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5 January 2018

Online at https://mpra.ub.uni-muenchen.de/104167/
MPRA Paper No. 104167, posted 15 Nov 2020 21:47 UTC

LONG-RUN RELATIONSHIP BETWEEN ISLAMIC STOCK INDICES AND US MACROECONOMIC VARIABLES

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Abstract

The aim of this paper is to examine the long-run relationship between Islamic stock indices (Dow Jones and FTSE) and US macroeconomic variables (economic uncertainty index, federal funds rate, money supply, volatility fear index, consumer price index, Treasury bill and Brent oil price). Daily closing stock prices for the period January 2006 – December 2017 were used selected from US, Europe, Canada, Japan, Turkey, Malaysia, China India, Qatar, Kuwait, and Taiwan. Johansen test for Cointegration and Vector Error Correction Model (VECM) were employed for the analysis. The study found the existence of a long run relationship between the selected Islamic indices, the broad market index (represented by Dow Jones Industrial Average) and the set of US macroeconomic variables. Results from the VECM showed slow speed of adjustments indicating the series were highly volatile and took long time to converge to equilibrium. It is recommended that investors should be concerned with the economic policies of US as it has the tendency to affect the expected returns of Islamic Dow Jones and FTSE in the selected countries.

***Key words**: Cointegration, VECM, Macroeconomic Variables, Islamic stock index, stock market*

JEL Classification G14, E44

2018

1. Introduction

Many studies have examined the relationship between stock prices and macroeconomic fundamentals in different countries. Theoretically, the relationship between stock prices and macroeconomic variables could be explained in terms of market efficiency. The speed and accuracy within which the stock market absorbs correct information and reflect it in stocks prices determines largely how efficient the market is. Informational efficiency of equity markets is determined by how it utilizes and integrates macroeconomic dynamics (Cooper, Chuin and Atkin, 2004: Bayezid, 2011). In other words, the volatility of stock prices is assumed to be a reflection of the transmission of information on corporate performance as well as shocks from changes in macroeconomic variables of a country (Inflation, broad money supply, interest rate, oil price, political uncertainty etc.). Madura (2008) argued that stock prices are possibly affected by three factors economic factor (interest rate and foreign exchange rate), market related factor, and firm-specific factor

Barbic and Condic – Jorkic (2011) explained that whereas stock prices should reflect future expectations on corporate performance, corporate profit should however reflect a country's level of economic activities. In situations where economic fundamentals are incorporated in stock prices, then stock prices could be used as good indicators of a country s' level of future economic performance and vice versa. If this holds, then the knowledge of the interrelationship between stock prices and macroeconomic fundamentals becomes imperative to investors and policy makers in drawing up efficient investment decisions and macroeconomic policies.

Numerous studies have examined the linkage between stock prices and macroeconomic fundamentals of different countries and regions. However, there is no uniformity in the set of financial and macroeconomic variables considered in these studies. The literature on the link between stock prices and macroeconomic variables could be broadly classified in to two: the first group is those that investigated the impact of macroeconomic factors on stock prices, and the second group concentrated on the nexus between volatility of stock prices and volatility of macroeconomic factors. Again the literature differs in terms of the methodology employed, and level of equity market development.

Some of the famous works in the area of macroeconomic variables and stock prices include Humpe and Macmillan (2007), Nasseh and Strauss (2000), Mahmood and Dinniah (2009), Brahmasrene and Jiranyakul (2007), Karamustafa and Kucukkale (2003), Robert (2008), Attari and Safdar (2013). Most of these studies used cointegration analysis and VECM model Akbar et al (2012), Maysami et al. (2004), Pethe and Karnik (2000), Rahman et al. (2009), Naik and Padhi (2012) and Ray and Vani (2003). It is observed that different macroeconomic variables were considered in the literature such as GNP, exchange rate, money supply, interest rate, inflation, the consumer price index, broad money supply, industrial production, treasury bills rates business expectations, and volatility fear index.

This study will build on the works of Nazlioghu, Hammoudeh and Gupta (2013), Khositkulporn (2013), Abugri (2002), Caner and Onder (2005), Ejaz and Akhtar (2015) and Granger, Huang and Yang (2000) by considering the following macroeconomic variables: Consumer price Index (CPI) proxy for inflation, Economic Uncertainty Index (EUI), Federal Funds Rate (ffr), T-Bill (TB), Brent Oil price (Oil), Economic Uncertainty Index (EUI), Volatility Fear Index (VFI) and Money Supply (M2).

