

The Impact of Macroeconomic Factors on US Islamic and Conventional Equity

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ABSTRACT. This study explores the influence of economic fundamentals on both Islamic and conventional equity in the US stock market by applying various methods of time series techniques focusing on the period from January 1996 to September 2013. The empirical results show that the exogenous variables are industrial production (IP), interest rate (T3), and consumer production index (CPI); whereas Islamic stock index (IS), conventional stock index (CS), and money supply (M2) are endogenous variables. When IP, T3, or CPI receives a shock, it will deviate from the equilibrium and will transmit the shock to other variables whereas if IS, CS, or M2 undergoes a shock, the long-run combination will correct it through the short-run adjustment to the equilibrium. The empirical findings also reveal a higher impact of industrial production and lower impact of interest rate on Islamic equity, as compared to conventional equity. Our results are consistent with the theory that Islamic finance, due to its effective Sharī'ah screening process, is more prevalent in the real economic sector and less associated with interest-based activities.

Keywords: Islamic equity, US stock market, Macroeconomics, Industrial production.

JEL Classification: Z12, G10, G15

KAUJIE Classification: I43, L43, H3

1. Introduction

A vast number of studies have explored the relationship between stock returns and macro-economic factors such as inflation, real output, interest rate, and money supply (Fama & Schwert, 1977; Fama, 1981; Fama, 1990; Schwert, 1990). These studies confirmed that a significant relationship exists between equity returns and changes in the macroeconomic environment.

On the one hand, Islamic finance is based on Islamic law (Shari'ah), which prohibits dealings tantamount to interest (*riba*), ambiguity (*gharar*), and gambling (*maysir*). On the other hand, conventional financial institutions' dealings and transactions are mainly associated with money lending and borrowing based on interest. Hence, unlike their conventional counterparts, Islamic financial institutions' (IFIs) activities must comply with the Shari'ah (el-Gamal, 2006, pp. 32-35). The alternatives offered by Shari'ah are solely based on real economic activities by means of risk sharing. In case of a financial catastrophe, risk-sharing contracts are meant to break up the loss and its associated burden to all parties of a given transaction in order to ease the unsympathetic effect of financial bubbles and crises on market players.

Shari'ah screening ensures compliance of players in the Islamic financial markets where every stock has to undergo a test against benchmarks of Shari'ah prohibitions in order to be a Shari'ah-compliant stock. For instance, a company will be excluded from Dow Jones Islamic Market index (DJIM) if its income from alcohol, tobacco, pork-related products, conventional financial services, weapons, and entertainment (e.g. hotels, casinos, cinema, pornography, etc.) exceeds 5% of revenue. Further, a second level of (DJIM) screening focuses on the debt level and interest income where total debt, accounts receivables, or interest-bearing securities must not exceed 33.3% (S&P Global, 2019, p. 27).

In theory, Islamic finance heavily relies on real economic investments as well as ethical and social investments. However, critics opine that Islamic finance is merely an instrument to attract wealthy Muslims. Generally, many hypotheses regarding this argument appear to be not well grounded by empirical evidence. This study aims to fill this gap through

testing whether the two equity classes (i.e., Islamic and conventional) are similarly affected by changes in the macroeconomic environment. Considering the Shari'ah screening, Shari'ah-compliant stocks shall be concentrated in industries that may differ from conventional stocks. The response to changes in the macroeconomic environment shall also vary accordingly. For instance, high concentration in real economic activities shall result in a stronger relationship between the stock and industrial production.

The study focuses on the US equity market seeing it as a developed market influencing many national markets in addition to the availability of long-term data sets of both Islamic and conventional equity prices and other macroeconomic variables that cover the whole period from January 1996 till September 2013 sourced from *datastream*. The macroeconomic variables used by the study are: Industrial Production US as proxy for real output; 3-Months Treasury Bills US and Money Supply US as proxies for monetary policy; and Consumer Price Index as a proxy for inflation.

The study aims to provide investors and policy-makers with empirical evidence on the macroeconomic factors that impact the US Islamic and conventional equity markets. The research objectives of this study are to: (i) identify the macroeconomic factors influencing the US stock market of both Islamic and conventional equity; (ii) analyze the relative effect of these macroeconomic factors on the two equity classes; and (iii) determine whether Islamic and conventional equity are similarly affected by changes in the macroeconomic environment. The study employs the Johansen multivariate cointegration approach to check the long-run theoretical relationship; vector error correction model (VECM) to determine the speed of the short-run adjustment towards long-term equilibrium; impulse response functions (IRFs) and variance decomposition technique (VDCs) to explore the relative exogeneity/ endogeneity of the equity indices; and persistence profile (PP) test to determine the time horizon required for the cointegrating relationship to move back to equilibrium following an economic shock.

