0.0177
AD+4	0.386	12:06	0.9911	0.3217	0.7698	0.4414	1.0452	0.2959	1.273	0.203	0.9487	0.3428
AD+5	-0.1256	08:10	-0.3226	0.747	-0.2307	0.8175	-0.2805	0.7791	-0.4825	0.6294	-0.9487	0.3428
AD+6	0.2625	13:05	0.674	0.5003	0.6352	0.5253	0.3902	0.6964	1.8123	0.0699	1.423	0.1547
AD+7	-0.5176	04:14	-1.3292	0.1838	-1.7323	0.0832	-1.8227	0.0683	-2.3268	0.02	-2.846	0.0044

Table C2 reports the "Mean Cumulative Abnormal Return" (*MCAR)* as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia KLCI 70 at the event-windows. The first column specifies the event-window, the second column reports the *MCAR*, the third column provides the number of firms with positive or negative returns, the fourth column provides t-test for time series with probability value in the fifth column. Sixth column provides Boehmer et al t-test with t-statistic with probability value in the seventh column. The eight column provides Corrado Rank test with probability value in ninth column and tenth column provides Cowan generalised sign test with probability values in eleventh column.

Event-Windows	MCAR	Pos:Neg	t-test time series	Prob.	t-test cross sectional	Prob.	Boehmer et. al	Prob.	Corrado Rank	Prob.	Sign Test	Prob.
AD-15, AD-1	0.0023	57:44	0.3972	0.6912	0.6211	0.5345	0.8476	0.3966	-0.1416	0.8874	-0.026	0.9793
AD, CD-1	-0.0006	49:52	-0.2102	0.8335	-0.2065	0.8364	-0.0562	0.9552	-1.0942	0.2739	-1.6319	0.1027
CD	0.0068	47:54	0.6412	0.5214	0.7588	0.448	0.4834	0.6288	-2.0344	0.0419	-2.0334	0.042
CD, CD+15	0.0238	52:49	2.0195	0.0434	2.2659	0.0235	1.8036	0.0713	-0.2216	0.8246	-1.0297	0.3032
AD-15, CD-1	0.0306	51:50	1.9327	0.0533	2.1137	0.0345	1.4753	0.1401	-1.5214	0.1282	-1.2304	0.2185
AD-15, CD+15	-0.0006	49:52	-0.2102	0.8335	-0.2065	0.8364	-0.0562	0.9552	-1.0942	0.2739	-1.6319	0.1027
AD,CD+15	0.0091	50:51	0.7536	0.4511	0.9305	0.3521	0.7515	0.4523	-1.8448	0.0651	-1.4312	0.1524
AD-7	0.0057	62:39	2.1419	0.0322	2.8096	0.005	2.2412	0.025	1.9787	0.0479	0.9778	0.3282
AD-6	0.0006	47:54	0.2177	0.8276	0.2387	0.8113	-0.6943	0.4875	-0.7122	0.4763	-2.0334	0.042
AD-5	0.0006	53:48	0.213	0.8313	0.3471	0.7285	0.2291	0.8188	-0.44	0.6599	-0.8289	0.4071
AD-4	-0.0014	39 : 62	-0.5429	0.5872	-0.6617	0.5082	-1.3773	0.1684	-2.0482	0.0405	-3.6394	0.0003
AD-3	-0.0006	51:50	-0.2388	0.8113	-0.2937	0.769	-0.2405	0.81	-1.0504	0.2935	-1.2304	0.2185
AD-2	0.0011	57:44	0.4019	0.6877	0.7003	0.4838	0.0594	0.9527	0.2743	0.7839	-0.026	0.9793
AD-1	0.0008	48:53	0.3179	0.7505	0.4009	0.6885	0.3355	0.7372	-0.4403	0.6597	-1.8327	0.0669
AD	-0.0009	45:56	-0.3541	0.7233	-0.5444	0.5862	-0.384	0.701	-1.0224	0.3066	-2.4349	0.0149
AD+1	0.0029	54:47	1.1141	0.2653	1.5977	0.1101	1.7312	0.0834	0.814	0.4156	-0.6282	0.5299
AD+2	0.0001	57:44	0.031	0.9752	0.05	0.9601	0.1976	0.8433	0.0031	0.9976	-0.026	0.9793
AD+3	-0.0012	46:55	-0.458	0.6469	-0.6051	0.5451	-0.4931	0.622	-1.2272	0.2197	-2.2342	0.0255
AD+4	0.0015	60:41	0.5553	0.5787	0.9368	0.3488	0.8491	0.3958	1.1159	0.2645	0.5763	0.5644
AD+5	-0.0006	49:52	-0.2102	0.8335	-0.2065	0.8364	-0.0562	0.9552	-1.0942	0.2739	-1.6319	0.1027
AD+6	0.0029	51:50	1.1071	0.2682	1.5311	0.1258	0.481	0.6305	-0.028	0.9777	-1.2304	0.2185
AD+7	-0.0013	46:55	-0.4934	0.6217	-0.7078	0.4791	-1.4579	0.1449	-1.4254	0.154	-2.2342	0.0255

Table C3 reports the “Mean Cumulative Abnormal Return” (*MCAR)* as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia Small Cap at the event-windows. The first column specifies the event-window, the second column reports the *MCAR*, the third column provides the number of firms with positive or negative returns, the fourth column provides t-test for time series with probability value in the fifth column. Sixth column provides Boehmer et al t-test with t-statistic with probability value in the seventh column. The eight column provides Corrado Rank test with probability value in ninth column and tenth column provides Cowan generalised sign test with probability values in eleventh column.