The present study will, therefore fill the knowledge gap in the literature by examining the long-run relationship between US macroeconomic variables and Islamic indices across 11 countries. A study like this will guide investors to gain maximum return from their investment portfolios comprising conventional and Islamic stocks. Also Regulators could utilize the study to formulate different policies and decisions for ensuring and creating smooth trading and investment environment in the stock market based on reasonably predictable stock market price behavior.

In line with the main purpose of this paper, emphasis is put on studies that deal with long run co-movements and short run dynamics of macroeconomic variables and stock prices using cointegration analysis. An advantage of cointegration analysis is that through building an error-correction model (ECM), the dynamic co-movement among variables and the adjustment process toward long-term equilibrium can be examined.

The rest of the paper is structured as follows: section two contains the literature review, section three is the research methodology, section four contains presentation and discussion whereas section five concludes the paper.

2. Literature Review

Humpe and Macmillan (2007) demonstrated that US stock prices were positively influenced by industrial production and negatively by inflation and the long interest rate, whereas money supply had a negative effect. Nasseh and Strauss (2000) found a strong relationship between stock prices and some selected macroeconomic variables comprising production, interest rates, business expectations and the consumer price index in France, Germany, Italy, Netherlands, Switzerland and the UK. Using Engle-Granger test and Johansen and Julius maximum likelihood procedure, Mahmood and Dinniah (2009) examined the relationship between stock price and three macroeconomic variables consisting of inflation, output and exchange rates of six countries in the Asian-Pacific region. They found a long-run relationship between stock prices and these variables in all countries. However, there was no evidence of short-run relationship between stock prices and the macroeconomic variables in the selected countries except between foreign exchange rates and stock price in Hong Kong and between real output and stock price in Thailand.

Brahmasrene and Jiranyakul (2007) examined the relation between stock market index and a set of macroeconomic variables in Thailand. They found a positive relation between the stock index and money supply and a negative relation with the industrial production index, the exchange rate and oil prices. Employing the same methodology on Turkish equity market, Karamustafa and Kucukkale (2003), showed that money supply, exchange rate of USD, trade balance, and the industrial production index were cointegrated with stock returns. However, the macroeconomic variables were not the leading indicators for the stock returns, while stock returns was the leading indicator for the macroeconomic performance. Robert (2008) examined the effect of two macroeconomic variables (exchange rate and oil price) on stock market returns for the BRIC countries. He found no significant relationship between present and past market returns with macroeconomic variables.

Attari and Safdar (2013) investigated the relationships between some macroeconomic variables and stock returns in developed and developing countries. Using EGARCH, they discovered that macroeconomic variables had substantial influence on stock prices. Akbar et al. (2012) studied the relationship between the Karachi stock exchange index and macroeconomic variables using vector error correction model (VECM), they discovered a long-run equilibrium relationship between the variables. The results suggested whereas a positive relationship existed between stock prices with money supply and short-term interest rates, a negative one existed with inflation and foreign exchange reserve. In their study, using a VECM model Maysami et al. (2004) reported a significant long-run equilibrium relationship between the Singapore stock market and macroeconomic variables. Using a similar method Pethe and Karnik (2000) examined the inter-relationship between stock price and macroeconomic variables. They found that there was no significant relationship between the state of economy and stock prices.

Other studies that also used the Johansen‘s co-integration and Vector Error Correction Model (VECM) to study the linkage between macroeconomic variables and stock prices included Rahman et al. (2009), Naik and Padhi (2012) and Ray and Vani (2003). Rahman et al. (2009) revealed that in the Malaysian stock market, interest rates, reserves and industrial production index were positively related to stock returns while money supply and exchange rate were inversely related to stock returns in the long-run. Naik and Padhi (2012) studied the Indian stock market index (BSE) and five macroeconomic variables (treasury bills rates, money supply, wholesale price index, industrial production index and exchange rates). They found that BSE had a significant and positive relation with money supply and industrial production but relates negatively with inflation. However, an insignificant relationship was found with exchange rate and the short-term interest rate, and BSE. Ray and Vani (2003) showed that, interest rate, industrial production, money supply, inflation rate and exchange rate had significant effects on stock prices. The studies of Ahmed (2008) and Pal and Mittal (2011) corroborated this finding.