The study is organized as follows. Section 2 outlines the literature in empirical finance related to

Islamic and conventional equity markets. Section 3 presents the data and methodology. Section 4 discusses the empirical results and we conclude with Section 5.

2. Literature Review

Efficient market hypothesis states that stocks are always traded at their fair value (Malkiel, 1989, pp. 127-129). Accordingly, changes in the macroeconomic fundamentals will impact firms' performance and their stock prices. There is a considerable amount of literature on the linkage between the macroeconomic variables and equity prices (Mukherjee & Naka, 1995; Bjørnland & Leitemo, 2009; Cherif & Gazdar, 2010; Forson & Janrattanagul, 2014; Nyasha & Odhiambo, 2015). In the US market, studies have reported contradictory evidence. For instance, Laopodis (2006, p. 519) reported an absence of a relationship between industrial production and equity prices. Whereas, Pesaran and Timmermann (1995, p. 1201) focused on the robustness of predicting US stock returns and found that the predictability level of stock returns was quite low during the 1960s but increased to exceed transactions costs and could have been exploited by investors in the volatile markets of the 1970s.

A strain of studies concentrated on the impact of macroeconomic fundamentals not only on conventional equity but also on Islamic equity. Hoque, Kabir, Abdelbari, and Manahov (2016, p. 217) focused on the newly launched MSCI Global Islamic Indices. Though fundamental differences exist between Islamic and conventional equity in terms of debt ratio, accounts receivables, and interest-bearing securities, their findings show that the two stock markets move in the same direction. Surprisingly, despite that Islamic equities are theoretically less volatile than conventional equities since the former must maintain leverage ratio at low levels, this study found that during the crisis period Islamic indices are more volatile than their conventional counterparts and vice versa during the post-crisis period. Mensi, Hammoudeh, Yoon, and Balcilar (2017, p. 1268) investigated the macroeconomic factors influencing the GCC stock markets and found that improvements in the global stock markets as well as oil prices enhanced the performance of GCC stock markets whereas gold prices and interest rates had a negative correlation with GCC stock markets' performance.

Dewandaru, Rizvi, Sarkar, Bacha, and Masih (2014, p. 1) focused on both developed and emerging countries in a large set of 37 countries. Their findings lend support to the existence of a linkage between macroeconomic factors vis-à-vis Islamic and conventional indices. They reported that, among the investigated macroeconomic factors, industrial production has a higher impact on Islamic equities whereas money supply and interest rate have a lower impact on Islamic equities in comparison to their conventional counterpart. Whilst this finding supports the notion that, compared to conventional stocks, Islamic stocks are more exposed to changes in the real sector of the economy, Laopodis (2006, p. 543) found that there is no linkage between real economic activity and stock prices during the last thirty years. Furthermore, Laopodis (2011, p. 247) focused on a set of developed countries including France, Germany, Italy, the UK, and the US. The study found that equity prices were not much affected by industrial production or interest rates.

In addressing the question of whether Islamic and conventional equity prices are similarly impacted by the macroeconomic factors, Dewandaru et al. (2014, p. 17) discovered that macroeconomic fundamentals impact Islamic and conventional equity differently. On the contrary, few studies such as Elfakhani, Hassan, and Sidani, (2005); Hassan and Antoniou (2007); Abdullah, Hassan, and Mohamad (2007); and Hassan and Girard (2010) investigated whether conventional mutual funds outperform the Islamic ones and reported that they perform similarly. This study, therefore, aims to fill the gap in the literature through providing an empirical evidence on the relative impact of the macroeconomic factors on both Islamic and conventional equity indices in a highly efficient and developed market such as the US equity market.

3. Data and Methodology

The stock market variables include Dow Jones stock indices of both Islamic and conventional in the US market. The key macroeconomic variables include industrial production US as a proxy for economic output, consumer price index US as a proxy for inflation, money supply US and short-term interest rate US as a proxy for monetary policy. The study takes M2 as a proxy for money supply and 3-month treasury bills rate as a proxy for short-term interest rate.

The study collects monthly data series starting from January 1996 to September 2013 of stock market and macroeconomic variables data from *Datastream*.

