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Impact of the Monetary Policy Instruments on Islamic Stock Market Index Return

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Abstract Previous studies found that Islamic stock market index in Malaysia (KLSI), does not react, or react negatively to interest rate, although one of the main criteria of Islamic finance is to avoid business and activities that yield interest because of its prohibition in Islamic laws. On the other hand, studies of Islamic stock market index in the US (DJIMI) found that there is no impact of interest rate on DJIMI. These two stock market indices have different screening criteria and different composite of securities. This study aims at investigating the monetary policy variables impact, the effect of interest rate, and the use of stock market indices as a hedge against inflation. It also examines the volatilities of monetary variables, interest rates, and inflation rate on two Islamic stock market indices. Using time series analysis such as GARCH the results are as follows. It is found that in the variance univariate models of the conventional indices that M1, M3, inflation rate, and real growth in GDP are significant in influencing KLCI volatility, while M2, M3, inflation rate and interest rate affected DJINA volatility. On the other hand, in the Islamic indices, KLSI and DJIMI variance is influenced by M2, M3, and inflation rate. In addition, in the multivariate model, DJIMI is influenced by the interest rate and the inflation rate in the mean and variance equations. In contrast, KLSI is influenced commonly in the mean and variance equations by M3, and the inflation rate.

JEL *E4, E6, F4*
Keywords *Macroeconomic volatility; GARCH, Islamic index*

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Introduction

Traditional finance theories are built on the assumptions of the neoclassical economics. The neoclassical theory of economics is based mainly on three fundamental inter-linked assumptions. First is that the goal of any individuals in the economy is to maximize his/her utility. The maximization of utility is done by being a rational individual who will weigh risk and return in each situation and nothing else. The other assumption is that the decision maker in any economic decision is the individual and not the society as a whole. The theory of finance is based on the individual as an investor who decides rationally to invest or not in any investment opportunity based on the concept of how much does he/she maximizes his/her utility.

This paper studies the impact of the monetary policy instruments on Islamic stock market index return. In addition, it examines the effect of the inflation on the Islamic and non-Islamic stock market indices. Studying inflation is done to investigate whether both indices are a good hedge against inflation or not. The rationale behind this paper is of two folds. First, the theory of Islamic finance emphasizes that interest rate is forbidden under Islamic jurisprudence and therefore Islamic transaction should be free from interest. The initiation of Islamic indices in many countries was based on the idea that Muslims need an index that is free from elements that are forbidden in Islamic Law. One of these elements is the rate of interest which scholars consider to be equivalent to Usury or Riba. The main Islamic Indices worldwide exclude any company that its main activity is based on interest. However, if the company earn interest from other non-related to business activity there will be a purification process. The purification process is done be estimating the forbidden increment coming from interest and taking it out so whatever remains is Halal.

Since interest is forbidden under Islamic law and Muslim investors try to avoid it by demanding an Islamic index that excludes companies that earn interest as its main business, therefore Islamic indices should not be affected by the change in the rate of interest. In other words, Islamic indices should be affected only by real factors in the economy and not by the fluctuations in the rate of interest. Theoretically, Zaher and Hasan indicated that there are seven "main pillars that work together to deliver competitive performance and to promote socially and ethically responsible business practices, which in turn, contribute to improvements in the quality of life throughout society." (Zaher and Hasan 2001:24). These pillars are, Shariah Supervision, Screening, Purification, Charity or Zakah, Shareholder Advocacy, Monitoring and Reporting, and Community-Based Investment. Some of these steps are practiced in the Islamic index to eliminate the unlawful element including interest rate effect whether directly or indirectly. On the other hand empirically, Hakim and Rashidian (2005) and Mohd. Yusof and Majid (2007) and Mohd. Yusof and Abd. Majid (2006) found that interest rate does not have any impact on the Islamic stock market index in US and Malaysia respectively. However, Yusof and Abd. Majid (2009) found that Malaysian Islamic index is affected positively by local interest rate and US federal fund rate. Their explanation of this relationship is that when interest rate increases Muslim investors will invest more in Shariah compliant stock rather depositing their money in banks and getting higher interest rates. In this sense, Muslim investors are basically avoiding the excess interest rate return from bank deposits or interest-bearing securities. This means that Muslim investors actually observe the interest rate movement and react accordingly, which follow the concept of rational investor. There are two flaws in this argument; first, the authors assume that only Muslim investors invest in Shariah compliant stocks. Based on Albaity and Ahmad (2008) KLSI started with 279 companies in 1999. However, it has grown to 826

companies as of April 2005, comprising 84% of the total listed companies on Bursa Malaysia. This indicates that many of the listed companies are in KLSI but not only traded by Muslims. The second problem is authors did not show whether the deposits in banks and demand for interest-bearing securities decreased when interest rate increases to support their claim.

Some may argue that Islamic indices are still a part of the economy and the impact of the interest rate might be indirectly affecting Islamic indices. If this is the case then the impact of interest rate should be minimized and other real factor will have a higher impact than the interest rate. Therefore, this study, in addition to including monetary instruments, local and US interest rates, is going to use real activity measure such as GDP.

The second rationale of this paper is that it studies two distinct Islamic indices from US and Malaysia. There are two main differences between these two markets. First difference is that each index uses distinct screening criteria. Dow Jones Islamic Market Index (DJIMI) uses four quantitative screening criteria (i.e. liquidity, interest, debt, and non-permissible incomes screens) based on both business activities and its products[1]. On the other hand, Kuala Lumpur Syariah Index (KLSI) focused more on the business activities.