In a study that examined the relationship between economic variables and abnormal returns in Amman stock exchange, AL- Shubiri F.N. (2013) found a statistically significant relationship between abnormal stock returns and consumer price index, gross fixed capital formation and money supply. In a similar study, Mookerjee and Yu (1997) discovered a positive relationship

between Singapore stock returns and narrow and broad money supply. Chen et al. (1986) reported a significant effect of a set of macroeconomic variables on stock prices in US . This was transmitted through their impact on future dividends and discount rates. Fama (1981) examined the linkages between stock market and macroeconomic variables. He found a strong relationship between the real output and stock prices.

Wongbampo and Sharma (2002) investigated the effect of some macroeconomic factors comprising GNP, Exchange rate, money supply, interest rate and inflation on the stock returns in Asian countries. They reported a long run positive correlation between stock returns and economic growth and negative correlation with the aggregate price level. However, they found a positive relationship between stock returns and interest rate in Indonesia and Malaysia, and a negative one in Philippines, Singapore and Thailand. In a similar study, Altay (2003) conducted the same investigation for Germany and Turkey stock markets and found a significant relationship between stock prices and interest rate and inflation rate in the Germany but a negative relation in Turkey.

In their study of the Japanese stock market, Mukherjee and Naka (1995) found a long run cointegration between the stock market return and the selected macroeconomic variables (inflation, money supply, exchange rate, industrial production index, the long-term government bond rate and call money rate). A similar result was obtained by Gan et al.also (2006) who found a long run relationship between market index and the macroeconomic variables (money supply, interest rate and real GDP) in New Zealand. These results corroborated the findings of Ratanapakorn and Sharma (2007) who found positive long-run linkage between stock prices and money supply, short term interest rate, industrial production, inflation, and exchange rate with the exception of long term interest rate.

Islam (2003) examined the short-run dynamic adjustment and the long-run equilibrium relationships between four macroeconomic variables (interest rate, inflation rate, exchange rate, and the industrial productivity) and the Kuala Lumpur Stock Exchange (KLSE) Composite Index. He found a statistically significant short-run (dynamic) and long-run (equilibrium) relationships among the macroeconomic variables and the KLSE stock returns. Cooper, Chuin

and Atkin, (2004) examined the long-term equilibrium relationships between selected macroeconomic variables and the Singapore stock market index (STI), as well as with various Singapore Exchange Sector indices—the finance index, the property index, and the hotel index. The study concludes that the Singapore's stock market and the property index form cointegrating relationship with changes in the short and long-term interest rates, industrial production, price levels, exchange rate and money supply.

Maysami and Koh (2000) examined such relationships in Singapore. They found that inflation, money supply growth, changes in short- and long-term interest rate and variations in exchange rate formed a cointegrating relation with changes in Singapore's stock market levels. Maghyereh (2002) investigated the long-run relationship between the Jordanian stock prices and selected macroeconomic variables, again by using Johansen's (1988) cointegration analysis and monthly time series data for the period from January 1987 to December 2000. The study showed that macroeconomic variables were reflected in stock prices in the Jordanian capital market.

Ahmed (2000) examines the causal relation between DSE stock index and a couple of macroeconomic variables like consumption expenditure, investment expenditures, real economic activity measured by GDP and industrial production index. He employed Granger (1988) causality test and found a causal relation from stock price to consumption expenditures. He also found a unidirectional causality from investment to stock prices; weak relationship between stock price and GDP and no causal relation between stock price and industrial production index. Finally he concluded in that study that stock market is not informationally efficient in Bangladesh.

Ahmed and Imam (2007) examined the long run equilibrium and short tern dynamics between DSE stock index and a set of macroeconomic variables. In the macroeconomic variables they use money supply, 91 day T-bill rate, interest rate GDP and Industrial production index. They applied Johansen and Juselius (1990) maximum likelihood Cointegration test, Vector Error Correction Model (VECM) and also employed Granger Causality test. In the cointegration test, they found two cointegrating vectors but between them one is statistically significant. In the VECM test, they found that the lagged stock index was adjusted to long run equilibrium by

percent by 43.82 percent by the combined lagged influence of all the selected macroeconomic variables. Granger causality test provides a unidirectional causality from interest rate change to stock market return.

