NEW ISLAMIC EQUITY STYLE INDICES AND THEIR APPLICATION IN MALAYSIAN CAPITAL MARKETS

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THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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ABSTRACT

An equity style index is a form of stock market index which has been developed as a benchmark to measure the performance of stocks by grouping stocks according to categories and characteristics. In the case of Malaysia, an Islamic equity style index which measures the performance of Islamic stocks has yet to be developed. This study will therefore attempt to address this issue by constructing new Islamic equity style indices which will then be tested for its benefits and potential utility by performing tests based on its information transmission efficacy and against the Fama and French three-factor model. Firstly, this dissertation will examine the importance of developing Islamic equity style indices by surveying relevant literature and reviewing the Islamic stock market in Malaysia and abroad. Secondly, the new Islamic equity style indices in this study will be created based on style classification systems as proposed by the Russell Co. and Focardi et al. (2004) as well as methodologies provided for through contemporary methods. Thirdly, the newly constructed Islamic equity style indices will be tested for its efficacy in information transmission by using the Vector Autoregression (VAR) model. Finally, this study will then attempt to analyse the Fama and French (1992, 1993) three-factor model by proving the validity of the model using the newly developed Fama and French factors. The results of the VAR test indicates that the LV and LG indices have short-run dynamics and precedes macroeconomic variables and is useful for purposes of predicting future economic conditions. The evidence also suggests that Islamic equity style indices follow the Fama and French three-factor model despite the persistence of the reversal of size effect. These findings are useful for investors, researchers and policy makers for purposes of portfolio construction, benchmarking and forecasting.

ABSTRAK

Indeks gaya ekuiti adalah satu bentuk indeks pasaran saham yang telah dibangunkan sebagai penanda aras untuk mengukur prestasi saham-saham dengan mengumpulkan saham-saham berdasarkan kategori dan ciri-ciri. Dalam kes Malaysia, indeks gaya ekuiti Islam yang mengukur prestasi saham-saham Islam masih belum dibangunkan. Oleh sebab itu, kajian ini akan cuba untuk menangani isu ini dengan membina indeks gaya ekuiti Islam yang baru yang kemudiannya akan diuji untuk manfaat dan potensi utiliti dengan melakukan ujian berdasarkan keberkesanan penghantaran maklumat dan terhadap model tiga-faktor Fama dan French. Pertama, kajian ini akan mengkaji kepentingan membangunkan indeks gaya ekuiti Islam dengan mengkaji selidik literatur yang berkaitan dengan pasaran saham Islam di Malaysia dan di luar negara. Kedua, indeks gaya ekuiti Islam yang baru dalam kajian ini akan dicipta berdasarkan sistem klasifikasi gaya seperti yang dicadangkan oleh Russell Co. dan Focardi et al. (2004) dan juga kaedah yang diperuntukkan melalui kaedah kontemporari. Ketiga, indeks gaya ekuiti Islam yang baru dibina akan diuji untuk keberkesanannya dalam penghantaran maklumat dengan menggunakan model Vector Autoregression (VAR). Akhir sekali, kajian ini akan cuba untuk menganalisa model tiga-faktor Fama dan French (1992, 1993) dengan membuktikan kesahihan model dengan menggunakan factor-faktor Fama dan French yang baru dibangunkan. Keputusan ujian VAR menunjukkan bahawa indeks LV dan LG indeks mempunyai dinamik jangka pendek dan mendahului pembolehubah makroekonomi dan berguna untuk tujuan meramalkan keadaan ekonomi masa depan. Bukti juga menunjukkan bahawa indeks gaya ekuiti Islam mengikut model tiga-fakctor Fama dan French walaupun masalah kesan pembalikan saiz masih wujud. Penemuan ini adalah berguna untuk pelabur, penyelidik dan pembuat dasar bagi tujuan pembinaan portfolio, penanda aras dan peramalan.

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LIST OF SYMBOLS AND ABBREVIATIONS

ADDTV	Average daily dollar trading volume
ADF	Augmented Dickey-Fuller test
AIC	Akaike Information Criteria
ALI	Automatic Leading Indicator
AMV	Aggregate Market Value
ARDL	Autoregressive Distributed Lag Model
ATR	Active trading ratio
AUM	Assets under management
B/P	Book-to-price ratio
BRIC	Brazil, Russia, India and China Economic Co-operation Pact
CAGR	Cumulative aggregate growth rate
CAPM	Capital Asset Pricing Model
CEI	Coincident Economic Indicator
DF-GLS	Dickey-Fuller GLS test
DJIA	Dow Jones Industrial Average
DLGDP	Natural log of Industrial Production index after first differencing
DLIPI	Natural log of IPI after first differencing
DLKLCI	Natural log of KLCI after first differencing
DLLEI	Natural log of LEI after first differencing
DLLG	Natural log of LG after first differencing
DLLV	Natural log of LV after first differencing
ETF	Exchange Traded Funds
FDI	Foreign Direct Investment
FF	Fama and French factors
FPE	Final prediction error

FTSE	Financial Times Stock Exchange
GDP	Gross Domestic Product
GMM	Generelized method of moment model
HML	High-Minus-Low Fama and French Growth and Value factors
HQ	Hannan-Quinn information criterion
IEF	Islamic equity funds
IPI	Industrial production index
IPO	Initial public offering
KLCI	Kuala Lumpur Composite Index
KLSE	Kuala Lumpur Stock Exchange
KPSS	Kwaitkowski-Phillips-Schmidt-Shin test
LC	Large Core Islamic equtiy style index
LEI	Leading Economic Indicator
LG	Large Growth Islamic equtiy style index
LogL	Natural Logarithm
LR	Sequential modified LR test statistic
LV	Large Value Islamic equity style index
MAPE	Mean absolute percentage error
MC	Medium Core Islamic equity style index
MG	Medium Growth Islamic equity style index
MSCI	Morgan Standley Composite Index
MV	Medium Value Islamic equity style index
MYR	Malaysian Ringgit
NAV	Net asset value
OLS	Ordinary least squares
RM	Market beta

RMSPE	Root mean square percentage error
ROE	Return on equity
S&P	Standard & Poors
SAC	*Shariah* Advisory Council
SC	Small Core Islamic equity style index
SC	Securities Commission of Malaysia
SIC	Schwartz Information Criteria
SG	Small Growth Islamic equity style index
SMB	Small-Minus-Big Fama and French Market Ccapitalization factors
SV	Small Value Islamic equity style index
US	United States of America
USD	US Dollar
UTF	Unit trust funds
VAR	Vector Autoregression model

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CHAPTER 1: INTRODUCTION

The study of equity style investing has been growing since the 1930's as investors discovered that stocks with certain specific characteristics perform in a similar way. This lead towards fund managers and investors developing portfolios based on style characteristics and choosing portfolios based on stocks with similar characteristics. Nonetheless, it was not until the 1990's when William Sharpe (1992) in his seminal paper, developed theory in order to classify stocks according to size and value characteristics. It was then that fund managers were able to systematically develop investment portfolios to outperform the broad market index. In his paper, Sharpe (1992) managed to highlight the benefits of creating equity style portfolios using a multifactor approach.

Following from findings by Sharpe (1992), Fama and French (1992, 1993) provided even more evidence that equity style investments could be explained theoretically through the Fama and French three-factor model. Fama and French (1992, 1993) argued that stocks could be classified as value and growth stocks, where value stocks have low book-to-price ratio and growth stocks have high book-to-price ratios. Furthermore, stocks could also be classified based on market capitalization, for instance large and small capitalization stocks. In performing this study, they also found that value stocks with small market capitalization would outperform growth stocks with larger market capitalization, in the long-run.

As a result of these findings by Sharpe (1992) and Fama and French (1993), fund managers and investors were encouraged to develop investment portfolios which would outperform the market. This newly developed theory was also put under heavy scrutiny by academicians and researchers. However, it is the commercial application of the findings of Sharpe (1992) as well as Fama and French (1993) which is of interest to researchers and investors. Stock market index providers such as Standard & Poor's,

Morgan Stanley Composite Index (MSCI), Morningstar and Frank Russell Co. would develop stock market indices based on classifying stocks according to size and value factors. These stock indices which are known as equity style indices would then be subscribed by investors for investment management purposes.

An example of an index provider which has successfully developed equity style indices is Morningstar. In developing the equity style indices, Morningstar used the returns based style analysis framework as proposed by Sharpe (1992) as well as the Fama and French (1992) three-factor model as a basis for creating the indices. The equity style indices developed by Morningstar can be better explained by the Morningstar Style Box in Figure 1.1 below. Based on the figure below, investment styles can be classified based on combinations of subgroups depending on growth, blend and value stocks or large, mid or small market capitalization.

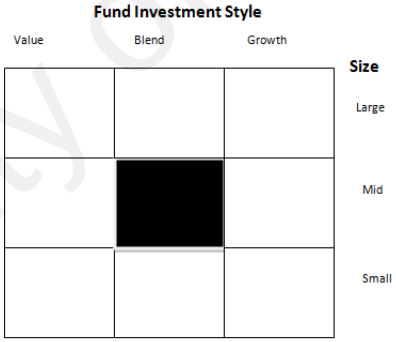


Figure 1.1: Morningstar Style Box

The commercial appeal of equity style investing has lead towards the growth in equity style indices. However, in its infancy, a majority of the equity style indices were conventional indices. For instance, there are a variety of conventional stock market indices which have been developed based on companies listed on the US stock market. As an example, the Russell Co. has developed equity style indices for large, medium and

small growth and value stocks based on the Russell Co. methodology and has made it commercially available to their clients.

It was not until the late 1990's that Islamic equity style indices were produced for commercial reasons. For instance, the Dow Jones Islamic Titans index, would track the performance of large Islamic stocks listed on the Dow Jones Index. Other Islamic equity style indices would include the Russell Co. US Islamic Large index as well as FTSE *Shariah* indices.

Nonetheless, even though Islamic stock market indices have been developed, there is a gap in terms of dedicated and commercially available Islamic equity style indices in international stock markets. For instance, the Russell Co. would have an Islamic stock market index for BRIC[1] countries which would be classified based on size, but not according to growth and value factors. The S&P Dow Jones Islamic indices on the other hand has produced an Islamic equity style index for top 100 companies listed on the Dow Jones Index (i.e. DJ Islamic Market International Titans 100 index) as well as an index which monitors the top 25 Islamic stocks listed on the Kuala Lumpur Stock Exchange (KLSE). However, the S&P Dow Jones indices have not been developed for Islamic stocks which are grouped according to growth and value factors.

The Islamic equity style indices which have so far been created are limited in terms of its focus on regional indices or in cases where they are created for a country's stock market, would not be comprehensive enough to include equity style factors such as value and growth factors. The absence of Islamic equity style indices therefore acts as a motivator in order to focus this research on constructing Islamic equity style indices based on a selection of Islamic stocks.

The *Shariah* compliant stocks listed on the KLSE will be used in this study as the Islamic equity market in Malaysia has been growing rapidly over the last couple of

[1] BRIC refers to Brazil, Russia, India and China.

decades with assets of over MYR1.02 trillion ringgit as at 2015[2]. From an international perspective, the Islamic capital markets have been growing considerably with an estimated growth rate in Islamic financial assets at a compounded annual growth rate (CAGR) of 19% from 2012-2020 totalling USD6.5 trillion in 2020[3].

Islamic capital markets is becoming an area of interest to fund managers and investors not only due to the growth of investments in the area of Islamic fund management, but also due to the fact that Islamic stocks have been proven to perform quite differently as compared to conventional stocks. This has lead towards investors looking to take investment positions in Islamic portfolios in order to diversity their holdings. For instance, Alam and Rajjague (2010), Ashraf (2013), Hoepner et al. (2013) as well as Merdad (2010) have all argued that Islamic investment funds are more resilient during periods of economic recession as compared to conventional funds.

Amongst the reasons cited by these authors to explain the differences between Islamic and conventional stocks include screening methodologies and prohibitions imposed by Islamic law. Furthermore, Shariah stocks have been argued to be concerned with socially responsible investments and not necessarily profit driven. Also, Shariah stocks are more successful in countries where customers and agents experience higher utility from adherence to Shariah law (Hoepner et al., 2013).

Despite the fact that there is significant growth in the area of Islamic stock markets, very little research has been performed on Islamic equity style investing. This is as a result of the absence of commercially available Islamic equity style stock market indices. In the case of the Islamic stock market in Malaysia, the FTSE EMAS *Shariah* index has been developed to monitor the performance of all *Shariah* compliant listings on the Kuala Lumpur Stock Exchange (KLSE). The FTSE EMAS Hijrah index on the other hand

[2] Total market capitalization of Shariah compliant stocks on Bursa Malaysia as at June of 2015 is taken from the Securities Commission of Malaysia website. (As accessed from https://www.sc.com.my/data-statistics/islamic-capital-market-statistics/)
[3] Figures are derived from the Islamic Financial Services Board's (IFSB) report on Propects and Challenges in the development of Islamic finance in Bangladesh (2014).

tracks the performance of the top 30 largest Islamic stocks on the KLSE. However, based on the evidence of existing stock market indices, there is no dedicated and commercially available index which has been developed for Islamic equity style categories of stocks based on *Shariah* compliant stocks on the KLSE.

The benefits of developing equity style indices are not only limited to investors and fund managers who use the equity style index for purposes of investment management. However, researchers who are interested in the area of asset pricing and fund management also have a keen interest in testing the theoretical underpinnings of the models surrounding equity style investing. Furthermore, government and prudential regulators who are concerned about the developments in the capital markets would also be interested in such an index. More importantly, studies of the Islamic stock markets which have been growing rapidly in the recent past would be aided considerably as a result of the development of the Islamic equity style indices.

1.1 Islamic stock market in Malaysia

The Islamic capital markets have been growing rapidly in Malaysia in the last few decades. The Islamic stock market in Malaysia is one of the largest and most developed in the world. In Malaysia, The FTSE Bursa EMAS *Shariah* index measures the performance of all *Shariah* compliant stocks which are listed on the KLSE. As at December 2015, the total market capitalization of 667 *Shariah* compliant stocks listed on the FTSE Bursa EMAS *Shariah* index is above MYR1 trillion. The cumulative 5 year return for the FTSE Bursa EMAS *Shariah* index is above 22%, which makes it an attractive investment alternative to the FTSE Bursa EMAS index, which by comparison has a total cumulative 5 year return of 13% (Reuters Datastream, 2016).

The Islamic stock market in Malaysia can be explained in Appendix B.1. The performance of Islamic stocks in Malaysia is measured based on the FTSE EMAS *Shariah* index as well as the FTSE EMAS Hijrah index (for large Islamic stocks).

The sheer size and rate of growth of the Islamic stock market in Malaysia has made it an attractive investment option for investors. Together with a robust economy which is growing at a rate of 4% to 5% (as forecasted by the World Bank[4]) from 2016 to 2020, the Malaysian economy has performed well in recent years. The performance of the Malaysian economy is especially remarkable given the fact that the economy has proven to be resilient to external shocks as a result of the Global Financial Crisis (GFC) of 2008.

The Islamic stock market in Malaysia consists of companies which are classified as *Shariah* compliant stocks. The constituents of the FTSE EMAS *Shariah* index is determined by the *Shariah* Advisory Council (SAC) of the Securities Commission of Malaysia (SC). The SAC requires companies to pass minimum standards of requirements when it comes to the amount of debts and types of activities companies can be involved in. Companies are prevented from being involved in gambling, have high levels of risk and also needs to comply with "*halal*" standards and other requirements of the SAC. Furthermore, the SAC has determined that the index is to be revised semi-annually.

The FTSE EMAS *Shariah* index provides investors with an alternative to the conventional index when it comes to creating an investment portfolio. Fund managers and investors are also able to benchmark the performance of their portfolios based on foreign Islamic equity indices. For example, the Dow Jones Islamic World Market index by Standard & Poors (S&P) measures the performance of Islamic stocks listed in a number of countries with a total market capitalisation of over USD21 trillion as at February 2016. Islamic stocks listed on the Malaysian stock exchange represents a total of 0.33% as compared to other countries on this index.

The development of the Islamic stock market in Malaysia is also dependant on the effectiveness of the SAC in promoting Islamic stocks. In order to do this, the SC of Malaysia is advocating greater transparency when it comes to the SAC's decisions to

[4] As taken from Global Economic Prospects East Asia and Pacific – January 2016, World Bank.

determine the constituents of the FTSE EMAS *Shariah* index. Also, the SC is encouraging Islamic stocks to be benchmarked against Islamic stocks in more mature stock exchanges. The future looks promising for the Islamic stock markets as investor participation is expected to rise. This will further encourage researchers and practitioners to contribute towards the development of the Islamic stock market in Malaysia.

1.2 Benefits of developing Islamic equity style indices

There are numerous advantageous to developing Islamic equity style indices. Reilly and Brown (2012) have provided a comprehensive explanation of benefits relating to stock market indices. This list of benefits could in fact be used as a framework to explain the benefits of developing equity style indices. These benefits include the creation of a benchmark for purposes of performance measurement, construction of index portfolios, as a means to compare performance against other asset classes, as a forecasting tool as well as to evaluate risk-return relationships of securities for purposes of asset allocation decisions.

Siegel (2003) further argued that the stock market index can be used in order to gauge the performance of funds managers. Coggins and Fabozzi (2003) indicated that equity style indices are beneficial for analysing exchange traded funds (ETF's) and listed various methods in which fund managers and investors can gain advantages by using style indices. These benefits are further explained in Appendix B.2.

However, for purposes of this study, the research will be centred on two main areas which have been explained by Reilly and Brown (2012). Firstly, the Islamic equity style indices will be tested for its degree of cointegration with macroeconomic variables. This is done in order to test the forecasting and information transmission properties of the newly created indices. Secondly, the validity of the Fama and French three-factor model will be evaluated by using data derived from the newly developed Islamic equity style indices.

By extension, the development of new Islamic equity style indices in an emerging economy such as Malaysia would highlight some areas of research pertaining to asset pricing models and stock market index forecasting which can be further studied. As a result of these two approaches towards analysing the Islamic style indices, it is hoped that investors, fund managers and government regulators will be able to use results of this study for their own purposes.

1.2.1 Information transmission and forecasting economic conditions.

For purposes of this study, the first test which shall be performed based on the newly developed Islamic equity style indices is on the efficacy in information transmission and usefulness in forecasting economic conditions. In order to achieve this objective, the Vector Autoregression (VAR) model as introduced by Sims (1980) will be used by testing the newly created indices against macroeconomic variables in Malaysia.

The development of macroeconomic variables such as leading economic indicators (LEI) and coincident economic indicators (CEI) by Stock and Watson in the 1940's has been a useful tool which can be used to forecast future economic health of a country. However, it was later found that stock market indices have a similar function in terms of being a barometer to test equity style indices and whether they can be used as a macroeconomic variable to forecast states of the economy.

There are various examples of researchers using stock market indices for purposes of forecasting economic conditions. For example, Black (2006) examined the relationship between conditional variance of factors from the Fama and French three-factor model and macroeconomic risk using real GDP growth rates as a proxy. The findings from this study would suggest that government regulators would better understand the state of the economy by understanding the relationship between risk and return of an asset versus the volatility of macroeconomic variables.

Abdelbaki (2013) in applying the Autoregressive Distributed Lag Model (ARDL) found that the development of the financial market, by using the stock market index as a proxy, is closely related to the growth of the economy. By extension, this further contributes towards the argument for having a well-developed stock market index.

Chen et al. (1986) as well as Campbell and Shiller (1988) have provided evidence to argue that there is a strong relationship between stock market returns and economic fundamentals. Chen et al. (1986) argued that there is a positive correlation between stock returns in developed and developing countries, by analysing stock returns of China and the US. In a recent paper, Choudry et al. (2016) used information from stock market indices to show evidence of bidirectional relationship and spill over effects across countries as a result of stock market volatility and the business cycle.

For the purpose of this study, the newly developed Islamic equity style indices can be used for similar purposes in gauging a countries economic performance. Lau and Lee (2015) provided evidence to suggest that equity style indices can be used as a leading economic indicator by applying the Vector Autoregression (VAR) model based on Malaysian conventional equity style indices versus macroeconomic indicators. The findings from this study shows evidence that growth style indices precedes sectoral stock market indices and would be a better candidate as an economic indicator.

The results thus far have been mixed when it comes to the usefulness of the equity style indices in gauging and forecasting economic health. However, what is evident is that an Islamic equity style indices have not been created. Consequently, this would also mean that there has not been studies performed on its forecasting ability. If so found to be true that Islamic equity style indices are in fact a reliable and robust forecasting tool, this would not only be useful to investors and fund managers, but also for government policy makers in designing economic policy.

1.2.2 Fama and French three-factor model

The second test which shall be performed based on the newly constructed Islamic equity style indices will be to examine the validity of the newly created indices vis-à-vis the Fama and French three-factor model. The Fama and French (1992, 1993) three-factor model has been regarded as a cornerstone for investors and analysts for purposes of developing and evaluating the performance of investment portfolios. The Fama and French model extends the CAPM model by adding two additional factors, namely size and value factors to evaluate expected returns. The argument developed by Fama and French is that a single risk factor is insufficient in order to explain expected returns. Instead, size and value factors which are included in the asset pricing model provides better estimates when it comes to stock returns.

However, there is insufficient research when it comes to analysing Islamic stocks performance as viewed against the Fama and French three-factor model as there are few Islamic equity style indices which have been developed using Islamic stock market data. By constructing the Islamic equity style indices based on Malaysian Islamic stocks, it is hoped that there will be an increase of interest in the area of investment management of Islamic stocks.

The validity of the three-factor model has been subject to much scrutiny. Cochrane (2001) argues that alternatives to the three-factor model have proven to be just as efficient. Nonetheless, researchers are still evaluating the validity of the indices. For instance, Baek and Bilson (2015) recently applied the three-factor model in evaluating and size and value risk premium in financial as well as non-financial firms. They found that size and value exists in both financial as well as nonfinancial markets. However, interest rate risk premium which is regarded as firm specific risk only appears in financial firms. Feng and Johansson (2015) used an extension to the three-factor model by applying the Carhart four-factor model in order to test the ability of mutual funds to select

IPO's in China. They found that mutual funds with higher residuals are better at predicting future performance of IPO firms.

Trimech et al. (2009) used a multiscale wavelet analysis in order to examine the relationship between stock returns and Fama and French risk factors at different time scales. The results of the analysis indicate that the Fama and French three factor model's explanatory power increases as the wavelet scale increases. The analysis is useful for investment managers who intend to construct dynamic portfolio management strategies which account for multiscale nature of risk and return.

Recent studies have also developed to extend the three-factor model. As an example is the Carhart (1997) four-factor model as well as the Fama and French's own extension of their model in the form of the Fama and French (2015) five-factor model which extends the existing model to include profitability and investment factors. Also, Pastor and Sambaugh (2003) investigated the role of liquidity premium for purposes of pricing stocks with promising results.

Nonetheless, one of the main issues with the Fama and French (1992, 1993) three-factor model relates to the negative size premia which is also known as the reversal of size effect. This anomaly which was explained by a negative size beta, was uncovered initially by Dimson and Marsh (1999). The yet to be solved issue has caused much consternation amongst investors and analysts and is subject to much debate.

For the purpose of this study, the validity of the Fama and French three-factor model will be tested using similar methods applied by Fama and French (1992, 1993). Faff (2001), which is often cited in this study as an authority relating to the application of the Fama and French three-factor model, managed to provide evidence to show that the Fama and French three-factor model can be tested using simple constructs of Fama and French factors. This study which was based on data taken from the Australian Stock Exchange

(ASX) however uncovered the negative size premia anomaly which contradicts with the Fama and French three-factor model. Nonetheless, the methodology proposed by Faff (2001) was later tested on the Japanese stock exchange by Long Pham (2007). In this study (Long Pham, 2007), the reversal of size effect was more distinct during periods of economic recession.

From an investment management point of view, the development of new Islamic equity style indices would also create new opportunities for studies relating to Islamic investment management. Reilly and Brown (2012) in fact explained investment management from the viewpoint of active and passive management. Passive management involves the use of indexing for purposes of investing. Active management on the other hand relies on a variety of dynamic methods of investing to seek returns above the market. When it comes to both active and passive management strategies, newly created Islamic indices would create new areas of interest for investors as well as researchers (refer to Appendix B.2). Furthermore, Reilly and Brown (2012) has suggested that investment management strategies involving a portfolio of different assets could also be developed as a result of the development of new indices.

1.3 Objectives of Study

Having identified the gulf in research related to Islamic equity style indices, the main objective of the study is to create Islamic equity style indices based on the FTSE Bursa EMAS *Shariah* index based on Islamic stocks in Malaysia. Once created, the Islamic equity style factors developed will be tested according to the Fama and French three factor model based on the GMM methodology. The Fama and French factors will be tested using the three factor model in relation to both sectoral indices as well as Islamic unit trust funds in Malaysia. Additionally, the indices will also be tested to see if it has forecasting properties based on the VAR model and if it can be included as a macroeconomic variable.

The results of the study will be useful to investors, researchers as well as policy makers. By addressing the objectives of this study, investors, researchers and policy makers will be able to gain valuable knowledge from the point of view of making asset allocation decisions, forecasting future economic conditions and designing policy measures. This can be achieved by testing the information transmission capabilites of the newly developed Islamic equity style indices and to determine whether the newly developed Islamic Fama and French factors follow the Fama and French three-factor model. However, before this can be done, the Islamic equity style indices have to be developed.

1.4 Research Questions

Following from the objectives mentioned above, this research paper will then attempt to answer the following questions:-

1. Whether it is possible to construct new Islamic equity style indices based on the FTSE EMAS *Shariah* index in Malaysia?
2. Does the newly developed Islamic equity style factors follow the Fama and French three factor model when tested against the sectoral indices and the Islamic unit trust funds in Malaysia?
3. Can the Islamic equity style indices be used as a macroeconomic variable to forecast the economy in Malaysia by using the VAR model?

1.5 Expected Contribution

There are several contributions that may result from this study. The first contribution of developing Islamic equity style indices is that it could aid investors in making asset allocation decisions. Investors could rely on the Islamic equity style indices in order to make active or passive investment decisions. The selection of Islamic equity style portfolios are only possible with the creation of Islamic equity style indices which

measures the performance of portfolios of Islamic stocks grouped according to similar characteristics.

Secondly, fund managers performance could also be evaluated based on their performance in investing in Islamic equity style portfolios. There have been various studies which have been performed to evaluate the performance of fund managers. Similar studies could be extended to the performance of fund managers of Islamic equity style portfolios.

Thirdly, policy makers which would include financial regulators such as Securities Commission of Malaysia and Bank Negara Malaysia (Central Bank of Malaysia) could use the indices as a gauge of performance of the Islamic stock market. The same would apply to Bursa Malaysia and rating agencies. An example of the benefit of creating Islamic equity style indices for government regulators was argued by Lee and Phillips (2015). In this study, it was proposed that Islamic equity style indices could be compared to conventional indices in order to analyse systemic risk in an economy.

In a recent study, Bamiatzi et al. (2016) argued that in analysing investor's stock selection preferences in Turkey, it was found that investors from the middle-class of the economy have a significant role in influencing trading activities on the Turkish stock exchange. In the same paper, they also recommended that government regulators improve the level of governance and transparency in the stock market in order to encourage participation of middle-class investors.

Sensoy et al. (2015) on the other hand argued that market efficiency should be improved as it relates to Islamic equities. Islamic stocks are argued to be weak-form efficient during the Global Financial Crisis of 2008 and policy makers and regulators need to take correct measures in order to make the market more efficient. Various other studies relating to Islamic indices including the increase of level of integration and

'financialization' of the Islamic markets into the global financial system (Yilmaz, 2015) also has an influence on government policy decision making.

Fourthly, the *Shariah* Advisory Council (SAC) could use the Islamic equity style indices as a means for them to make correct decisions relating to selection of Islamic stocks and based on listing requirements. The importance of making accurate Islamic stock selection decisions can be interpreted from the point of view of Merdad (2015). In this paper, it was argued that the "Islamic effect" when tested in a four-factor model does have an effect on a cross section of stock returns based on Saudi Arabian stocks. Therefore, *Shariah* councils need to be cognisant of this fact when making stock selection decisions.

Finally, the creation of Islamic equity style indices will provide some useful information regarding Islamic equity markets in developing economies especially from the point of view of the performance of stylized categories of stocks. This aspect can be viewed from the perspective of asset pricing models. For example, Hearn et al. (2010) tested the CAPM model on emerging market economies by including the size and liquidity premium. This study can be extended to the Malaysian Islamic market by extending data to include these factors. Based on this study, the evidence from Africa indicates that the stock exchanges need to extend financing to smaller undercapitalized companies. Furthermore, this would suggest that there is also a need to improve corporate governance and regulation to improve investor participation.

1.6 Chapter organization

The rest of this dissertation will be presented as follows. The second chapter will cover a summary of the literature relating to this research study. The study of literature will attempt to highlight the important research work in relation to the development of equity style investing and equity style indices as well as studies in macroeconomic variables which have been used as a tool to forecast economic health. Furthermore, the

coverage of the literature will attempt to encapsulate not only the important writings relating to this study, but also recent literature which may shed some light as to how equity style investing research will develop in the future. However, the research papers in the area of Islamic equity style investing is rather scant, but some notable findings have been made based on work which has been published.

The third chapter will then describe the construction of the Islamic equity style indices based on the FTSE Bursa EMAS *Shariah* index in Malaysia between May 2006 and April 2011. The stocks which were selected were based on Islamic stocks listed on the FTSE EMAS *Shariah* index which is chosen based on the listing requirements of the *Shariah* Advisory Council (SAC) of the Securities Commission of Malaysia (SC). A thorough and detailed description of the methodology for firstly selecting and delineating the Fama and French factors are initially explained. This is followed by an explanation of the methods used to construct the Islamic equity style indices which were based on the Russell Co. method of constructing and maintaining indices.

Chapter four will then test the new Islamic Fama and French indices and the relationship between new Fama and French equity style indices in relation to macroeconomic variables. The Vector Autoregression (VAR) methodology will be used in order to test information transmission efficacy of large value (LV) and large growth (LG) Islamic stocks in comparison to macroeconomic variables such as KLCI, LEI, CEI, IPI and GDP. The VAR model will be used as a method to test the short-run cointegration of the variables chosen.

Chapter five will then test validity of the Fama and French three factor model against ten sectoral indices and Islamic unit trust funds in Malaysia. The method that will be employed is the GMM methodology by Lars Peter Hansen (1982) in order to overcome some of the statistical limitations by using other well-known models including ordinary least squares (OLS) and maximum likelihood.

Finally, chapter six will conclude this research paper by revisiting some of the results of the study. This will be done by re-evaluating the research objectives and the outcomes based on the earlier hypothesis of the study. Also, a summary of possible future areas of research which could follow from this research will be discussed. Particular attention will be given to the results of the study as it relates to investors, researchers and policy makers.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The growth and development of Islamic capital markets in the last few decades have heralded the need to perform analysis on Islamic equities. The Islamic stock markets have been evolving rapidly over the last couple of decades with developments across countries in the banking industry, stock, fund management and Sukuk market as well as the Takaful industry[5]. The Islamic stock markets have evolved as a result of the international developments of the capital markets due to the contribution and involvement of government institutions and multinational companies in order to meet the needs of both Muslim and non-Muslim investors and financiers. The existing literature, however, does not provide enough evidence to suggest that research has been performed in relevant areas of Islamic fund management relating to asset pricing. More importantly, when it comes to analysing and making asset allocation decisions based on equity style investing, there seems to be a notable shortage in terms of studies related to the area, especially when it comes to the Islamic capital markets.

The Islamic capital markets have been experiencing robust development over the last few decades. The growth rate globally for Islamic financial assets have been estimated at 15% to 20% a year since 1990 (Iqbal and Mirakhor, 2013). According to Ernst & Young's World Islamic Banking Competitiveness Report (2014-2015), Islamic financial assets have grown at double digit rates from 2003 to 2013 and now stands at over USD1.8 trillion.

The growth of the Islamic stock market has also been promising over the last few decades. For example, the Dow Jones Islamic Market International Titans Index, which is a renowned Islamic stock market index developed by Standard & Poor's, has experienced a cumulative aggregate growth rate (CAGR) of 8.16% since its inception in January 1996

[5] Sukuk market refers to the market for Islamic bonds while the Takaful industry refers to the Islamic insurance industry.

to December 2015 (Thomson Reuters Datastream, 2016). The FTSE EMAS *Shariah* index, which is the Islamic stock market index that captures the performance of all *Shariah* compliant stocks in one of the largest and most dynamic Islamic stock markets in Malaysia, has been experiencing a CAGR of 6.79% since its introduction in January 2007 to December 2015 (Thomson Reuters Datastream, 2016). Growth of the FTSE EMAS Shariah index can be explained by the increasing internationalization of the Islamic capital markets, innovative product offerings as well as cross border cooperation between Islamic capital markets as explained by the chairman of the Securities Commission of Malaysia[6].

Malaysia has developed to become one of the most important centres for the development of the Islamic capital markets and as at the end of 2014 holds 57% of total market capitalization of the Islamic capital markets[7]. Also, as at December 2015, there are a total of 667 *Shariah* compliant stocks listed on the Kuala Lumpur Stock Exchange with a market capitalization of MYR1.086 trillion.

The development of the Islamic capital markets can also be proven by the increase in the total size of the Islamic fund management industry in Malaysia. Total Islamic Assets Under Management (AUM) exceeded MYR132 billion as at December 2015 (refer to Appendix C.1). Also, as at December 2015, the total number of Islamic Unit Trust Funds (UTF) are 193 from a total of 612 in the Malaysian unit trust fund industry. Furthermore, the total net asset value of the Islamic UTF's are MYR346.58 billion which represents 15% of the total size of the UTF industry. The Islamic UTF's in terms of NAV have grown from 13.6% to 15% from December 2014 to December 2015.

The majority of stock market indices which have been developed internationally does not distinguish between stocks which share similar characteristics. Historically, investors

[6] Refer to the speech by the Chairman of the Securities Commission of Malaysia, Mr. Ranjit Ajit Singh. (As accessed from the Securities Commission Website at https://www.sc.com.my/post_archive/launch-of-ftse-bursa-malaysia-hijrah-shariah-index-by-mr-ranjit-ajit-singh-senior-executive-director-securities-commission/)
[7] As reported in the *Thomson Reuters Canada Islamic Finance Outlook 2016*.

and fund managers have found that it is better to develop a portfolio of stocks which have similar characteristics for purposes of making asset allocation decisions. The process of developing portfolios of stocks with similar characteristics for purposes of making investment decisions is known as equity style investing.