The third rationale of this study is that it looks into the systematic risk measured by selected macroeconomic variables. Any investor planning to invest, whether in Islamic or non-Islamic, faces two types of risks. The first is the unsystematic risk which investor can diversify by looking at correlation of assets. The second risk is the non-diversifiable or systematic risk. This risk includes the fluctuations in macroeconomic variables, which is impossible to diversify against. Since there is a strong relation between macroeconomy and stock prices, therefore any shocks in these variables present a source of systematic risk. There have been studies done on

[1] Derigs and Marzban (2008)

macroeconomic volatilities and stock prices such as Chowdhury and Rahman, 2004; Arnold and Vrugt, 2006; Beltratti and Morana, 2006; Corradi et al., 2006; Diebold and Yilmaz, 2007; Teresiene et al., 2008. However, to the knowledge of the author there have been no studies done comparing volatilities from two distinctive Islamic stock market indices.

Therefore, this study intends to focus on the following objectives:

- To examine whether interest rates have any impact on the Islamic indices return in Malaysia and the US.
- To examine whether interest rates volatilities have any impact on the Islamic indices return volatilities in Malaysia and the US.
- To investigate which monetary policy instruments and their volatility have greater impact on the Islamic indices returns and their volatilities in Malaysia and the US.
- To examine whether the Islamic indices are a good hedge against inflation.

The rest of the paper is organized in the following manner. Section 2 summarizes the main previous studies done investigating the relationship between Macroeconomic variables and stock market indices. Section 3 focuses on the methodology and the data used. The result and analysis follow in section four. Finally, conclusion is presented in section five.

Literature Review

Ibrahim (1999) performed a study on the effect of macroeconomic variables on stock prices in Malaysia. He used seven macroeconomic variables, industrial production, consumer price index (CPI), narrow and broad money supply M1 and M2, domestic credit aggregates, official reserve and exchange rate as independent variables and Kuala Lumpur Composite Index (KLCI) as the proxy for stock prices. The data used were from January 1979 to June 1997. Results of the

bivariate analysis suggest cointegration between stock prices and three macroeconomic variables, CPI, credit aggregates and official reserve. Therefore, this indicated that the market was informationally inefficient while it was informationally efficient in the rest of the variables. In the multivariate model, cointegration confirmed and therefore efficiency was rejected. Moreover, the error correction model implied that there was reaction of the stock prices towards the deviation from the long run equilibrium.

However, an earlier study by Habibullah and Baharumshah (1996) applying econometric techniques, to test for the efficiency of the Malaysian market finds contrary results. They used Money supply (M1 and M2) and GDP with several stock price indices in Bursa Malaysia on a monthly basis from 1978 to 1992. They found that the Malaysian market with respect to these variables was informationally efficient, which means that all past information was reflected in the stock prices.

In addition, using three types of exchange rates Ibrahim (2000) analyzed the interaction between stock prices and exchange rates in Malaysia. The paper used three exchange rates measures, real effective exchange rate, the nominal effective exchange rate, the RM/US$ rate along with money supply broadly defined (M2), official reserve and Kuala Lumpur Composite Index. The period considered was from January 1979 to June 1997. The findings from bivariate models indicated no long run relationship between the stock market index and any of the exchange rates, while when M2 and reserves were included there was evidence of cointegration. However, in multivariate model, the results indicated the following. First, unidirectional causality from the stock market to the exchange rate, second, the exchange rate and stock index were caused by the money supply and the reserve, lastly, the error correction coefficients indicated the stock index and the exchange rates adjusted to correct of deviation from long run relationships that

constrained the co-movement of the variables. In addition, the analysis indicated that the Malaysian market was informationally inefficient due to the cointegration.

Nevertheless, Ibrahim and Yosoff (2001) criticized previous studies in Malaysia as being lacking in two main aspects. They argued that previous studies in Malaysia focused on a subset of the markets. That there were many variables that have not been included that was vital to the stock market. Second, they asserted that previous studies stop at reporting cointegration and Granger causality while there were stronger techniques that should be used such as impulse response and variance decomposition. The paper used Kuala Lumpur composite index, exchange rate, industrial production, broad money supply (M2) and consumer price index from 1977 to 1998 on monthly basis. After applying cointegration, VAR, impulse response and variance decomposition, they concluded the following. Variables were found to be cointegrated and that in the long-term industrial production and inflation were positively related to composite index while it was the opposite for M2 and exchange rate. Variance decomposition results in two different variables ordering showed that most of the variation in composite index was explained by its own and M2. Moreover, impulse response confirmed the earlier results of cointegration, whereby innovations in industrial production and consumer price index caused positive response in composite index. On the other hand, composite index started with a positive response to M2 but it faded away and became negative with time. For exchange rates, the result was consistent to the cointegration equation whereby it had a negative impact on composite index.

Using two samples to test the dynamic behavior of stock prices and money supply, Ibrahim (2001) applied Vector autoregressive techniques in the Malaysian market before and during the Asian crisis. He used Kuala Lumpur composite index (KLCI), Money supply (M2), exchange

rate, real activity (Industrial production) and inflation (consumer price index) from 1977 to 1997 and 1997 to 1998. He found that stock prices were more affected by money supply but not vice versa. Impulse response results suggested that KLCI responded positively to all the variables except exchange rates.