Event-Windows	MCAR	Pos:Neg	t-test time series	Prob.	t-test cross sectional	Prob.	Boehmer et. al	Prob.	Corrado Rank	Prob.	Sign Test	Prob.
AD-15, AD-1	-0.0301	115 : 166	-0.0837	0.9333	-0.2555	0.7983	-1.1597	0.2462	-0.1034	0.9177	-4.2175	0
AD, CD-1	0.0084	136 : 145	0.0406	0.9676	0.0751	0.9402	-1.0534	0.2922	-0.2025	0.8395	-1.7059	0.088
CD	-0.0053	164 : 117	-0.0569	0.9546	-0.0665	0.947	1.1893	0.2343	0.1318	0.8951	1.6429	0.1004
CD, CD+15	-0.073	138 : 143	-0.1968	0.844	-0.7164	0.4738	1.1596	0.2462	-0.5719	0.5674	-1.4667	0.1425
AD-15, CD-1	-0.0216	116 : 165	-0.0522	0.9584	-0.1807	0.8566	-1.1172	0.2639	-0.1908	0.8487	-4.0979	0
AD-15, CD+15	-0.0947	132 : 149	-0.1701	0.865	-0.7986	0.4245	0.7973	0.4253	-0.5234	0.6007	-2.1843	0.0289
AD,CD+15	-0.0646	119 : 162	-0.152	0.8792	-0.6215	0.5343	0.9953	0.3196	-0.598	0.5498	-3.7391	0.0002
AD-7	-0.1995	106 : 175	-2.1505	0.0315	-2.1858	0.0288	-2.8045	0.005	-2.7965	0.0052	-5.2939	0
AD-6	0.012	158 : 123	0.1295	0.8969	0.1166	0.9072	0.3015	0.763	0.6056	0.5448	0.9253	0.3548
AD-5	-0.0828	152 : 129	-0.8925	0.3721	-0.731	0.4648	-0.8716	0.3834	0.2902	0.7717	0.2077	0.8355
AD-4	0.1079	135 : 146	1.1634	0.2447	0.9985	0.318	0.9635	0.3353	-1.0172	0.3091	-1.8255	0.0679
AD-3	0.1757	183 : 98	1.8936	0.0583	1.9548	0.0506	2.1778	0.0294	2.5291	0.0114	3.9152	0.0001
AD-2	-0.1598	162 : 119	-1.7221	0.085	-1.6563	0.0977	-1.4844	0.1377	0.8126	0.4164	1.4037	0.1604
AD-1	0.0867	147 : 134	0.9348	0.3499	0.8548	0.3926	0.0318	0.9746	0.2367	0.8129	-0.3903	0.6963
AD	0.0225	154 : 127	0.2428	0.8082	0.2148	0.83	0.3301	0.7413	0.7582	0.4483	0.4469	0.655
AD+1	0.0044	137 : 144	0.0469	0.9626	0.0494	0.9606	0.4993	0.6175	0.3006	0.7637	-1.5863	0.1127
AD+2	-0.0256	178 : 103	-0.2762	0.7824	-0.3488	0.7273	0.0298	0.9762	-0.1712	0.8641	3.3172	0.0009
AD+3	0.0542	109 : 172	0.5841	0.5592	0.619	0.5359	0.5149	0.6066	-0.3282	0.7427	-4.9351	0
AD+4	-0.047	116 : 165	-0.5069	0.6122	-0.52	0.6031	-1.2077	0.2272	-1.0123	0.3114	-4.0979	0
AD+5	-0.0053	164 : 117	-0.0569	0.9546	-0.0665	0.947	1.1893	0.2343	0.1318	0.8951	1.6429	0.1004
AD+6	0.0579	152 : 129	0.6237	0.5328	0.6928	0.4884	0.0932	0.9257	-0.4756	0.6344	0.2077	0.8355
AD+7	-0.0487	119 : 162	-0.5254	0.5993	-0.5463	0.5849	-0.3607	0.7183	-0.5585	0.5765	-3.7391	0.0002

Table C4 reports the "Mean Cumulative Abnormal Return" (*MCAR)* as well as the respective t-statistic, for stocks deleted from the FTSE Bursa Malaysia KLCI 30 at the event-windows. The first column specifies the event-window, the second column reports the *MCAR*, the third column provides the number of firms with positive or negative returns, the fourth column provides t-test for time series with probability value in the fifth column. Sixth column provides Boehmer et al t-test with t-statistic with probability value in the seventh column. The eight column provides Corrado Rank test with probability value in ninth column and tenth column provides Cowan generalised sign test with probability values in eleventh column.