By definition, equity style investing is the process of developing investment portfolios based on stocks with common characteristics (Bernstein and Tupper, 1998). Different "styles" of investing can be developed based on defining stocks according to structural segments (i.e. investment charters of mandates, permissible investments and risk tolerance of managers and investors), psychological factors (i.e. regret aversion of the investment manager) and information asymmetry (i.e. not all companies have the same flow of information) (Bernstein and Tupper, 1998). Equity style investing therefore extends beyond investing in growth and value stocks (growth being high P/E ratio and value being low P/E ratio stocks) and categorizes stocks based on size and market capitalization.

Equity style investing has various benefits including developing style rotation strategies for managers. In Malaysia, the findings seem to suggest that growth strategies for stock picking has outperformed value strategies after the 1997 Asian Financial Crisis due to a slide in earnings per share growth (Bernstein, 1998). The style strategy which has proven to work in the case of Malaysia combines earnings, momentum, value and optimism. However, optimism as measured by high broker optimism (as explained by buy recommendations) and low broker optimism (as explained by sell recommendations) do not hold any predictive power and add to performance. This can be proven by the figure below which indicates that broker's buy recommendations have not only underperformed but also lost value added during the 1996-1997 Asian Financial Crisis (refer to Appendix C.2).

The evidence thus far seems to indicate that equity style investing has numerous advantages to investors and fund managers. Nonetheless, investors and fund managers are deprived of making equity style investment decisions based on *Shariah* compliant stocks due to the absence of Islamic equity style indices which group's Islamic stocks based on common characteristics. It can be hypothesized that better investment decisions can be made by applying Islamic equity style investing techniques based on Islamic stocks which have been categorized according to similar characteristics and its performance measured in the form of an Islamic equity style index.

There are various similarities and differences between Islamic and conventional stocks from the point of view of equity style investing. The differences between Islamic and conventional stocks can be described in Table 2.1 below:-

Table 2.1: Differences and similarities between Islamic and conventional shares from an equity style investing perspective

Areas	Islamic shares	Conventional shares
Screening methodology	Stocks needs to be approved by the *Shariah* Advisory Council (SAC) of the Securities Commission of Malaysia (SC) based on *Shariah* guidelines. Excludes equities which may promote Gharar (fraud), Bai al-Ma'dum (selling items which are not owned). Muslim intellectuals continue to argue about the legitimacy of interest and *riba* (Kamla and Alsoufi, 2015).	SC approves stocks listing of stocks based on conventional listing requirement guidelines.
Mutual funds	Islamic mutual funds are made up of funds which have been screened of debt based and profit based investments (Hartono et al., 2014).	Conventional mutual funds can freely choose between debt based and profit based investments.
Style investing	Recent interest in the area of style investing.	Graham and Dodd (1934) have argued for the benefits of investing in value stocks since the 1930's.

(Table 2.1 Continued)

Asset pricing models	Asset pricing models (Fama and French, 1992) in Islamic finance was tested by Kianpoor and Dehghani (2016) based on Tehran Stock Market. Little evidence Islamic stocks were tested by analysts in other studies.	Numerous examples including most recently the Fama and French five-factor model (Fama and French, 2015).
Equity style indices	Few equity style indices:– i.e. S&P Dow Jones Islamic Indices	Numerous equity style indices:- i.e. S&P, Vanguard, Russell Co., Morningstar etc.
(Risk and volatility	Islamic indices performance varies. Less volatile as compared to conventional indices (Sensoy et al., 2015)	More volatile as compared to Islamic indices.
Diversification benefits	Diversification benefits by creating a portfolio of conventional and Islamic stocks (Saiti et al., 2014). Also supported by Abbes et al. (2015). Hedging benefits of using Islamic investments was argued by Ashraf and Mohammad (2014).	Less benefits when comparing a portfolio purely made up of conventional stocks as compared to a portfolio which consists of conventional and Islamic stocks.
Decoupling of Islamic and conventional indices	Islamic and conventional indices are not decoupled (Yilmaz et al., 2015).	Not decoupled from Islamic indices.

By comparing Islamic and conventional shares in Table 2.1, one of the dissimilarities between conventional and Islamic stocks can be proven by evaluating screening methodologies for stocks based on listing requirements. While conventional stocks in Malaysia needs to be approved based on conventional listing requirement rules of the Securities Commission of Malaysia (SC) before being added as a constituent on the FTSE Bursa Malaysia EMAS Index, the *Shariah* compliant Malaysian stocks needs to be approved by the *Shariah* Advisory Council (SAC) of the SC. Once approved, the Islamic stocks will be added as a constituent in the FTSE Bursa Malaysia EMAS *Shariah* index which is rebalanced and reconstituted semi-annually.

At present, there seems to be a lack of commercially available Islamic equity style indices for purposes of developing Islamic equity style portfolios. This has proven to be

an impediment to investors who are now looking at Islamic stocks as an alternative to conventional stocks for the purpose of creating a diversified portfolio. Diversification benefits of Islamic stocks during periods of economic downturn has been argued by Saiti et al. (2014) as well as Abbes et al. (2015). Furthermore, Islamic stocks have been shown to be attractive investments during periods of recession as they are less volatile (Sensoy et al., 2015). However, studies by Yilmaz et al. (2015) has indicated that the Islamic stock market indices are not decoupled from conventional indices.

The differences between Islamic and conventional stocks in terms of the effects of screening does not prevent from developing Islamic equity style portfolios. The recent emergence of interest in the area as evidenced from studies by Dewandaru et al. (2015), Walkshäul et al. (2015) as well as Merdad et al. (2015) suggests that it would be beneficial to conduct further studies in the area of Islamic equity style investing.

The obvious gap in this area of study can be explained by the absence of Islamic equity style indices. The gap is even more evident when it comes to equity style indices in emerging economies. This phenomenon is not surprising given that the idea of equity style investment originates from studies done in the US market.

The first proponent of equity style investing comes from Fama and French (1992). In their seminal paper on the three-factor model, they argue, in addition to the market risk premium, there exist other factors like size and value that help to explain the stock returns. This discovery lead to the awareness of the existence of equity style investing, in the form of value and small cap portfolios into the investment fraternity. According to their argument, the three-factor model is a better way to describe how stocks behave relative to the capital asset pricing model (CAPM).

In the same year, the seminal paper on asset allocation and performance measurement was published by the Nobel Laureate William Sharpe (1992). In his paper, he introduced an asset class factor model which was able to decompose mutual fund returns into their

respective asset allocation categories based on a technique known as return-based style analysis (RBSA). The ability of this new technique to identify the style of a portfolio once again struck the interest of the investment fraternity. This method of determining the performance of stocks categorized based on similar characteristics was also known as style analysis. The introduction of the style box by Morningstar in the 1990's further enhanced the interest of academia and investment practitioners in style classification.

The findings from Sharpe (1992) as well as Fama and French (1992, 1993) in classifying stocks based on categories and characteristics for investment purposes has lead towards the development of equity style investing. Equity style investing has also been known as style investing (Barberis and Schleifer, 2003). Style investing is the process of allocating individual securities of with similar "styles" into an investment fund. This process of categorizing assets into broad classes such as large-cap stocks, value stocks and different asset classes also influences the way investors make asset allocation decisions (Bernstein, 1995).

The research work so far has focussed mainly on equity style investing by looking at stocks selected from the conventional universe of stocks in different markets. However, there has not been much work performed in terms of equity style investing based on Islamic stocks. The gap in the analysis of Islamic equity style investing is alarming especially given the growth of Islamic financial markets. Further analysis of Islamic stocks based on style characteristics would undoubtedly enrich investors who are seeking to further understand how to make asset allocation decisions based on Islamic stocks.

Furthermore, the research work performed thus far seems to indicate that even though there are a number of research work done on the three-factor model under different settings, there has not been as much work performed based on Islamic equity style indices. From the point of view of benefits of equity style investing alone, the evidence

seems to indicate that fund managers as of late have accepted the benefits of constructing portfolios which abide by some of the intuition of classifying stocks based on categories.

However, it is still unproven that fund managers can benefit from equity style fund management. The scarcity of work performed in the area of equity style investing, especially in relation to Islamic capital markets, has made it even more important that further research be performed in this area.

This survey of literature focuses on the area of equity style investing and how it relates to the Islamic stock market to highlight the current position in relation to the theoretical framework and possible future directions of research. The analysis begins by focusing on the current research work done on equity style investing. This is followed by the application of equity style investing based on the Fama and French (1992) three factor model. The Islamic equity style investing will then be analysed from the point of view of existing Islamic equity style indices.

2.2 The idea of Style and the Fama-French Three-factor Model

In as early as the 1970's, there was a fundamental shift in how investors made portfolio investment decisions as a result of research findings which indicated that stocks can be classified based on similar characteristics. These findings were eluded by Sharpe (1970) and Rosenberg (1974) and suggests that larger stocks exhibit similar characteristics in terms of performance. It was Fama and French (1992, 1993) and their studies in the area of asset pricing which found that the returns of a portfolio with small capitalization (small-minus-big ("SMB")) and return of portfolios of value stocks (high-minus-low,("HML")) as factors which disproves cross-sectional equity returns as a measure of determining performance relationship between stocks.

Fama and French's research evaluated the joint effects of market beta, size, E/P ratio, leverage and the Book Value (BV) / Market Value (MV) on a cross section of average returns and they found that there is a negative relationship between size and average

return as well as a positive relationship between BV/MV ratio and average return (Reilly and Brown, 2012). Consequently, Fama and French successfully argued that two additional factors, namely size and book-to-market ratio should be included in the capital asset pricing model to further improve the model. In fact, the same intuition was applied in this case to demonstrate that beta has no ability to explain cross-sectional variations in equity returns. Rather, size and book-to-market value of equity in fact explained the cross-sectional returns of stocks. This finding was later substantiated through research work done by Grinold (1993), Davis (1994) as well as He and Ng (1994) but to name a few.

Fama and French's (1992) finding which complements and improves on the capital asset pricing model (CAPM) was also known as the three-factor model. The findings from Fama and French suggests that it was in fact the characteristics of the stocks which explains the cross correlation between stocks of similar characteristics (Daniel and Titman, 1997). The Fama and French (1992) findings also paved the way for studies in the area of return based style analysis (RBSA). Based on the return based analysis, Horst et al. (2004) later found that style analysis leads to significant efficiency gains in factor loadings when factors have low cross-correlations.

Fama and French's stylized approach was further tested by various researchers with results which vary. For instance, Lakanishok, Shleifer and Vishny (1994) studied the Fama and French three factor model and its impact on value and growth investment strategies. Their findings seem to indicate that value investment strategies are more beneficial. This finding supports the hypothesis by Fama and French (1992). Earlier work by Chan, Hamao and Lakonishok (1991) also ascertained the benefits of value investing in the Japanese stock market.

However, there are research findings, which are contradictory to the three factor model. As an example, Ahmad and Nanda (2000) suggested that growth and value stocks

are not mutually exclusive and that the combination of the two stylized factors outperforms equity style stocks. Furthermore, Chan and Lakonishok (2004) argued that returns from growth stocks which originate from companies in fast paced and dynamic industries outperform value stocks.

These contradictions seem to indicate that further work needs to be performed in the area of fund management in relation to style investing. An area which needs further analysis in fact is investor behaviour. Lakonishok et al. (1994) argued that the problem with value investing strategies is that investors make suboptimal investment decisions which jeopardizes the effectiveness of the value style investment strategy. Nonetheless, there have been studies which seem to indicate that equity style "value" investing in emerging markets does benefit investors (Kargin et al., 2002)

2.3 Findings of Fama-French Three-factor Model in non-US Markets

The breakthrough by Fama and French (1992) was later used by researchers in order to test the newly hypothesized Fama and French three factor model. However, there still remains the issue of developing Fama and French factors before further analysis can be performed. In this vein, Faff (2001) managed to overcome this problem by creating Fama and French factors based on Frank Russell (i.e. Russell Co.) style portfolios construction methods. Consequently, Faff (2001, 2003) managed to ascertain that the Fama and French model can be supported after having been tested based on a multivariate asset-pricing analysis.

Having said that, the results of the analysis by Faff (2001, 2003) and other researchers seems to indicate that there are idiosyncrasies in the chosen data and methods applied in testing the three factor model that needs to be further explained. By analysing the performance of 24 Australian industry portfolios which were represented on the Australian Stock Exchange (ASX), Faff (2001) referred to a 'perverse' finding in the form of a 'reversal' of the size effect which contradicts the principles argued by Fama

and French (1992, 1993). Furthermore, Faff (2003) argued in his paper that there does not appear to be a high proportion of SMB and HML betas which take on a positive sign. Long Pham (2007) also contributed towards the debate surrounding the empirical performance of the CAPM and the Fama and French model by constructing market proxies for the Fama and French factors by using Daiwa Style indices based on Japanese stocks as stylized facts. Also, Walid and Lau (2009) who followed up on the work by Faff (2003) by using Russell/Nomura style index and supported the claims made by prior research.

However, support for the three-factor model was less persuasive based on research performed in subsequent studies. For instance, Faff (2009) sought to address some findings that he described as variables in the Fama and French model which not be as robust as suggested in prior literature. The research seems to indicate that when the estimated risk premium is taken into account, the support for the Fama and French model is less persuasive. Furthermore, this paper also uncovered a negative size premium and the argument which was initially posed by Dimson and Marsh (1999) of the reversal of the size effect where small, value type companies do not outperform growth companies.

Kothari (1995) further argued that book to market results are affected by a selection bias. The cross-section of expected return reveals statistically significant compensation for beta risk for an equally weighted index. However, the relation between book-to-market equity returns are weaker and less consistent as compared to Fama and French (1992).

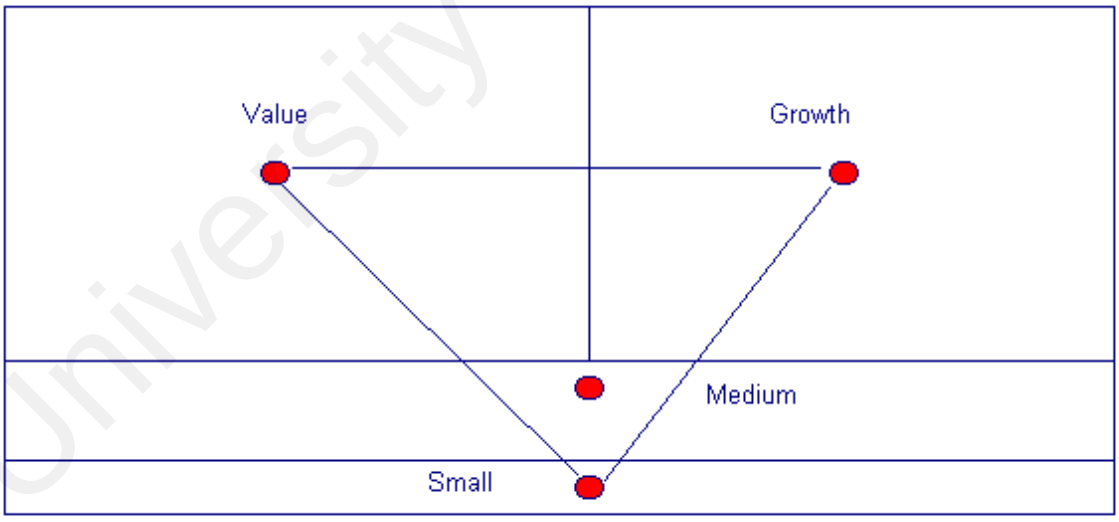
2.4 Style Investing and Performance Attribution

The seminal paper by Sharpe (1992) which was hailed as the cornerstone that defined this shift in thinking amongst investors towards a new approach in investment and portfolio management based on focussing on the characteristics of different categories of

shares. It was from the findings of this paper that investors later coined the phrase "style investing".

In his paper, Sharpe (1992) argued that equity style stocks can be classified further based on growth and value stocks. In doing so, he characterized growth and value stocks based on size and value stocks. To further explain, variables used to explain growth and value stocks are the Price-to-Book (P/B) ratio (where the higher P/B ratio represents growth stocks and the low P/B ratio represents value stocks) and market capitalization of firms (where large market capitalization represents growth stocks and low market capitalization represents value stocks).

Sharpe's 1992 paper has relevance to Islamic equity style investing as a framework was proposed to decompose and analyse the performance of stocks with different characteristics. According to Sharpe (1992) stocks can be grouped based on market capitalization as well as growth and value stocks, as explained by Figure 2.1 below:-



Source: Sharpe (1992)

Figure 2.1: Composition of four domestic equity classes

Sharpe's (1992) study also shows evidence that value stocks outperform growth stocks over the long-run and this also applies to various asset classes as well as mutual funds. The practical implications of Sharpe's (1992) study is that the performance of an

investment portfolio can be tracked based on a set of equity style indices which groups stocks based on common characteristics (Tan, 2003). This gave rise to Sharpe's style analysis that uses equity style index benchmarks in order to maximize the gains from a portfolio of stocks with similar traits. The combination of funds chosen would also imply the sort of asset allocation style preferred by the fund manager.

Sharpe's findings were later reiterated and tested by various researchers. For instance, Focardi and Fabozzi (2004) argued that there are categories of stocks with similar characteristics and patterns that performed differently as compared to other categories of stocks. It was also found in the same study that returns of stocks within certain categories were highly correlated in comparison with the returns of stocks within categories which were relatively uncorrelated.

As a result of these findings, there was a significant amount of interest in studying the implications of this observation regarding style investing amongst academics and practitioners. For instance, fund managers would use this knowledge of growth and value style stocks to firstly classify stocks according to style. Following from that, depending on their "style" of investing, a "growth" fund manager would seek to invest in high P/B ratio companies and "value" fund managers would invest in low P/B ratio companies. Value managers, however, have been viewed as investors who are the best in understanding the nature of classes of stocks and gain higher returns from the portfolio mix that they create.

The ability to select stocks which "outperforms" the market was also later argued by Kahl (2002). In this study, he argued that value investors would seek to invest in stocks which are priced below its perceived value. By choosing these, stock investors are aiming to generate returns over and above what the market expects. Consequently, this gave rise to another method of valuing over or under-valued stocks based on its P/B ratio and Price/Earnings (P/E) ratio.

2.5 Equity Style Indices

One of the most significant advancements which developed as a result of style investing is the development of equity style indices. Equity style indices, which serves as a benchmark index consisting of equity style shares, has been widely accepted and used as an index to measure the performance of portfolios.

The equity style index would not only be used as a gauge of performance for shares, but also to forecast future returns and the direction of the stock market. Haughton and Pritamani (2005) in testing the style index argued that in order for the index to be reliable as a benchmark, it needs to have a low tracking error ('standard deviation of return difference') between the mean return of the style universe and the style index itself. This characteristic is known as representativeness.

When analysed from the point of view of equity style investing in developing markets, there seems to be a lot of room for further study due to the lack of research performed in the developing economies. The same can also be said when it comes to the Islamic capital markets. However, in a recent study, which includes an analysis on style investing, Walkshäul and Loeb (2013) studied the performance of Islamic indices and conventional indices between 2002 and 2012. They found that Islamic indices generally outperforms the developing and emerging markets. Furthermore, an interesting finding relates to the fact that it was revealed that Islamic funds have a strong emphasis towards growth stocks in developed markets and large-capitalization stocks in emerging markets.

The scarcity of research on the Fama and French three-factor model on emerging market economies is limited not only from the point of view of conventional stock markets, but also from the point of view of Islamic equity markets. From the point of view of Islamic equity funds, or Islamic mutual funds which are known as unit trust funds in Malaysia, there is little evidence of research performed based on the Fama and French three factor model. However, in a recent research paper, Ajmi et al. (2014) managed to

argue that the decoupling of the Islamic market from their conventional counterparts reduces the portfolio benefits from diversification when viewed from the point of view of equity funds.

The generalized method of moments methodology introduced by Lars Peter Hansen (1982) however, has proven to be an effective method in analysing the Fama and French three factor model. The research thus far has proven to the affirmative that the Fama and French model is valid under various different settings. Wei et al. (2004) argued that the GMM is especially a useful method when it comes to analysing daily returns that are non-normal for most financial assets as the GMM estimator is simpler to apply as compared to the maximum likelihood estimator.

On the other hand, Walid and Lau (2009) continued the research by Faff whilst constructing a Russell/Nomura style index and supported the claims made by prior research. The results from the study were derived from the Generalized Method of Moments (GMM) technique. In doing so, the analysis managed to suggest that the Fama and French model is more reflective of the Japanese stock market.

The evidence from the literature seems to indicate that there is a need to perform further studies on Islamic mutual funds in relation to the Fama and French model. Even though this study is mainly concerned with the applicability of the Fama and French model when tested against Islamic mutual funds, the results of this analysis can be used to support claims from other studies about the diversification benefits and the performance of fund managers in Islamic mutual funds as compared to conventional funds.

2.6 Islamic Equity Style Indices

The subsequent increase in interest in the area of style investing contributed towards the development of equity style indices. Various internationally recognized index providers have developed equity style indices to serve the interest of fund managers and

investors. Examples of index providers which have created and managed their own style based indices include Morningstar, Vanguard, Standard and Poor's (S&P), MSCI and Russell Co. However, one important observation is that most of the equity style indices created are conventional in nature and are ordinarily created based on stocks which are listed in developed countries. In comparison, only a limited number of equity style indices which have been created for the purpose of monitoring Islamic *Shariah* compliant stocks.

Nevertheless, there has been considerable growth in the Islamic capital markets in since the 1990's. For instance the Dow Jones Islamic Market International Titans Index has experienced a CAGR of 8.16% since it was first introduced in January 1996 to December 2015[8], there have been a number of Islamic equity style indices created. This is followed by the creation of Islamic equity style indices by the well-established index providers which act as a benchmark for investors. Table 2.2 below provides summary information on the Islamic equity style indices based on index provider and details the coverage of the style indices according to categories of stock market index portfolios (including types of stock markets, country or region and groups of stocks) as well as the existence of style factors.

[8] As reported in the *Thomson Reuters Canada Islamic Finance Outlook 2016*.

Table 2.2: International Islamic Equity Style index providers

Panel A: Russell Co., FTSE and MSCI

Index Providers	**Russell Co.**	**FTSE**	**MSCI**
Islamic Index Coverage	Regional indices including:- - BRIC[1] - Developed Emerging Markets Global - Global + GCC[2] - US Islamic Large	*Shariah* Indices including:- - FTSE Bursa Malaysia EMAS *Shariah* Indices and Hijrah Indices - FTSE SET *Shariah* Indices - FTSE TWSE Taiwan *Shariah* Index - FTSE/JSE *Shariah* Indices - FTSE SGX *Shariah* Index - FTSE Physical Industrial Metals Index	Regional indices including:- - Developed economies - Emerging markets - GCC Frontier Markets
Source	Russell-Ideal Ratings Islamic Indices	FTSE *Shariah* Global Equity Index	MSCI Global Islamic Indices
Growth and Value Style Factors	No	No	No
Size Factor	Yes	Yes	Yes

(Table 2.2 Continued)

Panel B: S&P Dow Jones, Morningstar and Thomson Reuters

Index Providers	**S&P Dow Jones**	**Morningstar**	**Thompson Reuters**
Islamic Index Coverage	Country and Regional Islamic Indices including Strategic and Thematic Indices For example:- - DJ Islamic Market International Titans 100 Index - DJ Islamic Malaysia Titans 25 Islamic (USD) - DJ Islamic Sustainability Index	Classifies funds in Growth and Value factors. [9] For example:- - Aberdeen Islamic I Equity Class - Public Islamic Asia Tactical Allocation Fund However, no benchmark index is available	Regional, country and sectoral indices
Source	S&P Dow Jones Islamic Indices	my.morningstar.com	Thompson Reuters Ideal Ratings Islamic Indices
Growth and Value Style Factors	No	Yes	No
Size Factor	Yes	Yes	Yes

Table 2.2 (Panel A and B) indicates that most index providers have developed Islamic stock market indices based on categories or regions as well as categories of stocks. However, even though certain index providers have produced Islamic equity style indices, these indices are not comprehensive to include all stylized factors (such as growth, value and size factors) and may be targeting a specific group of stocks in other cases. As an example is the Thompson Reuters Ideal Ratings Islamic indices which have indices for countries and regions but does not produce indices which covers growth and value style factors. The absence of Islamic equity style indices for developing countries is

[1] BRIC refers to Brazil, Russia, India and China
[2] GCC refers to Gulf Cooperation Council which is a political and economic alliance of six Middle Eastern countries including Saudi Arabia, Kuwait, the United Arab Emirates, Qatar, Bahrain and Oman.

also an important fact to note as the Islamic capital markets in countries such as Iran, Malaysia and the Middle-East over the last few decades cannot be ignored and would prevent important research which could have been performed in these markets.

Nonetheless, it is important that equity style indices need to serve investors and fund managers and to this end should possess certain fundamental characteristics which investors value such as representativeness and reliability. Index providers use various different methods in constructing their indices, including value weighted, market capitalization method as well as the modified weighted method to construct an index. However, it has been argued that the market capitalization method is the most effective way to measure the performance of stocks and it also encapsulates all the various requirements of investors.

The Islamic equity style indices which have been created by the index providers such as Russell Co. and FTSE however seeks to report index values which are as accurate and reliable by following index construction rules and maintenance methods. The construction methodology can be found as explained in the websites of the index providers (i.e. Russell Co. Style Indexes).

In fact, index providers have placed a lot of importance in addressing the issues relating to representativeness, objectivity, transparency, definition as well as maintenance issues. It is in the area of the maintenance of the index, well known index providers have focused their efforts to manage issues relating to index reconstitution and rebalancing and possible effects on the index as a result of corporate actions such as stock splits and dividend announcements (refer to Russell Global Index's construction methodology).From the point of view of the various index providers, however, it can be observed that they apply their own methods when it comes to creating the equity style indices. This is done for the purpose of capturing certain style characteristics. For instance, the S&P Dow Jones index would include companies which are leaders in their

industry and would not necessarily need to meet market capitalization rules (Siegel, 2003). The Dow Jones index also would differ from the Russell Co. equity style index because it uses six factors; P/B, projected P/E, projected and trailing earnings per share (EPS) growth and dividend yield.

The different methods applied by the index providers has been argued to cause confusion amongst users of style indices, where it creates the problem of the trade-off between simplicity and the explanatory power of the index (Siegel, 2003). Nevertheless, this has not prevented researchers from improving the style indices by introducing a multifactor approach (Rosenberg et al., 1985).

The issue relating to the purity of the style indices is also a cause for concern as it was found that style indices could not be "purely" classified as either growth or value stocks. This issue was in fact addressed by Russell Co. as well as Wilshere which classified indices based on a "pure" growth, value or neutral equity style index.

Provided equity style indices can be developed efficiently to meet the requirements of investors and fund managers, they can undoubtedly serve as a tool which could be used to create portfolios which outperforms the market (Reilly and Brown, 2012). This argument was reiterated by Dor and Jagannathan (2003) who observed a substantial increase in investments by mutual funds, pension funds, hedge funds and institutional investors over the last two decades. Both active and passive fund managers can construct portfolios that can generate abnormal returns otherwise known as "alpha". Hence, the portfolio construction technique based on Islamic equity style indices, whether it may be through full replication, sampling or quadratic optimization (Reilly and Brown, 2012) would be advantages to fund managers.

Also, fund managers can utilize the style index in order to develop a "contrarian" strategy and gain abnormal returns. This was argued by Bernstein (1995) who found that

value stocks do not outperform growth stocks in all instances and that good companies are not necessarily good investments. Furthermore, he argued that there is a relationship between macroeconomic factors and style indices which needs to be taken into account when creating the equity style indices. Furthermore, it was found that certain growth-oriented managers who have particular skills contribute towards generating abnormal returns (Chen et al., 2013).

Dor and Jagannathan (2003) further argued that a common problem for fund managers is in interpreting the results of the style analysis. It is important that benchmarks are mutually exclusive, comprehensive and asset class returns should not be correlated with one another. To complement this, Lucas et al. (2002) found that by utilizing equity style stock market indices, fund managers can develop investment strategies which generates excess returns by applying a style rotation strategy. Furthermore, style analysis can also be beneficial after having accounted for county and sector factors (Hall et al., 2010).

The utility of equity style indices for fund managers was criticized by Siegel (2003) who argued that an equity style index should not only serve as a benchmark to understand individual stocks and to describe a fund managers approach to managing a portfolio but also should be used to evaluate a fund manager's performance. It was also argued that the equity style indices which were created was correctly classified based on objective and rigorous construction methods so that the indices which are created are intuitively appealing and are representative of stock performance in reality.

There does not appear to be much literature with regards to style indices in Islamic stock markets. This is even more apparent when it comes to Islamic stock markets in the developing countries. Siegel (2003) however, did caution that it is important that if equity style indices are to be applied in developing countries, that users of the indices needs to pay special attention to index maintenance issues, classification of emerging economies' stocks when it comes to selection as index constituents as well as the effects of currency

translation on the indices. Furthermore, it is vital that issues such as investibility, liquidity, transaction costs and float adjustments together with level of objectivity and transparency needs to be accounted for when viewed against style factors.

The special nature of developing countries has made it necessary for index providers make fundamental changes to the indices when required. An example is the case of Malaysia after the Asian Financial Crisis of 1997. MSCI experienced some problems in deciding on whether or not to include Malaysia as a member of the EAFE index as well as the EMF index as this would have been perceived as "double counting" or inflating the value of the index when they should in fact be excluded. This classification problem is an issue that index providers have since dealt with.

In studying equity style indices in developing countries, however, Walkshäul et al. (2012) found that investors in Islamic indices seem to invest mainly in growth and positive momentum stocks (Walkshäul et al., 2012). Ajmi et al. (2014) however, recently weighed in on this argument by arguing that Islamic stock market indices seem to have a link with conventional indices and the idea that both indices are decoupled is in fact not true. Dewandaru et al. (2015) on the other hand tested the merits of introducing a style based approach to Islamic stocks by using an Islamic portfolio using a multi-rotation strategy derived from three prominent styles notably momentum, value and quality investing.

More recently, Jawadi et al. (2014) identified a benefit of using the Islamic index during the financial crisis as Islamic stocks outperformed conventional stocks. From a portfolio diversification point of view, this would be an interesting option for investors and fund managers who are seeking to diversify their portfolio into stocks which are less risky and produce superior returns during periods of uncertainty.

Jawadi et al. (2014) further explained the outperformance of the Islamic funds due to the framework of Islamic finance which is based on principles of Shariah or Islamic law,

which encourages ethically oriented trade, social and responsible investment, sustainable finance and banking, and a highly regulated finance system. In essences, Islamic financial assets are low-risk and provide modest returns to invsetors. As a consequence, the moreal and ethical rules together with high degree of caution results in improved performance of Islamic funds during turbulent times.

Of the research papers that have been written about Islamic equity funds, there seems to be agreement that Islamic funds appear to perform differently from conventional funds. This does not necessarily mean that Islamic funds are more attractive as compared to conventional alternatives, as argued by Makni et al. (2015). Given that, there is evidence similar to Ajmi et al. (2014) to argue that Islamic funds are better for investors during financial crisis periods. For example, Kassim et al. (2012) found the benefits of investing in Islamic equity funds as well.

The breadth of the literature thus far seems to indicate that there is a limited amount of attention on analysing Islamic equities from an equity style point of view. Besides the examples that have so far been mentioned, Muslim scholars of Islamic finance at present have focussed their attention primarily on comparative studies between Islamic and conventional stocks (i.e. Jawadi et al., 2014, Ashraf et al., 2014). Other Muslim scholars are concerned about addressing some of the important issues relating to the religiosity of the Islamic capital markets. For instance, Kamla et al. (2015) seeks to address the issues relating to the treatment of bank-interest as it relates to the Islamic principle of discouraging *riba*, or interest in financial and banking activities.

However, in the recent past, there has been an emergence of interest in the area of Islamic equity style investing. For example, Dewandaru et al. (2015) described comprehensive study on how Islamic portfolios can be created using three different investment styles including momentum, value and quality investing. Kianpoor and Deghhani (2016) recently concluded in their study that stocks grouped according to

growth and value stocks on the Tehran stock exchange follows the Fama and French three-factor model (1992).

Islamic equity fund managers on the other hand have been accused of preferring growth and small-cap oriented stocks and indices and conventional indices are more value and mid-cap focused (Hassan and Girard et al.). Islamic fund managers have also been found to be inefficient when it comes to the timing and selection of Islamic stocks. This was in fact argued by Lai et al. (2010) as well as (Bashir, 2011). Furthermore, it was argued that socially responsible funds do not necessarily outperform conventional funds (Renneboog et al., 2008). Merdad et al. (2015) on the other hand used a four-factor model that controls for market capitalization, size, book-to-price as well as Islamic effects and described what was termed as the "negative Islamic effect" when comparing the returns of Islamic stocks versus conventional stocks in Saudi Arabia.

Even though there is a scarcity in the literature when it comes to studies on Islamic equity style investing there is evidence the interest has risen recently. The development of an Islamic equity style index would undoubtedly increase the depth and breadth of research in this niche area.

2.7 Conclusion and future areas of research

The evidence from the survey of literature seems to indicate that investors and fund managers are placing a greater importance on equity style investing. Fund managers have in fact moved ahead and are seeking to create stylized portfolios using more complicated multifactor beta models. An example of this is the smart beta portfolio construct which is becoming more popular amongst portfolio manager. This is currently happening despite the fact that researchers and analysts have argued for a more simple and parsimonious method for constructing equity style indices.

From an investment management point of view, it would be necessary for fund managers of Islamic equity style funds to study the implications of using Islamic equity

style indices on their portfolios. Nonetheless, as a first step, investors and fund managers need to create the Islamic equity style indices and this has to be done in an efficient manner. Furthermore, research has to be performed to evaluate whether emerging market Islamic style indices do in fact perform in a "contrarian" way in comparison to developed Islamic equity style indices as this will influence the design and construction of the Islamic equity fund.