Moreover, arguing that the line of researches in Malaysia were lacking in the area of integration with international markets Ibrahim (2003) included four economic variables two major international stock market. He used Kuala Lumpur Composite index (KLCI) with money supply (M1), consumer price index, industrial production and exchange rate along with US S&P 500 and Japan Nikkei 255 indices from 1977 to 1998 on monthly basis. The findings of the study was first, the variables were cointegrated and positively related to KLCI except exchange rate and US stock market, which were negatively related to KLCI. Second, variance decomposition and impulse response implied that the dominant effect on the stock market was for money supply, exchange rate, and consumer prices index and both international markets. It was worth mentioning that the domestic market exerted substantial effect on macroeconomic variables. Although, the study did not consider studying the predictability of the market, the author suggested that the bidirectional influence indicated that predictability of stock market from macroeconomic variables and vice versa.

Yuosof and Majid (2007) investigated whether there was a difference in the reaction towards macroeconomic variables between islamically complaint and non-Islamically complaint indices returns in Malaysia. Using monetary (M1, M2, exchange rate, interest rate), real (industrial production index) and international (federal fund rate) variables from 1992 to 2000. They found that both indices reacted similarly to all the macroeconomic variables except interest rate about Islamic index where there was no significant influence.

Data and Methodology

Rational investors derive their decision based on what maximizes their utility therefore their main concern when investing is to maximize the future cash flow of their investments. Anything that affects the future cash flow is included in the decision of whether to invest or not. Macroeconomic variables affect the future cash flow and therefore it is a very important to consider them in investment decisions. Various studies used different models to determine what variables influence stock returns. Ibrahim (2001), Yousof et. al. (2007), Morelli (2002), Kearney and Daly (1998), and Liljeblom and Stenius (1997) used stock valuation model. Therefore, the model that is used in this study is the stock valuation model. Valuation in the stock market refers to a process in which an investor determines the worth of a security using the risk and return concepts, which can be applied to any asset that produces a stream of cash flow. In order to set up the value of an asset, investors must determine certain variables that affect the amount of future cash flows, the timing of the cash flows and the rate required on the investment.

Kettell (2001), to clarify the classic method of calculating intrinsic value, applied present value analysis. The present value process involves the discounting of future cash flows. The intrinsic value of a security is said to be equal to the discounted or present value of the future stream of the cash flows that investors expect to receive from the asset. This is illustrated as:

$$\text{Estimated value of security} = \sum_{t=1}^{n} \frac{\text{cash flows}}{(1+k)^t} \qquad (1)$$

Where k is the appropriate discount rate or required rate of return and t is the time interval.

The variables used in this study for both US and Malaysian market are Kuala Lumpur Syariah Index (KLSI), Dow Jones Islamic Market Index (DJIMI), Kuala Lumpur Inter-Bank Offer Rate (KLIBOR) or interest rate, Money supply in its three definitions (M1, M2 and M3), Inflation rate, and the Federal Fund Rate (FFR). Each of these macroeconomic variables has its theoretical and empirical impact on stock returns. Changes in the direction of monetary policy have it effect on the stock returns. A brief explanation is given about the impact of these variables on stock returns.

Interest rate (IR) is one of the monetary policy tools used by central banks. Interest rate is hypothesized to have a negative relationship with stock returns. Based on the stock valuation model, whenever interest rate increases the value of cash flow is worth less after discounting. Therefore, the incentive to invest shrinks as well as the stock return. Another monetary policy tool used by central banks is the money supply.

Money supply is hypothesized to have both negative and positive relationship with stock returns. The negative relationship is channeled through the impact of increasing interest rate. Fama (1981) indicated that the increase in money supply leads to increase in interest rate and therefore a decrease in stock returns. However, Mukherjee and Naka (1995) argued that money supply can have a positive impact on stock returns if the increase in money supply leads to an expansion in economic activities. If the increase in money supply lead to an expansion this mean that cash flow increases and stock returns will increase. Money supply is one of the monetary policy instruments used by the central banks. The choice of the definition of money that measures the impact of money supply is debatable. Some studies choose the narrowest definition of money supply, i.e. M1, such as, Ibrahim (2003), and Wongbangpo et. al. (2002) on the other hand, Ibrahim (2000) and Ibrahim (2001) used broad definition of money i.e. M2. In addition, Ibrahim

(1999), Habibullah et. al. (1996), Mohd. Yusof et al. (2006) and Mohd. Yusof (2009) used M1, M2 and M3 in investigating the relationship between stock prices and macroeconomic variables. Tan et. al. (1996) in explaining the causal relationship among prices, output, money supply, and interest rate used the three definitions of money. They concluded that M1 and M3 are the most important monetary instruments affecting prices and output respectively. Ibrahim (2003), following Tan (1996), used M1 as one of the explanatory variables for stock prices in Malaysia. since there is no consensus on which money supply definition should be used this paper uses the main three definition of money supply.

In addition to interest rate and money supply, inflation can affect stock returns. Inflation like money supply has positive and negative relationship with stock returns. Previous studies on Malaysia such as Ibrahim (2003), Ibrahim et. al. (2001) and Ibrahim et. al. (2003) found that inflation is positively related to stock prices. According to Ibrahim (2003), Ibrahim et. al. (2001) and Ibrahim et. al. (2003), the positive relationship between stock returns and inflation suggest that stock prices are a good hedge against inflation. On the other hand, Naka (1994), Chen et. al. (1986) argued that inflation and stock return has negative relationship. The argument is that if the expected price level increases monetary authority intervenes to stabilize the price by concretionary monetary policy, which affects stock return negatively through interest rate effect.