Event-Windows	MCAR	Pos:Neg	t-test time series	Prob.	t-test cross sectional	Prob.	Boehmer et. al	Prob.	Corrado Rank	Prob.	Sign Test	Prob.
AD-15, AD-1	-0.0574	06:09	-0.0387	0.9691	-0.1264	0.8994	-0.3064	0.7593	-0.2812	0.7786	-0.7297	0.4656
AD, CD-1	0.1188	05:10	0.1388	0.8896	0.2866	0.7744	0.2142	0.8304	-2.1004	0.0357	-1.2461	0.2127
CD	-0.4653	03:12	-1.2156	0.2241	-1.9037	0.0569	-1.7184	0.0857	-1.7647	0.0776	-2.279	0.0227
CD, CD+15	-0.559	11:04	-0.3651	0.715	-1.3303	0.1834	-1.1717	0.2413	1.1028	0.2701	1.8525	0.064
AD-15, CD-1	0.0614	05:10	0.0359	0.9714	0.2194	0.8263	-0.137	0.891	-1.2937	0.1958	-1.2461	0.2127
AD-15, CD+15	-0.4977	06:09	-0.2167	0.8284	-1.2619	0.207	-1.512	0.1305	-0.2291	0.8188	-0.7297	0.4656
AD,CD+15	-0.4403	07:08	-0.251	0.8018	-0.7945	0.4269	-0.7676	0.4427	-0.0623	0.9503	-0.2133	0.8311
AD-7	0.4572	09:06	1.1944	0.2323	1.3757	0.1689	1.4679	0.1421	0.8118	0.4169	0.8196	0.4124
AD-6	0.1529	07:08	0.3995	0.6895	0.9951	0.3197	1.0397	0.2985	0.4034	0.6866	-0.2133	0.8311
AD-5	-0.3021	07:08	-0.7891	0.43	-0.9904	0.322	-1.2713	0.2036	-0.2308	0.8175	-0.2133	0.8311
AD-4	0.2998	10:05	0.7832	0.4335	0.7793	0.4358	0.6572	0.5111	1.1571	0.2472	1.336	0.1815
AD-3	0.1501	06:09	0.3923	0.6949	0.9692	0.3324	0.9749	0.3296	0.0581	0.9537	-0.7297	0.4656
AD-2	-0.4644	06:09	-1.2134	0.225	-1.406	0.1597	-1.4876	0.1368	-0.8035	0.4217	-0.7297	0.4656
AD-1	0.0043	09:06	0.0113	0.991	0.0086	0.9931	0.1552	0.8767	0.7421	0.458	0.8196	0.4124
AD	0.6065	08:07	1.5845	0.1131	1.7189	0.0856	1.6953	0.09	0.5196	0.6033	0.3032	0.7618
AD+1	-0.4665	04:11	-1.2187	0.2229	-1.9013	0.0573	-1.8993	0.0575	-1.9507	0.0511	-1.7626	0.078
AD+2	-0.3087	06:09	-0.8065	0.42	-1.4743	0.1404	-1.4645	0.1431	-0.8284	0.4074	-0.7297	0.4656
AD+3	0.1487	04:11	0.3884	0.6977	0.5482	0.5835	0.6916	0.4892	-0.9645	0.3348	-1.7626	0.078
AD+4	0.1388	04:11	0.3626	0.7169	0.3949	0.6929	0.1063	0.9153	-1.4726	0.1409	-1.7626	0.078
AD+5	-0.4653	03:12	-1.2156	0.2241	-1.9037	0.0569	-1.7184	0.0857	-1.7647	0.0776	-2.279	0.0227
AD+6	0.1505	06:09	0.3933	0.6941	0.3595	0.7192	0.4374	0.6618	0.5794	0.5623	-0.7297	0.4656
AD+7	0.1597	08:07	0.4172	0.6765	0.3366	0.7364	0.584	0.5592	0.772	0.4401	0.3032	0.7618

Table C5 reports the "Mean Cumulative Abnormal Return" (*MCAR)* as well as the respective t-statistic, for stocks deleted from the FTSE Bursa Malaysia KLCI 70 at the event-windows. The first column specifies the event-window, the second column reports the *MCAR*, the third column provides the number of firms with positive or negative returns, the fourth column provides t-test for time series with probability value in the fifth column. Sixth column provides Boehmer et al t-test with t-statistic with probability value in the seventh column. The eight column provides Corrado Rank test with probability value in ninth column and tenth column provides Cowan generalised sign test with probability values in eleventh column.