3.1 Econometrics Modeling

Considering the non-stationarity nature of most macroeconomic and financial variables, the traditional multivariate regression analysis has serious limitations as it provides either spurious relationship or a short-run relationship (Masih, al-Sahlawi, & De Mello, 2008, p. 203). The study employs the Johansen multivariate cointegration approach to examine the cointegration among the equity prices with a view to check the long-run theoretical relationship of the indices. After checking for cointegration, the study applies VECM to explore the speed of the short-run adjustment towards long-term equilibrium. VECM also helps to identify the endogenous and exogenous indices. Furthermore, to explore the relative exogeneity/endogeneity of the Islamic equity index, the study utilizes IRFs and VDCs. Finally, the study utilizes PP test to determine the required period to move back to equilibrium following an economic shock.

3.2 Non-Stationary Test and Johansen Cointegration

Augmented Dickey-Fuller (ADF) is used to check the stationarity of the variables as a starting point of the Johansen cointegration test. To determine the lag length for the time series analysis, the lag length given by the minimum Akaike Information Criteria (AIC) and Schwarz Information Criteria (SBC) is chosen. ADF test includes the estimation of the following specifications:

$$\Delta X_t = \alpha_0 + \alpha_1 T + \beta X_{t-1} + \sum_{j=1}^p \delta_j \Delta X_{t-j} + \varepsilon_t \quad (1)$$

Where, Δ represents the difference operator and α , β , and δ are coefficients to be estimated. X stands for the variable whose stationarity should be checked and ε is the residual term. The critical values for the Dickey-Fuller test (DF) depend on whether the DF regression contains an intercept term or a time trend.

After testing the stationarity of the variables, Johansen cointegration technique examines the cointegration of the concerned Islamic equity indices. The study considers the vector autoregressive (VAR)

model suggested by Johansen and Juselius (1990, p. 169) and Johansen (1988, p. 234), as follows:

$$\Delta Y_t = C + \sum_{i=1}^k \Gamma_i \Delta Y_{t-1} + \Pi Y_{t-1} + \varepsilon_t \quad (2)$$

Where, Y_t is a vector of non-stationary variables and C is a constant term. Γ_i comprises the short-run adjustment parameters whilst Π comprises the long-run equilibrium relationship information. Π could be decomposed into the product of two $n \times r$ matrix χ and v so that $\Pi = \chi v$, where v matrix contains r number of cointegration and χ represents the speed of adjustment parameters. To identify the number of cointegrating vectors, the study utilizes Trace statistic (λ_{Trace}) and the maximum Eigenvalue statistic (λ_{Max}).

A theoretical relationship between the variables is proven upon the presence of cointegration. Hence, despite short-term deviations, the variables are in equilibrium in the long-run. In other words, the variables are interdependent and each variable possesses information for predicting others. However, the presence of cointegration does not express the direction of Granger causality to determine the exogeneity/endogeneity of the variable. Thus, the study utilizes VECM to determine the endogeneity/ exogeneity of the variables. The error correction term (ECT) stands for the long-term relationships among the variables. One of the ECT terms must be significant for the validity of the cointegrating relationship in the long-run. VECM is represented in equation (5) whilst the generalized (reduced) VECM is represented in equation (6).

$$\Delta Y_t = C + \Pi Y_{t-k} + \Gamma_1 \Delta Y_{t-1} \dots + \Gamma_{k-1} \Delta Y_{t-(k-1)} + \varepsilon_t \quad (5)$$

Where, $\Pi = (\sum_{i=1}^k \theta_i) - I_g$ is the long-run coefficient of lagged Y_t , and $\Gamma_i = (\sum_{j=1}^i \theta_j) - I_g$ is a coefficient matrix of $k-1$ lagged difference variables, ΔY_t .

$$\Delta Y_t = C + \Pi Y_{t-k} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \quad (6)$$

Where, ΔY_t is the vector of the variables first differences. The long-run parameter matrix, Π with r cointegrating vectors ($1 \leq r \leq 5$), i.e., Π has a rank of r and can be decomposed as $\Pi = v\mu$, where both v and

μ are $5 \times r$ matrices. The μ matrix contains the parameters in the cointegrating relationships and the v matrix contains the adjustment coefficients, which measure the strength of the cointegrating vectors in the VECM. Finally, the study utilizes VDCs to explore the variance of the forecast error in which each variable proportionally attributes to other variables including its own. IRFs is the graphical representation of VDCs. IRFs demonstrates how each endogenous variable responds to a shock in its own and in every other endogenous variable over time.

4. Empirical results

This section provides the results of the study according to our objectives. The study performs several empirical tests that include unit root, cointegration,

long-run structural modelling (LRSM), VECM, VDCs, IRFs and PP.