Time series data usually exhibit three main characteristics. First, they exhibit volatility clustering or volatility pooling. In other words, periods of high volatility will be followed by periods of high volatility and the same applies for periods of low volatility. Second, their distribution is

leptokurtosis, which mean that the distribution fat tailed. Third characteristic is the leverage effect. The leverage effect is the fact that bad news affects returns more than good news. In other words, changes in the prices tend to be negatively correlated with changes in volatility. Therefore modeling such series needs to be extended using other models. The first two characteristics have been successfully modeled using ARCH (Autoregressive Conditional Heteroskedasticity) by Engle (1982) and GARCH (Generalized Autoregressive Conditional Heteroskedasticity) developed by Bollerslev (1986). The idea of ARCH and GARCH is to model the variance of the error term from the mean equation on the previous squared error terms. If the mean equation is as follow,

$$Y_t = \alpha_i + \theta_i Y_{t-1} + \beta_i X_{t-1} + \varepsilon_t \qquad (2)$$

Where Y_t is the dependent variable (i.e. KLSI, KLCI, DJINA and DJIMI) or Islamic and non-Islamic stock indices returns in this case, X_t is the independent variable money supply, interest rate and inflation (i.e. M1, M2, M3, IR, and CPI) and ε_t is the error term and α_i and β_1 are the coefficients. The error term $\varepsilon_t \sim N(0, \sigma^2)$ is assumed to have zero mean and a constant variance or homoscedasticity. However, it is unlikely in the financial time series that the variance of the error term be Homoskedastic. Ignoring the fact that the variance of the error term is Heteroskedastic will result in either over/under estimation of the standard error and therefore bias inferences. To overcome this problem ARCH model is used. The arch model is as follow,

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \partial_i \, \varepsilon_{t-i}^2 \qquad (3)$$

Where σ_t^2 is the conditional variance, ε_{t-i}^2 is the lagged term of the squared error term from the mean equation, and ω and α_i are the coefficients.

This model indicates that the variance of the error term is dependent on the lagged squared error term. Such model is referred to as ARCH (q) where (q) indicate the lag order of the squared error term in the variance equation.

Although ARCH model is capable of eliminating the heteroskedasticity in the mean equation, it still has some drawbacks that led to the development of GARCH model. GARCH model was developed by Bollerslev (1986) who indicated that a GARCH model with smaller number of terms can perform as well as or even better than ARCH model with many lags. The idea of the GARCH model is simply to include the lagged value of the variance in the variance equation. The GARCH model is as follow,

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} \partial_i \, \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \gamma_j \, \sigma_{t-j}^2 + \sum_{v=1}^{l} \emptyset_v \, X_{t-v} \qquad (4)$$

The first term in the right hand side is the ARCH term explained earlier, while the second term is the lagged variance that is GARCH. This model is referred to as GARCH (p,q) where (q) is the lagged ARCH term and (p) is the GARCH lagged term. The above model indicate that ω is the long-term average variance, α_i is the information about the volatility in the previous period, and the beta is the coefficient of the lagged conditional variance.

Although GARCH model is better than ARCH specification since it is more parsimonious and less likely to breach the non-negative constraint it is still does not account for the leverage effect in the apparent in financial time series and does not allow for any direct feedback between the conditional variance and the conditional mean.

The data used for this study cover two Islamic stock market indices namely, DJIMI and KLSI. The logarithmic difference is taken for money supply variables and CPI in order to measure growth rate. The period of the study start from April 1999 to December 2007 on monthly basis. Returns are calculated using the compounded return formula. The calculation is done as follows

$$R_{it} = \ln\left(\frac{P_{i,t}}{P_{i,t-1}}\right) * 100 \quad (5)$$

Where R_{it} is the return for index i at time t, $P_{i,t}$ is the price for index i at time t and $P_{i,t-1}$is the price of index i at time t-1.

Results and analysis

Table 4.1 and table 4.2 below report the descriptive statistics for the Islamic and non-Islamic stock market indices for US and Malaysia as well as their macroeconomic variables. It is clear that DJIA has higher returns than DJIMI 0.0015 compared to 0.0008 while the DJIMI has higher risk than the DJINA based on the standard deviation of 0.018 compared to 0.021. In contrast, the KLCI in bursa Malaysia has higher returns than KLSI 0.0041 compared to 0.0029 but higher risks than the Islamic index 0.025 compared to 0.023 respectively. All indices are negatively skewed except KLCI, which is positively skewed. The negative (positive) skewness indicates that there is a greater probability of large decrease (increase) in returns than increase (decrease). All the stock market indices have kurtosis more than three indicating leptokurtic distribution.

The J-B test of normality indicates that DJIA and KLSI are normally distributed while DJIMI and KLCI are not.

In term of macroeconomic variables, all the variables except federal fund rate and interest rate have positive averages or growth rate. The growth rate ranges between 0.0013 for real activity and 0.0062 for M3, while federal fund rate has a negative growth rate of 0.0048 for the US economy, while for Malaysia the mean ranges between 0.0017 for inflation rate and 0.011 for MI, while the interest rate has a negative growth rate of 0.0012. The volatility of macroeconomic variables ranges between 0.0008 for the rate of inflation and 0.22 for the federal fund rate for US economy, similarly in Malaysia the volatility ranges between 0.003 for rate of inflation and 0.084 for the interest rate. It is clear that interest rate in both economies is the most volatile while rate of inflation is the least. The skewness of all the macroeconomic variables is positive except the interest rates in both economies and the real activity in the US market. In addition, all the macroeconomic variables have kurtosis value more than three except rate of inflation for the US economy. Finally, J-B test of normality indicate that all the macroeconomic variables are not normally distributed except rate of inflation in the US economy.