Event-Windows	MCAR	Pos:Neg	t-test time series	Prob.	t-test cross sectional	Prob.	Boehmer et. al	Prob.	Corrado Rank	Prob.	Sign Test	Prob.
AD-15, AD-1	-0.0074	34:47	-0.8154	0.4149	-0.8954	0.3706	-0.5613	0.5746	0.7888	0.4302	-1.2507	0.211
AD, CD-1	0.0033	38:43	0.6232	0.5332	0.44	0.6599	1.1945	0.2323	1.524	0.1275	-0.3616	0.7176
CD	0.0012	43:38	0.5204	0.6028	0.5009	0.6164	1.0989	0.2718	0.8566	0.3916	0.7498	0.4534
CD, CD+15	-0.0128	28:53	-1.3613	0.1734	-1.8152	0.0695	-2.7861	0.0053	-0.5968	0.5506	-2.5843	0.0098
AD-15, CD-1	-0.0041	36:45	-0.3945	0.6932	-0.3481	0.7278	0.1994	0.842	1.4452	0.1484	-0.8062	0.4202
AD-15, CD+15	-0.0169	31:50	-1.2016	0.2295	-1.1102	0.2669	-1.1361	0.2559	0.6793	0.497	-1.9175	0.0552
AD,CD+15	-0.0095	32:49	-0.8841	0.3766	-0.8254	0.4091	-1.2791	0.2009	0.2227	0.8238	-1.6953	0.09
AD-7	-0.0035	34:47	-1.4881	0.1367	-1.6087	0.1077	-1.1482	0.2509	-0.5918	0.554	-1.2507	0.211
AD-6	-0.0035	36:45	-1.4786	0.1393	-1.6452	0.0999	-1.3164	0.1881	-0.5792	0.5625	-0.8062	0.4202
AD-5	-0.0052	22:59	-2.2249	0.0261	-2.8682	0.0041	-2.8179	0.0048	-2.2898	0.022	-3.918	0.0001
AD-4	0.0015	33:48	0.6244	0.5324	0.7521	0.452	0.0481	0.9617	0.3146	0.753	-1.473	0.1408
AD-3	0.0006	41:40	0.2572	0.797	0.31	0.7565	-0.2759	0.7827	0.2108	0.8331	0.3052	0.7602
AD-2	0.0056	49:32	2.3935	0.0167	1.92	0.0549	1.7932	0.0729	1.8757	0.0607	2.0834	0.0372
AD-1	0.0008	38:43	0.3446	0.7304	0.3679	0.713	0.4709	0.6377	0.4105	0.6815	-0.3616	0.7176
AD	0.0029	40:41	1.2386	0.2155	0.7132	0.4757	0.951	0.3416	0.9285	0.3532	0.0829	0.9339
AD+1	0.0049	46:35	2.0731	0.0382	1.639	0.1012	1.8622	0.0626	2.3457	0.019	1.4166	0.1566
AD+2	0.0037	50:31	1.5791	0.1143	1.8154	0.0695	2.506	0.0122	2.1882	0.0287	2.3057	0.0211
AD+3	-0.0055	27:54	-2.3415	0.0192	-2.6314	0.0085	-1.9519	0.0509	-2.4934	0.0127	-2.8066	0.005
AD+4	-0.0027	39:42	-1.1558	0.2477	-1.161	0.2457	-0.2054	0.8373	0.4387	0.6609	-0.1393	0.8892
AD+5	0.0012	43:38	0.5204	0.6028	0.5009	0.6164	1.0989	0.2718	0.8566	0.3916	0.7498	0.4534
AD+6	0.0023	44:37	0.9975	0.3185	1.371	0.1704	0.7916	0.4286	1.2334	0.2174	0.972	0.331
AD+7	-0.0054	31:50	-2.279	0.0227	-2.4975	0.0125	-2.824	0.0047	-1.6166	0.106	-1.9175	0.0552

Table C6 reports the "Mean Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia KLCI 30 at the event-windows. The first column specifies the event-window, the second column reports the *MBHAR*, and the third columns provides the number of firms with positive or negative returns, fourth column provides the t-statistic with probability value on fifth column and the sixth column provides skewness adjusted t-test with P-value in the last column for the *MBHAR*, for the event-windows.

Event window	MBHAR	Pos:Neg	t-statistic	Prob.	Skewness Adjusted	Prob.
AD+15,AD+120	6.1433	07:11	1.1296	0.2587	1.6158	0.1061
AD+15, AD+90	7.0688	04:14	1.1566	0.2474	1.6586	0.0972
AD+15, AD+60	6.8451	06:12	1.2299	0.2187	1.7738	0.0761
AD+15, AD+50	6.6759	06:12	1.2121	0.2255	1.7425	0.0814
AD+15, AD+40	6.2804	07:11	1.146	0.2518	1.6408	0.1008
AD+15, AD+30	6.4798	06:12	1.1394	0.2545	1.6315	0.1028
AD+15, AD+20	5.9855	09:09	1.0721	0.2837	1.5274	0.1267
AD+15	5.9855	09:09	1.0721	0.2837	1.5274	0.1267

Table C7 reports the "Mean Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia KLCI 70 at the event-windows. The first column specifies the event-window, the second column reports the *MBHAR*, and the third columns provides the number of firms with positive or negative returns, fourth column provides the t-statistic with probability value on fifth column and the sixth column provides skewness adjusted t-test with P-value in the last column for the *MBHAR*, for the event-windows.