The current study builds upon and extends the literature through the employment of Johansen (1988) cointegration test and VECM to examine the long-run equilibrium relationship between selected US macroeconomic variables and conventional and Islamic indices in 11 countries.

3. Data and Methodology

3.1 Data

Two sets of data were obtained in this study. The first was the data on conventional and Islamic indices which was obtained from the official website of *Wall Street Journal* www.wsj.com and the second set comprised of the data on US macroeconomic variables which were obtained from the official website of St. Louis Federal Reserve website *www.fred.stlouisfed.org.* The Dow Jones Industrial Average of the US (US1) was chosen as the broad market index as it has the widest global representation in over 34 countries. The rest were the Islamic Dow Jones in US, Europe, Canada, Japan, Turkey, Malaysia and china. Where the Dow Jones was not available the FTSE index was used as it is the second index with widest representation across countries as well as having Islamic index. As such Islamic FTSE was chosen from India, Qatar Kuwait, and Taiwan.

The US macroeconomic variables included in the Cointegration equations comprised: Brent oil price as a measure of oil market sensitivity and impulse on equity prices, US Economic Uncertainty Index (EPC) used as a proxy for US policy which is responsive to economic and political news, Federal Funds Rate (FFR) to capture the impact of monetary policy on the equity markets under consideration and, measure of volatility and fear index (VLF) in the US equity market to address anxiety in the world markets, US three months T-bills yield as a proxy for short-term interest rate, US inflation rate, and money supply.

Examining the relationship of stock market indices and macroeconomic variables is in line with the work of Barbic & Conduic-Jurkic (2011). The rationale is straightforward: if long run relationship between macroeconomic variables and stock market index exists, macroeconomic

variables are significantly and consistently priced in stock market returns. i.e. stock prices reflect available macroeconomic data.

3.2 Methodology

Johansen test for cointegration and Vector Error Correction Model (VECM) were used for the data analysis in this study. The stationarity of the series was first tested to detect the presence of unit root which is a precondition for cointegration and all the series must be integrated of the same order. Three standard unit root tests; the Augmented Dickey-Fuller (ADF), the Phillips-Peron (PP) and the KPSS test developed by Kwiatkowski, Phillips, Schmidt and Shin (1992) were conducted. Bida (2010), Luintel & Khan (1999) and Liang and Teng (2006) noted that the ADF and PP tests have problems of lower power in rejecting the null hypothesis of a unit root. The ADF test is an adjustment of the DF test to take care of possible serial correlation in the disturbance term by including the lagged difference terms of the dependent variable. Whereas the PP uses nonparametric statistical methods to address the problem of serial correlation without the need for adding lagged values. Both ADF and PP have the same asymptotic distribution (Gujarati and Porter, 2009:758). KPSS was found to have very large powers over the conventional unit root test as such it was employed to complement to the results of the ADF and PP tests.

The Johansen test of Cointegration model has two fundamental assumptions: the variables must be non-stationary and their first difference must be stationary. All the variables must be integrated of the same order. It is only if the variables have long run association (cointegrated) that the VECM model or the restricted VAR model could be applied. The VECM was used in this study because the first two conditions have been satisfied. It turned out that all the variables were non stationary at the levels and all became stationary at the first difference using the ADF, PP and KPSS tests respectively. To further verify this result, the correlogram tests was checked which further confirms the results by the ADF, PP and KPSS tests Therefore, we had the justification for the estimation of the Johansen and VEC models respectively.

The VECM has Cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The Cointegration term is known as the *error correction* term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments (Eviews.com 2018).

One of the leading researches on stock prices and macroeconomic variables is by Burgstaller (2002), who investigated the long-run relations between the stock prices and other macroeconomic variables as well short time dynamics. Using time series data, Burgstaller analyzed empirical relations using vector autoregression (VAR) model. The reduced form of the model is stated as follows:

$$X_t = \mu + \sum_{i=1}^{p} \theta_i X_{t-i} + e_t \qquad (3.1)$$

Equation (3.1) is of order p, with X being a vector of n time series, which are the exogenous explanatory variables. The corresponding vector error correction model (VECM) is given as:

$$\Delta X_t = \mu + \pi X_{t-1} + \sum_{i=1}^{p-1} r_i \Delta X_{t-i} + e_t \qquad (3.2)$$

This is equivalent to the VAR equation in equation (3.1), $r_i s$ are the parameter matrices and e_i is a vector of normally distributed random errors that are contemporaneously correlated, thus having a non-diagonal covariance matrix. If π has a reduced rank, it can be decomposed as $\pi = \alpha\beta$ with $\alpha \; and \; \beta$ being n by r matrices.