In conclusion, the results of the survey of literature seem to indicate that there are numerous opportunities looking forward to perform analysis on Islamic equity style investing methods. This will necessitate researchers to not only have a deeper understanding of contemporary methods to evaluate equity style portfolios, but also the idiosyncratic nature of Islamic equity style funds.

CHAPTER 3: CONSTRUCTION OF NEW ISLAMIC EQUITY STYLE INDICES AND ITS APPLICATIONS

3.1 Introduction

The equity style indices proposed by Fama and French (1992) has become an important area of study for researchers in the area of finance. Nevertheless, despite the benefits of adopting the model proposed by Fama and French, a benchmark index has yet to be constructed to analyse the Malaysian Islamic share market. The benefits of constructing such an index would open up various areas of research on the Malaysian FTSE EMAS *Shariah* index. The FTSE EMAS *Shariah* index in Malaysia has been growing in significance over the last decade signifying the growth of the Malaysian capital markets as one of the largest Islamic capital markets in the world with total market capitalization of over MYR1.02 trillion in 2015[10]. However, despite the efforts of the index providers in developing sub-indices which relates to the Malaysian Islamic share market, such as the Dow Jones Malaysian Islamic Index Titans Index, the FTSE Emas *Shariah* index and indices developed by fund management firms, there has yet to be a Malaysian Islamic Equity style index which has been created.

The equity style index serves the purpose of a benchmark index which can help fund managers to design portfolios in order to generate returns above the returns provided by the broad based benchmark index. This finding was at the centre of Sharpe (1992) and Fama and French's (1992) analysis which argued that value shares outperform growth shares based on a cross section of companies selected from the US share exchange. Following from that, various studies have followed which largely supports the findings from these researchers. Consequently, fund managers and index providers such as Russell and Morningstar as well as FTSE and MSCI followed these findings by developing equity style indices in various share exchanges. Examples of such equity style indices are

[10] Total market capitalization of Shariah compliant stocks on Bursa Malaysia as at June of 2015 is taken from the Securities Commission of Malaysia website. (As accessed from https://www.sc.com.my/data-statistics/islamic-capital-market-statistics/)

Russell Co.'s U.S. Islamic Large Indices. The development of commercial style indices in fact began in the mid-1980's as companies like Wilshere Associates and the Frank Russell Company started developing and using style indices. However, most other index providers have not developed a similar index and there also seems to be a void in the Malaysian Islamic share market.

This chapter will attempt to address this void by creating Malaysian equity style indices by using the Russell Co. methodology and focussing on companies which are listed on the FTSE EMAS *Shariah* index. The chapter will be organized as follows, the next section explains relevant literature followed by the data collection procedure and the index construction methodology. The newly created indices will then be presented together with descriptive statistics relating to the indices. This is followed by tests of usefulness of the newly created indices using forecasting evaluation methods. The last section concludes and discusses implications of the paper together with suggestions for further research.

3.2 Growth and Development of Equity Style Indices

The developments in the area of equity style classification has lead towards the creation of indices which are used as benchmarks to measure the performance of equity portfolios which are created. However, the development of Islamic equity style indices lagged conventional indices as they were only developed and utilized as a recognized share market index only as recent as the late 1990's.

The types of indices created however can be distinguished based on value weighted indices, market capitalization weighted indices and modified weighted indices. The market capitalization method has been argued to be the best method of constructing indices. The method of index construction includes methods suggested by Kok and Goh (1993), Vanguard, S&P, MSCI and Russell Co. method to name a few. However, it has to be highlighted that when it comes to determining companies that constitute the index,

appropriate consideration has to be given to the index construction rules including rebalancing of the index, liquidity of companies, stock splits and inactive companies. The total value weighted index is still being studied and improved till today based on papers by Nyberg et al. (2010) and Belter et al. (2005).

Notwithstanding the importance of following conventional rules when it comes to developing a equity style index, Haughton and Pritamani (2005) have argued that the main characteristic of a good benchmark index is representativeness. In so far as the representativeness of the index is concerned, the tracking error can be used. The tracking error, which measures the standard deviation of differences in returns of an index is regarded to be good provided it is low.

The creation of an Islamic equity style index in Malaysia would be an interesting addition to the body of knowledge relating to portfolio management as emerging market share markets have been proven to exhibit characteristics which are distinct to share markets in developed economies. As an example was the findings by Kargin (2002) who found that a portfolio of 'value' emerging markets generate superior returns.

3.3 Usage and Application of Equity style indices

Investors and fund managers have a distinct interest in the area of equity style investment based on the basic principle of selecting shares that outperform the market (Reilly and Brown, 2012). In doing so, both active and passive fund managers would rely on conventional finance theories with the aid of equity style benchmarks in order to aid them in constructing a portfolio of shares which can deliver returns above that provided by the market. Active managers refer to abnormal return as "alpha" and would attempt to "beat the market" by constructing equity portfolios which generates alpha returns, whilst passive managers would select a group of shares where its performance will closely track the performance of an equity style index. There are various different portfolio construction techniques which can be used including the full replication method,

sampling method and quadratic optimization method (Reilly and Brown, 2012). The funds which are created are then assessed based on its tracking error, or how closely the absolute returns match those of the benchmark.

Bernstein (1995) argued that value shares in fact outperform growth shares and that good companies do not necessarily make for good investments. It was further argued that by utilizing a style index, good fund managers can develop a "contrarian" strategy which does not only provide liquidity to the share market but also provides opportunities to gain abnormal returns. Nonetheless, good investors would ordinarily invest in good companies as a general rule. Value investors on the other hand have to contend with higher transaction costs but will be compensated in terms of higher returns on investment in value shares. When it comes to developing style indices in fact there is a correlation with macroeconomic factors which should be taken into account when developing the indices.

Style investing has been credited for the success that it has made in identifying size and value characteristics. For this purpose, Fama and French (1992) in fact successfully argued that value shares outperform growth shares.

The contemporary use of the style index can be better explained by the substantial increase in investments by mutual funds, pension funds, hedge funds and institutional investors over the last two decades and a reduction of equity investment by individual investors (Dor and Jagannathan, 2003). Fund managers within these large institutions in fact develop portfolios based on a style investing method that they are partial to and use return-based style analysis in order to compare the performance of a portfolio of shares against a benchmark. However, a common problem for fund managers is in interpreting the results of the style analysis. It is important that benchmarks are mutually exclusive, comprehensive and asset class returns should not be correlated with one another. Also, research has also indicated that too large a number of shares has the potential of

introducing "noise" to the analysis. A high R^2 in the analysis however would in large part signify results which are robust and reliable.

The recent literature relating to equity style indices seem to indicate various advantages to utilizing equity style indices. A study by Lucas et al. (2002) found that by utilizing equity style share market indices, fund managers can develop investment strategies which generates excess returns by applying a style rotation strategy. Furthermore, style analysis can also be beneficial after having accounted for county and sector factors (Hall et al., 2010). The effects of global and regional integration in relation to style portfolios was studied by Cho et al. (2003), and they found that the contagion effects of the Mexican and Asian crises is limited to regional effects.

In the recent past, Siegel (2003) asserted that a equity style index should not only serve as a benchmark to understand individual shares and to describe a fund managers approach to managing a portfolio but also should be used to evaluate a fund managers performance. However, a caveat should be placed on investors and fund managers in classifying shares based on conventional rules. In essence, the style index which is constructed needs to be rigorously and objectively constructed, with a relatively transparent methodology and should be intuitively appealing. This has led to improvements to equity style index construction methods in order to create an index which is more representative of share performance in reality.

There are various different methods of constructing a style index. The methods may differ depending on the index provider and this is done on purpose to develop a style index which certain meets guidelines of the index provider and captures a certain style characteristics. For instance, the Standard and Poors (S&P) index includes companies which are regarded as industry leaders into their style index and is not governed by strict market capitalization rules (Siegel, 2003). The Dow Jones index on the other hand has implemented buffer rules to reduce turnover within the capitalization indices. Also, in

comparison to the Russell Company method, the Dow Jones style index uses six factors; P/B, projected P/E, projected and trailing earnings per share (EPS) growth and dividend yield. Wilshere Associates on the other hand has developed sets of indices known as "target" and "style" indices to capture the performance of active managers.

The different methods applied by index providers has caused confusion amongst users of the style indices. As an example is the trade-off between simplicity and the explanatory power of the constructed index (Siegel, 2003). The single common variable which is used is in fact the P/B ratio (or the inverse, B/P ratio) by index providers. However, the various different forms of variables used to build the indices including revenue and dividend growth factors have made comparisons between indices a cumbersome and often purposeless activity. Nonetheless, this has not prevented researchers from finding methods to improve the style index by introducing a multifactor approach as pioneered by Rosenberg, Reid and Lanstein (1985).

The completeness versus purity of the created style indices was also a concern as style indices would often be developed by classifying shares according to size and value, however the size and value shares were not "pure" in its classification. Shares classified as value shares would not have in its entirety value share characteristics. This has spurred the growth of the development and classification of "neutral" or core shares (as an example the Russell Company core value and core growth shares). This has further led to index developers providing an exclusive classification to identify a group of shares. For instance, the Wilshere style includes classifying shares based on 100 percent value, 100 percent growth of 100 percent neutral.

The multifactor nature of the findings by Sharpe (1992) in proposing the classification of shares was further improved in terms of the momentum effects from a style level perspective (Carhart, 1997). It was found that there is significant style level momentum returns based on data taken from international share exchanges (Chao et al., 2012).

Barberis and Schleifer (2003) also argued that style investing generates momentum and reversals as well as co-movements between individual assets and their styles.

Another important contribution of equity style based studies is the gains of using the equity style indices as a benchmark to determine the performance of portfolio managers. For instance, it was found that certain growth-oriented managers who have particular skills contribute towards generating abnormal returns (Chen et al., 2013).

Nonetheless, further research needs to be performed on style based investing due to findings by Barberis and Shleifer (2003) who argued that style patterns exhibit patterns of co-movement and cross-autocorrelation with style counterparts. The researchers however did manage to argue that there are long run pressures towards fundamentals and non-trivial autocorrelation patterns in style returns which could be valuable to investors and fund managers.

3.4 Equity style indices in Islamic stock markets

There is a scarcity in terms of literature relating to style indices in Islamic share markets. Nevertheless, the few studies which involves classifying Islamic shares based on different styles have been performed by researchers who had an interest in investor asset allocation decisions. For instance, Walkshäul and Lobe (2012) found that investors in Islamic indices seem to invest mainly in growth and positive momentum shares. Dewandaru et al. (2015) on the other hand tested the merits of introducing a style based approach to Islamic shares by using an Islamic portfolio using a multi-rotation strategy derived from three prominent styles notably momentum, value and quality investing.

The existing literature relating to Islamic share market indices, especially in emerging economies revolves around dealing with index maintenance issues and their distinctive characteristics. Researchers in this area have cautioned users of these share market indices to understand these salient features before making investment decisions.

Research into share market indices in emerging economies has shown that users of the benchmark indices needs to pay special attention to the fact that there are index maintenance issues, classification of emerging and developed countries when it comes to selection of index constituents as well as the issue of currency translation that needs to be taken into account when developing style indices (Siegel, 2003). Other important issues that needs to be considered when it comes to international indices include investibility and liquidity of the shares in the index, transaction cost and float adjustments from rebalancing, and finally the degree of objectivity and transparency of the created index. Style and size characteristics should be considered an important factor in studying style indices in emerging countries but the fundamental factors are important in the development of the indices needs to be addressed.

As an example is the interesting case of Malaysia, which is the country of interest in this research paper, which was in highlighted in 1998 when Malaysia announced that they would implement capital controls as a result of the Asian Financial Crisis in 1997. It became an issue for index providers and investors as Malaysia was included a member of the MSCI EAFE index as well as the MSCI EMF index. The MSCI in fact did not have clear rules as at 1998 when it came to classifying countries such as Malaysia in terms of whether it should be included specifically in either one of the indices and this lead towards double counting when it came to the created indices. The index provider has since made changes to their rules in recognizing and classifying countries but this only underlines the importance of classifying countries based on their idiosyncratic characteristics in developing economies for purposes of index construction.

Bernstein (1995) did however indicate the importance of identifying the idiosyncratic nature of equity style shares in emerging economies and how they may perform differently as compared to equity style shares in developed countries. The regional effects

were highlighted as important factors which needs to be considered when it comes to identifying the performance of equity style shares.

Campbell et al. (2014) provided further evidence to support Bernstein's (1995) argument based on the behaviour of investors in India in making portfolio allocation decisions based on equity style shares. Their findings seem to indicate that investors tend to have a "bias" towards growth shares rather than value shares. The authors regard this "bias" as an undesirable and unconventional form of trading behaviour. Nonetheless, the findings of the study found that investors in India are "getting better" by not getting involved in regular "style shifting".

In contrast to the idea of an idiosyncratic nature of style investing as posed by Bernstein (1995) and others, Ajmi et al. (2014) however managed to prove that Islamic share market indices seem to have a link with conventional indices. In this study, the authors suggested that the idea that both indices Islamic and conventional indices are decoupled is not true. The paper also indicated that there is a relationship between the Islamic indices with interest rate and interest bearing securities, which does not agree with *Shariah* rules. It would be interesting to see the degree of relationship between Islamic equity style indices with its conventional counterpart based on the newly created indices in this paper.

Krasicka and Nowak (2012) agreed with Ajmi et al. (2012) by presenting evidence to claim that the Malaysian Islamic Sukuk market and the conventional market have common factors. They further argued that the gap in terms of financial practices between Islamic and conventional finance is diminishing. By using bivariate copulas to model tail dependence between indices, Hammoudeh et al. (2014) also argued that the global Islamic equity market index has significant dependence with conventional stock market indices.

Jawadi et al. (2014) identified a benefit of using the Islamic index during the financial crisis as Islamic shares outperformed conventional shares. This would be an interesting option for investors and fund managers who are seeking to diversify their portfolio into shares which are less risky and produce superior returns during periods of uncertainty.

The literature so far has indicated that despite the idiosyncratic nature of equity style shares in emerging countries, investors and fund managers would benefit from the development of the equity style indices. As of late, the fund managers and investors have found benefits in developing "smart" factor indices which can be used as an investable proxy for stock selection purpose **(**Amenc et al., 2014)**.** By addressing the shortcomings of cap-weighted indices with respect to undesirable factor exposures and heavy concentration, factor indices are selected which seeks exposure to reward risk factors and diversify away unrewarded risk. This method of determining factor premia is also known as the "smart beta" method. Researchers have found that relevant security selection as well as appropriate weighting schemes which are designed using the smart beta methodology results in improvements to risk adjusted performance of investment portfolios.

3.5 Index Construction Methodology and Data Collection

3.5.1 Index construction methodology

3.5.1.1 Selection of Islamic equity style growth and value shares

The first step in developing the Islamic Equity style indices in Malaysia is to sort companies on the FTSE EMAS *Shariah* index according to growth, value and blend shares. The shares are selected based on companies listed on the *Shariah* Index by the *Shariah* Advisory Council of the Securities Commission of Malaysia (SC). The list of *Shariah* compliant companies on the KLSE is revised semi-annually and is reported twice a year. The list is then compiled and matched with the list of companies on the FTSE EMAS *Shariah* index. The companies which are selected are then divided based

on the top 30 companies (large companies), companies between the range of 31 to 100 (mid-sized companies) and 101 and remaining companies (small companies) based on their market capitalization[11].

Once the list of *Shariah* compliant companies have been collected, the methodology for sorting shares according to growth and value shares is achieved by the following steps. The method which is employed is similar in part to the method which was proposed by Fabozzi (1998) (and has been used by index providers such as the Russell Co. and Morningstar in order to develop the equity style indices) (Appendix D.2).

The Russell Co. methodology is used in this study in order to develop growth and value stock market indices. As argued earlier in the literature review section, investors have a keen interest in ensuring that the equity style indices which are created have been constructed with a focus on "purity", representativeness and efficiency. The Russell Co. method of developing style indices was one of the earliest commercially available indices which was created and uses the principle of parsimony to make certain that the style indices are meets investors high standards of representativeness. In comparison, other index providers including S&P, MSCI and Morningstar have developed their own methods of creating style indices using a variety of variables in order to develop the indices. The different style methodologies used is detailed in the Comparison of Style Index Methodology chart (refer to Appendix D.1).

By comparing the methodologies applied by index providers in Appendix D.1, it can be concluded that even though the Russell Co. method is the simplest in terms of number of growth and value factors which are used for purposes of index construction, it has the benefit of parsimony as well as being the earliest available style index. The Morningstar style indices in comparison uses a larger number of variables (which includes both historical and projected earnings and sale growth information in order to determine the

[11] The FTSE Russell Bursa Malaysia Index Series method was used in order to group Islamic stocks into large-cap, mid-cap and small-cap stocks (refer to FTSE Russell Ground Rules for FTSE Bursa Malaysia Index Series).

growth factor). However, for commercial reasons, each index provider has a claim to make in terms of the superiority of their commercial index as compared to those developed by competing index providers.

The sequence of steps which were followed in order to sort shares based on growth, value and blend shares is explained as below:-

(i) Determine and match growth and value factor variables related to the *Shariah* compliant companies including market capitalization, Return on Equity (ROE), Revenue Growth Rate, Book-to-Price (B/P) ratio. This is achieved by matching the companies from the *Shariah* index with the variables which are downloaded from Reuters Datastream. The missing data relating to these companies will result in these companies not being chosen as a constituent of the index.

(ii) The B/P ratio is used to compare a share market's value to its book value, where:-

B/P ratio = (Total assets – Intangible Assets and Liabilities)/ Share price (1)

In order to determine growth factors, return on equity and revenue growth rate are chosen as the variables to be used to identify a share' style. Return on equity (ROE) measures how well the management is making use of assets of the company in generating returns to shareholders. The ROE can be described as:-

ROE ratio = Net Income/Shareholder's equity

where net income is determined for the whole fiscal year (excluding dividends paid to common shareholders and after taking into account distribution of dividends to preferred shareholders). Shareholder's equity is calculated based on a firms total assets minus total liabilities. Revenue growth on the other hand is calculated based on the trailing revenue growth rate (as applied by the Dow Jones method) change in revenue from this year to the previous semi-annual period (Rt-Rt-1) divided by revenue from the previous year (Rt-1).

(iii) The list of companies together with the mentioned variables are then arranged in a spreadsheet. The growth and value shares are selected based on a composite value score. This score is determined by firstly determining the probability score of each variable, ROE, GR and BP. This is achieved by using the linear probability algorithm which was proposed by Russell Co. This algorithm is explained as below:-

$$Probability_{value} = \frac{1}{1 + \exp[\frac{5(X_M - X)}{X_M - X_L}]} \quad (2)$$

$$Probability_{value} = \frac{1}{1 + \exp[\frac{5(X_M - X)}{X_U - X_M}]} \quad (3)$$

(iv) The companies are arranged vertically in a spreadsheet and variables related to determining the composite variable score is arranged horizontally. These variables include market capitalization, ROE, Revenue Growth rate, and BP ratio.

(v) The Composite Value Score (CVS) is then determined by firstly establishing the probability value for ROE, revenue growth rate, BP ratio and the market capitalization ratio. This is determined by using the STATA software to determine the upper (Xm), median (X) and lower (Xl) percentiles which will be substituted into the Russell algorithm above to establish the probability value for each variable. The lower limit is based on the 10th percentile, the median limit is at the 50th percentile and the upper limit is at the 90th percentile.

(vi) For purposes of calculating the probability value, the exponential value for the 10th and 90th percentile is then determined for each share and then the IF function on MS Excel is applied and is used to decide on the probability value for each variable based on its market capitalization (where the X(median) value of market capitalization based on the 50th percentile is used). The IF function formula basically argues that if the market

capitalization for the company is less than its median (as determined by using the STATA software), therefore the probability value for the variable is based on the value derived from the 10th percentile. Alternatively, the value from the 90the percentile is used.

Once the probability values have been established for each variable, the CVS is

$$Composite\ probability = (((1 - probability\ value\ ROE) + (1 - probability\ value\ Revenue\ Growth)) * 0.5))) + (probability\ value \frac{B}{P} X\ 0.5)) \quad (4)$$

determined by using the composite probability for each share based on the formula below:-

(vii) The algorithm above which is used to determine probability value is once again applied where the X_m is at the 75th percentile, X is at the 50th percentile and the X_l is at the 25th percentile for both the composite probability value above against market capitalization. Similar to the above, the exponential value is firstly determined for the 25th and 75th percentile. This is followed by determining the CVS where if the market capitalization for the share is less than the market capitalization at the 50th percentile as determined by STATA therefore the probability value at the 25th percentile is chosen. Alternatively, if the market capitalization is more the value at the market capitalization at the 50th percentile, than the probability value at the 75th percentile is chosen.

(viii) The CVS has now been determined. The shares will then be differentiated between growth, value and core (between growth and value) based on the following:-

Probability value between 0-40% = Value shares

Probability growth between 41%-59% = Core shares

Probability value between 60%-100% = Growth shares

(ix) This process is repeated for the large, medium and small groups of companies in order to determine a collection of companies which can be categorised as large growth (LG), large value (LV), large core (LC), medium growth (MG), medium value (MV, medium core (MC), small growth (SG), small value (SV) and small core (SC) groups of companies.

3.5.1.2 Creation of the share market index

The share market index is created for each style index by firstly matching the companies against its share price and number of shares. The list of companies based on the groups of companies which have been chosen are matched against the list of share price and number of shares as downloaded from Reuters Datastream and the companies which have missing data are excluded from the list of companies used to construct the index.

The data for number of shares and share prices are daily data and they are arranged vertically according to date in a spreadsheet. The companies are then listed horizontally and the total market capitalization for each company is determined daily by multiplying the two variables. As the index begins from May 2006, the index value for May 2006 is calculated as 100. However, subsequent to that date, the index value is determined based on the following formula (Kok and Goh, 1995):-

$$Index\ Value = \frac{Total\ market\ value\ of\ all\ companies\ (t+1)}{Total\ market\ value\ of\ all\ companies\ (t)}\ X\ 100 \qquad (5)$$

The *Shariah* index is revised semi-annually and when the following list of *Shariah* compliant securities is released, the index would need to be rebalanced. Rebalancing of the index is done based on a method which is mentioned below:-

a) The list of companies from the new period is compared against the list of companies from the previous period. The companies are then matched to see which companies remain on the index belonging to the current period. Companies which are new and

should be included in the new index as well as companies which should be excluded from the index is then determined. This is followed by calculating the market capitalization for companies which should be included and companies which should be excluded.

b) Once this is done, the following formula is applied to determine the adjusted base Aggregate Market Value (AMV):-

$$Old\ Base\ AMV\ X\ \frac{Old\ current\ AMV + Market\ value\ of\ Included\ Stoc}{Old\ Current\ AMV} \quad (6$$

and adjusted base AMV for delisted component shares is formulated as

$$\text{Old Base AMV X } \frac{\text{Old current AMV + Market value of Excluded Shares}}{\text{Old Current AMV}} \quad (7)$$

where the Old current AMV is determined by the sum market capitalization for all companies as at the last date of the previous period and the Old base AMV is the total market capitalization as at 30 May 2006 (i.e. the first date chosen for construction of the index).

c) The index value after the rebalancing is done for the first day of the new semi-annual period is calculated as follows:-

$$Index\ value\ (First\ day\ after\ rebalancing) \quad (8)$$
$$= \left(\frac{Adjusted\ base\ AMV}{Total\ market\ value\ for\ all\ companies\ (At\ first\ day)}\right) X\ 100$$

The index value following the first day of rebalancing:-

$$Index\ value\ = \left(\frac{Toal\ market\ capitalization\ (t+1)}{Adjusted\ base\ AMV}\right) X\ 100 \quad (9)$$

d) This process is repeated for all the groups of equity style shares and six new Islamic equity style indices have now been created.

3.5.2 Data collection procedure

3.5.2.1 Company and share series information

The primary aim of this paper is to construct an equity style share market index based on the Malaysian Islamic universe of shares. For this purpose, companies have been chosen from May 2006 to August 2011. These dates are chosen based on the Securities Commission of Malaysia's *Shariah* Advisory Council (SAC) list of companies that selected by the SAC. This list is determined twice a year and will be used to determine the universe of companies which form part of the universe of Islamic companies which constitutes the FTSE EMAS *Shariah* index. The source of data is taken from the Reuters Datastream database.

In order to generate the list of *Shariah* compliant shares, firstly, companies listed on the SAC list will be matched against the companies listed on the FTSE EMAS *Shariah* index. This process involves checking to ensure that the companies which are not on the SAC list are eliminated from the list of companies to make up the index.

In order to develop the equity style indices, the growth and value factors are chosen based on variables which includes the Book-Price ratio, revenue growth rate, earnings per share, share price and number of outstanding shares. These ratios will then be selected in order to form part of the factors which decides the different forms of companies, whether they are in fact growth or value shares.

Based on the list of companies which have been chosen, companies with missing data would be eliminated from the number of companies selected for purposes of index construction. For instance, the 30 June 2006 list of 871 companies, only 333 companies were selected for purposes of constructing the base index due to companies which were missing from the list or unavailable data based on the other data sets which were used.

3.5.2.2 Liquidity requirement

The liquidity screen is a method used to ensure that companies listed on an index have been checked to ensure that those that are not heavily traded are excluded from the index. This is to ensure that they index is more representative of the performance of companies. For the purpose of the Islamic equity style indices, once the companies have been categorised into SG, MG, LG as well as SV, LV and LG shares, and before the indices are created, the liquidity test is conducted to eliminate companies which do not meet the liquidity requirements.

The liquidity test that is applied is based on the Russell Co. global indices method of screening for liquidity. Under this method, the securities with inadequate liquidity are eliminated from the index. This is done by evaluating the average daily dollar trading volume (ADDTV) and the active trading ratio (ATR). The ADDTV is applied for purposes of smoothing abnormal trading volumes over short periods of time and measures the actual transactions taking place in the share market. On the other hand, the ATR further refines the evaluation by looking at the possibility that a few transactions across the year could distort the ADDTV of individual shares. This two-step liquidity screen provides accurate assessment of the market and its liquidity. The formula for calculating both ADDTV and ATR are as below:-

$$\text{ADDTV} = \frac{\text{Annual accumulated trading volume in USD}}{\text{Number of available trading days (open for trading)}} \quad (10)$$

$$\text{ATR} = \frac{\text{Number of active trading days (minimum 1 share traded)}}{\text{Number of available trading days}} \quad (11)$$

All securities in investable countries with eligible share types are ranked by ADDTV. The list of companies which are eligible for inclusion in the Islamic indices upon rebalancing is based on securities with an above-median ADDTV and greater than 90% ATR. These companies usually corresponds to the threshold of the bottom 5% cumulative total market capitalization universe, in descending order of ADDTV. Furthermore, as part

of the requirement of the liquidity test, the companies in the bottom 2% of the equity style indices were eliminated. This process was performed in order to match the requirement of capturing 98% of the eligible universe of shares for each particular index.

The Russell Co. method also presupposes that companies that qualify for the index has met the liquidity test. The liquidity test requires that companies that are inactive for periods of 30 days or more during the financial year should be eliminated from the index. This process was performed by initially ensuring that the list of companies for each semi-annual period has been determined through the process of matching and elimination. Once this has been performed, a spreadsheet is designed to sort companies which meets this index selection criteria.

The final list of companies list that has been created is constructed as a result of conducting the liquidity test. The test was repeated over again for the nine remaining semi-annual periods.

3.5.3 Index maintenance and corporate actions

The Islamic share market indices are further maintained in order to ensure that daily changes to the share market and its impact on companies which constitutes the Islamic equity style indices have been taken into account. The indices are in fact evaluated during business (i.e. trading days) and excludes all public holidays and uses closing share prices. The daily maintenance of the index is also done based on the companies which have been chosen and have met the liquidity screen. These alterations to the index involves changes as a result of delisting and relisting shares, stock splits and mergers and acquisitions.

In the event of a spin-off, the companies which have come into existence from the parent company are now in existence. There are no changes that are required to the indices due to the companies spinning off assets and equity from the parent company. These newly established companies however needs to meet the index eligibility requirement such as the size and liquidity requirement in order to form the index.

Companies which have stopped trading (halted securities) will be kept on the indices based on its most recent closing price or until trading is resumed or officially delisted.

A company is removed from the Islamic equity style index as soon as the announcement is made that the company is to be delisted. However, no changes are made to the indices if the company decides to list in another share exchange other than its primary share exchange.

In the event of a share split, the increase in number of shares and the decrease in number of shares would not necessitate any changes to be made to the index. The share split in fact is done in order to reduce the share price in order to have more investors to invest and this does not have any significant effects on an index. Conversely, in the event of a reverse split, based on the Russell method, the decrease in number of shares and increase in share price is adjusted accordingly. However, no other changes needs to be made to the index.

When it comes to reclassification of share classes into other classes, the method which is used is to make changes to indices once the reclassification has been finalized. The acquiring companies unified share price is used as the total market capitalization of the company. As the total number of shares rises proportionately following reclassification, the combined market capitalization remains unchanged for the company as a whole. This would mean that there are no changes which needs to be made to the indices when such an event occurs.

Finally, if the share exchange temporarily closes, the last closing price will be used when the share market reopens.

3.6 Descriptive statistics

The six Islamic equity style indices for each semi-annual period between May 2006 and April 2011 according to the index construction methodology mentioned above. By utilizing the Securities Commission's *Shariah* Advisory Council's (SAC) list, shares

which are either excluded, included or continue to remain as a constituent on the indices. Furthermore, the Russell Co. index construction, screening and index maintenance methodology was also applied.

As a result of decomposing the Islamic shares based on different styles, the number of *Shariah* compliant companies which becomes a constituent of each style classification that combines both value and growth as well as market capitalization characteristics is presented in Table 3.1 below. Based on these tables, Islamic equity style indices can be grouped based on large growth, large value, large core, medium growth, medium value, medium core, small growth, small value and small core shares[12].

Table 3.1: Cross Tabulation of Style and Market Capitalization

May-06		Growth	Value	Blend	Total	Nov-07		Growth	Value	Blend	Total
Large	**Count**	21	8	1	30	**Large**	**Count**	21	7	2	30
	%	70%	27%	3%	100%		**%**	70%	23%	7%	100%

[12] Value and growth as well as size characteristics are determined based on the Russell Co. methodology which was applied in the index construction methodology section.

Core	**Count**	46	23	1	70	**Core**	**Count**	12	50	8	70
	%	66%	33%	1%	100%		**%**	17%	71%	11%	100%
Small	**Count**	170	57	3	230	**Small**	**Count**	432	168	38	638
	%	74%	25%	1%	100%		**%**	68%	26%	6%	100%
Total	**Count**	239	89	5	333	**Total**	**Count**	466	226	48	740
	%	72%	27%	2%	100%		**%**	63%	31%	7%	100%
Oct-06		**Growth**	**Value**	**Blend**	**Total**	**May-08**		**Growth**	**Value**	**Blend**	**Total**
Large	**Count**	21	7	2	30	**Large**	**Count**	22	8	0	30
	%	70%	23%	7%	100%		**%**	73%	27%	0%	100%
Core	**Count**	48	20	2	70	**Core**	**Count**	44	24	2	70
	%	69%	29%	3%	100%		**%**	63%	34%	3%	100%
Small	**Count**	162	49	31	242	**Small**	**Count**	361	60	29	450
	%	67%	20%	13%	100%		**%**	80%	13%	6%	100%
Total	**Count**	233	77	35	345	**Total**	**Count**	429	93	31	553
	%	68%	22%	10%	100%		**%**	78%	17%	6%	100%
May-07		**Growth**	**Value**	**Blend**	**Total**	**Nov-08**		**Growth**	**Value**	**Blend**	**Total**
Large	**Count**	22	7	1	30	**Large**	**Count**	23	7	0	30
	%	73%	23%	3%	100%		**%**	77%	23%	0%	100%
Core	**Count**	30	37	3	70	**Core**	**Count**	59	9	2	70
	%	43%	53%	4%	100%		**%**	84%	13%	3%	100%
Small	**Count**	250	86	20	356	**Small**	**Count**	245	90	2	337
	%	70%	24%	6%	100%		**%**	73%	27%	1%	100%
Total	**Count**	304	131	24	459	**Total**	**Count**	329	106	4	439
	%	66%	29%	5%	100%		**%**	75%	24%	1%	100%

(Table 3.1 Continued)

May-09		Growth	Value	Blend	Total	May-10		Growth	Value	Blend	Total
Large	**Count**	20	5	5	30	**Large**	**Count**	22	7	1	30
	%	67%	17%	17%	100%		**%**	73%	23%	3%	100%
Core	**Count**	45	19	6	70	**Core**	**Count**	43	24	3	70
	%	64%	27%	9%	100%		**%**	61%	34%	4%	100%
Small	**Count**	189	59	13	261	**Small**	**Count**	201	99	0	300
	%	72%	23%	5%	100%		**%**	67%	33%	0%	100%
Total	**Count**	256	84	24	364	**Total**	**Count**	268	131	4	403
	%	70%	23%	7%	100%		**%**	67%	32%	1%	100%
Nov-09		Growth	Value	Blend	Total	**Nov-10**		Growth	Value	Blend	Total
Large	**Count**	19	6	5	30	**Large**	**Count**	20	8	2	30
	%	63%	20%	17%	100%		**%**	67%	2%	0%	69%
Core	**Count**	50	18	2	70	**Core**	**Count**	38	29	3	70
	%	71%	26%	3%	100%		**%**	54%	41%	4%	100%
Small	**Count**	354	165	0	519	**Small**	**Count**	136	75	12	223
	%	68%	32%	0%	100%		**%**	61%	34%	5%	100%
Total	**Count**	425	190	7	622	**Total**	**Count**	196	113	17	326
	%	68%	31%	1%	100%		**%**	60%	35%	5%	100%

Table 3.1 above indicates that there are a larger number of growth shares as compared to value shares for all categories of market capitalization. For instance, in May 2006, 70% of large market capitalization shares are growth shares as compared to 27% value shares. Similarly, in October 2006, 70% of large market capitalization shares are growth shares as compared to a relatively small decrease of 23% value shares. Similar observations were found for other categories of market capitalization where it appears that there is more than two-thirds of a majority of Islamic growth shares as compared to value shares.