Event window	MBHAR	Pos:Neg	t-statistic	Prob.	Skewness Adjusted	Prob.
AD+15,AD+120	-0.0038	47:54	-0.1721	0.8633	-0.1674	0.867
AD+15, AD+90	0.0119	55:46	0.6408	0.5217	0.6557	0.512
AD+15, AD+60	0.0256	59:42	1.7059	0.088	1.9006	0.0574
AD+15, AD+50	0.0197	52:49	1.5513	0.1208	1.6866	0.0917
AD+15, AD+40	0.01	55:46	1.1573	0.2472	1.174	0.2404
AD+15, AD+30	0.0056	46:55	0.8637	0.3877	0.8504	0.3951
AD+15, AD+20	0.0001	47:54	0.0297	0.9763	0.0311	0.9752
AD+15	0.0029	50:51	1.4388	0.1502	1.5088	0.1314

Table C8 reports the "Mean Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks added to the FTSE Bursa Malaysia Small Cap at the event-windows. The first column specifies the event-window, the second column reports the *MBHAR*, and the third columns provides the number of firms with positive or negative returns, fourth column provides the t-statistic with probability value on fifth column and the sixth column provides skewness adjusted t-test with P-value in the last column for the *MBHAR*, for the event-windows.

Event window	MBHAR	Pos:Neg	t-statistic	Prob.	Skewness Adjusted	Prob.
AD+15,AD+120	7.9359	114 : 167	1.5199	0.1285	2.4172	0.0156
AD+15, AD+90	3.4784	107 : 174	3.6231	0.0003	5.2457	0
AD+15, AD+60	6.4666	110 : 171	2.3342	0.0196	3.975	0.0001
AD+15, AD+50	3.8596	121 : 160	3.8035	0.0001	5.3511	0
AD+15, AD+40	6.3629	103 : 178	1.7555	0.0792	2.8489	0.0044
AD+15, AD+30	4.6503	124 : 157	4.281	0	6.0123	0
AD+15, AD+20	4.6521	134 : 147	4.1675	0	5.887	0
AD+15	6.8862	137 : 144	1.7908	0.0733	2.9206	0.0035

Table C9 reports the "Mean Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks deleted from the FTSE Bursa Malaysia KLCI 30 at the event-windows. The first column specifies the event-window, the second column reports the *MBHAR*, and the third columns provides the number of firms with positive or negative returns, fourth column provides the t-statistic with probability value on fifth column and the sixth column provides skewness adjusted t-test with P-value in the last column for the *MBHAR*, for the event-windows.

Event window	MBHAR	Pos:Neg	t-statistic	Prob.	Skewness Adjusted	Prob.
AD+15,AD+120	2.8921	11:04	2.6421	0.0082	3.1035	0.0019
AD+15, AD+90	1.6228	09:06	1.7111	0.0871	2.1164	0.0343
AD+15, AD+60	15.3803	10:05	1.6647	0.096	2.2184	0.0265
AD+15, AD+50	10.5096	11:04	1.4351	0.1513	2.0959	0.0361
AD+15, AD+40	9.5579	10:05	1.5082	0.1315	2.2103	0.0271
AD+15, AD+30	2.9498	11:04	2.4628	0.0138	2.817	0.0048
AD+15, AD+20	2.3586	08:07	2.0532	0.04	2.4332	0.015
AD+15	14.4326	08:07	1.6201	0.1052	2.1346	0.0328

Table C10 reports the "Mean Buy Hold Abnormal Return" (*MBHAR)* as well as the respective t-statistic, for stocks deleted from the FTSE Bursa Malaysia KLCI 70 at the event-windows. The first column specifies the event-window, the second column reports the *MBHAR*, and the third columns provides the number of firms with positive or negative returns, fourth column provides the t-statistic with probability value on fifth column and the sixth column provides skewness adjusted t-test with P-value in the last column for the *MBHAR*, for the event-windows.

Event window	MBHAR	Pos:Neg	t-statistic	Prob.	Skewness Adjusted	Prob.
AD+15,AD+120	0.0192	40:41	0.8286	0.4074	0.8586	0.3906
AD+15, AD+90	-0.006	38:43	-0.3341	0.7383	-0.3388	0.7348
AD+15, AD+60	-0.0139	37:44	-1.2193	0.2227	-1.2587	0.2081
AD+15, AD+50	-0.0176	37:44	-2.2409	0.025	-2.356	0.0185
AD+15, AD+40	-0.01	38:43	-1.3906	0.1643	-1.3645	0.1724
AD+15, AD+30	-0.0019	36:45	-0.318	0.7505	-0.2958	0.7674
AD+15, AD+20	-0.0002	36:45	-0.1528	0.8786	-0.1347	0.8929
AD+15	-0.0002	36:45	-0.1528	0.8786	-0.1347	0.8929