Table 4.1 Descriptive statistics for US stock indices returns and macroeconomic variables

	DJIA	DJIMI	M1	M2	M3	IP	FFR	CPI
Mean	0.0015	0.0008	0.0021	0.0050	0.0062	0.0013	-0.0048	0.0018
Std. Dev.	0.018	0.021	0.0079	0.0033	0.0042	0.0051	0.22	0.0008
Skewness	-0.093	-0.491	0.744	0.927	0.813	-0.386	-1.42	0.116
Kurtosis	3.44	3.75	13.94	7.28	4.32	3.71	6.84	2.74
J-B	1.003	6.67**	528*	94.22*	14.97*	4.73***	98.54*	0.533

*, **, and *** significant at 1%, 5%, and 10%

Table 4.2 Descriptive statistics for Malaysia stock indices returns and macroeconomic variables

	KLCI	KLSI	M1	M2	M3	IP	IR	CPI
Mean	0.0041	0.0029	0.011	0.0067	0.0091	0.005	-0.0012	0.0017
Std. Dev.	0.0252	0.023	0.026	0.0081	0.012	0.048	0.0844	0.0025
Skewness	0.39	-0.280	0.367	0.36	0.96	0.52	-1.12	2.04
Kurtosis	5.23	3.52	4.51	4.47	4.49	4.14	13.92	9.49
J-B	24.40*	2.56	12.24*	11.65*	25.41*	10.36*	538*	254*

*, **, and *** significant at 1%, 5%, and 10%

Table 4.3 displays the simple correlation coefficients between all the variables in the US economy. The strongest relationship is found between the three different definitions of money supply the highest being between M2 and M3 at 0.74 followed by M3 with M1 at 0.56 and the lowest is between M1 and M2 at 0.54. The relationship between KLSI and KLCI is low and not significant at 0.16. The relationship between KLCI and the macroeconomic variables ranges between 0.04 for real activity and 0.22 for M1 while the relationship is negative and significant between interest rate and KLSI indicating a negative effect of interest rate on the Islamic index in Malaysia. In addition, KLCI relationship with all the macroeconomic variable ranges between 0.21 for M1 and 0.005 for the rate of inflation, while it negatively related to the growth of the interest at 0.32 and the growth in real activity at 0.06. The rate of inflation has a positive relationship with money supply the strongest being with M3 at 0.31 followed by M2 at 0.28 and finally by M1 at 0.14, while it has a very low positive relationship with real activity but negative relationship with the interest rate growth rate. Moreover, the interest rate is negatively related to M1, M2, and rate of inflation but positively related to M3, though none of the relationship is significant. Lastly, the real activity growth rate has negative relationship with M1, M2, M3, and interest rate and positively with inflation rate though not significant.

Table 4.3 simple correlation coefficients for Malaysia stock market indices and macroeconomic variables

	KLCI	KLSI	M1	M2	M3	CPI	IR	IP
KLCI	1							
KLSI	0.16	1						
M1	0.203**	0.217**	1					
M2	0.180***	0.16	0.535*	1				
M3	0.15	0.171***	0.562*	0.735*	1			
CPI	0.005	0.12	0.14	0.283*	0.306*	1		
IR	-0.32*	-0.17***	-0.12	-0.01	0.01	-0.03	1	
IP	-0.06	0.04	-0.10	-0.05	-0.04	0.06	-0.05	1

*, ** and *** significant at 1%, 5%, and 10 % respectively.

Table 4.4 displays the simple correlation coefficients between all the variables in the US economy. The highest positive and significant correlation is between DJIMI and DJIA at 0.76 followed by M2 with M3 at 0.71, finally between M2 and M1 at 0.60. DJIA has positive relationship with all the variable ranging from 0.008 with inflation rate to 0.17 with M1. DJIA has negative relationship with M2 and the interest rate though not significant. In contrast, DJIMI has a positive relationship with the real activity at 0.13, interest rate at 0.096, inflation rate at 0.092, and M1 at 0.093. In the other hand, DJIMI has a negative relationship with M2 and M3 though the relationship is not significant. The real activity and the interest rate are negatively related to M1 (0.20, 0.43), M2 (0.21, 0.39), and M3 (0.072, 0.15) respectively. In addition, the real activity has a positive and significant relationship with the interest rate at 0.30. Lastly, the rate of inflation is positively related to M3 at 0.34, and M2 at 0.19 while is it negatively related with M1 at 0.04, real activity at 0.096 and interest rate at 0.27.

Table 4.4 simple correlation coefficients for Malaysia stock market indices and macroeconomic variables

	DJINA	DJIMI	M3	M2	M1	IP	FFR	CPI
DJINA	1							
DJIMI	0.762*	1						
M3	0.014	-0.032	1					
M2	-0.083	-0.224**	0.712*	1				
M1	0.168	0.093	0.330*	0.603*	1			
IP	0.128	0.133	-0.204***	-0.206***	-0.0721	1		
FFR	-0.088	0.096	-0.43*	-0.394*	-0.154	0.300*	1	
CPI	0.008	0.092	0.337*	0.191***	-0.040	-0.095	-0.168	1

*, ** and *** significant at 1%, 5% and 10 % respectively.

Table 4.5 shows the results of the estimation of the mean as well as the volatility estimation of the KLCI against each of the variables independently. The rationale behind estimation each variable individually against the stock market index is to disentangle the relationships. The lag classification was done following AIC for each variable.

One-month lag of the return of KLCI was included to correctly specify the estimation. The one-month lag of KLCI is only significant in the equation where M2 is included. In term of the macroeconomic variables, only M1 has a significant positive impact on KLCI.