Furthermore, shares which are classified as "blend", or a mix between growth and value shares based on the Russell Co. methodology represents the fewest number of shares for all large, core and small market capitalization shares across all sub-periods.

In addition, the results of the analysis based on the Islamic share market shows that investors favour growth shares over value shares. This observation agrees with Waulkhausl and Loeb's (2012) analysis of growth shares in Islamic share markets. Furthermore, Bernstein (1995) also argued that investors have an inherent preference for growth shares based on conventional markets. This analysis would provide further evidence that investors, both in conventional as well as Islamic share markets have similar preferences for growth shares.

The results also indicate that, investors have a preference for "pure" shares, which are either "growth" or "value" shares. The low number of "blend" shares which according to the definition based on the Russell Co. methodology, consist of shares with both growth and value features, would indicate that investors do not perceive there to be any value in investing in shares with "blend" features. Amenc et al. (2003) argued that "pure" indices are more valuable than "overlapping" or "blend" indices and would outperform the blend indices. The findings from this study would further suggest that completeness and purity of shares are important to investors who have preferences for "pure" growth and value shares. For this reason, core of "blend" categories of shares (which includes large core, medium core and small core stocks) are excluded for purposes of analysis.

The results above seems to indicate that investors have similar preferences when it comes to growth shares and shares which are pure in nature. Preferences for growth shares during periods of economic recession (during the Global Financial Crisis) would be another area of interest which could be a subject for further studies.

The tables above also seems to indicate that growth shares constitute a larger percentage of total shares (with an average of 74%) which make up the Islamic equity style indices over the ten semi-annual periods. This is followed by the value shares (with an average of 29%) and finally the blend of large and small shares (with an average of

about 10%) which constitutes the smallest percentage of the total shares selected. This finding in fact corresponds with findings by Bernstein (1995) who argued that there is a preference for investors to invest in large growth style shares in conventional U.S. equities.

3.7 Forecasting Evaluation

An important method that can be applied in order to test the robustness of an index is the Vector Auto Regression (VAR) forecasting evaluation method. The forecasting method which is used is the one-step ahead and the multi-step ahead forecasting method. The forecasting algorithm VAR forecasting method is based on a VAR (p) equation where:-

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + \varepsilon_t \tag{12}$$

where y_t is defined as $(y_{1,t}, y_{2,t}, y_{k,t})^1$, of k x 1 vector, where each c is a k x 1 vector of constant (intercept), each is A_i is a *k x k* coefficient matrix and ε_i is k x 1 error terms vector.

By assuming parameter A of the VAR(1) is known, the traditional 1 step ahead forecast based on time t is:-

$$y_{t=1|t} = c + A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p+1} \tag{13}$$

The h steps ahead forecast error is therefore expressed as:-

$$y_{t+h} - y_{t+h|_t} = \sum_{s=0}^{n-1} \psi_s \varepsilon_{t+h-s} \tag{14}$$

where the matrices Ψ_s are recursive substitution :-

$$\psi_s = \sum_{j=1}^{p-1} \psi_{s-j} A_j \tag{15}$$

and $A_j = 0$ if j>p.

The test of a forecasting model is in fact the out of sample forecast performance. In computing the out-of-sample VAR forecast, the mean absolute percentage error (MAPE) and the root mean square percentage error (RMSPE) is used. For h steps ahead forecasted results, the MAPE can be calculated based on:-

$$MAPE(h) = (\frac{1}{h}\sum_{t=1}^{h} | \mathrm{e_t})100\% \tag{16}$$

The RMSPE on the other hand can be determined based on:-

$$RMSPE(h) = \sqrt{\frac{1}{n}\sum_{t=1}^{h}(e_h)^2} * 100\% \tag{17}$$

where

$e_h = y_t - \hat{y}_t(h), \hat{y}_t$ is forecast value for y_t

The simulated (pseudo) based forecasting applied in this study applies both stochastic and deterministic simulation as both of these simulations are unbiased predictors of linear models. Forecasting remains primarily deterministic because application of the deterministic method is more straightforward as compared to the stochastic method (Essi et al., 2010).

In this study, the out of sample forecast of the VAR model is performed for three systems. Similar forecasts using the VAR method was performed by Arino and Franses (2000) as well as Mayr and Ulbricht (2007) by taking into consideration the issues of heteroscedasticity and normality of the time series. However, this is the first study to test for the VAR forecasting abilities of Islamic equity style indices.

In order to perform the forecast, three systems of variables are developed. The first system of variables (Table 3.2) consists of LV and LG shares together with macroeconomic variables including GDP, IPI, KLCI and LEI. The second system of variables (Table 3.3) on the other hand is made up of MV and MG shares together with

macroeconomic variables and the third system (Table 3.4) is made up of SG and SV shares as well as macroeconomic variables. The forecasting evaluation seems to indicate that large growth and large value indices seem to provide the best forecasting estimates based on the chosen system of variables. This can be seen from Table 3.2 to 3.4 where the RMSPE and MAPE is lower as compared to the other 2 systems.

The stochastic simulated forecast is preferred because it provides a lower RMSPE and MAPE. In summary, this would infer that it would be better to use the LG and LV indices for purposes of estimation.

Table 3.2: Simulation based out of sample forecast for First System

Forecast error	**Simulation based out of sample forecast**											
%	Types of simulation: Deterministic and stochastic											
	D	S	D	S	D	S	D	S	D	S	D	S
	LG		**LV**		**GDP**		**IPI**		**KLCI**		**LEI**	
MAPE	0.8938	0.8340	1.0151	0.9213	0.0445	0.0442	0.5444	0.5470	0.8528	0.8466	0.2015	0.2008
RMSPE	0.0495	0.0462	0.0544	0.0499	0.0066	0.0063	0.0332	0.0332	0.0695	0.0691	0.0107	0.0106

Table 3.3: Simulation based out of sample forecast for Second System

Forecast error	**Simulation based out of sample forecast**											
%	Types of simulation: Deterministic and stochastic											
	D	S	D	S	D	S	D	S	D	S	D	S
	MG		**MV**		**GDP**		**IPI**		**KLCI**		**LEI**	
MAPE	2.0569	2.0224	2.2966	2.2503	0.1518	0.1574	0.6455	0.6399	1.0442	1.0523	0.2432	0.2442
RMSPE	0.1097	0.1085	0.1279	0.1273	0.0227	0.0235	0.0366	0.0364	0.0816	0.0823	0.0133	0.0134

Table 3.4: Simulation based out of sample forecast for Third System

Forecast error %	Simulation based out of sample forecast; Types of simulation: Deterministic and stochastic											
	D	S	D	S	D	S	D	S	D	S	D	S
	SG		**SV**		**GDP**		**IPI**		**KLCI**		**LEI**	
MAPE	1.1642	1.1251	1.0396	1.0170	0.1071	0.1081	0.5897	0.5876	0.8340	0.8175	0.1811	0.1826
RMSPE	0.0631	0.0617	0.0619	0.0608	0.0159	0.0161	0.0334	0.0333	0.0648	0.0637	0.0099	0.0100

3.8 Newly Created Islamic equity style indices

The created indices can be classified as large growth (LG), large value (LV), medium growth (MG), medium value (MV), small growth (SG) and small value (SV) shares.

These indices which have been constructed can be seen as below in Figure 3.1 to 3.3 below:-

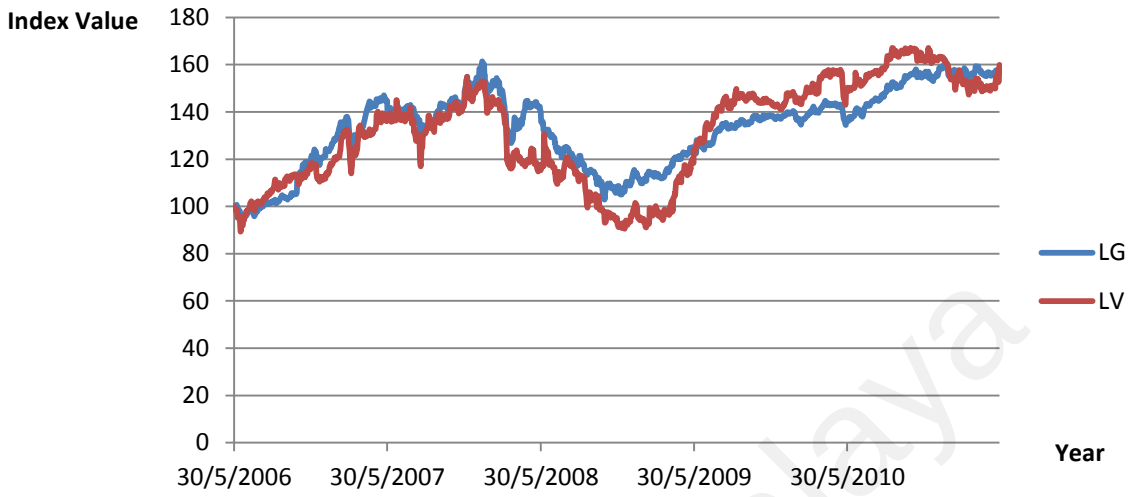


Figure 3.1: Large Growth (LG) and Large Value (LV) Islamic Equity style indices

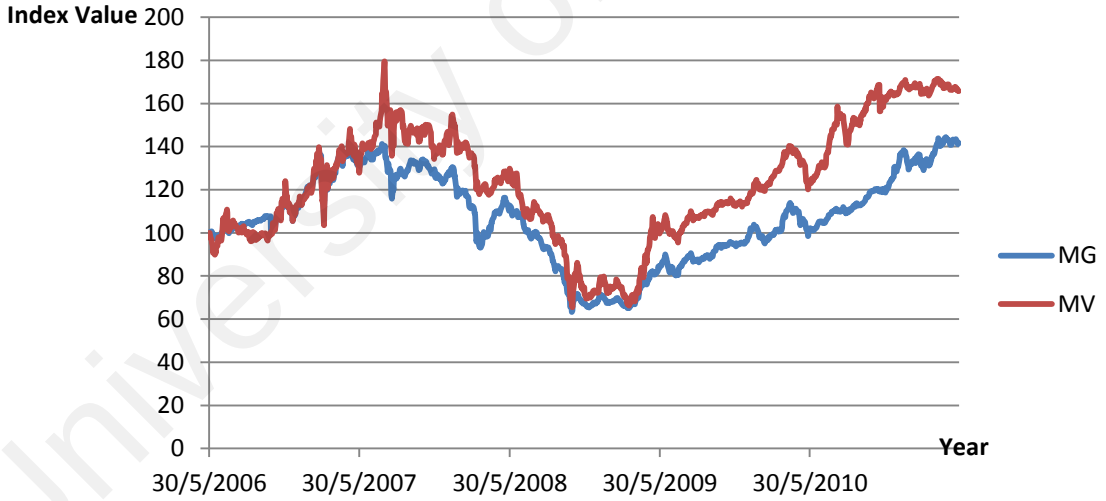


Figure 3.2: Medium Growth (MG) and Medium Value (MV) Islamic Equity style indices

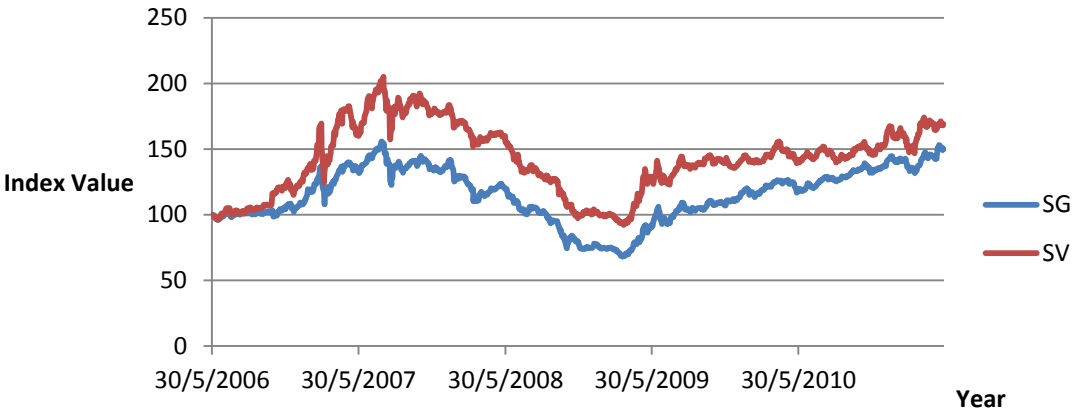


Figure 3.3: Small Growth (SG) and Small Value (SV) Islamic Equity style indices

The newly constructed indices will only be valuable provided it can be proven that it has theoretical can practical significance. However, some simple tests can be performed to find for the efficacy of the newly constructed indices. An example of a test that can be conducted is to test the index against the FTSE KLCI to see the degree of correlation of the index. Figure 3.4 below shows a graphical representation and a correlation between Islamic Equity style indices with the broad based FTSE KLCI index.

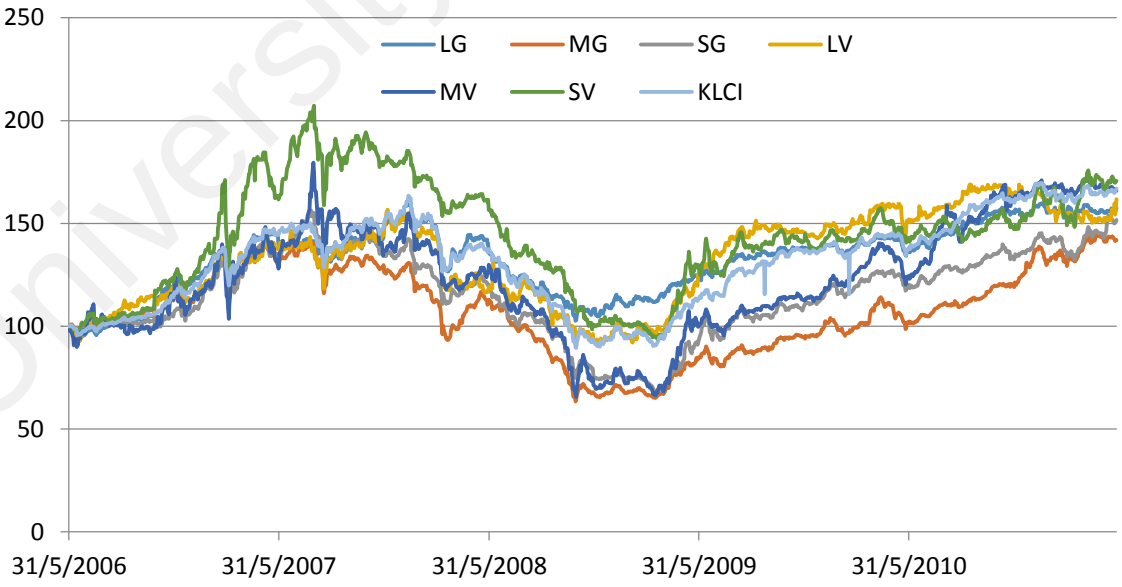


Figure 3.4: Islamic Equity Style Indices (LG, LV, MG, MV, SG, SV) and the Kuala Lumpur Composite Index (May 2006-April 2011)

The graph above (Figure 3.4) seems to indicate that the FTSE KLCI broad market index seems to move in tandem with the rest of the newly created Islamic Equity style indices. Furthermore, it is also evident from the graph that Islamic equity style indices and conventional indices are pro-cyclical in the sense that they move downwards during periods of economic crisis and upwards when the economy recovers. The downtrend of the Islamic equity style indices during the Global Financial Crisis in late 2007 and its pro-cyclical nature with the conventional index (KLCI) would be of interest to both invertors and regulators.

Intuitively, regulators would be able to infer by looking at the behaviour of the Islamic equity style indices that it acts as a bellwether for economic conditions. The strength and reliability of the Islamic equity style indices which is to be used as a forecast for economic conditions however has to be tested based on contemporary econometric methods.

Investors on the other hand would be able to use the newly constructed indices a useful tool for purposes of making asset allocation decisions. The graphs based on Figure 3.4 seems to indicate that the Islamic equity style indices would not offer diversification benefits to investors due to the positive correlation between Islamic equity style indices and the conventional index (KLCI). The correlation between the newly developed Islamic equity style indices and the KLCI is presented in Table 3.5 below. However, benefits of the newly constructed indices for investors have not been tested unless further studies are done based on the predictive properties as well as volatility studies relating to the indices.

Table 3.5: Correlation matrix

	LG	MG	SG	LV	MV	SV	KLCI
LG	1.0000						
MG	0.6568	1.0000					
SG	0.8087	0.9411	1.0000				
LV	0.9016	0.5765	0.7606	1.0000			
MV	0.8568	0.8872	0.9561	0.8140	1.0000		
SV	0.8080	0.8053	0.8994	0.6722	0.8311	1.0000	
KLCI	0.9659	0.7907	0.9132	0.9078	0.9427	0.8406	1.0000

3.9 Conclusion and Implications

This study successfully demonstrates that an equity style index for Islamic shares listed on the the FTSE EMAS *Shariah* index can be successfully created. The development of the Islamic equity style indices can be summarized as a series of steps beginning with sorting growth, value and blend stocks using the Russell Co. method into large, small and core (or mid-cap) stocks. This is followed by using the market capitalization method in order to construct the six Islamic equity style indices including LG, LV, MV, MG, SV and SG indices. Finally, the indices are rebalanced semi-annually to coincide with the release of the *Shariah* compliant list of shares on the FTSE EMAS *Shariah* index and is screened based on index maintenance methods suggested by the Russell method.

The descriptive statistics shows evidence that there is a preference for Islamic growth stocks under all categories of market capitalization. Furthermore, “blend” stocks which has a combination of properties of both growth and value shares are least preferred amongst investors. This would imply that investors are more convinced about investing in “pure” shares which does not have crossover properties.

The study also suggests that Islamic indices has a correlation with the FTSE KLCI index and can be used for research in areas relating to asset pricing and Islamic capital

markets. The out-of-sample VAR forecast on the other hand seems to indicate that the LG and LV indices are the best candidates for purposes of benchmarking.

From the perspective of investors and fund managers, the newly created indices has various applications which helps from the point of view of benchmarking performance of portfolios. The recent interest in smart beta in the investment community is a new direction which Islamic funds may pursue. Also, the newly created share market indices will have a positive effect on the Islamic capital markets as an information source for managers who are keen on developing Islamic share market portfolios which could outperform conventional indices.

Policy makers would also benefit from the creation of the Islamic equity style indices for a number of reasons. Firstly, the Islamic equity style indices can be used as a bellwether and a benchmark for economic conditions. Secondly, it is important that the regulators are aware of developments in investing community. Investors are looking for transparency and indices which are reliable, efficient and representative. The SAC should be aware of the implications of making correct decisions when it comes to the selection of companies which later become constituents of the FTSE EMAS *Shariah* Index. This is to ensure that the equity style indices are correctly developed. Also, further studies would help to uncover types of investors that have preferences for Islamic growth shares. The SC would also be wise to set up measures in order to best protect the interest of existing and potential investors.

CHAPTER 4: TESTING THE EFFICACY OF INFORMATION TRANSMISSION: DOES THE NEWLY DEVELOPED ISLAMIC EQUITY STYLE INDICES CONTAIN ECONOMIC INFORMATION?

4.1 Introduction

Studies in the area of stock market indices have in the past been limited to the area of conventional indices. With further analysis of the Malaysian stock markets, it is apparent that there is a gap in the area of Islamic capital market analysis. For the purpose of this study however, the analysis will seek to contribute to academic literature by analysing the Malaysian Islamic stock markets and its linkages with the macro economic variables. More importantly, the Islamic indices in Malaysia will be tested to prove that it can be used as a means to efficiently evaluate the performance of the economy when evaluated based on the Vector Autoregression method introduced by Sims (1980).

This study is made possible by the creation of a new set of Malaysian Islamic equity style indices which was based on the methods proposed by the Russell Co. With the newly created Islamic style indices, the large growth (LG) and large value (LV) indices will be selected for purposes of analysis and to evaluate its information transmission capabilities. Prior studies in fact have been performed to evaluate the Fama and French (1992) stylized factors, most notably the analysis performed by Liew and Vassalou (1999) and Vassalou (2003). From these studies if was found that the style indices based on conventional stock market indices were promising and that they do contain information content which lead other economic indicators. However, there is little evidence to suggest that similar studies have been performed on Islamic equity style indices.

The success of the equity style indices as a benchmark for investment management purposes has gained momentum in the recent past. It is hypothesized that if the Fama and French variables can be used as a reliable benchmark, it should be able to transmit information to the rest of the economy efficiently. Based on this assumption, this study

will focus on the Islamic equity style indices which are tested against Malaysian macroeconomic variables using the Vector Autoregression model (VAR). The results seem to indicate that the large growth (LG) and large value (LV) variables seem to produce information which precedes other macroeconomic variables. In short, the findings substantiate prior findings by Lau (2005) and Tan and Lau (2013).

The rest of this chapter is presented as follows. Section 2 will discuss relevant literature used in developing this study. Section 3 will outline relevant empirical methods which has been applied in this study. Section 4 discusses the data and variables being used in the study. Section 5 discusses results of the study and finally Section 6 will conclude the paper by presenting conclusions and recommendations.

4.2 Literature Review

The research work performed in the area of forecasting future economic conditions have mainly revolved around the usage of macroeconomic variables and their ability to predict the health of the economy. However, following from findings by Fama and French (1992), researchers have successfully managed to show evidence that the size and value Fama and French factors are useful when it comes to forecasting the economy. The review of literature below shows evidence that the studies relating to Fama and French factors and its utility to forecast the economy mainly relates to conventional stock market indices in developed economies. It is hoped that this research study will help researchers to better understand the behaviour of Fama and French factors derived from Islamic stock market indices, especially in relation to emerging market economies.

The seminal work by Burns and Mitchell (1945) contributed to the study of macroeconomic variables and its use as a technique to isolate and measure cyclical and non-cyclical behaviour in an economic time series has lead towards the development of coincident economic indicators (CEI) and leading economic indicators (LEI). These experimental economic indicators were then formalized in the form of economic indices

which were used primarily for the purpose of forecasting future economic performance in countries. The studies that followed from the Burns and Mitchell (1945) analysis seems to support the use of economic indicators which leads the economy in terms of an indicator of future economic growth or recession.

However, the indicators which were proposed by Burns and Mitchell (1945) were later revised in the form of leading and coincident economic indices by Stock and Watson (1989) based on contemporary tools of time series econometrics. Stock and Watson (1989) managed to develop a formal probability model which gives rise to the CEI and LEI indices and in doing so designed a mathematical framework where other alternative variables and indices could be evaluated. Their study went beyond developing the LEI and CEI, but also a Recession Index which would provide signals to suggest the possibility of an economic downturn.

Consequently, Diebold et al. (1991) continued the work of Stock and Watson (1989) by testing the composite leading economic indicators which were used to forecast future economic activity. The results of their study which was premised on evaluating the performance of the composite leading index and its ability to predict industrial production were not as promising as expected. When tested using real-time forecasting equations, the composite leading index was not able to improve forecasting performance. Nonetheless, the results need to interpreted carefully as experienced investors and users of the composite leading index can use their knowledge in interpreting the index based on methods that they are accustomed to. This would therefore suggest that the composite leading index does in fact possess forecasting abilities. Furthermore, Diebold et al. (1991) also suggests that the components that were used to develop the composite leading index may need to be correctly selected and there may be "mistakes" in their selection of components which have lead towards the inexplicable results.

Gaudreault et al. (2003) followed the methods proposed by Stock and Watson (1989) in order to develop coincident and leading indices for the Canadian economy. However, they improved on the methods applied by Stock and Watson (1989) by using past changes in the CEI as well as other variables to forecast the changes in the CEI for up to six months. They also found an improved recession in index based on logit models. Megna and Xu (2003) were also successful in creating leading and coincident economic indicators for the New York state economy in the United States based on methods proposed by Stock and Watson (1989).

The findings by Burns and Mitchell (1945) became a catalyst for future research on the area of leading economic indicators and its predictive qualities. An interesting study by Liew and Vassalou (1999), which was predicated on the research work performed by Fama and French (1993) managed to support the argument that the Fama and French factors ((i.e. "High-Minus-Low" (HML) and "Small-Minus-Big" (SMB) factors)) contains economic information which precedes future GDP growth. With the benefit of data provided from ten developed international markets, it was found that HML and SMB factors are better at explaining future GDP growth as compared to the winners minus losers (WML) factor.

The utilization of the Fama and French factors however was found to be valuable to forecast mutual fund returns as described by Ahmed (2001). It was described as part of this study that the estimate for future correlations from the multi-style index, dynamic and Fama and French three-factor model produces the lowest prediction errors. Nonetheless, it was recommended that active fund managers can benefit by designing a diversified fund based on appropriate selection of style classification of stocks.

Vassalou (2003) extended her earlier research study by applying the Fama and French factors to the Fama and French (1992) three-factor model. The results of the study however indicates that even though HML and SMB factors contain information related to

future GDP growth, when tested against the three-factor model, the Fama and French factors do not significantly explain cross-section of asset returns.

With the theoretical underpinnings firmly established, research studies began to emerge in areas relating to the development of composite and leading economic indicators. Diebold and Rudebusch (1996) for instance found that dynamic factor model's nonlinear regime-switching models of macroeconomic variables have better usefulness in analysing business-cycle data. The evidence from the study seems to indicate that the business community are concerned with economic turning points and that small forecast improvements as a result of a regime switch may lead to large effects in terms of company profits.

Diebold et al.'s (1991) study was further tested by Hamilton (2011) who argued that there are difficulties in predicting economic downturns in real-time. He further suggested that this was due to the ability of economic participants to predict recession, the effect of data revisions and the relationship between key variables changes over time. Nonetheless, Ferrara and Van Dijk (2014) have recommended that investors and policy makers are not only concerned about point forecasts, or the signalling qualities of the chosen macroeconomic variable, but also the effects on their decision making as a result of the various different possible effects that needs to be contemplated based on the results of probability distribution studies. Diebold, Gunther and Tay (1998) for instance cautioned that the distributional assumptions attributed to forecasting methods are mis-specified due to assumptions made that the time series is parametric (normal) in its distribution.

Frankel and Saravelos (2012) on the other hand found that it is important to identify and specify economic variables which can accurately describe the 2008 and 2009 financial crises. It was found that the level of central bank reserves can be used as a significantly consistent leading indicator which leads the financial crises. This conclusion was made even after having considered other variables such as falls in GDP and

industrial production, currency depreciation, stock market performance and participation in IMF program.

Banerjee and Marcellino (2006) conducted an analysis in order to evaluate the merits of alternative approaches for forecasting inflation and GDP growth in the United States. Interestingly, their findings managed to provide some guidance as to the best leading indicators that should be selected. Efforts to find the most suitable leading economic indicators were also studied by Babecky et al. (2013) which found that domestic house prices, share prices, credit growth and global variables such as private credit are viable options as a benchmark for forecasting economic activity.

The evidence from emerging market economies with regards to the use of leading economic indicators and its usefulness in forecasting economic activity even though sparse, however has been increasing in the recent past. The future economic performance of a nation has been analysed from the point of view of a regression analysis in the form of a time series or panel data studies of a country's macroeconomic variables. For instance, Gupta and Kotze (2015) most recently applied a nonlinear dynamic stochastic general equilibrium (DSGE) model in order to forecast economic performance of South Africa which is classified as an emerging economy. In the same study, it was found that the DSGE model in fact outperforms the vector autoregression model (VAR).

By using the Markov switching panel model, a new approach was introduced by Chen (2007) to measure business cycle turning points. Also, this new approach seems to complement earlier studies which was founded by Stock and Watson (1989) in finding that the Markov switching model is better in forecasting recessionary economic conditions in Japan.

Similar studies of leading indicators including Burkart and Coudert (2002) analysed economic indicators in emerging countries which precedes the currency crises. Based on a study which includes 15 emerging market economies, it was found that capital controls,

contagion dummies and a banking sector indicator could be used as a leading indicator to indicate looming currency crisis. Seip and McNown (2007) did however caution that leading and trailing indices are in fact influenced by their timing and accuracy. Further evidence by Spierdijk and Umar (2014) further suggests that it is necessary to highlight the importance of the element of time, and the timing of investments in emerging market stocks which are useful for international diversification purposes in the short-run.

The Granger causality in a dynamic panel co-integration test was studied by Abbes et al. (2015) with interesting findings in relation to the foreign direct investment (FDI) to GDP growth in developing countries. It was found in the same study that there is causal relationships between FDI in the form of tourism spending and GDP growth.

A study by Qin et al. (2008) revealed that the forecast performance of automatic leading indicators (ALI) and macroeconomic structural models (MESMs) provide time varying results. Based on a data set which includes developing countries such as China, Indonesia and the Philippines, it was found that the ALI method is superior to the MESM method over a period of one period ahead but loses its forecast superiority as the forecast period increases. However, the authors also agree that it is advised that a comparison is made between forecast methods using two models in order to reduce specification uncertainty of models.

An extension of the study of the relationship emerging market stock exchanges with developed stock exchanges were conducted by Diamandis (2009) who found that based on long-memory components in a cointegrated system, stock markets in four Latin American countries are partially correlated with the United States stock market. Furthermore, it was found that the five markets being studied have common components and cointegrating relations. Such a study could indeed benefit emerging markets in Asia as was found in the Diamandis (2009) study where the US market has more influence

over Latin American counterparts. Also, it was argued in the same study that a financial crisis produces some interesting consequences which are short-term in nature.

The link between equity style indices and leading economic indicators in emerging market economies like Malaysia however, was studied by Lau and Lee (2015). In this paper, the evidence suggests that the equity style index is better at transmitting economic information as compared to the stock market sectoral index. Furthermore, it was shown that growth style indices contain economic information that precedes the leading economic index (Tan and Lau, 2013). The results of the study are promising and it seems to support the hypothesis of information content contained within Fama and French variables.

Click and Plummer (2005) used stock market variables to test the level of integration amongst ASEAN-5 economies. By applying time series techniques, they found that there are long-run dynamics amongst ASEAN-5 countries and that the stock markets are economically ntegrated. However, Lin and Lin (2011) who studied co-integration of stocks and real estate markets in six Asian countries found mix results.

Zare and Azali (2014) provided some interesting evidence when it comes to testing the association of monetary policy and stock market prices in Malaysia using the vector error correction model. Their findings found that there is a long-run relationship between monetary policy and stock prices. From an economic forecasting and modelling point of view, the study seems to indicate that short-term interest rates is a leading economic indicator which positively impacts the state of the economy both in the short and long-run.

Nevertheless, for the purpose of this study, the application of the vector autoregression (VAR) model in analysis of the newly devised Islamic Fama and French factors. This co-integration method has been commended for its utility in forecasting future economic activity even though more contemporary and updated methods have been introduced.

Simkins (1995) in fact contributed to this argument by applying the Bayesian VAR model to complement the then widely accepted unrestricted VAR model to forecast macroeconomic time series.

4.3 Empirical Framework

4.3.1 VAR model

The Vector Autogregression (VAR) model which is employed in this study is based on Sims (1980) model which takes the form of multiple simultaneous equations, and the endogenous variables in each equation form a regression with the lagged values of all endogenous variables. This is done in order to estimate the dynamic relationships between all endogenous variables. Furthermore, it enables both long-run and short-run restrictions to be to be explained by economic considerations. As a result, the VAR model can be used to describe the impact of factors influencing dependant variables based on the indices chosen for this study.

The mathematical equation of a general VAR(p) model are as follows:-

$$Y_t = \mathrm{C} + \emptyset_1 Y_{t-1} + \emptyset_2 \Delta Y_{t-2} + \ldots + \emptyset_p Y_{t-p} + \mu_{t,} \quad (1)$$

where Y_t is a K x 1 vector of variables, Φi is a K x K coefficient matrices, and u_t is a K x 1 vector of stochastic disturbances, which is assumed to be white noise processes.

As a practical tool, the VAR model is able to reflect all dynamic innovations between variables due to large lag periods (p and q). However, there is a fundamental flaw in the model where the longer the lags, the more parameters are to be estimated, which lowers the degrees of freedom. Consequently, a balance has to be made between the numbers of lag periods and the degrees of freedom. As a general guide, the number of lags chosen should be based on the lowest values of the Schwartz Information Criteria (SIC) and Akaike Information Criteria (AIC). The formula to explain the SC and AIC are as follows:-

$$\text{AIC} = -2l/n + 2k/n \quad (2)$$

$$\text{SIC} = -2l/n + k\ log\ n/n \quad (3)$$

where k=m(qd+pm) represents number of parameters which needs to be estimated, and n is the sample size which satisfied the following:-

$$l = -2\frac{nm}{2}\ (1 + log2\pi) - \frac{n}{2}\log[\det(\sum_{t} \check{\varepsilon}t\ \check{\varepsilon}'t/n)] \quad (4)$$

In order to ensure estimation accuracy, the number of variables and the lag periods are considered carefully. This will hopefully produce more robust estimates for purposes of achieving the research objectives of this paper.

4.3.2 Stationarity Test

In order to proceed with the VAR model, it is essential that the economic time series is stationary. A differencing method is commonly used in order to eliminate non-stationary trend for time series data which has a non-stationary sequence. In order to establish sequence stationarity, standard unit root rests will be performed. The tests which shall be employed include the Augmented Dickey-Fuller (ADF) test, Kwaitkowski-Phillips-Schmidt-Shin (KPSS) test and the Dickey-Fuller GLS test in order to improve the credibility of the empirical findings. These tests are further explained below.

4.3.2.1 Augmented-Dickey Fuller (ADF) Test

The Augmented-Dickey Fuller (ADF) test is an extension of the Dickey-Fuller test which is used to test the unit root a series by adding lagged terms of dependant variables to ensure that error terms are not correlated. Furthermore, by adding the lagged difference term of variable y_t, the ADF test enables higher-order serial correlation to be avoided.