The speed of adjustment of the series was measured by the estimated coefficients towards the long-run relations after a shock to the equilibrium has taken place. Burgstaller (2002) claimed that at least one of the long run variables must be responsible for the adjustment.

Johansen and Juselius (1990) specify two likelihood ratio test statistics to test for the number of cointegrating vectors. The first likelihood ratio statistics for the null of exactly *r* cointegrating vectors against the alternative of *r+1* vectors are the maximum eigenvalue statistic. The second statistic for the hypothesis of at most *r* cointegrating vectors against the alternative is the trace statistic. Critical values for both test statistics are tabulated in Johansen and Juselius (1990). The

number of lags applied in the cointegration tests is based on the information provided by the multivariate generalization of the AIC.

4. Presentation and Discussion

Table 4.1 presents the results for the unit root at levels and the first difference. Clearly for the ADF/PP tests, most of the Islamic indices as well as the US macroeconomic variables were not more negative than the critical values; therefore the null hypotheses cannot be rejected, the series were non-stationary. Similarly for the KPSS tests most of the test statistics exceeds the critical values, even at the 1% level, thus the null hypothesis of a stationary series were rejected. The KPSS result corroborates the results of the ADF and PP. Based on these, it is ruled that all the time series were non stationary at the levels. However, the notable exceptions that seemed to be stationary at the level were Islamic indices of China (CHN2) in the ADF and PP tests at 5% level. The US Volatility fear index (VFI) was stationary using the PP statistics as well as economic uncertainty index (EUI) for the ADF statistics.

However, almost all the series became stationary after taking their first differences as depicted in Table 4.1 All the stock indices were stationary at the first difference using the three unit root tests. However, the KPSS test showed some of the macroeconomic variables were non-stationary which comprises ffr (5%), TB (1%), and M32 (1%) and at various levels of significance though they were stationary using the ADF and PP tests. Thus, based on the first two tests it's reasonably concluded that all the series were stationary.

Table 4.1 Results for Unit Root Tests: Levels

Unit Root Test	**Test: Level**			**Test: First Difference**		
Variable	**ADF**	**PP**	**KPSS**	**ADF**	**PP**	**KPSS**
US1	0.998575	1.153444	5.355197	-59.8011	-60.1752	0.404988
US2	-0.30681	-0.15815	6.501568	-58.7662	-58.9586	0.103279
CA2	-2.31873	-2.36459	1.734754	-54.6142	-54.5999	0.07628
JP2	-1.52042	-1.40971	1.997162	-45.0291	-64.6132	0.174815
TKY2	-0.66892	-0.64165	6.236758	-56.177	-56.182	0.075505
MLY2	-1.26393	-1.35838	1.601448	-47.3717	-47.5177	0.197101
CHN2	**-2.89571	-2.80618	1.845581	-57.8755	-57.9459	0.062327
IND2	-2.7571	-2.83016	0.625885	-49.1848	-49.1829	0.305673
QTR2	-1.79868	-1.78086	3.356092	-43.3533	-43.3771	0.071492
KWT2	-0.94111	-0.97878	3.831432	-44.9833	-45.0056	0.133952
EU2	-2.41359	-2.29464	1.842516	-58.6415	-58.7568	0.058961
TWN2	-2.26872	-2.23747	4.601263	-45.7426	-45.774	0.085227
US MACROECONOMIC VARIABLES						
OIL	-1.599154	-1.615346	1.249688	-52.40338	-52.39610	0.093347
VFI	-2.186307	*-4.957853	1.593470	-21.78689	-63.99724	0.033379
FFR	-2.462663	-2.098046	3.777666	-22.45245	-62.36295	0.820596
EUI	*-6.691499	-43.54159	0.936865	-28.75689	-493.3229	0.060885
TB	-2.525841	-2.548085	3.693658	-7.670289	-56.58084	1.393265
M2	2.231925	2.996604	7.139616	-9.712949	-15.58709	1.063345
CPI	-0.932660	-0.932761	6.759878	-54.98392	-54.98978	0.060924

*, and ** imply 1%, and 5% levels of significance respectively

4.3 Johansen Co-integration Test

The Johansen Cointegration test was used to test for Cointegration and the presence of a long run relationship and to determine the number of cointegrating vectors. To estimate the VAR model, the first step is to check the lag structure of the model. It was discovered that eight lags was the optimum for the Johansen and VEC models and therefore, was used in the estimations. based on the AIC criterion.