In term of the volatility estimation, the results indicate a non-significant ARCH effect in all the equations. On the other hand, a significant GARCH effect exists in all the estimations indicating that KLCI is explained by its own volatility. Among the macroeconomic variables volatilities only M1, M2, rate of inflation and real activity have an impact on KLCI volatility. The narrow and broad definition of money supply (M1 and M2) has the positive and significant impact on KLCI volatility. This means that the fluctuations of KLCI are caused positively by M1 and M2 fluctuations. Industrial production and the rate of inflation fluctuations have a negative and

significant impact on KLCI volatility. The instability of the real activity and the price level drive away investors and might cause panic in the market. Therefore, any fluctuations in the GDP or rate of inflation will cause a decrease on stock returns. However the real activity does not faluctuate frequently and therefore its effect on stock prices might be minimized. Lastly, diagnostic tests indicate that there is evidence of homoscedacity and normality.

Table 4.5 mean and volatility estimates for KLCI

Independent variable						
	IR	M1	M2	M3	CPI	IP
α_i	0.003	0.003	0.002	0.002	0.002	0.003
KLCI(-1)	0.069	0.089	0.053*	0.071	0.124	0.085
θ_1	-0.025	0.154**	0.30	0.202	0.097	-0.021
Volatility estimation GARCH (1,1)						
ω	0.000002	-0.00002	-0.00004	0.00001	0.00004	0.00002
∂_1(ARCH)	-0.053	-0.046	-0.024	-0.060	0.045	-0.029
γ_1 (GARCH)	1.032*	1.012*	1.014*	1.023*	0.87*	1.004*
$\emptyset_1$	0.0001	0.003*	0.005*	0.000	-0.014**	-0.002*
$\partial_1 + \gamma_1$	0.98	0.97	0.99	0.96	0.92	0.98
Normality	1.516	0.8373	0.4135	1.791	0.707	0.1611
ARCH LM	7.653	8.015	4.812	7.071	9.489	9.470

*, ** and *** significant at 1%, 5%, and 10% respectively.

Table 4.6 reports the results of the mean and volatility estimates of KLSI on the interest rate, M1, M2, M3, CPI, and industrial production. In term of the macroeconomic variables, M3 and inflation have significant positive impact on KLSI. On the other hand, the interest rate has a negative significant impact on KLSI this is similar to Yusof and Abd. Majid (2008). This means that the most effective monetary policy instruments on KLSI is the broad definition of money or M3 and the interest rate. The inflation coefficient being positive and significant indicates that KLSI is a good hedge against inflation this is in line with Ibrahim(2003) and Ibrahim (2001) who found the same relationship in the Malaysian economy.

In term of volatility estimation, the results show that ARCH effect is significant in M1, M2 and industrial production estimation while GARCH effect is significant in all the estimated

equations. This means that fluctuation in KLSI is explained by its own lagged fluctuation and by the mean equation volatility in some cases. In addition, M3, M2, and the rate of inflation are the significant variables explaining the volatility of KLSI. Moreover, money supply M3 and the inflation rate have negative impact on the volatility of KLSI, signifying a negative influence on KLSI. On the other hand, the volatility of M2 has a positive and significant impact on KLSI volatility. This means that rate of inflation and M3 volatilities decreases stock returns while shocks in M2 increases stock returns. Since the money supply is based on the discretion of Bank Negera it does not fluctuate frequently. Similarly, the inflation rate is linked to the money supply and therefore the monetary authority especially in a small economy can control it.

In term of diagnostic tests, it is found that there is evidence of homosckadicity and normality.

Table 4.6 mean and volatility estimates for KLSI

Independent variables						
	IR	M1	M2	M3	CPI	IP
α_i	0.0039	0.0033	0.0022	-0.0018	-0.0012	0.0035
KLSI(-1)	0.108	0.094	0.046	0.058	0.1051	0.0987***
θ_1	-0.03***	0.064	0.304	0.3369*	1.198*	0.0122
Volatility estimation GARCH (1,1)						
ω	0.000002	-0.000001	-0.00001	0.00005	0.0002	0.000005
∂_1(ARCH)	-0.05998	-0.058*	-0.0518*	0.0223	0.112	-0.073*
γ_1 (GARCH)	1.034*	1.0177*	1.025*	0.9057*	0.619***	1.039*
$\emptyset_1$	0.00008	0.00078	0.002**	-0.0028*	-0.023***	0.0001
$\partial_1 + \gamma_1$	0.974429	0.960092	0.973421	0.928006	0.73129	0.965584
Normality	1.44	0.536	0.827	1.113	0.003	1.193
ARCH LM	9.192	7.725	7.153	6.215	14.587	6.240

* ,** and *** significant at 1%, 5%, and 10% respectively.

Table 4.7 reports the results of the mean and volatility estimates of DJINA on the interest rate, M1, M2, M3, CPI, and industrial production. The one-month lag of DJINA is significant in all of the equations except M1 and industrial production equations. In term of the macroeconomic variables, none is influencing DJINA. In the volatility estimation, GARCH effect is significant in all the estimated equations while ARCH is significant only in M1 and industrial production equations. In terms of macroeconomic volatility M2, M3, and inflation rate are affecting

positively and significantly DJINA fluctuations while the federal fund rate influences DJINA negatively. In term of diagnostic tests, it is found that there is evidence of homosckadicity and normality.