Table C11 reports the stock additions to the FTSE Bursa Malaysia KLCI 30 index, the paired two sample means for the free float percentage of the "Government Held Shareholding" (NOSHGV), "Employee Held Shareholdings" (NOSHEM), sum of the "Government Held Shareholding" and the "Employee Held Shareholdings" (NOSHGV+ NOSHEM), and "Total Strategic Holding" (NOSHST), as well as the respective t-statistic, for several event windows. The first column specifies the event windows, the second, fourth, sixth, eighth and tenth columns report the results for the NOSHGV, NOSHEM, NOSHGV+NOSHEM, NOSHT, and NOSHFF respectively, and the third, fifth, seventh, ninth and eleventh columns provide the respective t-statistic. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Additions – KLCI 30										
Event-window	NOSHGV %	*t*-stat	NOSHEM (%)	*t*-stat	NOSHGV +NOSHEM (%)	t-stat	NOSHST %	t-stat	NOSHFF%	t-stat
AD-120,AD-1 to	2.076	9.296***	1.0766	-3.9145***	3.1527	7.451***	31.7	2.1345**	66.79	-10.44***
CD,CD+120	1.597		1.133		2.730		31.317		68.68	
AD-30,AD-1 to	2.244	12.04***	1.133	na	3.3777	12.04***	32.437	7.232***	67.56	-7.23***
CD,CD+30	1.8		1.133		2.933		32.08		67.92	
AD-15,AD-1 to	2.155	5.291***	1.133	na	3.288	5.291***	32.333	3.150***	67.66	-3.15***
CD,CD+15	1.8		1.133		2.933		32.026		67.97	
AD-7,AD-1 to	1.952	1.5491	1.133	na	3.0857	1.5491	32.1047	1.5491	67.89	-1.54
CD,CD+7	1.8		1.133		2.9333		31.933		68.06	

Table C12 reports my results for the stock additions to the KLCI 30 based on the equation (9) in chapter four. In the first column are the independent variables, where, "const." is the regression interception, *D_KLCI* is a dummy variable that takes the value of "1" for the period after the index change and "0" otherwise; $logVol_{i,t}$, $log\ Price_{i,t}$, and $LogStdDev_{i,t}$ are, respectively, the natural logarithm of the stock i's average daily closing price, average daily trade volume in shares and daily return volatility, for the time period t; $LogVolD\_KLCI$ is the natural logarithm of the product of the stock added traded volume by the dummy variable *D_KLCI;* NOSHGVD_ KLCI, NOSHEMD_ KLCI, NOSHSTD_ KLCI and NOSHFFD_ KLCI are, the product of, respectively, the percentage of the "government held share", "employee held share", "strategic held share" and "publicly available shares" by the dummy variable D_KLCI. In the second row, from the second to the fifth columns, are the regression dependent variables, where LogSpread (quoted) is the natural logarithm of the stock bid-ask spread quoted, LogSpread (effective) is the natural logarithm of the stock bid-ask spread effective transacted, The RtoV, RtoTR and RtoTRF are the return to trade and return to volume ratios defined for the equations (3), (5), and (7) respectively. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

	FTSE Bursa Malaysia KLCI30				
Additions	***Dependant Variables***				
Independent Variables	log spread (quoted)	log spread (effective)	RtoV	RtoTR	RtoTRF
Const.	-4.021	-5.863	3.70E-06	27.99	14.287
	(-24.78)***	(-6.63)***	(4.377)***	(6.81)***	(7.468)***
logVol	0.0100	0.1910	-7.55E-07	-3.356	-1.2702
	(0.714)	(2.55)**	(-9.72)***	(-7.98)***	(-6.35)***
logVolD_ KLCI	-0.089	-0.265	-1.52E-07	-0.700	-0.5839
	(-5.39)***	(-2.76)***	(-2.02181)**	(-1.00)	(-2.52)**
log Price	-0.0905	0.6139	-5.98E-07	-1.004	-2.840
	(-2.701)***	(2.901)***	(-4.1089)***	(-0.961)	(-6.41)***
logStdDev	0.2010	0.1599	-2.01E-07	0.00962	0.0424
	(6.83)***	(1.4230)	(-2.9896)***	(0.594)	(5.822)***
NOSHGVD_ KLCI	0.00672	-0.010	8.83E-09	0.059	0.0193
	(3.97)***	(-1.104)	(1.196)	(1.105)	(0.849)
NOSHEMD_ KLCI	0.0219	0.0137	-6.99E-09	0.0353	-0.1032
	(2.58)***	(0.2791)	-0.1824	(0.127)	(-0.868)
NOSHSTD_ KLCI	0.0005	0.0178	8.44E-09	0.064	0.0376
	(0.399)	(2.44)**	(1.475)	(1.167)	(2.149)**
NOSHFFD_ KLCI	0.0089	0.02358	1.20E-08	0.042	0.047
	(7.30)***	(3.32)***	(2.1675)**	(0.820)	(2.797)***
R^2	0.102	0.126	0.091	0.0847	0.0715