The ADF test equation can be explained below:-

$$\Delta y_t = \mu + \beta t + \gamma y_{t-1} + \sum_{i=1}^{p} \beta \Delta y_{t-1} + \varepsilon_t \quad (5)$$

where μ is a constant and β denotes the coefficient on a time trend, whilst p is the lag order of the autoregressive function and Ɛ is the error term. The test for stationarity can be further explained based on the hypothesis below:-

Ho: y=0 (The series needs to be differenced in order to make it stationary);

H_1: y<0 (The series is stationary and need not be differenced)

The test statistic refers to

$$DF = \frac{\hat{\gamma}}{\mathrm{SE}(\hat{\gamma})} \sim \tau distribution \quad (6)$$

and Ho is rejected if the computed DF>Mackinnon critical value and the series y_t is integrated to the order of 0. In choosing the appropriate lag length for the unit root test, the value that minimizes the information criteria such as Akaike Information Criteria (AIC) (as described below):-

$$AIC = n\sum \tilde{\varepsilon}_t^{\,2} + 2m \quad (7)$$

and Schwarz's Bayesian Information Criteria (BIC) as below:-

$$BIC = n\sum \tilde{\varepsilon}_t^{\,2} + m \ln n \quad (8)$$

where ε_t is the residual of the unit root test regression and m is the parameter in the test regression including a constant is used.

4.3.3.2 Dickey-Fuller GLS test

Notwithstanding the fact that the ADF test is the most commonly used unit root test, it has been argued to lack efficacy. This is particularly true when the sample size is small and there is a high degree of correlation in the data set.

In order to improve the efficacy of the ADF test, Elliott, Rothenberg and Stock (1992) has proposed the Dickey Fuller GLS (DF-GLS) test. In order to perform this test, w the

tested sequence is firstly differenced, random disturbances and time trend items. Secondly, a regression is performed between the differenced sequence of the tested sequence and the differenced sequence of the random disturbances and the time trend. This is followed by extracting the residuals from the regression to perform a unit root test.

The DF-GLS test which allows for a linear time trend is performed based on the following regression:-

$$(1-L)y_l^{\tau} = \alpha_0 y_{t-1}^{\tau} + \sum_{j=1}^{p} a_j \quad (1-L)y_{t-1}^{\tau} + \mu_t \tag{9}$$

where, L is the lag operator, u*t* is a white noise error term, and y_t is the locally detrended data process under the local alternative of *a*, which is given as:-

$$y_l^{\tau} = y_t - y_t\check{\beta} \tag{10}$$

With z_t=(1,*t*) and *B* being the regression coefficient of *y* on *z* for which $\tilde{y}_t = (y_1, (1-\tilde{a}L)y_2, \dots, (1-\tilde{a}L)y_T)'$ and $\tilde{z}_t = (z_1, (1-\tilde{a}L)z_2, \dots, (1-\tilde{a}L)z_T)'$.

4.3.3.3 Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test

Both the ADF and DFGLS tests assume that time series variables have a constant and trend term. Nonetheless, this assumption does is not necessarily true for all economic time series variables. In order to compensate for the limitations of the ADF test and the DFGLS test, the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test is performed.

To further explain the KPSS test, it could be argued that KPSS is another unit root test with time trend, *t*, where:-

$$y_t = \mu + \beta t + \varphi \sum_{i=1}^{t} \varepsilon_{t-1} + u_t \tag{11}$$

which is tested under $H_{0:}\phi=0$ (trend is stationary) against $H_{0:}\phi\neq0$ (trend is not stationary) where μ is constant, u_t is a stationary process and the past error ε_{t-1} ~ i.i.d (0,1). The test

statistic is based on the LM statistic where H_o is rejected if computed LM>KPSS asymptotic critical value, and the series y_t is regarded as being stationary.

4.3.3 Granger Causality Test

In order to test the information transmission dynamics of the Islamic equity style indices and the macroeconomic variables, Granger's (1969) tests will be used. This test will be performed in a bivariate framework, where if variable *x* Granger causes variable *y*, the mean square error (MSE) of a forecast of *y* based on prior values of both variable *x* and *y* should be lower that the MSE of the forecast which only uses past value of *y*. The Granger causality is further explained in Equation 12 below:-

$$\Delta y_t = \alpha + \sum_{i=1}^{p} \beta_i \, \Delta y_{t-1+} \sum_{i=1}^{p} \gamma_i \, \Delta x_{t-1} + \varepsilon_t \tag{12}$$

and testing the joint hypothesis

$H_0 : \gamma_1 = \gamma_2 = \ldots.. = \gamma_p = 0$

H_1 : At least one of the γ_1 is not equal to zero

The asymptotic chi-square test will then determine the Granger causality between variable *x* and *y*. If the asymptotic chi-square test rejects H_0, therefore short-run dynamics exist from variable *x* to variable *y*. Furthermore, if the test statistic is significant, therefore it could be argued that variable *x* has predictive value for forecasting movement in variable *y*.

Furthermore, the joint significance of the lagged independent variables can be tested using the F-statistics (the null hypothesis is $H_0: \beta_j = \alpha_1 = 0$ in Eq. 1 and $H_0: \beta i = \alpha_2 = 0$ in Equation 14).

The test statistics are as below:-

$$F = \frac{(RSS_R - RSS_u)/p}{RSS_u/(n - kp - 1)} \sim F\ Distribution \tag{13}$$

which is computed where RSS_R is the residual sum square of the restricted model while the RSS_u is the residual sum square of the unrestricted model; *n* represents number of observations and *p* is the order of the VAR model. Based on the hypotheses H_o is rejected if $F>F_{\alpha,n-kp-1.}$ The possible outcomes of the Granger Causality test are unidirectional causality, bidirectional causality or no causality.

4.4 Data and Variables

The data for this study is taken from various sources including Bank Negara Malaysia (Central Bank of Malaysia), Department of Statistics Malaysia, Securities Commission of Malaysia (SC), Department of Statistics of Malaysia as well as from Reuters Datastream. Data for the construction of the indices were collected from data retrieved on a daily basis. The Cubic Spline[13] method was employed to determine monthly data points for macroeconomic data which was reported on a quarterly basis. The data period selected was from 30 May 2006 to 25 May 2011 to coincide with the *Shariah* Listing of *Shariah* compliant stocks from the Securities Commission of Malaysia.

The macroeconomic data chosen for this study is the Leading Economic Indicator (LEI), Kuala Lumpur Composite Index (KLCI), Industrial Production Index (IPI) and Gross Domestic Product (GDP). These variables are later differenced once in order to create a time series of variables for purposes of stationarity. As mentioned earlier, it is the hope of this study that the macroeconomic variables chosen have a relationship with the Fama and French factors which are developed.

The Fama and French factors are developed by using Islamic Equity style indices as derived from the Malaysian *Shariah* stock market, which is then used to construct the Fama and French 'SMB' and 'HML' factors which are produced by using the Russell Company method. These indices are identified as Large Growth (LG), Large Value (LV),

[13] The Cubic Spline method is used for purposes of interpolating quarterly economic data to produce monthly data which is relevant to this analysis. This method also enables the development of a smooth curve which interpolates values of monthly data. The Cubic Spline output was produced using MS Excel. The application of the Cubic Spline method in capital markets through the mathematical application of a piecewise polynomial function is explained by de la Granville (2001). The estimated values of GDP for periods May 2006 to April 2011 is exhited in Appendix E.1.

Core Growth (MG), Core Value (MV), Small Growth (SG) and Small Value (SV). The universe of Islamic stocks chosen are determined by the *Shariah* Listing of *Shariah* Compliant Securities[14] from the Securities Commission of Malaysia.

Table 4.1 documents descriptive statistics. The summary includes unit of measurement, means, medians, minimum and maximum values, standard deviations as well as number of observations. The statistics indicates that the GDP index has the highest standard deviation which would indicate that it has the highest variance and also the highest level of risk as compared to other indices. The LEI index has the lowest level of standard deviation which would imply that it has the lowest variance and level of risk. The LV index has a higher level of standard deviation at 21.7 in comparison to the LG index at 16.5. This would indicate that the LV index is a riskier index to invest in.

Table 4.1: Summary Statistics, May 2006 – April 2011

Variable	Unit of Measurement	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
LEI	Base Value (100)	107	107	112	101	3	60
KLCI	Base Value (100)	1,219	1,259	1,545	864	202	60
GDP	MYR ('000)	463,806	461,047	507,164	432,350	19,164	60
IPI	Base Value (100)	104	104	116	91	5	60
LG	Base Value (100)	133	136	159	97	17	60
LV	Base Value (100)	133	138	168	93	22	60

4.5 Empirical Test Results

This section discusses the empirical results. Subsection 4.5.1 shows results of the unit root tests. Subsection 4.5.2 discusses the selection of the co-integration model followed by subsection 4.5.3 which discusses robustness checks. Finally, subsection 4.5.4 will discuss the results as it relates to relationships between variables and its short-run dynamics.

[14] Shariah Compliant Securities are stocks listed on the Kuala Lumpur Stock Exchange (KLSE) which are approved by the Shariah Advisory Council (SAC) of the Securities Commission of Malaysia (SC) (refer to Securities Commission of Malaysia website). These stocks are classified as Shariah Compliant based on the SAC's methodology in screening companies to be included in their list of Islamic Shariah Compliant securities. The list of Shariah Compliant securities is produced twice a year.

4.5.1 Unit root tests

The table below (Table 4.2) presents the unit root tests for the six different indices which have been developed. Three types of tests were performed which include the Augmented Dickey-Fuller test, Phillips-Perron test and the Kwiatkowski-Phillips-Schmidt-Shin Test (KPSS). The results of the tests are presented:-

Table 4.2: Unit Root Test Results for ADF, DF-GLS and KPSS

	Series	ADF		DF-GLS		KPSS	
		Constant	Constant and Trend	Constant	Constant and Trend	Constant	Constant and Trend
Levels	LLEI	-1.5575 (0)	-1.7752 (0)	-0.4209(0)	-1.6666(0)	0.48870 (6)**	0.1135 (6)*
	LKLCI	-1.5390 (1)	-1.1731 (0)	-0.6887(1)	-1.4881(1)	0.2636 (6)	0.1179 (6)
	LGDP	-1.0140 (2)	-2.2235 (2)	0.8253(2)	-1.9833(2)	0.8238 (6)***	0.0825 (5)***
	LIPI	-2.0986 (1)	-2.5457 (1)	-2.0887(1)**	-2.3540(1)	0.4290 (5)*	0.1048 (5)
	LLG	-1.7236 (0)	-1.6264 (0)	-0.1091(0)	-1.2893(0)	0.3709 (6)*	0.1023 (6)
	LLV	-2.3075 (2)	-2.5569 (2)	-1.5070(2)	-2.4985(2)	0.4113 (6)*	0.1065 (6)
First Difference	LLEI	-8.4234 (0)***	-8.3522 (0)***	-7.8920(0)***	-8.1458(0)***	0.1077 (3)	0.1074 (3)
	LKLCI	-5.7990 (0)***	-5.7486 (0)***	-5.5490(1)***	-5.7654(0)***	0.1070 (5)	0.1078 (5)
	LGDP	-7.0941 (1)***	-6.9948 (1)***	-6.8536(1)***	-7.0635(1)***	0.0611 (4)	0.0413 (4)
	LIPI	-14.3762 (0)***	-14.4283 (0)***	-14.4395(0)***	-13.8824(0)***	0.0609 (3)	0.0482 (3)
	LLG	-6.3774 (0)***	-6.3982 (0)***	-5.2056(0)***	-5.9921(0)***	0.1223 (5)	0.1126 (5)
	LLV	-3.2075 (1)**	-3.1980 (1)*	-3.1750(1)***	-3.2361(1)**	0.0932 (4)	0.0902 (4)

The asterisks ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively.

Figures in parentheses are the optimal lag length chosen.

Crtitical values are based on Kwiatkowski , Phillips, Schmidt and Shin (1992)

Table 4.2 summarizes the unit root tests for the LKLCI, LLV, LLG, LLEI, LIPI and LGDP, for which the before mentioned indices have been transformed into natural log form for the purpose of avoiding the possibility of non-stationarity in the variances of the indices. The PP and ADF tests for all the variables seem to indicate that all the indices except for the LIPI index are not stationary in level form. These results are further corroborated by the results of the KPSS test results. Consequently, the series was first differenced in order to ensure they are stationary. The automatic lag length selection was chosen for the PP and ADF unit root tests.

However, the unit root rest results seem to indicate that all six variables are stationary after taking a first difference. As such, this would indicate that the LKLCI, LLV, LLG, LLEI, LIPI and LGDP are integrated of order one.

4.5.2 Selection of model

The results of the unit root tests seems to indicate that in variable level, all of the indices are not stationary except for LIPI and LKLCI. However, after first differencing, it is found that the series' are all integrated to the order of one. This would indicate that the VAR model should be used chosen. The optimal lag order selection analysis is presented in Table 4.3. The proper selection of lag period is important because long lag structures can reduce autocorrelation of the error term. Based on results of the lag order selection analysis, a lag of 3 is chosen as dictated by the sequential modified LR test statistic (LR), Final prediction error (FPE) and the Hannan-Quinn information criterion (HQ).

Table 4.3: Lag selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	613.8312	NA	1.01e-17	-22.10295	-21.88397	-22.01827
1	861.6772	432.6039	4.61e-21	-29.80644	-28.27357	-29.21367
2	947.9098	131.7008	7.78e-22	-31.63308	-28.78632*	-30.53222
3	1002.669	71.68430*	4.45e-22*	-32.31522	-28.15457	-30.70627*
4	1039.731	40.43149	5.51e-22	-32.35385	-26.87930	-30.23680
5	1093.187	46.65274	4.64e-22	-32.98862*	-26.20019	-30.36348

* Indicates lag order selected by the criterion

The test results so far would indicate that the VAR(3) model is the optimal model to be applied to the indices which have been selected. The lag order estimate is chosen based on minimizing the value of the criterion for the lag-order selection criteria (i.e. minimizing the value of LR, FPE and HQC). The Generalized Cholesky decomposition test was also applied when testing for the sensitivity of forecasting results to the ordering of the VAR model. Following from this, further diagnostics checks will be performed. In order to ensure that the chosen model it well-specified, it is necessary to conduct the stability test of the VAR model. This is done in order to test whether the estimated parameters change over time. Model misspecification or non-constant parameters may adversely affect statistical inferences. Therefore, in order to test the stability of the model, the VAR roots of characteristics polynomial test is performed. The results of the test as indicated by Figure 4.1 shows that all the characteristic roots are less than 1 and lies inside the unit circle. This would indicate that the VAR (3) model which was chosen satisfies the stability condition.

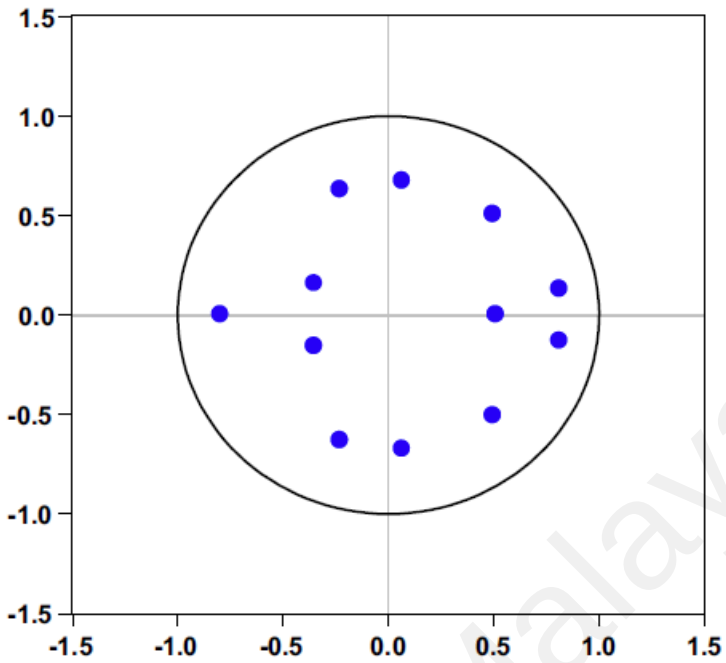


Figure 4.1: VAR roots of characteristics polynomial test results

4.5.3 Robustness tests

This section deals with the robustness of the VAR (3) model which has been selected. A number of diagnostics tests have been selected to confirm the validity of the results. The tests are performed in order to check the following: (i) violation of normality; (ii) autocorrelation, (iii) and (iii) heteroscedasticity. Taken together, the except for issues of normality of data, the results of the diagnostics tests seem to indicate that the selected model is robust, and allows for inferences to be made.

4.5.4 Short-run dynamics of VAR model

The short-run causal relationship between the indices are analysed in Table 4 below through the Granger causality approach. The Granger causality allows for causal relationships to be identified in all equations. It further suggests that causal relationships exist when contemporary or past realizations helps to predict future values of another variable.

The results from Table 4.4 indicates that for all significance levels, the Granger causality is detected and its direction is:

DLIPI ⟷ DLKLCI; DLKLCI ⟶ DLGDP; DLKLCI ⟶ DLLEI;

DLGDP ⟶ DLIPI; DLLG ⟶ DLLV; DLLG ⟶ DLKLCI; DLLG ⟶ DLLEI;

DLLV ⟶ DLIPI; DLLV ⟶ DLLEI.

It should be noted that the nature of the causality was determined within the time span under analysis and it should be cautioned that it cannot be claimed that similar causality exists outside this time frame.

In summary, the results of the Granger causality test indicates that there is bi-directional causality between the IPI and KLCI indices. There are short-run dynamics between all the other indices, except for the LEI index does not Granger cause other indices. As for the newly constructed Islamic equity style LG and LV indices, both indices have short-run dynamics. However, the LG index appears to be better in predicting future economic conditions as it Granger causes LV, LEI and KLCI indices.

The absence of a relationship between LV and LG indices with GDP is an issue which may possibly need to be studied in further detail. However, the information transmission capabilites of both the LG and LV indices in relation to both the LEI as well as the IPI indices seems to indicate that the Islamic style indices are useful for predicting future economic performance. Also, the short-run dynamics between the LV and the KLCI which can be explained through the IPI index would indicate that the LV index is valuable in predicting the future performance of the stock market.

The findings of the short-run Granger causality tests can be further explained in the form of a chart in Figure 4.2.

Table 4.4: VAR Granger causality tests

	Independent Variables					
Dependent Variables	**D(LIPI)**	**D(LGDP)**	**D(LKLCI)**	**D(LLEI)**	**D(LLG)**	**D(LLV)**
D(LIPI)		5.8392	3.96344	1.48612	1.7934	3.94991**
		(0.0017)***	0.0132**	0.2299	0.1607	0.0134
D(LGDP)	0.52762		2.66879	0.36755	1.90415	1.56851
	0.6654		0.0578*	0.7767	0.1412	0.2089
D(LKLCI)	2.20119	0.88437		0.30275	2.86158	1.54612
	0.0998*	0.4558		0.8233	0.0462**	0.2144
D(LLEI)	0.85193	0.61338	4.29362		5.51329	4.29147
	0.4723	0.6096	0.0091***		0.0024***	0.0091***
D(LLG)	3.73132	0.64623	0.82936	0.13638		1.23417
	0.0171**	0.5891	0.4841	0.9378		0.3074
D(LLV)	0.96094	1.61711	0.76764	0.81411	2.36191*	
	0.4187	0.1974	0.5177	0.4923	0.0827	

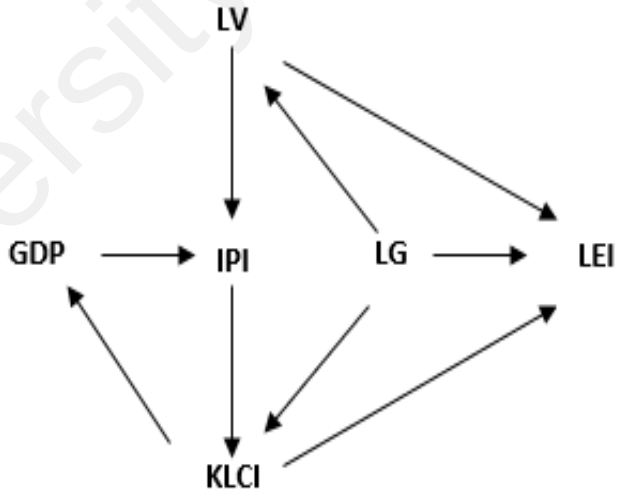


Figure 4.2: Short-run Granger Causality between LV, LG and macroeconomic variables

4.6 Conclusion and Recommendations

In summary, the VAR results based on the system of six macroeconomic variables chosen seems to show evidence that LV and LG has information content that precedes the

macroeconomic variables in the short-run. Also, the evidence does indicate that the LG and LV indices have short-run dynamics which is useful in order to predict future economic conditions. However, the results of the Granger causality test seems to indicate that the LG index is better in predicting future economic events as it Granger causes the LV index as well as macroeconomic variables such as KLCI and LEI.

The results of the VAR tests also proves the efficacy of the newly constructed Islamic equity style indices. The results also confirms previous findings by Liew and Vassalou (1999), Lau and Lee (2015) and others. Consequently, it could be argued that investors, fund managers as well as regulators could use these indices for purposes of benchmarking and to improve their understanding of the Islamic stock market and its constituents.

CHAPTER 5: CONSTRUCTING FAMA-FRENCH FACTORS FROM STYLE INDICES; EVIDENCE FROM THE ISLAMIC EQUITY MARKET

5.1 Introduction

The introduction of the Fama and French (FF) three-factor model in the early 1990's has been greeted with both acceptance and scepticism by researchers in the area of asset pricing. Nonetheless, the seminal work has been widely accepted as an advancement to the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965) by proving that beta has little or no ability to explain cross sectional variations in equity returns (Fama and French, 1992).

Research studies emanating from this work was mainly conducted in the setting of the United States of America where there was a growing acceptance for the asset pricing theories developed by Fama and French throughout the world. Nonetheless, studies performed by Faff (2001) as well as Long Pham(2007) respectively have provided evidence of the validity of the three-factor model in both Australia and Japan using national stock market data. Both studies substantiated the robustness of the Fama and French factor betas with the use of simple "off-the-shelf proxies" based on FF size and book-to-market factors with the exception of the reversal of size effect anomaly that contradicts theory by Fama and French (1992).

This study performs similar tests identified by Faff (2001, 2003) and Long Pham (2007). However, the study focuses on the Islamic capital markets in Malaysia and the *Shariah* index which are currently under-researched. The importance of conducting tests on this Islamic stock market index cannot be overlooked due to the significance and growth of the Islamic stock market index in Malaysia. In this study, the FF factors which are newly created from Malaysian Islamic stock market indices in and of itself contributes a new body of knowledge to the area of asset pricing relating to the Malaysian Islamic stock market data.

As a result of the newly developed Islamic FF factors, this paper attempts to address some of the issues pertaining to the validity of the FF model as well as areas which warrant further research. The validity of the model will be tested against two sets of indices namely; (i) ten sectoral indices based on companies listed on the KLSE and (ii) Islamic unit trust funds in Malaysia.

The results of the analysis based on both sets of indices indicate that there is a reversal of size effects relating to post-crises periods, similar to finding by Dimson and Marsh (1999). Faff (2001) and Long Pham (2007). The three-factor model also appears to be empirically superior to the CAPM model in explaining stock prices. To further prove the existence of the FF model in the Malaysian Islamic stock market, several tests based on the Generalized Method of Moment (GMM) methodology were carried out to prove the validity of the newly created FF factors.

After having performed the empirical tests, the GMM test results indicate that the FF three-factor model does in fact follow previous studies. It would also suggest that the three-factor model based on Islamic stocks can be used for purposes of devising an asset portfolio. Furthermore, the findings indicate that there are issues relating to the three-factor model which requires further study. In particular, issues regarding the reversal of size effects anomaly requires additional analysis.

Nonetheless, the results of this study has meaningfully contributed by way of validating the use of the Islamic Equity style indices as a benchmark index. It is also believed that the index can be used in this case for assessing the performance of the Malaysian sectoral indices. These findings will prove useful both for investors who intend to improve their asset allocation decision making as well as for policy makers who are concerned with developing the Islamic financial markets. Another compelling reason might be the fact that the Malaysian government has an interest in ensuring that the success in growth of the Islamic capital markets can be sustained with a better

understanding of the nature of Islamic equity markets. A reliable set of Islamic equity style indices may not help to overcome all the possible problems pertaining to managing the Islamic capital markets, but might aid in further understanding.

Furthermore, from the point of view of Islamic unit trust funds, fund managers and investors will be able to better manage their portfolios by using information derived from the newly developed Islamic equity style indices. Also, the Islamic unit trust fund industry will also benefit by having a new benchmark that can be used for purposes of determining the performance of fund managers. The benefits will also extend to researchers in the area of Islamic unit trust funds.

The remainder of the paper is organized as follows. Section 5.2 and Section 5.3 reviews the related literature and Section 5.4 presents the empirical methodology used to analyse the Islamic stock market data. Section 5.5 describes the data and variables employed while Section 5.6 and 5.7 discusses the descriptive statistics as well as findings and how they are related to the objectives of this study. Finally, conclusions and suggestions for future research appear in Section 5.8.

5.2 Fama and French Three-factor Model in Islamic Stock Markets

The three-factor model by Fama and French as described by many finance scholars from their seminal paper in 1992, represents one of the most influential papers in the last two decades (Faff, 2003). Their study proves that beta has no ability to explain cross-sectional variations in equity returns. Instead, other more fundamental factors, more notably size and book-to-market value of equity better explains the cross-sectional returns of stocks.

The research performed by Faff (2001, 2003) lends credence to the three-factor model as proposed by Fama and French by successfully proving that Frank Russell Co. style portfolios can be used to create Fama and French factors. As a proxy to mimic the portfolio suggested by Fama and French(1992), the Russell based style indices do not

reject the Fama and French model after having being tested based on a multivariate asset-pricing analysis (Faff, 2001 and 2003). Instead, these "off-the-shelf" style indices possess very useful information which can be translated into an active investment management system.

Faff (2003), in his paper also proves that there does not appear to be a high proportion of SMB and HML betas which take on a positive sign. Walid and Lau (2009) on the other hand followed up on the research by Faff whilst constructing a Russell/Nomura style index and supported the claims made by prior research. The results from the study were derived from the Generalized Method of Moments (GMM) technique. In doing so, the analysis managed to prove that the Fama and French model is more reflective of the Japanese stock market. There was also evidence that the Fama and French index can be used as a benchmark to be linked to a financial distress indicator. The authors also suggested that investors would require compensation for additional risk as a result of holding small size stocks of high BM ratio and would prefer to accept a discount for larger size stocks (Walid and Lau, 2009).

Following from his earlier study (Faff, 2003), Faff in 2004 provided evidence to argue against the validity of the Fama and French (1992) three-factor model by analysing stocks listed on the Australian Stock Exchange. In this study, Faff (2004) provided evidence that when the estimated risk premia is taken into account, the Fama and French three-factor model becomes less persuasive. Furthermore, a "negative size premium" was found to exist. This "negative size premium" anomaly would suggest that the "size effect" which was argued by Fama and French (1992) does not exist. Dimson and Marsh (1999) had earlier suggested that the "negative size premium" anomaly did exist in what they referred to as the "reversal of size effect".

Long Pham (2007) also contributed towards the debate surrounding the empirical performance of the CAPM and the Fama and French model. Similar to Faff (2003) he

attempted to overcome the problems in constructing market proxies for the Fama and French factors by using Daiwa Style indices as stylized factors to be compared to Daiwa sectoral indices. This paper extends Faff's (2003) study and found that the Fama and French factors created based on stocks listed on the Tokyo stock exchange does not follow the three-factor model. Furthermore, the "reversal of size effect" anomaly was argued to be a conundrum which continues to persist in post-bubble periods.

Notwithstanding the fact that there is evidence of a reversal of size effect anomaly which continues to challenge the theoretical soundness of the Fama and French (1992) three-factor model, Dimson and Marsh (1999) have argued that the "size effect" will continue to persist. Smaller firms were argued to perform differently and not necessarily "outperform" larger firms. It was also suggested that the zero or negative size premium occurs as a result of a change in market fundamentals and not just a change in sentiment. Also, Dimson and Marsh (1999) have cautioned that it would be a mistake fail to take into account the size effect when it comes to making asset allocation decisions. To support this assertion, one of the arguments that was presented by Dimson and Marsh (1999) is that the premium for beta risk has "evaporated" as compared to the beta risk premium predicted by the CAPM.

Nonetheless, the Fama and French three-factor model has come under a lot of criticism. For instance, the empirical evidence suggests that beta is not robust under the Fama and French model and is still subject to scrutiny. Kothari, Shanken and Sloan (1995) for instance argue that the sampling period needs to be lengthened in order to estimate beta. Also, as argued by Amihud, Christensen and Mendelsohn (1993), the econometric methods applied only partially explain the Fama and French asset pricing model. Nevertheless, the three-factor model has gained in importance in the real world as a method to manage funds despite the criticisms against the model.

Notwithstanding all the scrutiny against the model, researchers have developed new models as an extension to the Fama and French three-factor model. For instance, Breloer et al. (2014) found that when it came to mutual funds, the country momentum and sector momentum factors explain more than 50 % of the funds are significantly affected by these factors. Interestingly, when viewed in comparison to the Islamic equity market, Merdad et al. (2015) found that an extension to the Fama and French model by introducing an Islamic effects factor would be a better approach when it comes to pricing Islamic equity stocks.

5.3 Fama and French Three-factor Model and its application to Islamic unit trust funds

5.3.1 Growth of Islamic Unit trust funds industry in Malaysia

The Islamic unit trust fund industry has been growing significantly over the last ten years. The first Islamic unit trust fund was introduced in Malaysia in 1993 with the introduction of the Arab Malaysian Tabung Ittikal. Ever since then, the total number of Islamic unit trust funds has increased to 198 with a total net asset value (NAV) of RM49 billion worth of funds under management as at 31 July 2015 (Securities Commission of Malaysia website).

The Securities Commission of Malaysia (SC) has promoted the development of *Shariah* compliant Islamic stocks which provides opportunities for fund managers to diversify their portfolio. The SC has also placed a lot of emphasis on improving the unit trust fund industry by improving regulations relating to the mutual fund industry in order to favour investors. The improvements to these regulations have been tabled in the most recent Capital Master Plan 2 (CMP2). Among other things, these new rules that encourage public investment in mutual funds by enabling them to have easy access to information regarding the funds which they have invested in. Also, fund managers are

also required to report fully their risk management procedures, processes, methods and investment strategies at least every quarter.

The largest Islamic unit trust fund in Malaysia is CIMB Islamic DALI Equity Growth fund which was firstly established in 1998 and has a well-diversified portfolio of both local and international *Shariah* compliant stocks from various industries. The total annual return on investment for the fund for the last year ending 2015 is 5.50% with a size of RM4.5 billion[15]. The Aberdeen Islamic World Equity Fund on the other hand is another Islamic mutual fund which is performing well at a year-over-year return as at June 2015 of 8.70% and total assets under management of RM242 million[16].

Table 5.1 below is a summary of Islamic unit trust funds in Malaysia according to NAV and number of funds:-

Table 5.1: Total Number of Funds and Net Asset Value of Islamic Unit Trust Funds in Malaysia between June 2006 to June 2015

Date	Number of Funds	Total Net Asset Value (RM billion)
June 2006	87	8.75
June 2007	113	12.26
June 2008	136	17.54
June 2009	143	19.71
June 2010	156	22.69
June 2011	160	26.18
June 2012	168	31.37
June 2013	180	37.55
June 2014	186	45.27
June 2015	198	49.25

Figure 5.1 below on the other hand summarizes Islamic unit trust funds based on NAV and number of funds:-

[15] Fund size and performance as taken from the Bloomberg website (As accessed from https://www.bloomberg.com/quote/BHLPDAI:MK on 10 January 2016). Also, performance of the CIMB ISLamic DALI Equity Growth fund is taken from the Morningstar website (As accessed from http://my.morningstar.com/ap/quicktake/returns.aspx?PerformanceId=0P00008MJD&activetab=TotalReturn on 10 January 2016).
[16] Performance of the Aberdeen Islamic World Equity Fund is taken from the Bloomberg website (As accessed from https://www.bloomberg.com/quote/ABIWEFI:MK on 10 January 2016).

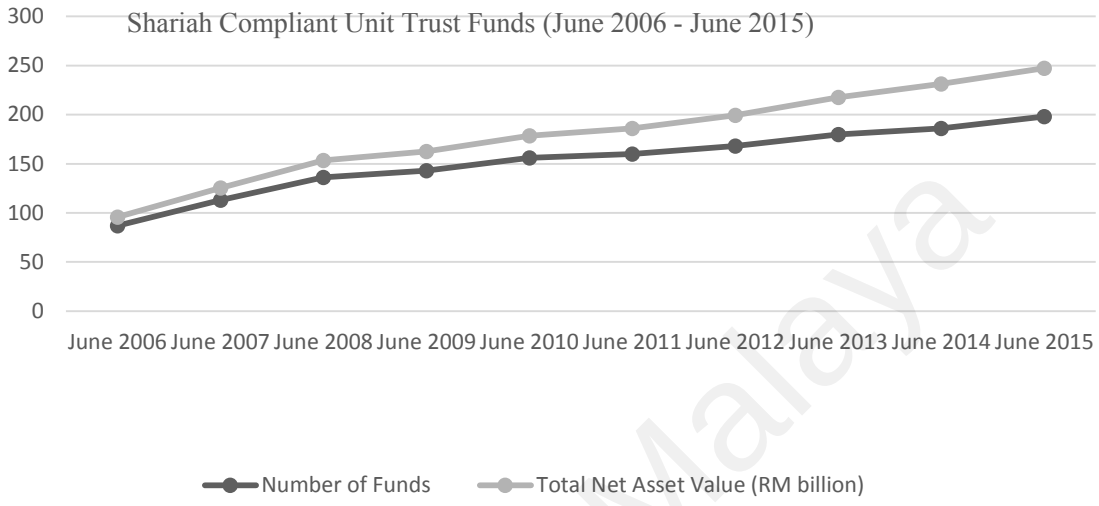


Figure 5.1: Graph of Total Number of Funds and Net Asset Value of Islamic Unit Trust Funds in Malaysia between June 2006 and June 2015

Figure 5.1 above clearly shows that there is an increase in importance in Islamic unit trust funds in Malaysia. An analysis of the above chart indicates that there is a 463% (or RM41 billion) increase in NAV from June 1996 to June 2015. On the hand, there is a 128% increase (or an increase of 111 funds) in total number of Islamic unit trust funds during the same period.