Table 4.7 mean and volatility estimates for DJINA

Independent variables						
	M1	M2	M3	CPI	IP	FFR
α_i	0.002	0.0010	0.002	0.002	0.003	0.003
DJIA(-1)	-0.163	-0.16***	-0.23*	-0.14***	-0.146	-0.186**
θ_1	0.166	0.2176	-0.142	-0.023	-0.024	-0.003
Volatility estimation GARCH (1,1)						
ω	0.00001	-0.00004	-0.00004	-0.00006	0.00001	0.000
∂_1(ARCH)	0.224**	0.012	-0.027	0.039	0.212**	0.093
γ_1 (GARCH)	0.747*	0.941*	1.0*	0.958*	0.772*	0.837*
$\emptyset_1$	0.001	0.010*	0.008*	0.031*	0.001	-0.0001**
$\partial_1 + \gamma_1$	0.97	0.953	0.973	0.997	0.984	0.930
Normality	1.293	1.33	1.642	0.297	0.806	0.790
ARCH LM	5.449	10.364	5.317	8.431	4.283	6.089

*, ** and *** significant at 1%, 5%, and 10% respectively.

Table 4.8 reports the results of the mean and volatility estimates of DJIMI on the interest rate, M1, M2, M3, CPI, and industrial production. One-month lag of the return of DJIMI was included. The one-month lag of DJIMI is not significant in any of the equations. In term of the macroeconomic variables, none is influencing DJIMI. In the volatility estimation, ARCH and GARCH effect are significant in all the estimated equations. In terms of macroeconomic volatility, only M3 and inflation have positive and significant influence on DJIMI fluctuations while M2 has a significant negative effect on DIMI.

The monetary authority can control the supply of money and therefore inflation and the interest rate. Therefore, both DJIMI and DJINA are influenced by the systematic risk of the macroeconomic variables. In term of diagnostic tests, it is found that there is evidence of homosckadicity and normality.

Table 4.8 mean and volatility estimates for DJIMI

Independent variables						
	M1	M2	M3	CPI	IP	FFR
α_i	0.0033	0.004	0.0056	0.009	0.003688	0.0036
DJIMI (-1)	-0.069	-0.031	-0.0663	-0.046	-0.05181	-0.059
θ_1	0.24	-0.138	-0.3072	-2.56	-0.14165	-0.0006
Volatility estimation GARCH (1,1)						
ω	0.00001	0.0001	-0.00002	-0.00005	0.000003	0.00001
∂_1(ARCH)	0.213**	0.37*	0.21***	0.196**	0.22**	0.219**
γ_1 (GARCH)	0.753*	0.59*	0.74*	0.740*	0.75*	0.744*
$\emptyset_1$	-0.0012	-0.017*	0.007***	0.036*	0.0041	0.000002
$\partial_1 + \gamma_1$	0.970	0.960	0.943	0.936	0.971	0.963
Normality	2.346	2.627	2.345	2.148	2.572	2.71
ARCH LM	3.548	4.060	1.955	3.601	3.328	3.147

* ,** and *** significant at 1%, 5%, and 10% respectively.

Table 4.9 displays the results of the full estimation model for returns and its volatility for DJIMI and DJINA with the selected macroeconomic variables. The results of the mean returns model of DJIMI indicate that it is influenced positively by interest rate and M2 and negatively by the growth in inflation. Interest rate and the inflation rate are affecting DJIMI negatively. The negative relationship between rate of inflation and stock returns can be explained by proxy effect introduced by Fama (1981) where indicated that real activity is positively related to stock returns but negatively with inflation leading to the negative relationship between inflation and stock returns. On the other hand, relationship between interest rate and stock prices is different from the negative the hypothesized relationship. The same was found by Bulmash and Trivoli(1991) in the US, Mukherjee and Naka (1995)in Japan, Maysami and Koh (2000) in Singapore, and Maysami Howe, Hamzah (2004) in Singapore. They justified the positive relationship by indicating the short run interest rate does not reflect the movement in nominal interest and that the long run interest rate might be a better proxy for nominal interest rate. The positive relationship of M3 with DJIMI can be explained by the quantity theory of money. The positive impact indicates that the increase in money supply will lead to economic stimulus and therefore

will increase the stock prices. Moreover, in the volatility estimation the ARCH effect, interest rate and rate of inflation are significant.

In comparison, DJINA returns are influenced negatively by its own lag, M2 and positively by M3. On the other hand, DJINA volatility is explained negatively by real activity and M3 but positively by M2.

Table 4.9 mean and volatility estimates for DJIMI and DJINA with all macroeconomic variables

	DJIMI	DJINA
α_i	0.004	0.001
DJIMI (-1)/DJINA (-1)	-0.135	-0.261*
FFR(-1)	0.025*	-0.004
CPI(-1)	-6.143*	-1.336
IP(-1)	0.232	0.185
M1(-1)	0.219	0.472
M3(-1)	1.481*	1.197*
M2(-1)	-0.423	-1.395**
Volatility estimation GARCH (1,1)		
ω	0.000	0.000
ARCH	0.6963*	0.036
GARCH	0.1330	-0.025
FFR(-1)	-0.0003*	0.000
CPI(-1)	-0.0296*	-0.013
IP(-1)	0.0072	-0.011**
M1(-1)	0.0029	-0.002
M3(-1)	-0.0084	-0.020*
M2(-1)	-0.0013	0.047*
Normality	2.80	1.635
ARCH LM	0.044	0.44

* ,** and *** significant at 1%, 5%, and 10% respectively.

Table 4.10 reports the results of returns and volatility estimation of KLSI and KLCI with the selected macroeconomic variables. The estimation for each index was done in two stages one without M3 and one with M3. The reason behind the two estimation is that M1 and M2 have a very strong correlation with M3 creating a problem of multicollinearity in the model. The results of the returns estimation indicates that KLSI are influenced positively by the inflation rate, M1 and M3 while it is influenced negatively by the interest rate. The positive relationship between

inflation and the stock return indicate the KLSI is a good hedge against inflation. M1 and M3 seem to be important policy instrument in effecting stock returns. It means that the increase in M1 or M3 leads to economic stimulus and therefore increases in stock prices. Lastly, the interest rate influence KLSI negatively as hypothesized. The stock evaluation model can explain the negative relationship where the increase in the discount rate reduces the present value of future cash flow.