Table C13 reports for the stock additions to the FTSE Bursa Malaysia Small Cap index, the paired two sample means for the free float percentage of the "Government Held Shareholding" (NOSHGV), "Employee Held Shareholdings" (NOSHEM), sum of the "Government Held Shareholding" and the "Employee Held Shareholdings" (NOSHGV+ NOSHEM), and "Total Strategic Holding" (NOSHST), as well as the respective t-statistic, for several event windows. The first column specifies the event windows, the second, fourth, sixth, eighth and tenth columns report the results for the NOSHGV, NOSHEM, NOSHGV+NOSHEM, NOSHT, and NOSHFF respectively, and the third, fifth, seventh, ninth and eleventh columns provide the respective t-statistic. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Additions - FTSE Bursa Malaysia Small Cap										
Event-window	NOSHGV %	*t*-stat	NOSHEM (%)	*t*-stat	NOSHGV +NOSHEM (%)	t-stat	NOSHST %	t-stat	NOSHFF%	t-stat
AD-120,AD-1 to CD,CD+120	0.113	2.059**	5.966	-1.007	6.080	-1.115	22.271	-5.344***	77.276	-5.344***
	0.159		6.211		6.371		26.444		73.120	
AD-30,AD-1 to CD,CD+30	0.116	-1.060	6.372	0.377	6.489	0.339	23.393	-3.193***	76.154	-3.193***
	0.130		6.202		6.332		25.692		73.857	
AD-15,AD-1 to CD,CD+15	0.117	-1	6.517	0.696	6.635	0.662	23.835	-2.892***	75.712	-2.892***
	0.129		6.221		6.351		25.504		74.045	
AD-7,AD-1 to CD,CD+7	0.127	-1	6.743	1.253	6.870	1.246	24.444	1.5491	75.103	-1.593
	0.130		6.192		6.3223		25.047		74.5	

Table C14 reports my results for the stocks added to Small Cap index based on the equation (9) in chapter four. In the first column are the independent variables, where, “const.” is the regression interception, *D_KLCI* is a dummy variable that takes the value of “1” for the period after the index change and “0” otherwise; $logVol_{i,t}$, $log Price_{i,t}$, and $LogStdDev_{i,t}$ are, respectively, the natural logarithm of the stock i’s average daily closing price, average daily trade volume in shares and daily return volatility, for the time period t; $LogVolD\_KLCI$ is the natural logarithm of the product of the stock added traded volume by the dummy variable *D_KLCI;* NOSHGVD_ KLCI, NOSHEMD_ KLCI, NOSHSTD_ KLCI and NOSHFFD_ KLCI are, the product of, respectively, the percentage of the “government held share”, “employee held share”, “strategic held share” and “publicly available shares” by the dummy variable D_KLCI. In the second row, from the second to the fifth columns, are the regression dependent variables, where LogSpread (quoted) is the natural logarithm of the stock bid-ask spread quoted, LogSpread (effective) is the natural logarithm of the stock bid-ask spread effective transacted, The RtoV, RtoTR and RtoTRF are the return to trade and return to volume ratios defined for the equations (3), (5), and (7) respectively. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

	FTSE Bursa Malaysia Small Cap				
Additions	***Dependant Variables***				
Independent Variables	log spread (quoted)	log spread (effective)	RtoV	RtoTR	RtoTRF
Const.	-2.798 (-69.48)***	-4.1915 (-60.98)***	0.000242 (8.83)***	21.124 (29.55)***	15.843 (26.595)
logVol	-0.1213 (-25.771)***	-0.1243 (-10.09)***	-2.76E-05 (-8.15)**	-3.326 (-27.7)***	-2.459 (24.93)***
logVolD_ KLCI	-0.00306 (-0.542)	-0.048 (-3.02)***	-1.19E-05 (-3.14)***	-0.246 (-1.61)	-0.1845 (1.771)*
log Price	-0.3503 (-42.965)***	0.4423 (18.28)***	-4.11E-05 (-7.30)***	-2.769 (-12.87)	-2.077 (-11.583)
logStdDev	0.2247 (1.104)	-0.0040 (0.766)	6.28E-06 (2.189)**	0.014 (4.90)***	0.154 (5.28)***
NOSHGVD_ KLCI	0.0057 (1.04)	-0.0176 (-1.14)	-4.18E-06 (-1.19)	0.052 (0.38)	0.039 (0.429)
NOSHEMD_ KLCI	0.0026 (3.89)***	0.0102 (5.28)***	8.68E-07 (0.05)	0.014 (0.78)	0.155 (1.13)
NOSHSTD_ KLCI	-0.00049 (-1.19)	0.00132 (1.13)	6.25E-07 (0.022)	-0.002 (-0.17)	-0.015 (-0.12)
NOSHFFD_ KLCI	0.00095 (2.89)***	0.0037 (3.98)***	7.05E-07 (3.209)***	0.025 (2.76)***	0.019 (3.03)***
R^2	0.0816	0.07621	0.01604	0.0152	0.0175