The growth of the Islamic mutual fund industry in Malaysia has further highlighted the importance of implementing new methods to further improve the management of the mutual funds. Style based investing as proposed by Sharpe (1992) as well as Fama and French (1992) will help to aid in the management of Islamic unit trust funds. Consequently, fund managers can benefit by adopting the newly created Islamic equity style indices in order to manage their portfolios. By testing the Fama and French three-factor model against Islamic unit trust funds, this will hopefully help fund managers in managing their portfolios by utilizing Islamic equity style indices.

5.3.2 Fama and French three-factor model and Islamic unit trust funds

The review of literature on Islamic unit trust funds indicates that there has not been sufficient work performed on the Fama and French three-factor model in relation to Islamic unit trust funds, especially in stock markets of emerging economies. The existing research on Islamic mutual funds however has shown that fund managers approves of investments in these funds due to diversification benefits and the outperformance of these funds over conventional funds after a financial crisis periods.

The study of the Fama and French three-factor model in relation to the Islamic unit trust fund industry in developing countries however would be of interest to fund managers as well as regulators who are keen on improving their asset allocation strategies and further developing the Islamic capital markets. Prior studies have shown that even though Islamic unit trust funds produce lower returns as compared to conventional funds, they do provide benefits from the point of view of reduction of portfolio risk and diversification.

The performance of unit trust funds is well researched, but there is a lack of interest in data from unit trust funds in emerging markets, especially in relation to the Fama and French three-factor model. The research thus far relating to mutual funds in emerging markets and Islamic equity funds (IEF's) has been centred on the diversification benefits as well as the performance of these fund managers under periods of economic growth and recession. The research also compares the performance of emerging market funds and Islamic funds against conventional funds.

Prior research seems to indicate that there are diversification benefits by choosing to select emerging market equity stocks in a portfolio. For instance, the benefits of selecting emerging market funds is made even more attractive when compared to the performance of developed market funds during periods of economic crisis. Ajmi et al. (2014) however

argue that decoupling of the Islamic market from their conventional counterparts reduces the portfolio benefits from diversification.

Islamic equity funds have been argued to outperform conventional funds during times of financial crises. Nonetheless, the results are mixed when it comes to the diversification benefits of emerging market mutual funds. For instance, there is evidence that although Islamic funds are safer and less affected by the financial crises, the performance of the fund is not attractive enough for funds managers and investors (Makni et al., 2015). Furthermore, Kassim et al. (2012) and Ho et al. (2014) provided some evidence that Islamic funds are in fact a better choice for investors in Malaysia during the financial crisis periods. In a recent paper, Dewandaru et al. (2014) argued that due to their low leverage, Islamic equities do not provide good diversification benefits and are highly vulnerable to other financial crises.

When it comes to the behaviour of emerging market fund managers, research seems to suggest that Islamic fund managers have a preference for growth and large stocks (Waulkhausl et al., 2012). Similar findings were made by Girard et al. (2007) where Islamic indices were compared to conventional indices that Islamic indexes are growth and small-cap oriented while conventional indices are value and mid-cap focused. Investors on the other hand have been proven to chase hedge fund investment styles with funds which are better performing (Horst et al., 2014).

The study on Islamic unit trust funds was also performed by comparing the performance of Islamic equity funds (IEF) as compared to conventional equity funds. Current literature provide evidence that even though IEF's benefits from stock selection methods which are based on religious and moral selection standards, they do not necessarily provide investors with stable and abnormal returns. For instance, the studies by Hayat et al. (2011) and Abdullah et al. (2007) indicate that IEF do not perform as well as Islamic or conventional indices. Renneboog et al. (2001) also discover that socially

responsible funds do not necessarily outperform conventional funds. This finding however was later refuted by Abdessalam et al. (2014) who argued that Islamic funds do in fact outperform socially responsible funds. Nonetheless, there are various studies which argue that IEF benefit from Islamic screening standards and selection standards thus outperforming their conventional counterparts (Mohamed N. et al., 2015).

Research in the area of Islamic equity funds however has been extended to the area of the performance and behaviour of funds managers. In this case, fund managers have been found to be inefficient when it comes to the timing and selection of Islamic stocks. This was in fact evidenced by Lai et al. (2010) as well as (Bashir, 2011). The performance of fund managers for Islamic equity style stocks in fact was highlighted and it was found that fund managers have poor timing ability and they are unable to correctly identify good bargain stocks (Bashir, 2011).

5.4 Empirical Framework

In describing the three-factor model, Fama and French (1993) ascertained a theoretical model to explain the stylized effects of two additional factors namely SMB and HML factors which serves as an addition to the existing CAPM model. The three-factor model is described in equation (1) based on Long Pham (2007):-

$$E(\widetilde{R})_i - R_f = b_i[E(\widetilde{R}_M - R_f)] + s_i E(\widetilde{R}_{SMBt}) + h_i E(R_{HMLt}) \quad (1)$$

where $E(\widetilde{R})_i - R_f$, $E(\widetilde{R}_M - R_f)$, $E(\widetilde{R}_{SMBt})$, (R_{HMLt}) represent the expected excess return on asset *i*, the expected excess return on market portfolio, the expected return on proxy portfolio for the "small minus big" size factor, the expected return on proxy portfolio for "high minus low" book-to-market factor, respectively.

The factor loadings of b_i, s_i, and h_i from the slopes of the empirical counterpart in equation (2):-

$$\widetilde{R}_{it} - R_f = \alpha_i + b_i(\widetilde{R}_{Mt} - R_f) + s_i\widetilde{R}_{SMBt} + h_i R_{HMLt} + \widetilde{\varepsilon}_{it} \quad (2)$$

where $R_{it} - R_f$, $R_{MT} - R_f$, $R_{SMB,t}$ R_{HMLt} denote the realized excess return on asset i, the realized excess return on market portfolio, the realized return on proxy portfolio for size factor and the realized return on proxy portfolio for the book-to-market factor at time t, respectively. The beta coefficients, b_i, s_i, and h_i, represent the sensitivity of the excess return on asset i to changes in returns on common risk factors. Following from this, by taking the expectation of equation (2) and comparing it to equation (1), the intercept α is expected to be zero for all i.

Using Faff's (2001, 2003, 2004) methodology of introducing time series regression by applying GMM to test the Fama and French model, the following system of equations is developed:-

$$\widetilde{R}_{it} - R_f = b_i(\widetilde{R}_{Mt} - R_f) + s_i\widetilde{R}_{SMBt} + h_i\widetilde{R}_{HMLt} + \widetilde{\varepsilon}_{it} \quad (3)$$

$$\widetilde{R}_{Mt} - R_{ft} = \mu_M + \widetilde{\xi}_t \quad (4)$$

$$\widetilde{R}_{SMBt} = \mu_{SMB} + \widetilde{\psi}_t \quad (5)$$

$$\widetilde{R}_{HMLt} = \mu_{HML} + \widetilde{\omega}_t \quad (6)$$

$$i = 1,2,...,N$$

where μM, μSMB, μHML are the estimated market premium, SMB premium, and HML premium, respectively. Correspondingly, there are seven sample moments in this system of equations namely:-

$$(1/T\sum_{t=1}^{T}\widetilde{\varepsilon}_{it}, 1/T\sum_{t=1}^{T}\widetilde{\varepsilon}_{it}(\widetilde{R}_{Mt} - R_f), 1/T\sum_{t=1}^{T}\widetilde{\varepsilon}_{it}\widetilde{R}_{SMBt}, 1/T\sum_{t=1}^{T}\widetilde{\varepsilon}_{it}\widetilde{R}_{HMLt}, 1/T\sum_{t=1}^{T}\widetilde{\xi}_{it}, 1/T\sum_{t=1}^{T}\widetilde{\psi}_{it}, 1/T\sum_{t=1}^{T}\widetilde{\omega}_{it})$$

Also, there are six parameters (bi, ,si, ,h_i, μM , μSMB,μHML) to be estimated for each asset. Since the system is over identified (i.e. having more known than unknown variables), the test for assessing identification is conducted to verify whether moment

restrictions are valid or not. Under the null hypothesis, the moment restrictions are found to be valid, implying the choice of FF model is appropriate.

5.5 Data and Variables

5.5.1 Data

The data is taken from various Malaysian regulatory bodies including Bank Negara Malaysia (Central Bank of Malaysia), Securities Commission of Malaysia (SC), Department of Statistics of Malaysia as well as from Reuters Datastream. Monthly data covering the period May 2006 until April 2011 is used. The Cubic Spline[17] method was employed to determine monthly data points for economic data which was reported on a quarterly basis. The data period was chosen to coincide with the *Shariah* Advisory Council's (SAC) of the Securities Commission of Malaysia (SC) listing of *Shariah* Compliant Securities[18].

The market index being used is the newly constructed Islamic Equity style, which is then utilised to construct the Fama and French 'SMB' and 'HML' factors which are produced by using the Russell Co. method. These indices are identified as Large Growth (LG), Large Value (LV), Core Growth (MG), Core Value (MV), Small Growth (SG) and Small Value (SV). The risk-free rate is based on the Malaysian Treasury Bill (Band 10) rate.

For purposes of clarity, the Islamic growth and value stocks (LG and LV) are taken from the top 30 largest *Shariah* compliant companies listed on the Kuala Lumpur Stock Exchange. The Core value (MV) and Core Growth (MG) stocks represents the following 70 largest stocks. The SV and SG stocks represents the remaining 98% of stocks in the universe of Islamic stocks.

[17] The Cubic Spline method is used for purposes of interpolating quarterly economic data to produce monthly data which is relevant to this analysis. This method also enables the development of a smooth curve which interpolates values of monthly data. The Cubic Spline output was produced using MS Excel. The application of the Cubic Spline method in capital markets through the mathematical application of a piecewise polynomial function is explained by Granville (2005). Refer to Appendix 1 for plot of GDP using Cubic Spline method from period May 2006 to April 2011.

[18] Shariah Compliant Securities are stocks listed on the Kuala Lumpur Stock Exchange (KLSE) which are approved by the Shariah Advisory Council (SAC) of the Securities Commission of Malaysia (SC) (refer to Securities Commission of Malaysia website). These stocks are classified as Shariah Compliant based on the SAC's methodology in screening companies to be included in their list of Islamic Shariah Compliant securities. The list of Shariah Compliant securities is produced twice a year.

5.5.2 Creation of Malaysian Islamic Equity Style Indices to Develop Fama and French factors

The large and small growth and value Malaysian Islamic Fama and French factors are developed by using data from the list of *Shariah* Compliant shares traded on the KLSE. Malaysian Islamic Equity style LG, LV, SG and SV indices are then derived from the KLSE *Shariah* Index using the Frank Russell Co. Method of creating indices.

The Fama and French three factor model will be tested against two sets of indices. Firstly, the KLSE Sectoral Indices which shall be used for purposes of this study are derived from the KLSE Index. For further explanation regarding the relationship between the indices, refer to Figure 5.1 below:-

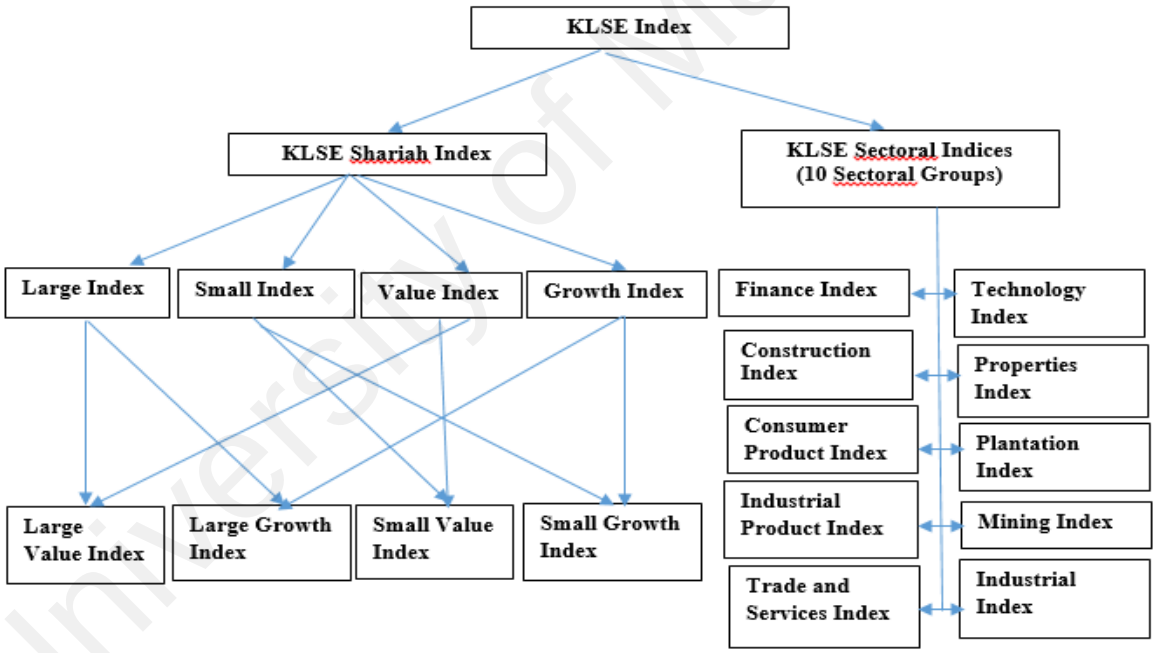


Figure 5.1: Relationship between KLSE Shariah Equity Style Indices and KLSE Sectoral Indices

Secondly, the Malaysian Islamic unit trust funds indices which shall be used for purposes of this study are in fact derived from Reuters Datastream. Figure 5.2 below explains the relationship between the Islamic equity style indices and the Malaysian Islamic unit trust funds:-

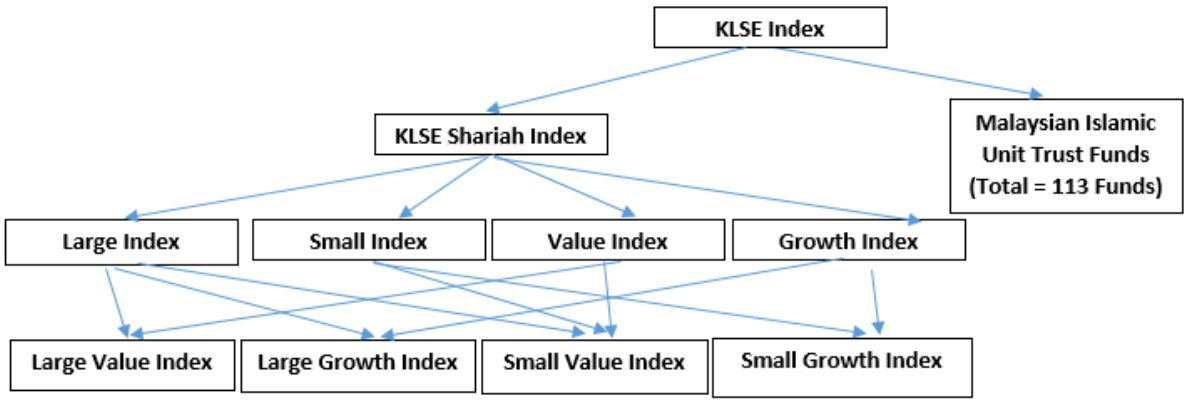


Figure 5.2: Relationship between KLSE Shariah Equity Style Indices and Malaysian Islamic Unit Trust Funds

Once the Islamic Equity style indices of growth and value factors have been created, they are then utilized to determine the returns of small minus big 'SMB' and high minus low 'HML' book-to-market factor. These factors can be described as follows:-

$$SMBt = \left(\frac{RSVt+RSGt}{2}\right) - \left(\frac{RLVt+RLGt}{2}\right) \quad (7)$$

$$HMLt = \left(\frac{RLVt+RSVt}{2}\right) - \left(\frac{RLGt+RSGt}{2}\right) \quad (8)$$

where RSG_t is the return on the SG index in the period *t*, RLVt is the return on the LV index in period *t* and the LG is the return on the LG index in period *t*.

Figure 5.3 below illustrates the performance of Fama and French factors as derived from Equation 7 and 8 during the period May 2006 to April 2011. The SMB and HML factors appear to be correlated and perform in a similar fashion before and after the financial crisis period (financial crisis period was identified as August 2008). Both SMB and HML factors are more volatile prior to and right after the financial crisis period and is less volatile during periods of recovery in late 2009. Furthermore, it appears that the size factor (SMB) tends to be more volatile as compared to the value factor (HML).

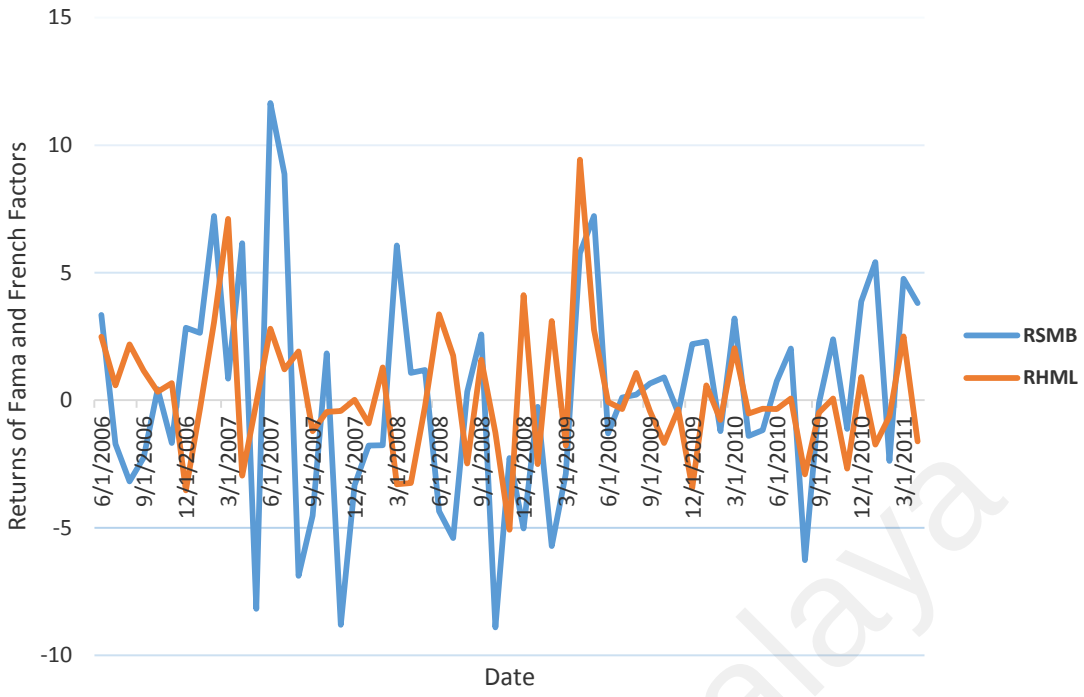


Figure 5.3: Performance of Fama and French Factors from May 2006 to April 2011

In creating the Malaysian Islamic Equity style indices for purposes of deriving the FF factors, there were certain limitations from the point of view of availability of data which needs to be used for the purpose of constructing the indices. This issue is dealt with by carefully selecting companies which are listed on the *Shariah* Compliant list of companies and also has data available from Reuters Datastream. However, certain companies have been deliberately excluded from the indices due to unavailable data.

5.6 Descriptive Statistics

Table 5.2 and 5.3 below provides summary statistics for the pre-Lehman Bros. period and the post-Lehman Bros. period. An important observation from the statistics is that the average SMB and HML premiums are positive for both sub-periods tested. This finding is similar to that of Fama and French (1993) which argues for a positive FF premium. Also, the market factor produces the highest average return and the highest standard deviation. This is not consistent with Fama and French's study which argues that the average return of the market is lower than for FF factors. However, results are similar

when it comes to the standard deviation of the market returns when compared between both sub-periods.

Table 5.2: Pre-Crisis Period Basic Descriptive Statistics and Correlations Between FF Factors

Descriptive Statistics			
	RM	SMB	HML
Mean	0.7314	0.0245	0.3975
Median	1.4272	0.3365	0.3262
Max	9.3453	11.6461	7.1141
Min	-8.0949	-8.8007	-3.5360
Standard Deviation	4.4872	5.0869	2.3994

Correlation Matrix			
	RM	SMB	HML
RM	1.0000		
SMB	0.1395	1.0000	
HML	-0.0183	-0.0461	1.0000

Table 5.3: Post-Crisis Period Basic Descriptive Statistics and Correlations Between FF Factors

Descriptive Statistics			
	RM	SMB	HML
Mean	1.1610	0.2396	-0.0226
Median	1.2511	0.1625	-0.3554
Max	13.5454	7.2273	9.4306
Min	-15.2226	-8.8989	-5.0792
Standard Deviation	4.8429	3.6261	2.6235

Correlation Matrix			
	RM	SMB	HML
RM	1.0000		
SMB	0.4609	1.0000	
HML	0.3895	0.3142	1.0000

The results from Table 1A and 1B also indicates that the FF factors are weakly correlated with one another. The strongest degree of correlation is between SMB factor against the market factor (0.46) during the post-Lehman Bros. sub-period. The lowest degree of correlations are between the HML factor when compared against the SMB factor (0.14) during the pre-Lehman Bros. sub-period.

5.7 Structural Break Test

Results of the structural break test using Bai and Perron's (2003) methodology to test for multiple structural breaks is summarized in Table 5.4 below. The F statistic rejects the null hypothesis of no structural break in the case of all the series. The multiple break point test finds the presence of five breakpoints for GDP, four breakpoints for KLCI, LEI, LG and LV as well as two breakpoints in the case of IPI.

However, similar break dates which was reported on August 2008 for KLCI, LEI, LG and LV indices corresponds to the expected structural break at the time of the Lehman Bros. collapse which or the beginning of the Global Financial Crisis. We have therefore divided the period of the study into periods before and after the collapse of Lehman Bros. to improve statistical inferences.

Table 5.4: Bai and Perron (2003) Multiple Structural Break Test Results

	Number of breakpoints	95% Confidence interval for break dates	F-Statistic	BP (2003) Critical Value
GDP	5	2007M02, 2007M11, 2008M11, 2009M08, 2010M06	123.03	3.91
KLCI	4	2007M02, 2007M11, 2008M08, 2009M07, 2010M08	82.91	4.99
IPI	2	2007M07, 2008M11	44.31	7.22
LEI	4	2007M02, 2007M11, 2008M08, 2009M07, 2010M08	50.86	4.99
LG	4	2007M02, 2007M11, 2008M08, 2009M07, 2010M08	68.26	4.99
LV	4	2007M02, 2007M11, 2008M08, 2009M05, 2010M03	68.32	4.99

5.8 Empirical Test Results

5.8.1 Fama and French Model and Malaysian Sectoral Indices

To test the validity of the Fama and French three-factor model, firstly, the analysis based on the performance of the ten Malaysian sectoral indices will be conducted. The validity of the three-factor model will be tested by using the Generalized Method of Moments method.

Prior to conducting this study, the SMB (Small-minus-Big) and HML (High-minus-Low) factors have been chosen from the Islamic Indices which were created. The factors are then regressed against Malaysian sectoral indices and then divided into two sub-periods on a monthly basis between June 2006 to August 2008 and September 2008 to

April 2011 respectively. The segmentation of the analysis into two sub-periods is done on purpose to coincide with the events before and after the collapse of Lehman Bros upon declaring bankruptcy on 15 September 2008. By doing so, the research attempts to empirically evaluate the performance of Islamic equity style indices in Malaysia having isolated any spill over effects as a consequence of the ill-fated downfall of Lehman Bros. and the Global Financial Crisis (GFC). Also, the attempt to separate the indices based on two sub-periods will also test the robustness of the Fama and French three-factor model based on normal assumptions.

The choice of using GMM as an alternative to ordinary least squared (OLS) test is because the GMM method of estimation has several advantages in this case as compared to OLS. Amongst others, GMM modelling provides a general estimator which encompasses standard econometric estimators including OLS, instrumental variables (IV), and maximum likelihood. Also, GMM is valid under weaker assumptions about the normality of data distribution. Finally, GMM provides a consistent variance estimation that gains in efficiency and helps to avoid biasness in calculating test statistics (Long Pham, 2007).

Table 5.5 and 5.6 below presents the GMM test results based on the Pre-Lehman Brothers collapse sub-period. Results from the tables indicate that market betas are positive and significant. Furthermore, four out of ten size factor (s_i) betas are positive and significant at the 1% significance level. Also, one out of ten value factors (hi) are positive and significant for this sub-period. The GMM test statistic seems to indicate that the FF model cannot be rejected at the 10% significance level but for the case of the Technology Index subsector.

Table 5.5: GMM test results for Malaysian sectoral indices when regressed against Malaysian Islamic FF variables for the Pre-Lehman Bros. sub-period

KLSE Subsector Index	bi	si	hi	GMM
Finance Index	0.888 (9.23***)	0.168 (2.36***)	0.067 (0.43)	0.48 [0.827]
Construction Index	1.413 (10.38***)	-0.144 (-0.02)	-0.378 (2.08**)	0.62 [0.803]
Consumer Product Index	0.582 (6.95***)	0.176 (3.35***)	0.078 (0.53)	1.80 [0.179]
Industrial Products Index	0.992 (17.30***)	0.353 (6.72***)	-0.089 (-0.71)	0.37 [0.952]
Trade and Services Index	0.948 (26.01***)	-0.024 (-0.58)	-0.046 (-0.66)	1.08 [0.300]
Technology Index	0.504 (3.79***)	-0.027 (-0.14)	-0.231 (-1.00)	5.79 [0.016]
Properties Index	1.153 (7.63***)	0.678 (9.91***)	0.345 (1.26)	0.24 [0.627]
Plantation Index	1.504 (6.22***)	0.063 (0.46)	-0.145 (-0.50)	1.68 [0.195]
Mining Index	1.059 (2.95***)	0.366 (0.69)	1.276 (2.27**)	2.43 [0.119]
Industrial Index	0.894 (15.52***)	-0.152 (1.71)	-0.109 (-1.04)	0.32 [0.858]

Table 5.6: Summary of Market, SMB and HML betas for the Pre-Lehman Bros. sub-period

	Mean	Max	Min	Sig. Positive	Sig. Negative
bi	0.9937	1.504	0.504	10	0
si	0.1457	0.678	-0.152	6	4
hi	0.1524	1.276	-0.231	4	6

Notes: This table presents the results of testing the FF model in the system of regressions (3), (4), (5), and (6). The sample is monthly return data extending from January 1984 to December 2004. GMM is Sargan or J test statistic of overidentifying restrictions. Standard Errors computed from heteroscedastic-consistent matrix (Robust-White). The associated t-statistic is in parentheses ( ). The associated p-value is in square brackets [ ]. ***, **, * indicate significant at 1% level, 5% level, and 10% level, respectively.

Table 5.7 and 5.8 below however presents the GMM test results based on the Post-Lehman Brothers sub-period. It can be shown that market betas are also positive and significant and three out of ten size factor (s_i) are positive and significant at the 1% significance level. Also, four out of ten value factors (hi) are positive and significant for this sub-period. However, in comparison to the Post-Lehman Brothers sub-period three out of ten GMM test statistics are below the 10% significance level, most notably the Consumer Product Index subsector which has a GMM test statistic below 5%.

Table 5.7: GMM test results for Malaysian sectoral indices when regressed against Malaysian Islamic FF variables for the Post-Lehman Bros. sub-period

KLSE Subsector Index	bi	si	hi	GMM
Finance Index	1.138 (19.59***)	0.137 (1.59)	0.016 (0.18)	0.71 [0.400]
Construction Index	0.906 (7.36***)	0.288 (1.60)	-0.014* (-0.05)	0.12 [0.726]
Consumer Product Index	0.561 (6.46***)	-0.224 (-0.02)	-0.089 (-0.64)	4.68 [0.031]
Industrial Products Index	0.810 (9.61***)	0.513 (5.02***)	0.041 (0.69)	0.20 [0.658]
Trade and Services Index	0.771 (9.95***)	0.068 (0.79)	0.233 (1.88*)	0.13 [0.061]
Technology Index	0.718 (2.62***)	0.853 (2.92***)	0.918 (2.28**)	0.32 [0.571]
Properties Index	0.914 (8.05***)	0.681 (5.76***)	0.413 (2.07**)	2.84 [0.092]
Plantation Index	1.290 (5.42***)	0.056 (0.22)	-0.623 (-1.73*)	0.23 [0.635]
Mining Index	1.986 (5.46***)	0.288 (0.72)	1.801 (3.62***)	0.25 [0.875]
Industrial Index	0.595 (6.46***)	-0.011 (-0.14)	-0.032 (-0.32)	0.32 [0.858]

Table 5.8: Summary of Market, SMB and HML betas for the Post-Lehman Bros. sub-period

	Mean	Max	Min	Sig. Positive	Sig. Negative
bi	0.9689	1.986	0.561	10	0
si	0.2649	0.853	-0.224	8	2
hi	0.2661	1.801	-0.623	6	4

Notes: This table presents the results of testing the FF model in the system of regressions (3), (4), (5), and (6). The sample is monthly return data extending from January 1984 to December 2004. GMM is Sargan or J test statistic of overidentifying restrictions. Standard Errors computed from heteroscedastic-consistent matrix (Robust-White). The associated t-statistic is in parentheses ( ). The associated p-value is in square brackets [ ]. ***, **, * indicate significant at 1% level, 5% level, and 10% level, respectively.

The single rejection of an industry subsector is similar to the Australian scenario identified by Faff (2004) where the Resources sector industries rejected the FF model over the full sample period (from May 1996 to April 1999)[19]. In fact, the findings by Faff (2004) seems to suggest that the FF Model is not overwhelmingly endorsed due to the fact that the overall GMM test statistic for the sample period proving that the model needs to be rejected at the 10% significance level.

[19] Refer to Faff (2004) paper entitled 'A simple test on Fama and French factors using daily data; Australian evidence'.

In comparing results from both sub-periods, the plantation subsector beta was the highest for the Pre-Lehman Bros. period at 1.504 whilst the mining subsector was highest at 1.986 post-Lehman Bros. This would imply that both of these important subsectors are the riskiest by virtue of the high betas which can be seen across sub-periods. The technology subsector on the other hand has recorded a beta of 0.504 pre-Lehman Bros whilst the Consumer products subsector recorded the lowest beta of 0.561 in the corresponding sub-period. Both subsectors registered the lowest beta coefficients and implies the riskiest form of investment opportunities across both sub-periods.

Nonetheless, there is proof to suggest that the reversal of the size effect can be identified across the two sub-periods. This finding is consistent with the results of Gompers and Metrick (1998), Gustafson and Miller (1999) and others.

In testing the validity of the moment's restrictions, the GMM statistics seem to indicate that the Fama and French model is supported in most cases for all 10 sub sectors against both sub-periods. However, the Technology Index during the Pre-Lehman Bros. period did not produce a satisfactory GMM statistic. In the Post-Lehman Bros. period on the other hand, the Consumer Product Index presents GMM statistics suggests that the FF model needs to be rejected at the 5 percent level.

In summary, the results of the GMM test results suggest that the Fama and French three-factor model can be supported in the case of *Shariah* compliant stocks on the KLSE. In comparison to Long Pham's (2007) findings, there are fewer negative size premium stocks during the post-crisis period in Malaysia.

5.8.2 Fama and French Model and Islamic unit trust funds in Malaysia

The empirical test shall now be performed on the Islamic Unit trust funds in Malaysia. A summary analysis of factor betas as well as GMM test results of the FF model during the pre-Lehman Bros. period is presented in Table F.1.1 and Table F.1.2 of Appendix F.1. With respect to market betas, 77 from 103 market betas are statistically significant. Also,

75 out of 103 market betas are statistically significant at 1 percent level. However, when it comes to the size factor, there were a total of 24 betas out of 103 betas which were statically significant and 5 size betas were negative and significant. Finally, in relation to value betas, there were 16 value betas which were statistically significant and 14 out of 103 value betas were both negative and statistically significant.

The analysis of the risk premium of the Islamic unit trust indicates that the highest market beta is 1.597 and the lowest market beta is -0.759. The results also suggests that a large majority (100 funds or 97% of funds) have positive market betas. A total of 8% of Islamic unit trust funds have market betas above 1 and could be regarded as risky funds. In comparison, 46 unit trust funds (or 45% of funds) have negative size betas with the smallest size beta at -1.151 and highest size beta at 0.929. Lastly, with respect to value betas, there are a larger number (56 funds or 54%) of funds with the lowest value beta at -1.158 and the highest value beta at 0.929.

The GMM test results based on Table F.1.1 of Appendix F.1 is summarized in Table 5.9 below. Table 5.9 indicates that the FF model cannot be rejected in 83% of the cases. However, from the total funds analysed in the pre-Lehman Bros. period, 10% of the funds or 10 funds has a test statistic of 0.10 to 0.20 and only marginally passed the GMM test. The pre-Lehman Bros. test results shows evidence that a significant number of funds passed the GMM test and that the results follow the Fama and French model.

Table 5.9: Pre-Lehman Bros. Sargan Test Statistics

Sargan Test Statistics	Number of Islamic unit trust funds
Less than 10%	19
Above 10%	84
Total	103

The larger number of positive and statistically significant market betas would suggest that the Pre-Lehman Bros. unit trust funds performance follows the FF model. Also, the larger number of positive and statistically significant size betas also favours the three-factor model. However, the fewer number of positively significant value factors does not

follow the three-factor model. The results of the GMM test statistics however would suggest that the Fama and French model should be accepted in most cases.

Table F.1.3 and Table F.1.4 of Appendix F.1 on the other hand presents GMM test results and summary market, SMB and HML betas for the post-Lehman Bros. sub-period. The results of the analysis indicates that 92% (95 funds) have a positive market beta. Nonetheless, only 31% (32 funds) and 21% (22 funds) have a significant size and value factor respectively. The mean market beta, size and value beta is also significantly below one in this case.

Furthermore, it is also observed that 69% (71 funds) and 40% (60 funds) of SMB and HML betas have positive betas respectively. Also, it could be shown that 47% (46 funds) have market betas below 0.5 and 94% (93 funds) as well as 96% (99 funds) have SMB and HML betas below. 0.5. In contrast, there are a larger number of funds with market beta above 0.5 (47%, or 48 funds).