The Cointegration results presented in Table 4.2 suggests a long run relationship between Islamic indices, the broad market index, represented by Dow Jones Industrial Average (US1) and the macroeconomic variables of the US.

Table 4.2 Johansen Test of Co-integration

Variables	No. of CE(s)	Trace Statistics	0.05 Critical Value	Probability	Max-Eigen Statistic	0.05 Critical Value	Probability
US2	None*	720.7195	197.3709	0.0001	303.3308	58.43354	0.0000
	At Most 5	43.24918	47.85613	0.1266	23.32606	27.58434	0.1600
EU2	None*	768.6238	197.3709	0.0001	313.6106	58.43354	0.0000
	At Most 6	23.36422	29.79707	0.2286	12.47583	21.13162	0.5014
CA2	None*	773.9467	239.2354	0.0000	308.3863	64.50472	0.0001
	At Most 5/6	69.64402	69.81889	0.0516	13.93548	27.58434	0.8271
CHN2	None*	815.2894	239.2354	0.0001	305.2217	64.50472	0.0001
	At Most 6	43.57532	47.85613	0.1192	25.21674	27.58434	0.0975
IND2	None*	420.2817	239.2354	0.0000	146.3172	50.45921	0.0000
	At Most 4	90.85373	95.75366	0.1037	35.64463	40.07757	0.1453
JP2	None*	786.3816	239.2354	0.0000	306.2951	64.50472	0.0001
	At Most 6	46.86213	47.85613	0.0618	22.19774	27.58434	0.2104
KWT2	None*	723.5732	239.2354	0.0000	250.9998	64.50472	0.0001
	At Most 6	47.69246	47.85613	0.0518	29.74428	33.87687	0.1440
MLY2	None*	578.8148	239.2354	0.0000	163.9123	64.50472	0.0000
	At Most 7	18.73103	29.79707	0.5124	10.34474	21.13162	0.7117
TKY2	None*	760.2918	239.2354	0.0000	310.6401	64.50472	0.0001
	At Most 5	68.37990	69.81889	0.0648	33.60312	33.87687	0.0539
TWN2	None*	498.8559	239.2354	0.0000	137.1736	64.50472	0.0000
	At Most 6	45.05494	47.85613	0.0895	20.76254	27.58434	0.2908
QTR2	None*	1211.533	239.2354	0.0001	624.4988	64.50472	0.0001
	At Most 6/5	46.94422	47.85613	0.0608	21.22219	27.58434	0.2630

* denotes rejection of hypothesis at the 5% level
Note: optimal number of time lags selected using AIC obtained after VAR estimation of all endogenous variables

The results shows that all the Islamic indices were cointegrated or have a long-run association with the Dow Jones Industrial average (broad market index), economic uncertainty index, federal funds rate, money supply, volatility fear index, consumer price index, treasury bill and Brent oil price. In all the cases the null hypothesis was rejected which implies that there is cointegration between the selected stock indices and the US macroeconomic variables. In order words they move in the same direction.

In the estimations, both the Trace and Eigen statistics indicated the presence of Cointegration relation between the Islamic stock indices and the US macroeconomic variables with at least 5 cointegrating equations. The specification for the EU index had highly significant Trace and Eigen statistics with at least 6 cointegrating equations. Canada had 5 cointegrating equations in the Trace statistics and 6 cointegrating equations in the Eigen statistics. Both the Trace and Eigen statistics had 6 cointegrating equations for China index. India index had 4 cointegrating

equations and therefore had long term associations with the US macroeconomic variables. Both Japan and Kuwait had highly significant Trace and Eigen statistics with each having 6 cointegrating equations. Malaysia had 7 cointegrating equations in its long term association with the US macroeconomic variables. Turkey had at most 5 cointegrating equations whereas Taiwan had at most 6 cointegrating equations. In Qatar, the Trace statistics had at most 6 cointegrating equations whereas the Eigen statistics had at most 5 cointegrating equations.