Table C15 reports, for the stock deletions from the FTSE Bursa Malaysia KLCI30 , the paired two sample means for free float percentage of the "Government Held Shareholding" (NOSHGV), "Employee Held Shareholdings" (NOSHEM), sum of the NOSHGV and the NOSHEM and "Total Strategic Holding" (NOSHST), as well as the respective t-statistic, for several event windows. The first column specifies the event window, the second, fourth, sixth, eighth and tenth columns reports the coefficients for the NOSHGV, NOSHEM, NOSHGV+NOSHEM, NOSHT and NOSHFF variables, respectively, and the third, fifth, seventh, ninth and eleventh columns provides the t-statistic for each variable and event window. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

Deletions-FTSE Bursa Malaysia KLCI30										
Event-window (deletions)	NOSHGV %	*t*-stat	NOSHEM %	*t*-stat	NOSHGV +NOSHEM %	t-stat	NOSHST %	t-stat	NOSHFF %	t-stat
AD-120,AD-1 to	3.562	-71.1***	1.037	-10.7***	4.6	-53.5***	32.516	-48.1***	60.54	48.1***
CD,CD+120	7.410		2.020		9.431		49.508		50.94	
AD-30,AD-1 to	3.664	-20.3***	2.302	1	5.966	-18.1***	37.351	-18.7***	62.64	18.7***
CD,CD+30	7.005		2.230		9.235		49.441		50.55	
AD-15, AD-1 to	4.097	-10.9***	2.482	3.5***	6.579	-11.6***	39.451	-10.2***	60.54	10.17***
CD,CD+15	7.076		2.230		9.307		49.051		50.94	
AD-15,AD-1 to	4.901	-6***	2.230	NA	7.131	-5.9***	42.780	-4.22***	57.21	4.21***
CD,CD+15	7.076		2.230		9.307		48.384		51.615	

Table C16 reports my results for the stock deleted from the KLCI 30 based on the equation (9) in chapter four. In the first column are the independent variables, where, "const." is the regression interception, *D_KLCI* is a dummy variable that takes the value of "1" for the period after the index change and "0" otherwise; $\text{logVol}_{i,t}$, $\text{log Price}_{i,t}$, and $\text{LogStdDev}_{i,t}$ are, respectively, the natural logarithm of the stock i's average daily closing price, average daily trade volume in shares and daily return volatility, for the time period t; $LogVolD\_KLCI$ is the natural logarithm of the product of the stock added traded volume by the dummy variable *D_KLCI;* NOSHGVD_ KLCI, NOSHEMD_ KLCI, NOSHSTD_ KLCI and NOSHFFD_ KLCI are, the product of, respectively, the percentage of the "government held share", "employee held share", "strategic held share" and "publicly available shares" by the dummy variable D_KLCI. In the second row, from the second to the fifth columns, are the regression dependent variables, where LogSpread (quoted) is the natural logarithm of the stock bid-ask spread quoted, LogSpread (effective) is the natural logarithm of the stock bid-ask spread effective transacted, The RtoV, RtoTR and RtoTRF are the return to trade and return to volume ratios defined for the equations (3), (5), and (7) respectively. Results are significant at 1%, 5% and 10% if identified by the superscripts ***, ** and *, respectively.

	FTSE Bursa Malaysia KLCI 30				
Deletions	***Dependant Variables***				
Independent Variables	log spread (quoted)	log spread (effective)	RtoV	RtoTR	RtoTRF
Const.	-4.021	-5.863215785	3.70E-06	27.99	14.28
	(-24.78)***	(-6.63)***	(4.37)***	(6.81)***	(7.46)***
logVol	0.0100	0.1910	-7.55E-07	-3.35	-1.27
	0.714	(2.554)**	(-9.72)***	(-7.98)***	(-6.35)***
logVolD_ KLCI	-0.0898	-0.2657	-1.52E-07	-0.700	-0.583
	(-5.39)***	(-2.76)***	(-2.021)**	-(1.00)	(-2.52)**
log Price	-0.090	0.6139	-5.98E-07	-1.004	-2.84
	(-2.70)***	(2.90)***	(-4.108)***	(-0.961)	(-6.41)***
logStdDev	0.201	0.159	-2.01E-07	0.009	0.0424
	(6.83)***	(1.423)	(-2.98)***	(0.594)	(5.823)***
NOSHGVD_ KLCI	0.00672	-0.0106	8.83E-09	0.059	0.0193
	(3.97)***	(-1.104)	(1.196)	(1.105)	(0.849)
NOSHEMD_ KLCI	0.021	0.013	-6.99E-09	0.035	-0.103
	(2.58)***	(0.279)	(-0.182)	(0.127)	(-0.868)
NOSHSTD_ KLCI	0.000502	0.0178	8.44E-09	0.064	0.0376
	0.399	(-2.44)**	(1.475)	(1.167)	(2.149)**
NOSHFFD_ KLCI	0.00895	0.0235	1.20E-08	0.042	0.047
	(7.30)***	(3.32)***	(2.1675)**	(0.820)	(2.797)***
R^2	0.0881	0.08525	0.10565	0.1320	0.158