The analysis of the GMM test results based on Table F.1.3 from Appendix F.1 is summarized in Table 5.9 below. Table 5.9 indicates that the FF model cannot be rejected in 78% of the cases. Also, 12% (12 funds) show a GMM test statistic between 0.1 and 0.2. When compared against the pre-Lehman Bros. sub-period, there is evidence to show that even though there are fewer GMM test results which supports the Fama and French model in the post-Lehman Bros. sub-period, the overall results shows evidence that the Fama and French model cannot be rejected. The results also indicates that even in comparison with the pre-Lehman Bros. sub-period, there are a larger number of positive SMB betas while there are fewer positive HML betas.

Table 5.10: Post-Lehman Bros. Sargan test statistics

Sargan Test Statistics	Number of Islamic unit trust funds
Less than 10%	23
Above 10%	80
Total	103

In summary, the results of the analysis over the two sub-periods shows evidence that the FF model though accepted in most cases, suffers from low and negative risk premiums. In contrast to findings by Dimson and Marsh (1999) which argues that a negative size premium exists in post crisis periods, the findings of this research suggests that there are fewer negative size premiums in the post financial crisis period. Nonetheless, the results would suggest that the Fama and French model should be accepted in Islamic stock markets.

5.9 Conclusion and Implications

In conclusion, these findings are supportive of the Fama and French three-factor model and verifies the results of Faff (2001, 2003, 2004) and Long Pham (2007). By testing the three-factor model against ten sectoral indices on the KLSE as well as Islamic unit trust funds indices, the evidence seems to indicate that the Fama and French three-factor model performs consistently across periods of economic change. What is even more interesting is the fact that the newly developed Islamic Equity style indices, of which the Fama and French factors are derived for purposes of this study have by and large survived a test of its validity by supporting claims made by previous research work done in the area.

The findings of the study also would lead us to believe that the fund managers and investors who trade in the Islamic stock markets can use the evidence provided from this study to aid in the construction of asset portfolios. The empirical evidence seems to indicate that the size and value effect does in fact exist in most cases when it comes the *Shariah* stock market index. Nonetheless, they should be cautioned to take into account the "negative size premium" anomaly as described by Faff (2001, 2004) as well as Dimson and Marsh's (1999) which also exists in Islamic stock markets.

The evidence would also suggest that fund managers could benefit by using Islamic unit trust funds as an alternative for purposes of diversifying investments. For purposes of

portfolio selection, studies should also be extended to test the performance of Islamic unit trust funds in comparison to conventional unit trust funds during periods before and after a financial crises.

The findings also indicate that certain sectoral indices appear to be riskier than others. For instance, the construction and plantation sector are riskiest during the pre-Leman Bros. sub-period as compared to the mining and the plantation sector which is riskiest during the post-Lehman Bros. sub-period. This observation could also be useful for investors and fund managers of creating diversified portfolios. Furthermore, observation in relation to a reduction in number of negative size premiums during post-crisis periods could also be useful for portfolio construction.

Divisors of policy and regulations would also benefit from the results of this study. Assuming the Islamic Equity style indices are used for purposes of benchmarking performance of securities, it is incumbent on the regulators to ensure that the *Shariah* Advisory Council (SAC) acts efficiently and consistently when it comes to selecting Islamic compliant securities. This is because, the selection criteria may have an influence on the Islamic Equity style indices and adversely affect the ability of investors to rely on the validity of the indices.

Regulators would be able to benefit from this analysis as they would be encouraged to develop Islamic equity style indices. Also, it would be more important for the SAC to perform screening of stocks becomes more important. Studies have shown that investor participation has increased as a result of increasing transparency. Investors would be encouraged to increase their investments as a result of improved understanding of the stock market indices. This will lead towards further growth of the Islamic stock market. Hence, it would also be beneficial to increase research in the area to provide more valuable knowledge to aid investors.

To summarize, even though the results of this study are largely supportive of the FF three-factor model, it needs to be qualified and further analysed in order to explain reversal of size effect anomaly. Given the limitations of this study, it would be interesting to analyse the results when compared against other international indices Islamic equity style indices, as this may give researchers and analysts a clearer idea of risk premia as it relates to Islamic stocks.

CHAPTER 6: CONCLUSIONS, IMPLICATIONS AND AREAS FOR FURTHER RESEARCH

This chapter will review some of the conclusions drawn from previous chapters on the developments of the Islamic equity style indices and its efficacy as a tool for information transmission and application to the Fama and French three factor model. By reviewing these chapters, we will also discuss any limitations that developed as a result of conducting the research in this area. Furthermore, the possible implications to fund managers and investors as well as market regulators as a result of developing the Islamic equity style indices will be highlighted. Finally, the chapter will discuss future areas of research which could be studied.

The construction of the Islamic equity style indices were discussed in Chapter 3 of this dissertation. Six newly constructed Islamic equity style indices were successfully constructed including SG, SV, MG, MV, LG and LV indices. Subsequent to the construction of the indices, the VAR forecasting method was applied to the indices and it was found that the LG and LV indices have the smallest RMSPE and MAPE and are the most viable candidates which were subsequently used in later chapters for purposes of estimation.

The construction of the indices using the Russell Co. method enabled stocks to be decomposed according to size and value factors. These variables are subsequently utilized for purposes of testing the validity of Fama and French (1992) three-factor model and to highlight the importance of developing indices based on groups of stocks categorized according to size and value. The descriptive results indicate that there is a significant number of *Shariah* compliant companies which are categorized as growth companies. This is consistent with growth Walkshäul and Loeb's (2013) results when

comparing Islamic and conventional stock market indices. Also, their analysis also indicates investors have a preference for Islamic growth stocks.

The creation of Islamic equity style indices will benefit investors and fund managers who are seeking to benchmark the performance of their portfolios. Furthermore, investment managers can also use this newly created benchmark index to devise active and passive fund management strategies. Also, the portfolios of stocks can be grouped according to stock characteristics such as value and growth stocks as well as size of market capitalization. Investors who invest in equity style portfolios can also better analyse the performance of their fund managers as suggested by Siegel (2003).

Government and prudential regulators would also benefit from having a newly developed Islamic equity style indices in Malaysia. This is especially true of the capital market regulators in Malaysia who intend to further develop and understand the Islamic stock market. The newly developed Islamic growth and value style indices do not only serve the purpose of providing the stock market with much needed information about the performance of Islamic stocks, but also as a proxy for the performance of the Islamic equity market as a whole. It is however important that the Securities Commission of Malaysia ensure that the *Shariah* Advisory Council (SAC) is consistent and transparent in classifying the *Shariah* compliant stocks which are done semi-annually as this has a significant influence on the value of the index.

Lastly, the Islamic equity style indices can be further evaluated by testing the tracking error of the indices to improve its representativeness and reliability (Haughton and Pritamani, 2005).The results of this analysis would provide useful evidence as to the effectiveness of the Islamic equity style indices for purposes of benchmarking.

In chapter 4, the Islamic equity style indices were tested for its information transmission properties when compared against macroeconomic variables in Malaysia. It was found that there are short-run dynamics when it comes to the LG and LV indices

when tested in a VAR framework. The LG index Granger causes the IPI but the LV index has bi-directional relationship with the KLCI index.

The results are useful not only for investors and fund managers but also for government and regulators. Results of the VAR analysis supports prior studies by Liew and Vassalou (1999) and can be used to infer that Islamic equity style indices are useful for purposes of forecasting. Furthermore, by demonstrating that the indices has information transmission properties, both investors as well as regulators can use the Islamic stylized indices for purposes of forecasting economic conditions. The cointegration and information transmission abilities of the Islamic equity style indices can be improved by extending the series. Further work has to be performed in order to construct this longer series of data and refinements to the index maintenance should be performed whilst constructing the index.

For purposes of further study, it would be beneficial to analyse the degree of integration between Islamic equity style indices with conventional indices. Prior research work has been performed for purposes of testing the level of integration or decoupling effect of the two indices, including a recent study by Yilmaz et al. (2015). Nonetheless, by performing this comparative study based on Islamic style indices, analysts and researchers would have a better idea of information transmission properties and possible linkages between the two stock market indices.

The research could also be extended to test for the efficacy of the Islamic equity style indices to predict economic turning points by comparing the Islamic style indices performance against conventional indices. The results of performing this comparison is useful for investors and analysts from a practical point of view. In testing the Islamic equity style indices, the predictive powers of the indices during different states of the economy (such as growth or recession) and financial market conditions (such as bearish

versus bullish markets) and the effect of growth or value investing strategies would also be useful future area of research.

In chapter 5, the newly constructed indices is tested based on the Fama and French (1992) three-factor model. The three-factor model was analysed based on ten sectoral indices in Malaysia as well as Islamic unit trust funds for periods before and after the collapse of Lehman Bros. The results of the analysis indicates that the three-factor model is valid when tested against both sets of indices. However, consistent with Faff (2001, 2003), Long Pham (2007) and others, there is evidence to show that the reversal of size effect exists for in both sets of indices tested. This anomaly which was firstly identified by Dimson and Marsh (1999) continues to challenge investors and analysts who rely on the Fama and French model for purposes of investments.

Evidence of the Fama and French three-factor model test also indicates that there are sectoral biases before and after the Lehman Bros. crisis. For instance, investors would demand a higher return from the construction and plantation sector before the crisis period but prefer the mining and plantation sector after the crisis period. Furthermore, the low risk premia for the consumer product sector during both sub-periods would indicate investor's preference with regards to these sectors. These results are useful to investors for purposes of stock selection. Furthermore, investors could also benefit by extending the study to evaluate Islamic stocks categorized based on industrial sectors.

The results of the three-factor model is useful for investors who are planning on constructing index tracking portfolios based on Islamic value stocks. Furthermore, the results also indicates that Islamic equity style indices perform better after financial crisis periods which provides for a good alternative for fund managers who intend to diversify and mitigate risk.

For future studies, it would be interesting to conduct an analysis based on the Fama and French five-factor model as well as to evaluate the performance of the stylized

indices based on smart Beta methodologies which were recently applied. The Carhart (1994) four factor model could also be tested by adding a fourth momentum variable. Also, the study could be further extended to the Fama and French (2015) five-factor model which argues for a better estimate of of cross section of returns by including profitability and investment risk factors.

To further study the efficacy of the Islamic growth and value indices, it would be valuable to extend the study by testing the assertions of Dimson and Marsh (1998) in relation to the reversal of size effects. Notwithstanding the fact that the results of the study which indicates that the reversal of size effect exists, it would be interesting to see the effects of dividend-payout policies as well as industry sector performance and its effect on the size premium.

The creation of the Islamic equity style indices also enabled the study to be extended to identifying value managers and to evaluate their investment behaviour. For instance, further research could be performed to identify the characteristics of value and growth managers. Value and growth managers of Islamic equity style stocks could also be evaluated based on style investing. Also, the performance of investment managers can be evaluated based by matching investments according to industrial sectors and to test the performance of managers during different economic cycles.

The overall results of the study indicates that there are significant benefits from constructing Islamic equity style indices. The Islamic equity style indices would benefit investors, fund managers as well as regulators. It is in the best interest of the Securities Commission of Malaysia to promote these indices, especially as it increases transparency and improves the ability of the government to understand and promote Islamic capital markets.

As a final note, it would also be interesting to see the performance of the Islamic equity style indices as they relate to other conventional indices as well as Islamic indices

in other countries. This will enable investors to understand the performance of Islamic equity style indices as compared to conventional equity style indices and the utility of the indices for purposes of portfolio construction.

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Shaharuddin, S. S, Lau, W.Y., and Ahmad, R. (2016). Survey of Litrerature on Islamic equity style indices, Capital Markets Review. *Capital Market Review*, 24(1): 1-22. (*Non-ISI/Non-SCOPUS Cited Publication*)

Shaharuddin, S. S, Lau, W.Y., and Ahmad, R. (2016). Constructing Fama-French factors from style indices; Evidence from Islamic Equity Market. *Emerging Market Finance and Trade*. DOI: 10.1080/1540496X.2016.1278529. (*ISI Cited Publication*)

Papers Presented

Shaharuddin, S. S, (2015). Constructing Fama-French factors from style indices; Evidence from Islamic Equity Market. Proceedings, 29-31 May 2015. *Malaysian Finance Association Conference 2015*, Kota Kinabalu, Sabah, Malaysia. (*Non-ISI/Non-SCOPUS Cited Publication*)

Shaharuddin, S. S, (2016). Testing the efficacy of information transmission: Does the newly developed Islamic Equity Style Indices contain economic information?, Proceedings, 2-4 June 2016. *Malaysian Finance Association Conference 2016*, Malacca, Malaysia (*Non-ISI/Non-SCOPUS Cited Publication*)

Shaharuddin, S. S, (2016). Is the Fama French three-factor model relevant? Evidence from Islamic unit trust funds, Proceedings, 2-4 June 2016, *Malaysian Finance Association Conference 2016*, Malacca, Malaysia. (*Non-ISI/Non-SCOPUS Cited Publication*)

APPENDIX

B.1 *Shariah* indices on the FTSE Bursa Malaysia index

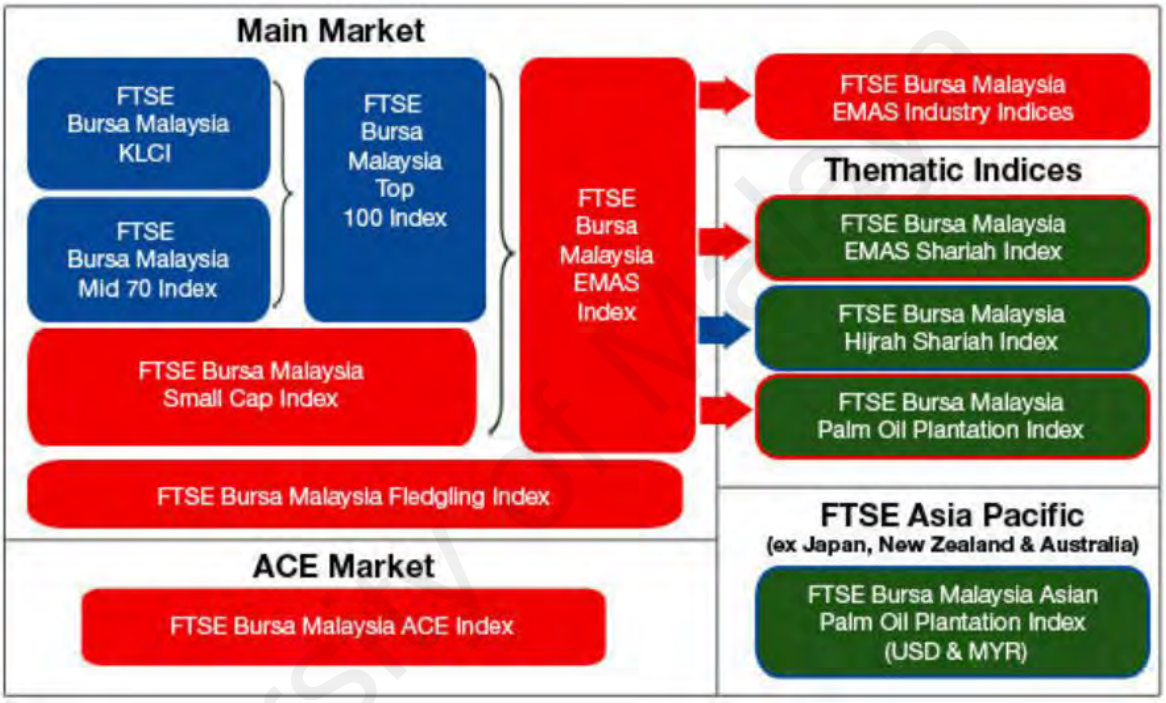
The FTSE Bursa Malaysia Stock market index is illustrated in the Figure B.1 below. Stocks listed on the Kuala Lumpur Stock Exchange (KLSE) are grouped based on Main Market and ACE Market stocks. The Main Market index consists of FTSE Bursa Malaysia EMAS Index which with constituents made up of the top 100 largest stocks listed on the KLSE (FTSE Bursa Malaysia Top 200 Index) as well as the remaining 98% largest stocks listed on the exchange (i.e. FTSE Bursa Malaysia Small Cap Index). The FTSE Bursa Malaysia Fledgling Index is comprised of companies which are too small to be included in the FTSE Bursa Malaysia EMAS Index. The FTSE Bursa Malaysia EMAS Index has a full market capitalization of MYR1.39 trillion as at April 2016 and is significantly larger than the full market capitalization of the FTSE Bursa Malaysia Fledgling Index worth MYR41.76 billion[20].

The Bursa Malaysia ACE index on the other hand consists of companis which are categorised in accordance with the Industry Classification Benchmark (ICB)[21]. Based on the ICB sector breakdown, technology companies dominate this index with a total weightage of 57% of the index and a net market capitalization of above MYR5 billion.

The *Shariah* Indices however are derived from the Main Market Indices and consists of the FTSE Bursa Malaysia EMAS *Shariah* Index as well as the FTSE Bursa Malaysia Hijrah *Shariah* Index. The companies which are constituents on the *Shariah* indices are screened according to the *Shariah* Advisory Council (SAC) of the Securities Commission of Malaysia (SC) screening methodology. Companies are excluded from the indices if they are not *Shariah* compliant based on involvement in activities which includes *riba*

[20] Full market capitalization is taken from FTSE Russell Bursa Malaysia Index Series Monthly report as at April 2016 and accessed from the FTSE website http://www.ftse.com.
[21] The Industry Classification Benchmark (ICB) is the global standard for industry sector analysis (refer to FTSE Bursa Malaysia ACE Index factsheet for April 2016 as accessed from the FTSE website.

(interest), gaming and gambling, sale of non-*halal* products and others[22]. The FTSE Bursa Malaysia EMAS *Shariah* Index consists of the top 30 largest *Shariah* compliant companies in Malaysia and a net market capitalization of over MYR400 billion as at April 2016. The FTSE Bursa Malaysia Hijrah *Shariah* index on the other hand is made up of the next 70 largest *Shariah* compliant stocks and has a net market capitalization of over MYR300 billion as at April 2016.



Source: Bursa Malaysia website

Figure B.1: FTSE Bursa Malaysia Indices

B.2 Benefits of equity style indices for purposes of analysing the performance of Exchange traded funds (ETF's)

Hill (2003) argued that equity fund managers who categorize their investment management styles based on value or growth styles, have benefited as a result of using equity style indices[23]. It was also argued that equity style indices are especially useful as a benchmark for active fund managers. The author also suggested that equity style indices

[22] For a full list of core activities which are deemed non-compliant based on the SAC's screening methodology, please refer to Bursa Malaysia's website relating to Shariah Compliant Listed Equities (refer to http://www.bursamalaysia.com).
[23] Refer to Hill, J.M. (2003) *Trading (and Investing) in "Style" Using Futures and Exchange-Traded Funds*, Chapter 20 from *The Handbook of Equity Style Management* (2003) by T.Daniel Coggin and Frank J. Fabozzi (Wiley Co.).

will deliver both short and long-run returns for value or growth oriented stocks as a result of grouping stocks based on style.

In this paper, it was indicated that equity style indices are beneficial for purposes of analysing the performance of exchange traded fund's (ETF's) for the following reasons:-

(i) For purposes of equitizing cash from dividend flows;

(ii) Hedging style equity exposure;

(iii) Rebalancing (or tilting) portfolios to manage tracking error or to take active style view in a fund;

(iv) Transitioning from cash into equity style portfolios via index products;

(v) To capture upside exposure in equity style index; and

(vi) Managing the risk of dealer exposure.

Over and above the benefits to active and passive fund managers, equity style indices is especially useful for purposes of managing style index funds, style "overlay" management or as a component of a hedging strategy.

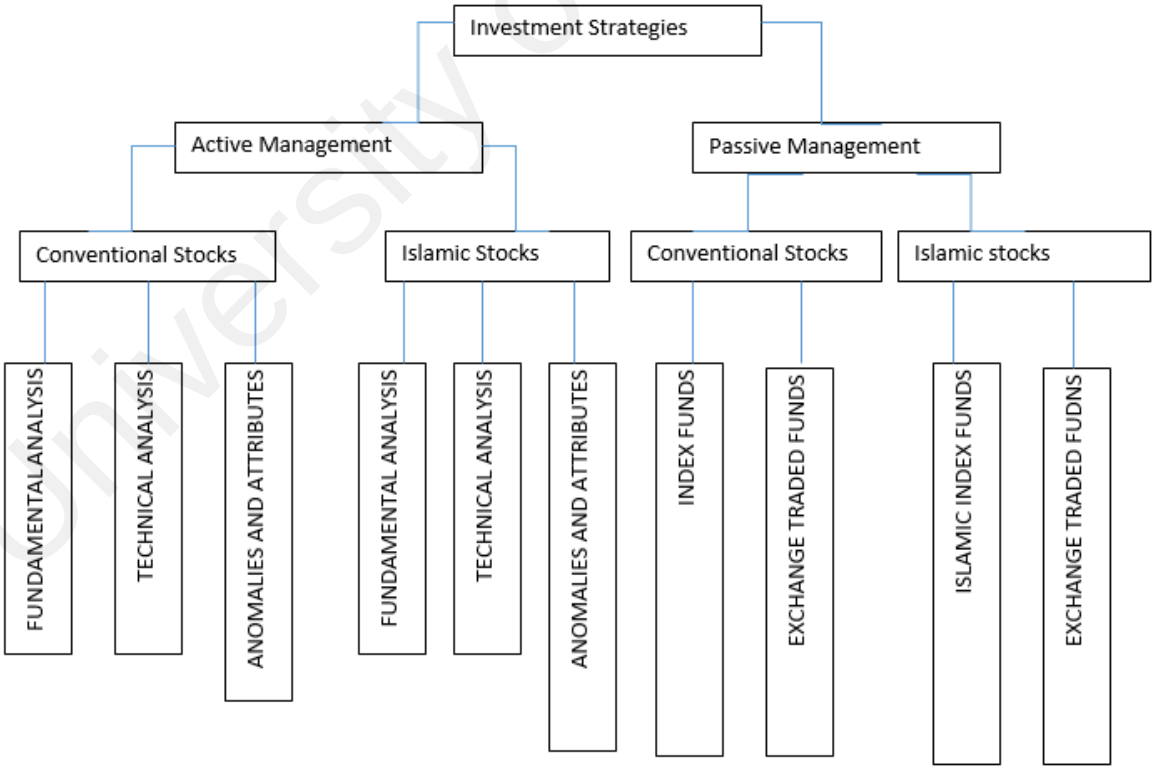
B.3 Investment strategies and Islamic equity style investing

Reilly and Brown (2012) have presented a framework for equity portfolio management which can be explained by way of two types of strategies, namely passive and active management strategies. Passive management strategies involves the designing a portfolio of stocks that replicates a stock market index. The objective of designing such a portfolio is to gain returns which closely matches the stock market index which has been benchmarked.

Active management strategies on the other hand requires active fund managers to earn a return which exceeds a benchmark index. This return is known as 'alpha'. Active managers are demand lucrative returns by being able to outperform the market and produce alpha returns. Various techniques have been suggested for purposes of active fund management including stock picking based on fundamental and technical analysis as

well as selecting stocks based on idiosyncratic characteristics (also referred to as anomalies and attributes).

Figure B.3 below illustrates the investment strategies based on Reilly and Brown's (2012) framework. We argue in this study that at present, both fund managers and researchers have focussed their efforts mainly on investment management in conventional stocks. Nevertheless, we argue that the development of Islamic equity style indices will uncover new areas of study and and potential investment opportunities for investors and researchers in the area of active and passive management. As a beginning, the newly developed Islamic equity style indices have a direct benefit for Islamic stock investors due to its utility as a benchmark index. It would be interesting to see how the newly developed Islamic style indices aids both active and passive fund managers when applied under different strategies.



Source: Reilly and Brown (2012)

Figure B.3: Investment Management Strategies

C.1 Islamic fund management statistics as at December 2015

Figure C.1 below presents Islamic fund management information as at December 2015 as reported by the Securities Commission of Malaysia. The figure indicates that there has been an increase of total Islamic assets under management (AUM) of financial management companies in Malaysia December 2014 to December 2015 by approximately 20%. The total net asset value (NAV) of Islamic unit trust funds (UTF's) is above MYR52 billion and the percentage of Islamic UTF's as a percentage of the total industry is increasing year on year.

Islamic Fund Management

Islamic assets under management (AUM)

(MYR billion)	**Dec-15**	**Dec-14**
Islamic AUM of FMCs[24]	132.38	110.60
Total fund management industry	667.88	629.98
% Islamic AUM of FMCs to total industry	19.8%	17.6%

Note: The AUM includes assets that are sourced from collective investment schemes as well as private mandates

[24] FMCs refers to Fund Management Companies

(Figure C.1 Continued)

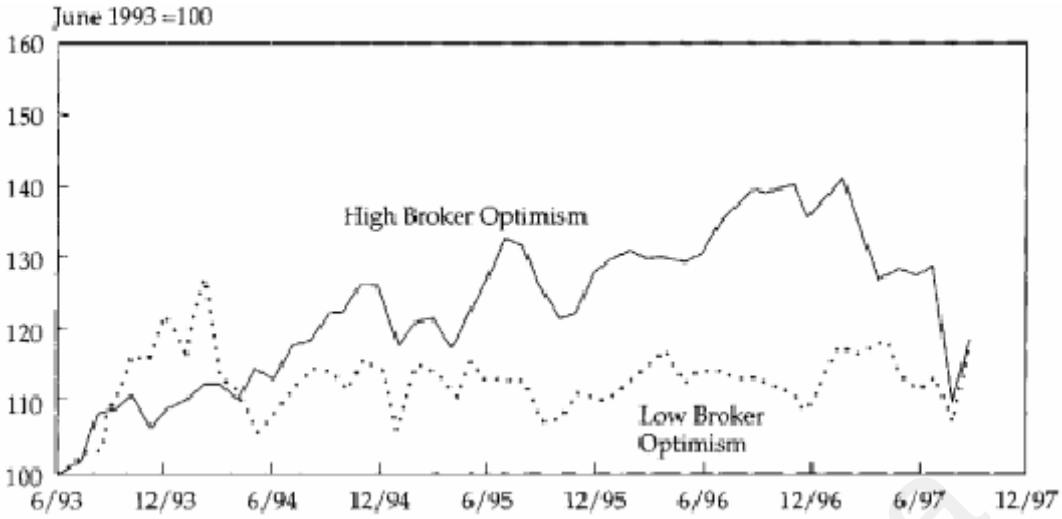
Launched funds Unit trust fund (UTF)	**Dec-15**	**Dec-14**
Islamic UTF	193	188
Total industry	612	612
NAV Islamic UTF (RM billion)	52.12	46.66
NAV total industry (RM billion)	346.58	343.02
% to total industry	15.0%	13.6%

Source: Securities Commission of Malaysia website

Figure C.1: Islamic Fund management statistics

C.2 Malaysian Brokers' Optimism, June 1993- September 1997

Style investing strategies can be seen in Malaysia based on analysis by Bernstein and Tupper (1998). After the Asian Financial Crisis in 1997, value strategies were expected to underperform. Also, as a means for stock picking, broker's optimism has lost value as a means to aid in stock selection. This is evidenced in Figure C.2 below where brokers buy recommendations have not only underperformed but also lost value added during the financial crisis period. Instead, earnings momentum and value strategies are more useful for purposes of making stock selection.



Note: Cumulative performance relative to the Kuala Lumpur Composite Index

Source: Based on data from The Estimate Directory (Bernstein and Tupper, 1998)

Figure C.2: Broker Optimism in Malaysia during Asian Financial Crisis of 1997

D.1 Comparison of style index methodology

Table D.1 below indicates the style classification methods applied by various index providers including Russell Co., S&P, MSCI, Dow Jones and Morningstar. The table indicates that the Russell Co. methodology is the most well established methodology used as utilizes the fewest number of variables for purposes of style classification. The Morningstar method uses the most number of variables (total of 10 style factors) but allows for unique style classification.

Index Family	Russell Pure Style	Russell	S&P	S&P Pure	MSCI	Dow Jones	Morningstar
Originated	2015	1987	1995	2005	2002	2005	2002
Universe	Russell 3000	Russell 3000	S&P 1500 Composite	S&P 1500 Composite	MSCI Investible Market	Dow Jones U.S. Total Stock Market	Morningstar U.S. Market
Total Number of Stocks	3,000	3,000	1,500	1,500	2,500	Variable (all U.S. equity issues)	2000+
Transparent Methodology	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eligibility	Stocks of the largest 3,000 companies domiciled in the U.S. listed on a major U.S. exchange	Stocks of the largest 3,000 companies domiciled in the U.S.listed on a major U.S.exchange	Stocks of all U.S. domiciled companies listed on the NYSE or NASDAQ	Stocks of all U.S. domiciled companies listed on the NYSE or NASDAQ	Stocks of companies domiciled in the U.S., listed on a major U.S. exchange	Stocks of companies domiciled in the U.S., listed on a major U.S. exchange	Stocks of companies domiciled in U.S., listed on the NYSE or NASDAQ
Weighting Method	Style Weighted	Market-Cap	Market-Cap	Market-Cap – Style Score	Market-cap	Market-Cap	Market-Cap
Cut-Off Method for Size Break Points	Fixed Number of Stocks	Fixed Number of Stocks	Fixed Number of Stocks	Fixed Number of Stocks	Fixed Number of Stocks	Fixed Number of Stocks	Market Cap Percent
Unique Style Classification	Yes	No (stock overlap allowed)	No (stock overlap allowed)	Yes	No (stock overlap allowed)	Yes	Yes
Core Style Index Offered	No	No	No	No	No	No	Yes
Reconstitution Frequency	Annual	Annual	Annual	Annual	Semi-Annual	Annual	Semi-Annual
Number of Style Factors	3*	3*	6	6	8	6	10
Value Factors	Book-to-Price	Book-to-Price	Book-to-Price Sales-to-Price Earnings-to-Price	Book-to-Price Sales-to-Price Earnings-to-Price	12-Mth Forward Earnings to Price Book-to-Price Dividend Yield	Projected Price-to-Earnings Price-to-Book Dividend Yield	Price-to-Projected Earnings Hist. Price-to-Book Hist. Price-to-Sales Hist. Price-to-Cash Flow Hist. Dividend Yield
Growth Factors	Sales Per Share Hist. Growth (5-Yrs) I/B/E/S Medium-Term Growth Forecast (2-Yrs)	Sales Per Share Hist. Growth (5-Yrs) I/B/E/S Medium-Term Growth Forecast (2-Yrs)	Momentum (12-mth % Price Change) 3-Yr Sales Per Share Growth 3-Yr Change in EPS over Price Per Share	Momentum (12-mth % Price Change) 3-Yr Sales Per Share Growth 3-Yr Change in EPS over Price Per Share	L-T Forward EPS Growth S-T Forward EPS Growth Current Internal Growth Rate L-T Hist. EPS Growth L-T Hist. Sales Per Share Growth	Trailing Revenue Growth Trailing Earnings Growth Projected Earnings Growth	L-T Projected Earnings Growth Hist. Earnings Growth Hist. Sales Growth Hist. Cash Flow Growth Hist. Book Value Growth

Table D.1: Style Classification Systems by index providers

Source: As accessed from https://www.invesco.com/static/us/investors/

D.2 Style classification and index construction methodology

The style classification method which shall be used in order to create growth and value stocks is based on the style classification system as explained by Fabozzi (1997). To classify and construct a index based on value and growth shares, the Price-to-Book (P/B) ratio is employed. The lower P/B ratio is classified as value stocks and higher P/B ratio is classified as growth stocks. The style classification system can be described as below:-

Step 1: Select a universe of shares

Step 2: Calculate the total market capitalization of all shares in the universe

Step 3: Using the variables for classification, develop a score for each share, with the highest score being value

Step 4: Sort the shares from highest score to lowest score

Step 5: Calculate the capitalization-weighted median of the scores

Step 6: Select the shares with a score above the capitalization-weighted median found in Step 5 and classify them as value shares

Step 7: Classify the remaining shares in the universe as growth shares.

This style classification system has been argued to have theoretical and practical problems. From a theoretical point of view, there may be an argument for misclassification as a result of "size jitter". In this case, the P/B ratios may change in the future which may result in the stocks to be rebalanced. However, there have been refinements to this problem in the form of usage of categorization variables (i.e. dividend yield and cash flow to price ratio). Also, better procedures have been suggested to determine the cut-off point between growth and value stocks.

E.1 Plot of Malaysian GDP using Cubic Spline Method for period May 2006 to April 2011

Figure E.1 below illustrates the GDP of Malaysia (in Ringgit Malaysia) between May 2006 to April 2011. The method used to derive the GDP is based on the cubic spline method and allows for the interpolation of GDP values from a quarterly basis to a monthly basis (de la Granville, 2001).

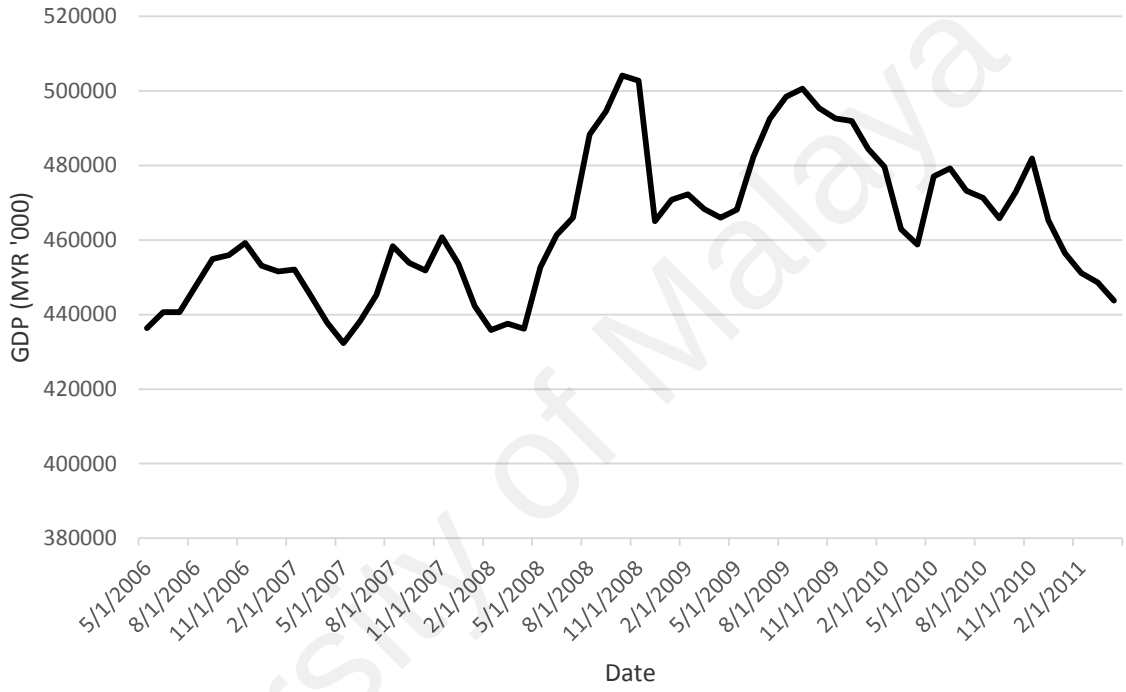


Figure E.1: GDP of Malaysia from May 2006 to April 2011 based on cubic spline interpolation

F.1 GMM test results of Islamic unit trust funds in Malaysia

Table F.1.1, F.1.2, F.1.3 and F.1.3 below presents GMM test statistics based on Islamic unit trust funds in Malaysia for periods before and after the collapse of Lehman Bros. There are a total of 103 Islamic unit trust funds which were tested for the period between May 2005 and April 2011. The results GMM test results for the pre-Lehman Bros. period is presented in Table F.1.1 and corresponding summary betas in Table F.1.2. The post-Lehman Bros. sub-period results on the other hand are presented in Table F.1.3 and corresponding summary betas in Table F.1.4.