From the foregoing, it could be reasonably concluded that there is a long-run association between the Islamic indices of the respective countries, the broad market index (Dow Jones Industrial average) and the US macroeconomic variables comprising economic uncertainty index, federal funds rate, money supply, volatility fear index, consumer price index, Treasury bill and Brent oil price.

4.4 Results of Vector Error Correction Model (VECM)

The results of the VECM as presented in Table 4.3 shows that most of the indices have no long-run association with the US macroeconomic variables with the exception of Kuwait, Malaysia and Qatar indices. The error correction term or speed of adjustment coefficient needs to be negative and significant for the existence of a long-run relationship between the variables.

Table 4.3 Results of VECM

Variables	Coefficient	Std. Error	t-Statistic	Prob
US2	-0.000113	0.000271	-0.414521	0.6785
EU2	1.58E-05	0.000682	0.023158	0.9815
CA2	-6.99E-07	0.000182	-0.003830	0.9969
CHN2	9.29E-05	0.000219	0.423111	0.6722
IND2	0.000139	0.000337	0.411701	0.6806
JP2	-3.93E-06	7.41E-06	-0.530153	0.5960
KWT2	-0.010498*	0.002676	-3.922623	0.0001
MLY2	-2.96E-05*	9.60E-06	-3.079369	0.0021
TKY2	1.98E-05	0.000124	0.159441	0.8733
TWN2	0.001038	0.000334	3.105770	0.0019
QTR2	-0.211191*	0.008272	-25.53051	0.0000

**Significant at the 5% level*

The speed of adjustment of the coefficient of Qatar, Kuwait and Malaysia were found to be highly significant which implies the existence of a long-run association between the Islamic indices of the Dow Jones Industrial average (broad market index), and the US macroeconomic variables. This implies that they all converge to equilibrium in the long-run.

The slow speed of adjustments obtained in the results clearly shows the series were highly volatile and takes a long time to converge to equilibrium. Here investment decisions on these stocks should be based on all available information regarding the dynamics of stock returns. This is important because a fall in stock returns is likely to be followed by further falls in the returns. Similarly, a rise in the stock returns will probably be followed by further rises. This explains the possible reason for the slow adjustment coefficients. Barbic and Condic-Jurkic (2011) are of the view that efficient market hypothesis is confirmed by the presence of cointegration relationship between macroeconomic variables and stock index. This implies that investors in the selected countries could be able to gain above average profit by using information on changes in macroeconomic fundamentals. A similar result was obtained by Barbic and Condic-Jurkic (2011).

5. Conclusion

The study examined the long-run relationship association between selected Islamic stock indices, and set of US macroeconomic variables. Johansen test for Cointegration and Vector Error Correction Model were used. The results shows that all the Islamic indices were cointegrated or have a long-run association with the Dow Jones Industrial average (broad market index), and the US macroeconomic variables comprising economic uncertainty index, federal funds rate, money supply, volatility fear index, consumer price index, treasury bill and Brent oil price. In all the cases the null hypothesis was rejected which implies that there is cointegration between the selected stock indices and the US macroeconomic variables that is, they move in the same direction. In addition, the result of the VECM shows that the speed of adjustment was very slow which is consistent with highly volatile markets. This could be attributed to volatility clustering such that periods of high volatility were followed by periods of high volatility and similarly periods of low volatility were followed by periods of low volatility.

A major policy implication of this finding is that US economic polies have the tendency to affect the Islamic stock returns of Dow Jones and FTSE in US, Europe, Canada, Japan, Turkey, Malaysia, china India, Qatar, Kuwait, and Taiwan. This implies that changes in the US economy, especially macroeconomic fundamentals such as consumer price index, money supply Federal Funds Rate, and T bill rates could transmit volatility shocks to the stock prices of Islamic Dow Jones and FTSE in the selected countries. This is especially likely because the US Dollar is the currency of the basis point for these two stock indices. It is recommended that the presence of long-run relationship implies that investors should be concerned with the economic polies of US as it has the tendency to affect the expected returns of Islamic Dow Jones and FTSE in the selected countries.

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