In addition, the volatility of KLSI is influenced positively by KLSI lagged volatility and negatively by M1, M3 and rate of inflation.

Table 4.10 mean and volatility estimates for KLSI and KLCI with all macroeconomic variables

	KLSI		KLCI	
KLSI(-1)/ KLCI(-1)	-0.015	-0.002	0.092	0.084
C	-0.003	-0.003	-0.001	-0.001
IP(-1)	-0.015	-0.021	0.001	-0.027
CPI(-1)	1.629*	1.526*	0.797***	0.558
IR(-1)	-0.035**	-0.041**	-0.016	-0.012
M2(-1)	0.285	----------	0.149	----------
M1(-1)	0.113**	----------	0.179***	----------
M3(-1)	----------	0.341*	----------	0.295**
C	0.000	0.000	0.000	0.000
ARCH	0.061	0.043	0.080	0.100
GARCH	0.528*	0.527***	0.532*	0.514*
M2(-1)	-0.009**	----------	-0.008	----------
IP(-1)	-0.001	-0.001	-0.001	0.000
CPI(-1)	-0.031***	-0.030*	-0.028**	-0.026
IR(-1)	0.000	0.000	-0.001**	-0.001*
M1(-1)	-0.002	----------	-0.001	----------
M3(-1)	----------	-0.006*	----------	-0.007**
Normality	1.00	1.5	2.35	0.46
ARCH LM	1.90	3.01	0.27	0.69

* ,** and *** significant at 1%, 5%, and 10% respectively.

Summary

Based on the above tables, the results can be divided into two main categories, the first is the individual effect of macroeconomic variables, and the second is the collective effect of the macroeconomic effect.

In terms of the individual effect on the KLSI, it is clear that in the mean return equation M3 and the rate of inflation influence KLSI while the interest rate has a negative effect on KLSI. This indicates that the best monetary policy instruments to influence the Islamic index in Malaysia are M3 and the interest rate. The relationship between KLSI and these three variables is as hypothesized and found in previous studies in Malaysia.

In addition, the results indicate that none of the macroeconomic variables included influence DJIMI.

In terms of the collective effect on the Islamic indices, the result suggests that there are three variables (M2, M3 and the inflation rate) that influence both Islamic indices but in the opposite directions. The inflation rate and M3 are negatively influencing KLSI while M2 has a positive impact on KLSI. This means that KLSI will decrease if there are any shocks to the volatility of the inflation rate and M3 but it will increase if the shocks were on M2.

On the other hand, the opposite is true for DJIMI. M3 and the inflation rate are found to be positively affecting DJIMI while M2 has a negative impact on DJIMI.

Conclusion

This paper is aimed at investigating the effect of monetary policy, interest rate and the rate of inflation the Islamic stock market indices in Malaysia and the US as well as the non-Islamic stock market indices.

The results suggest the following. In the mean equation, KLSI is influenced positively by M3 and the rate of inflation and negatively by the interest rate while DJIMI is not influenced by any of these variables individually. KLSI has different screening criteria from DJIMI this might be

the reason why KLSI is affected by the monetary instruments and inflation but not DJIMI. The result suggest that investors in KLSI react negatively to the increase in the interest rate which is what would any rational investor would do. This means that investors in general whether Muslims or not look at the same macroeconomic variables in this case the interest rate when deciding to invest or not.

In the volatility equation, both Islamic indices are influenced by the same set of monetary variables but in the opposite manner. KLSI (DJIMI) volatility is positively (negatively) influenced by M2. On the other hand, M3 and the rate of inflation volatilities influence DJIMI positively but they affect KLSI negatively. This could lead to the conclusion that the most effective monetary policies in both these stock indices are M2, M3 and the rate of interest. This means the uncertainty in M3 and the inflation rate have positive impact on DJIMI. The opposite is true for KLSI where the lagged volatility in both M3 and the inflation rate have a negative impact on stock returns.

In terms of the collective effect on the Islamic indices, the result suggests that there are three variables (M2, M3 and the inflation rate) that influence both Islamic indices but in the opposite directions. The inflation rate and M3 are negatively influencing KLSI while M2 has a positive impact on KLSI. On the other hand, the opposite is true for DJIMI. M3 and the inflation rate are found to be positively affecting DJIMI while M2 has a negative impact on DJIMI.

In terms of volatility KLSI and DJIMI are affected negatively by the inflation rate. In addition KLSI is affected positively (negatively) by M2 (M3). DJIMI returns volatility is affected by the interest rate risk. In other words, inflation fluctuations influenced DJIMI and KLSI negatively while interest rate volatility affect DJIMI and M2 and M3 affect KLSI only.

The monetary authorities in each economy control these variables. Therefore, the investor should be less concerned about these types of systematic risks and focus more on variables that fluctuate frequently based on market activities such as oil prices and gold prices.

In short, interest rates influence the Islamic stock market indices in Malaysia and the US, although the impact in the US Islamic indices is with the opposite sign. In terms of volatility, interest rate influence DJIMI but not KLSI, which might be due to the stability of the interest rate in small economies such as Malaysia compared to the US. The best money supply definition that the central bank can use is M3 in the case of Malaysia and M1 and M3 in the US. Both have positive impact on the Islamic market indices. Lastly, investing in KLSI is a good hedge against inflation but not DJIMI.

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