Table F.1.1: Pre-Lehman Bros. Fama and French three-factor model tests based on GMM estimates

No.	Unit Trust Fund	bi	si	hi	GMM
1	AIA DANA DINAMIK	0.875 (20.393***)	0.810 (0.107)	-0.044*(-0.531)	6.020 [0.013]
2	AIA DANA PROGRESIF	0.844 (15.526***)	-0.041 (-0.631)	-0.056 (-0.658)	6.442 [0.011]
3	ALLIANCE DANA ADIB	0.892 (11.105***)	0.151 (1.721*)	-0.854 (-0.055)	4.557 [0.033]
4	ALLIANCE DANA ALIF	0.511 (7.049***)	0.071 (1.118)	-0.058 (-0.483)	0.160 [0.689]
5	AM ASSURANCE DANA TEGUH	0.708 (16.844***)	0.546 (0.134)	0.061 (0.830)	4.364 [0.037]
6	AM BON ISLAM	0.131 (2.613***)	0.276 (0.976)	-0.123 (-1.953*)	0.670 [0.796]
7	AM ISLAMIC BALANCED	0.706 (15.142***)	-0.967 (-0.225)	0.021 (0.266)	2.408 [0.121]
8	AM ISLAMIC GROWTH	0.990 (17.935***)	-0.034 (-0.693)	0.035 (0.461)	0.853 [0.356]
9	AM ITTIKAL	0.968 (12.465***)	-0.086 (-1.378)	-0.056 (-0.295)	0.278 [0.868]
10	AM OASIS GLOBAL ISLAMIC EQUITY	0.289 (2.473***)	0.036 (0.539)	-0.220 (-1.220)	0.735 [0.786]
11	AMANAH SAHAM BANK SIMPANAN NASION	0.517 (7.202***)	0.064 (0.927)	-0.172 (-1.407)	1.467 [0.226]
12	AMANAH SAHAM DARUL IMAN	0.769 (10.830***)	0.793 (0.178)	0.090 (1.270)	3.500 [0.061]
13	AMB DANA ARIF A MYR	0.092 (1.633)	-0.056 (-0.836)	0.164 (0.014)	1.018 [0.313]
14	AMB DANA YAKIN	0.767 (15.320***)	0.014 (0.410)	0.200 (0.234)	1.352 [0.245]
15	APEX DANA AL-FAIZ-I	0.996 (6.870***)	-0.079 (-0.605)	0.178 (0.621)	0.191 [0.989]
16	APEX DANA AL-SOFI-I	0.768 (10.386***)	0.268 (3.796***)	-0.037 (-0.378)	0.138 [0.906]
17	APEX DANA ASLAH	0.730 (17.935***)	-0.034 (-0.693)	0.035 (0.461)	0.371 [0.543]
18	ASM AMANAH SAHAM PEKERJA TNB	0.805 (11.542***)	0.012 (0.172)	-0.126 (-0.851)	3.304 [0.069]
19	ASM DANA AL-AIMAN	0.661 (13.976***)	-0.022 (-0.358)	-0.012 (-0.136)	0.912 [0.763]
20	ASM DANA BESTARI	0.654 (12.009***)	-0.059 (-0.903)	-0.142 (-1.185)	1.821 [0.177]
21	ASM DANA MUTIARA	0.911 (12.345***)	0.014 (0.269)	-0.201 (-2.166**)	2.772 [0.096]
22	ASM SHARIAH AGGRESSIVE	0.726 (10.584***)	0.056 (0.919)	-0.095 (-0.682)	2.348 [0.125]
23	ASM SHARIAH BALANCED	0.474 (17.424***)	-0.111 (-1.752*)	-0.134 (-1.744*)	2.940 [0.086]
24	ASM SHARIAH CASH MANAGEMENT	0.066 (3.070***)	-0.046 (-1.393)	-0.116 (-2.091)	0.232 [0.629]
25	ASM SHARIAH GROWTH	0.990 (17.935***)	-0.034 (-0.693)	0.035 (0.461)	0.853 [0.356]
26	ASM SHARIAH INDEX	0.856 (23.621***)	-0.088 (-3.404***)	0.833 (0.122)	0.144 [0.705]
27	ASM SHARIAH PREMIER	0.525 (9.367***)	0.038 (0.855)	0.074 (0.737)	2.834 [0.092]
28	ASM SHARIAH TACTICAL	0.675 (12.757***)	0.179 (3.279***)	0.069 (0.790)	0.182 [0.670]
29	AXA AFFIN DANA IMBANG	0.990 (17.935***)	-0.034 (-0.693)	0.035 (0.461)	0.853 [0.356]
30	BIMB DANA AL-FAKHIM	0.020 (0.406)	0.070 (2.068**)	-0.086 (-0.812	0.148 [0.701]
31	BIMB DANA AL-FALAH	0.757 (7.549***)	0.076 (1.302)	-0.082 (-0.576)	0.246 [0.620]
32	BIMB DANA AL-MUNSIF	0.576 (7.467***)	0.158 (2.549**)	-0.115 (-0.931)	0.628 [0.428]
33	BIMB I GROWTH	0.729 (10.102***)	0.054 (0.549)	-0.258 (-2.424**)	0.886 [0.347]
34	CIMB ISLAMIC BALANCED	0.697 (13.061***)	0.082 (1.446)	-0.038 (-0.397)	0.403 [0.841]
35	CIMB ISLAMIC BALANCED GROWTH	0.618 (4.635***)	-0.053 (-0.304)	-0.144 (-1.102)	1.840 [0.175]
36	CIMB ISLAMIC DALI EQUITY GROWTH	0.348 (1.796*)	-0.387 (-1.524)	0.389 (1.360)	0.409 [0.949]
37	CIMB ISLAMIC ENHANCED SUKUK	-0.053 (-0.618)	-0.038 (-0.388)	0.244 (2.00**)	0.217 [0.883]
38	CIMB ISLAMIC EQUITY AGGRESSIVE	0.218 (1.556)	-1.151 (-0.559)	0.397 (1.347)	0.759 [0.783]
39	CIMB ISLAMIC SMALL CAP	0.160 (0.903)	0.014 (-0.062)	0.322 (0.869)	1.454 [0.228]
40	CIMB ISLAMIC SUKUK	0.659 (0.216)	-0.044 (-1.395)	0.033 (0.987)	0.471 [0.493]
41	DANA EKUITI PRIMA	0.315 (1.589)	-0.057 (-0.230)	0.366 (1.376)	0.319 [0.572]
42	DANA ISLAMIAH AFFIN	0.110 (0.825)	-0.073 (-0.462)	0.185 (1.039)	0.326 [0.568]
43	DANA MAKMUR PHEIM	0.200 (1.632)	-0.023 (-0.182)	0.149 (0.905)	0.171 [0.679]
44	DANA PENDAPATAN PRIMA	0.064 (1.258)	0.433 (0.084)	-0.696 (-0.097)	0.305 [0.581]
45	DANA RESTU	0.212 (1.443)	-0.149 (-0.771)	0.370 (1.376)	0.923 [0.337]
46	DANA SEJATI	0.091 (1.826*)	-0.084 (-1.526)	0.744 (0.135)	6.285 [0.012]
47	EASTSPRING INVESTMENTS DANA AL-ILHA	0.200 (1.140)	-0.161 (-0.577)	0.477 (1.420)	1.142 [0.285]
48	EASTSPRING INVESTMENTS DANA AL-ISLA	0.058 (1.503)	-0.054 (-0.574)	0.132 (1.469)	0.807 [0.776]
49	EASTSPRING INVESTMENTS DANA DINAMIK	0.148 (1.065)	-0.067 (-0.346)	0.252 (1.107)	1.355 [0.244]
50	EASTSPRING INVESTMENTS DANA WAFI	0.048 (0.854)	-0.115 (-1.933*)	0.011 (0.128)	0.669 [0.413]
51	HLA VENTURE DANA PUTRA	0.189 (1.352)	0.669 (0.046)	0.154 (0.962)	0.547 [0.459]
52	HONG LEONG DANA MAA'ROF	0.122 (0.083)	-0.034 (-0.194)	0.443 (1.754*)	0.133 [0.908]

(Table F.1.1 Continued)

	Unit Trust Fund	bi	si	hi	GMM
53	HWANG AIIMAN GROWTH	0.178 (1.237)	-0.264 (-1.166)	0.929 (3.226***)	0.676 [0.795]
54	HWANG AIIMAN INCOME PLUS	0.609 (7.718***)	0.036 (0.616)	0.011 (0.075)	1.904 [0.168]
55	KENANGA ISLAMIC	1.597 (7.893***)	0.303 (2.925***)	0.173 (0.446)	0.696 [0.934]
56	KENANGA ISLAMIC BALANCED	0.868 (14.902***)	0.102 (1.689*)	0.079 (0.392)	0.410 [0.522]
57	KENANGA OA INV-KENANGA BON ISLAM	0.091 (3.745***)	-0.032 (-1.631***)	-0.039 (-0.733)	4.927 [0.026]
58	KENANGA OA INV-KENANGA EKUITI ISLAM	1.142 (14.461***)	-0.142 (-0.687)	-0.130 (-0.484)	0.708 [0.400]
59	KENANGA OA INV-KENANGA SHARIAH BAL	0.533 (19.210***)	-0.679 (-0.235)	0.037 (0.917)	4.469 [0.035]
60	KENANGA OA INV-KENANGA SHARIAH GRC	0.886 (9.004***)	0.246 (2.568***)	0.036 (0.160)	0.143 [0.706]
61	KENANGA SYARIAH GROWTH	0.897 (14.359***)	0.078 (1.124)	-0.043 (-0.433)	3.553 [0.059]
62	LIBRA AMANAH SAHAM WANITA	0.848 (13.483***)	0.054 (1.381)	-0.722 (-0.519)	1.051 [0.305]
63	LIBRA ASNITA BOND	0.061 (2.609***)	0.062 (3.258***)	-0.110 (-1.923*)	0.347 [0.556]
64	LIBRA SYARIAH EXTRA	0.776 (11.437***)	0.027 (0.546)	-0.294 (-2.112**)	3.399 [0.065]
65	MAAKL AL-FAID	0.923 (18.295***)	-0.767 (-0.107)	0.062 (0.585)	0.798 [0.778]
66	MAAKL AL-FAUZAN	0.533 (7.069***)	-0.093 (1.722*)	0.056 (0.555)	3.666 [0.056]
67	MAAKL AL-UMRAN	0.609 (8.225***)	-0.071 (1.799*)	-1.158 (-1.645*)	0.209 [0.885]
68	MAAKL AS-SAAD	-0.093 (-1.283)	0.010 (0.376)	-0.469 (-0.055)	0.989 [0.757]
69	MAAKL SYARIAH INDEX	0.961 (20.172***)	-0.165 (-1.739*)	-0.116 (-1.136)	0.968 [0.756]
70	MANULIFE DANA EKUITI DINAMIK	0.928 (14.489***)	0.183 (2.228**)	-0.292 (-1.752*)	2.035 [0.154]
71	MIDF AMANAH DYNAMIC	0.687 (12.427***)	-0.126 (2.997***)	-0.117 (-0.689)	0.141 [0.999]
72	MIDF AMANAH GROWTH	0.690 (8.256***)	0.011 (0.135)	-0.028 (-0.194)	0.345 [0.557]
73	MIDF AMANAH ISLAMIC	0.757 (11.921***)	0.034 (0.751)	-0.012 (-0.105)	1.597 [0.206]
74	MIDF AMANAH MONEY MARKET	0.028 (1.338)	0.039 (1.236)	-0.666 (-0.167)	0.659 [0.797]
75	MIDF AMANAH STRATEGIC	0.620 (11.817***)	0.176 (4.310***)	-0.126 (-0.011)	4.841 [0.028]
76	PACIFIC DANA AMAN	0.827 (8.700***)	0.119 (1.838**)	-0.296 (-0.877)	0.276 [0.599]
77	PACIFIC DANA MURNI	0.087 (3.229***)	-0.033 (-1.577)	-0.125 (-1.319)	0.190 [0.965]
78	PB ISLAMIC BOND	0.094 (2.715***)	-0.977 (-0.151)	-0.125 (-1.653*)	0.296 [0.863]
79	PB ISLAMIC EQUITY	1.015 (5.444***)	0.199 (1.287)	0.118 (0.791)	0.521 [0.470]
80	PRULINK DANA AMAN	0.086 (3.105***)	-0.244 (-0.109)	-0.024 (-0.424)	4.706 [0.030]
81	PRULINK DANA UNGGUL	0.937 (12.441***)	0.105 (2.011**)	0.025 (0.217)	0.147 [0.904]
82	PRULINK DANA URUS	0.702 (12.428***)	0.073 (1.739*)	0.782 (0.098)	0.104 [0.919]
83	PUBLIC ISLAMIC BOND	0.028 (0.407)	0.068 (1.940*)	-0.096 (-1.181)	0.244 [1.876]
84	PUBLIC ISLAMIC DIVIDEND	0.896 (18.716***)	0.039 (0.718)	-0.051 (-0.675)	0.176 [0.895]
85	PUBLIC ISLAMIC EQUITY	1.099 (10.398***)	-0.082 (-0.536)	-0.272 (-1.699*)	2.141 [0.143]
86	PUBLIC ISLAMIC MIXED ASSET	0.666 (10.585***)	0.020 (0.359)	0.032 (0.352)	0.981 [0.322]
87	PUBLIC ISLAMIC OPPORTUNITIES	1.021 (9.825***)	0.490 (5.095)	0.093 (0.394)	0.299 [0.584]
88	PUBLIC ITTIKAL	1.046 (9.656***)	-0.097 (-0.836)	-0.251 (-1.558)	1.714 [0.191]
89	RHB-OSK DANA ISLAM	1.128 (15.639***)	0.231 (3.706***)	-0.068 (-0.406)	2.868 [0.090]
90	RHB-OSK ISLAMIC BOND	0.077 (1.630)	-0.782 (-0.197)	-0.096 (-0.974)	0.420 [0.948]
91	RHB-OSK ISLAMIC GROWTH	0.986 (13.732***)	0.038 (0.539)	0.057 (0.536)	0.728 [0.932]
92	RHB-OSK MUDHARABAH	0.637 (13.515***)	0.122 (2.377)	-0.064 (-0.677)	0.553 [0.814]
93	TA DANA OPTIMIX	0.833 (8.421***)	0.285 (2.250**)	-0.186 (-1.170)	0.265 [0.607]
94	TA ISLAMIC	0.857 (12.724***)	0.064 (0.368)	-0.307 (-1.581)	0.636 [0.801]
95	TABUNG AMANAH SAHAM KEDAH	0.505 (3.965***)	0.358 (3.378***)	-0.151 (-0.414)	1.398 [0.237]
96	ZURICH DANA MAS YAKIN	0.582 (14.590***)	0.553 (0.117)	0.110 (1.921*)	1.671 [0.196]
97	ZURICH DANA SERI MULIA	-0.759 (-0.101)	0.054 (1.820*)	-0.033 (-0.384)	0.725 [0.932]
98	AMB DANA IKHLAS	0.783 (0.0489)	0.228 (1.540)	0.135 (0.651)	0.145 [0.704]
99	CIMB ISLAMIC ASIA PACIFIC EQUITY	0.075 (-0.326)	0.081 (0.460)	0.048 (0.154)	0.137 [0.712]
100	CIMB ISLAMIC DALI EQUITY	1.073 (16.371***)	0.023 (0.433)	-0.339 (-3.021***)	0.257 [0.873]
101	HONG LEONG DANA MAKMUR	0.863 (9.431***)	0.262 (4.217***)	-0.046 (-0.186)	0.902 [0.342]
102	MIDF AMANAH SHARIAH MONEY MARKET	0.028 (1.338)	-0.034 (-0.693)	0.035 (0.461)	0.853 [0.356]
103	ZURICH DANA MAS MAJU	0.798 (13.078***)	-0.019 (-0.426)	0.135 (1.338)	2.434 [0.119]

Table F.1.2: Summary of Market, SMB and HML betas for the Pre-Lehman Bros. sub-period

	Mean	Max	Min	Sig. Positive	Sig. Negative
bi	0.568	1.597	-0.759	100	3
si	0.008	0.810	-1.151	57	46
hi	-0.014	0.929	-1.158	47	56

Notes: This table presents the results of testing the FF model in the system of regressions (3), (4), (5), and (6). The sample is monthly return data extending from May 2006 to August 2008. GMM is Sargan or J test statistic of over identifying restrictions. Standard Errors computed from heteroscedastic-consistent matrix (Robust-White). The associated t-statistic is in parentheses ( ). The associated p-value is in square brackets [ ]. ***, **, * indicate significant at 1% level, 5% level, and 10% level, respectively.

Table F.1.3: Post-Lehman Bros. Fama and French three-factor model tests based on GMM estimates

No.	Unit Trust Fund	bi	si	hi	GMM
1	AIA DANA DINAMIK	0.745 (8.562***)	0.191 (1.576)	0.563(0.056)	2.047 [0.152]
2	AIA DANA PROGRESIF	0.353 (10.028***)	-0.030 (-0.478**)	-0.030(-0.478)	0.536 [0.817]
3	ALLIANCE DANA ADIB	0.583 (10.202***)	0.272 (3.042***)	-0.103(-1.032)	0.193 [0.660]
4	ALLIANCE DANA ALIF	0.506 (4.779***)	0.173 (1.971**)	-0.079(-0.893)	0.763 [0.782]
5	AM ASSURANCE DANA TEGUH	0.429 (6.348***)	0.101 (1.316)	-0.031(-0.379)	3.183 [0.074]
6	AM BON ISLAM	0.063 (1.740*)	-0.361 (-0.053)	-0.071(-0.791)	3.601 [0.058]
7	AM ISLAMIC BALANCED	0.462 (12.816***)	0.061 (1.381)	0.057(1.01)	0.855 [0.355]
8	AM ISLAMIC GROWTH	0.595 (6.626***)	0.144 (1.014)	-0.082(-0.648)	0.328 [0.954]
9	AM ITTIKAL	0.628 (6.184***)	-0.072 (-0.590)	0.033(0.349)	0.501 [0.479]
10	AM OASIS GLOBAL ISLAMIC EQUITY	0.289 (2.473**)	0.036 (0.539)	-0.220(-1.220)	0.735 [0.786]
11	AMANAH SAHAM BANK SIMPANAN NASIONAL	0.807 (11.170***)	0.330 (0.049)	0.492(3.714***)	0.581 [0.446]
12	AMANAH SAHAM DARUL IMAN	0.342 (3.221***)	0.303 (1.376)	0.228(2.098**)	4.075 [0.044]
13	AMB DANA ARIF A MYR	0.217 (2.686***)	-0.140 (-1.391)	-0.060(-0.682)	3.975 [0.046]
14	AMB DANA IKHLAS	0.457 (9.718***)	0.057 (0.815)	-0.079(-1.228)	4.633 [0.031]
15	AMB DANA YAKIN	0.683 (10.025***)	0.055 (0.639)	-0.191 (-1.691*)	0.249 [0.618]
16	APEX DANA AL-FAIZ-I	0.525 (8.064***)	0.071 (0.642)	0.039 (0.207)	0.116 [0.914]
17	APEX DANA AL-SOFI-I	0.768 (10.386***)	0.268 (-0.378***)	-0.037(-0.378)	0.138 [0.906]
18	APEX DANA ASLAH	0.539 (7.862***)	0.282 (1.576***)	0.170(1.599)	3.159 [0.075]
19	ASM AMANAH SAHAM PEKERJA TNB	0.539(6.786***)	0.386 (3.754***)	0.200(2.207**)	0.896 [0.344]
20	ASM DANA AL-AIMAN	0.436 (7.737***)	0.015 (0.149)	-0.043(-0.592)	1.239 [0.266]
21	ASM DANA BESTARI	0.373 (3.825***)	0.230 (1.772*)	0.137(1.319)	1.040 [0.300]
22	ASM DANA MUTIARA	0.524 (5.662***)	0.283 (3.036***)	-0.031(-0.228)	0.759 [0.384]
23	ASM SHARIAH AGGRESSIVE	0.342 (3.221***)	0.303 (1.376)	0.228 (2.010**)	4.075 [0.044]
24	ASM SHARIAH BALANCED	0.387 (7.559***)	0.170 (3.376***)	0.132(1.613)	1.906 [0.167]
25	ASM SHARIAH CASH MANAGEMENT	-0.026 (-1.917*)	0.016 (0.722)	0.019(0.908)	0.237 [0.626]
26	ASM SHARIAH GROWTH	0.595 (6.626***)	0.144 (1.014)	-0.082(-0.648)	0.328 [0.954]
27	ASM SHARIAH INDEX	0.593 (15.447***)	0.310 (0.051)	-0.088(-1.513)	0.696 [0.404]
28	ASM SHARIAH PREMIER	0.501 (5.580***)	0.365 (3.185***)	0.127(1.284)	0.339 [0.854]
29	ASM SHARIAH TACTICAL	0.420 (4.086***)	0.196 (0.962)	-0.220(-1.028)	2.483 [0.115]
30	AXA AFFIN DANA IMBANG	0.694 (8.998***)	0.200 (1.800*)	0.176(1.688*)	0.352 [0.553]
31	BIMB DANA AL-FAKHIM	0.432 (0.076)	-0.053 (-0.562)	-0.532(-0.109)	0.321 [0.571]
32	BIMB DANA AL-FALAH	0.291 (4.786***)	0.075 (0.850)	0.089(1.321)	0.414 [0.520]
33	BIMB DANA AL-MUNSIF	0.210 (3.380***)	0.121 (1.433)	0.095(1.654*)	0.178 [0.665]
34	BIMB I GROWTH	0.560 (14.970***)	-0.023 (-0.513)	0.097(1.420)	0.400 [0.527]
35	CIMB ISLAMIC ASIA PACIFIC EQUITY	0.880 (4.061***)	0.285 (0.955)	-0.281(-1.044)	0.233 [0.879]
36	CIMB ISLAMIC BALANCED	0.618 (4.635***)	-0.053 (-0.304)	-0.144(-1.102)	1.840 [0.175]
37	CIMB ISLAMIC BALANCED GROWTH	0.620 (4.635***)	-0.053 (-0.304)	-0.144(-1.102)	1.840 [0.175]
38	CIMB ISLAMIC DALI EQUITY	0.706 (3.274***)	-0.076 (-0.160)	0.093(0.200)	1.670 [0.196]
39	CIMB ISLAMIC DALI EQUITY GROWTH	0.733 (5.966***)	-0.218 (-0.910)	0.193(0.738)	0.199 [0.656]
40	CIMB ISLAMIC ENHANCED SUKUK	0.060 (8.562***)	0.057 (1.758*)	-0.113(-3.675***)	9.247 [0.002]
41	CIMB ISLAMIC EQUITY AGGRESSIVE	0.918 (6.142***)	-0.098 (-0.309)	0.376 (1.085)	0.320 [0.572]
42	CIMB ISLAMIC SMALL CAP	0.623 (2.694***)	0.101 (0.217)	0.473(0.841)	0.592 [0.808]
43	CIMB ISLAMIC SUKUK	0.623 (2.694***)	0.101 (0.218)	0.473(0.841)	0.592 [0.808]
44	DANA EKUITI PRIMA	0.753 (3.440***)	-0.151 (-3.440***)	0.536 (1.222)	0.179 [0.672]
45	DANA ISLAMIAH AFFIN	0.304 (3.305***)	-0.014 (-0.066)	0.330(1.606)	0.504 [0.478]
46	DANA MAKMUR PHEIM	0.422 (4.341***)	-0.041 (-0.140)	0.777(2.693***)	0.945 [0.331]
47	DANA PENDAPATAN PRIMA	0.118 (5.287***)	0.014 (0.572)	-0.131(-4.362***)	6.578 [0.010]
48	DANA RESTU	0.594 (7.664***)	-0.181 (-0.661)	0.458(1.559)	0.426 [0.514]
49	DANA SEJATI	0.108 (3.461***)	0.084 (2.199**)	-0.220(-4.624***)	6.400 [0.011]
50	EASTSPRING INVESTMENTS DANA AL-ILHAM	0.688 (8.466***)	-0.357 (-1.132)	0.677(2.054**)	0.544 [0.816]
51	EASTSPRING INVESTMENTS DANA AL-ISLAH	0.132 (3.888***)	-0.652 (-0.241)	0.017(0.417)	3.158 [0.076]
52	EASTSPRING INVESTMENTS DANA DINAMIK	0.243 (1.463)	-0.194 (-1.100)	0.429(1.740*)	0.747 [0.387]

(Table F.1.3 Continued)

No.	Unit Trust Fund	bi	si	hi	GMM
53	EASTSPRING INVESTMENTS DANA WAFI	-0.973 (-0.321)	0.023 (0.607)	0.014(0.363)	3.642 [0.056]
54	HLA VENTURE DANA PUTRA	0.346 (2.709***)	-0.785 (-0.031)	0.202(0.787)	0.356 [0.850]
55	HONG LEONG DANA MAA'ROF	0.390 (3.334***)	-0.165 (-0.662)	0.253(0.857)	0.252 [0.615]
56	HONG LEONG DANA MAKMUR	0.591 (3.974***)	-0.288 (-0.952)	0.302(0.911)	0.168 [0.682]
57	HWANG AIIMAN GROWTH	0.597 (3.707***)	0.027 (0.110)	0.221(0.854)	0.591 [0.808]
58	HWANG AIIMAN INCOME PLUS	0.268 (4.772***)	0.150 (1.802*)	0.177(2.490**)	1.781 [0.182]
59	KENANGA ISLAMIC	0.636 (5.418***)	0.623 (2.00**)	-0.257(-0.621)	1.569 [0.210]
60	KENANGA ISLAMIC BALANCED	0.463 (4.586***)	0.478 (1.596)	-0.456(-1.173)	1.915 [0.166]
61	KENANGA OA INV-KENANGA BON ISLAM	0.091 (3.746***)	-0.032 (-1.631)	-0.039(-0.733)	4.923 [0.026]
62	KENANGA OA INV-KENANGA EKUITI ISLAM	0.678 (7.444***)	0.242 (1.889*)	-0.174(-1.521)	0.462 [0.497]
63	KENANGA OA INV-KENANGA SHARIAH BALANCED	0.359 (6.881***)	0.115 (1.947*)	-0.094(-1.505)	0.399 [0.528]
64	KENANGA OA INV-KENANGA SHARIAH GROWTH OPPS	0.719 (10.963***)	0.321 (3.137***)	-0.219(-2.673***)	0.390 [0.532]
65	KENANGA SYARIAH GROWTH	0.428 (11.250***)	0.261 (2.767***)	-0.065(-0.718)	11.977 [0.001]
66	LIBRA AMANAH SAHAM WANITA	0.532 (7.738***)	0.171 (1.839*)	-0.427(-0.448)	0.889 [0.346]
67	LIBRA ASNITA BOND	-0.094 (-2.163**)	0.014 (0.243)	0.185(2.311**)	5.056 [0.025]
68	LIBRA SYARIAH EXTRA	0.455 (5.997***)	0.120 (0.926)	-0.077(-0.685)	0.716 [0.789]
69	MAAKL AL-FAID	0.605 (7.782***)	0.232 (2.128**)	0.176(0.016)	0.859 [0.354]
70	MAAKL AL-FAUZAN	0.575 (4.402***)	0.127 (1.064)	-0.034(-0.204)	0.833 [0.773]
71	MAAKL AL-UMRAN	0.286 (5.046***)	0.144 (2.001**)	0.140(1.140)	2.227 [0.136]
72	MAAKL AS-SAAD	-0.197 (-0.074)	-0.023 (-0.617)	0.138(2.424**)	0.495 [0.482]
73	MAAKL SYARIAH INDEX	0.715 (11.827***)	0.066 (1.031)	-0.866(-0.111)	0.282 [0.867]
74	MANULIFE DANA EKUITI DINAMIK	0.714 (6.066***)	0.244 (1.388)	0.078(0.425)	2.440 [0.118]
75	MIDF AMANAH DYNAMIC	0.690 (5.409***)	0.517 (3.230***)	0.287(1.607)	0.384 [0.536]
76	MIDF AMANAH GROWTH	0.662 (5.362***)	0.576 (3.708***)	0.344(2.005**)	0.571 [0.450]
77	MIDF AMANAH ISLAMIC	0.463 (3.321***)	0.338 (1.897*)	0.169(1.109)	0.219 [0.640]
78	MIDF AMANAH MONEY MARKET	0.463 (0.660)	-0.313 (-0.171)	0.209(-0.084)	3.585 [0.058]
79	MIDF AMANAH SHARIAH MONEY MARKET	-0.012 (-0.686)	-0.063 (-0.957)	0.089(1.019)	1.387 [0.239]
80	MIDF AMANAH STRATEGIC	0.392 (3.906***)	0.451 (2.754***)	-0.117(-0.859)	0.312 [0.576]
81	PACIFIC DANA AMAN	0.811 (13.267***)	0.191 (1.322)	0.075(0.479)	0.694 [0.405]
82	PACIFIC DANA MURNI	0.023 (1.004)	-0.014 (-0.382)	0.498(0.143)	1.285 [0.257]
83	PB ISLAMIC BOND	-0.013 (-0.250)	-0.094 (0.053*)	-0.022(-0.252)	6.600 [0.010]
84	PB ISLAMIC EQUITY	0.722 (6.641***)	0.250 (2.380**)	0.164(1.175)	0.921 [0.337]
85	PRULINK DANA AMAN	0.116 (3.708***)	-0.085 (-1.420)	-0.087(-2.150**)	9.097 [0.003]
86	PRULINK DANA UNGGUL	0.756 (13.785***)	0.011 (0.188)	0.563(0.056)	1.420 [0.233]
87	PRULINK DANA URUS	0.596 (14.277***)	-0.021 (-0.447)	0.115(1.589)	2.870 [0.090]
88	PUBLIC ISLAMIC BOND	-0.980 (-0.164)	0.135 (0.019)	0.175(1.623)	1.656 [0.198]
89	PUBLIC ISLAMIC DIVIDEND	0.692 (13.107***)	-0.138 (-1.799*)	-0.026(-0.411)	0.242 [0.876]
90	PUBLIC ISLAMIC EQUITY	0.625 (10.786***)	0.094 (1.360)	0.104(1.667*)	0.271 [0.869]
91	PUBLIC ISLAMIC MIXED ASSET	0.468 (11.829***)	0.248 (2.434**)	-0.041(-0.381)	0.241 [0.877]
92	PUBLIC ISLAMIC OPPORTUNITIES	0.558 (3.582***)	0.836 (2.855***)	0.125(0.528)	0.777 [0.378]
93	PUBLIC ITTIKAL	0.636 (4.549***)	0.154 (0.792)	0.085(0.466)	0.193 [0.890]
94	RHB-OSK DANA ISLAM	0.524 (8.896***)	0.200 (2.799***)	0.087(0.957)	0.873 [0.768]
95	RHB-OSK ISLAMIC BOND	0.067 (3.056***)	-0.160 (-2.853***)	-0.184(-3.536***)	2.936 [0.085]
96	RHB-OSK ISLAMIC GROWTH	0.685 (10.387***)	0.168 (1.956**)	0.406(0.496)	0.880 [0.348]
97	RHB-OSK MUDHARABAH	0.328 (6.659***)	0.132 (1.634)	-0.030(-0.390)	3.102 [0.078]
98	TA DANA OPTIMIX	0.622 (5.443***)	0.577 (3.212***)	-0.784(-0.036)	0.279 [0.597]
99	TA ISLAMIC	0.656 (7.531***)	0.040 (0.301)	0.071(0.581)	0.103 [0.919]
100	TABUNG AMANAH SAHAM KEDAH	0.545 (9.931***)	0.330 (4.673***)	0.095(1.056)	0.396 [0.529]
101	ZURICH DANA MAS MAJU	0.582 (14.590***)	0.553 (0.117)	0.110(1.921*)	1.671 [0.196]
102	ZURICH DANA MAS YAKIN	0.547 (8.114***)	0.189 (2.237**)	-0.906(-0.083)	2.995 [0.084]
103	ZURICH DANA SERI MULIA	-0.013 (-0.318)	-0.094 (-0.850)	0.169(1.183)	0.914 [0.339]

Table F.1.4: Summary of Market, SMB and HML betas for the Post-Lehman Bros. sub-period

	Mean	Max	Min	Sig. Positive	Sig. Negative
bi	0.441	0.918	-0.980	95	8
si	0.098	0.836	-0.785	71	32
hi	0.055	0.777	-0.906	60	43

Notes: This table presents the results of testing the FF model in the system of regressions (3), (4), (5), and (6). The sample is monthly return data extending from May 2006 to August 2008. GMM is Sargan or J test statistic of over identifying restrictions. Standard Errors computed from heteroscedastic-consistent matrix (Robust-White). The associated t-statistic is in parentheses ( ). The associated p-value is in square brackets [ ]. ***, **, * indicate significant at 1% level, 5% level, and 10% level, respectively.