4.1 Unit Root Test and Order of VAR

The stationarity of variables should be checked before proceeding to the cointegration test. The study applies ADF unit root test to check the stationarity of the variables at level and difference form (Table 1). The requirement is that the level-form variable should follow unit root (non-stationary) while the difference form has to be stationary. The ADF basically tests the null hypothesis $\rho=0$ given by the t-ratio of the coefficient of x_{t-1} . If the t-ratio of the coefficient is not statistically significant, we can accept the null that $\rho=0$ and the variable is non-stationary.

Table (1) ADF Test for Level-Form and Difference-Form

Variable	Statistical value	Critical value	Null Hypothesis
<i>ADF test for level-form of variables:</i>			
LIS	-2.4099	-3.4325	Accepted
LCS	-2.5603	-3.4325	Accepted
LIP	-3.0465	-3.4325	Accepted
LM2	-2.3335 (AIC)	-3.4325	Accepted
	-2.0026 (SBC)		
LT3	-1.8856 (AIC)	-3.4325	Accepted
	-2.3114 (SBC)		
LCPI	-2.2257	-3.4325	Accepted
<i>ADF test for difference-form of variables:</i>			
DIS	-10.0632	-2.8756	Rejected
DCS	-10.4697	-2.8756	Rejected
DIP	-3.4566	-2.8756	Rejected
DM2	-5.6274 (AIC)	-2.8756	Rejected
	-6.9345 (SBC)		
DT3	-10.4919	-2.8756	Rejected
DCPI	-10.0543	-2.8756	Rejected

Source: Author’s computations.

Stationarity of the variables necessitates an accurate and efficient prediction in future. Table (1) concludes that all variables are non-stationary at level and stationary at first difference, implying that the variables are integrated of order I(1). Based on the highest AIC and SBC, the study chooses the ADF regression order. Note that in some instances AIC and SBC give different orders and the study therefore takes different orders and compares both (LM2, DM2, LT3). However, this is not a problem considering that the implications are consistent.

Considering the order of VAR, the test will include AIC and SBC that determine how many lags of each variable should be included in our model (Table 2). The results show that the best optimum is 4 lags, based on the highest value of AIC (3390.3) compared to AIC (3372.8) of 5 lags. The study relies on AIC considering the high number of observations (209).

4.2 Engle-Granger, Johansen Cointegration and Long Run Structural Modeling (LRSM)

The study applies the standard Johansen Cointegration test to check the cointegration among the variables with a VAR order of 4 (Table 3).

Table (2) Order of Lags

Order	AIC	SBC	P-Value	Null Hypothesis
0	3316.6	3300.6	.000 < .05	Rejected
1	3395.4	3353.4	.000 < .05	Rejected
2	3386.6	3256.8	.003 < .05	Rejected
3	3385.1	3195.4	.023 < .05	Rejected
4	3390.3	3140.7	.490 > .05	Accepted
5	3372.8	3063.3	.250 > .05	Accepted

Source: Author's computations.

Table (3) Johansen Cointegration Test and Cointegration LR

Johansen Cointegration Test				
Criteria	Cointegrating Vectors			
Maximal Eigenvalue	1			
Trace	1			
AIC	6			
SBC	0			
HQC	1			

Cointegration LR based on Maximum Eigenvalue				
Null	Alternative	Statistic	95% CV	90% CV
R=0	R=1	53.9806	43.6100	40.7600
R=1	R=2	29.8853	37.8600	35.0400

Cointegration LR based on Trace Stochastic Matrix				
Null	Alternative	Statistic	95% CV	90% CV
R=0	R=1	134.8426	115.8500	110.6000
R=1	R=2	80.8620	87.1700	82.8800

Choice of the Number of Cointegrating Relations Using Model Selection Criteria				
Rank	AIC	SBC	HQC	
R=0	-	3252.0	-	
R=1	-	-	87.1700	
R=6	3467.9	-	-	

Source: Author's computations.

Maximum eigenvalue test statistic, trace test statistic, and HQC indicate the presence of one cointegrating relationship among the I(1) variables whereas according to AIC and SBC, there are 6 and 0 cointegrating vectors, respectively. For AIC, SBC, and HQC, the study derives the number of cointegrating vectors through locating the highest numbers. We tend to believe that there is one cointegration vector, based on intuition as well as familiarity with theory, that stock market is connected to the performance of macroeconomic factors, e.g., interest rate, industrial production, money supply, and inflation.

The results show that, on the one hand, eigenvalue statistic null hypothesis (H0): R=0 against alternative hypothesis (H1): R=1 is 53.9806 > 43.6100 (95% CV), which implies the rejection of H0 and

acceptance of H1. On the other hand, trace stochastic matrix test shows that statistic null hypothesis (H0): R=0 against alternative hypothesis (H1): R=1 is 134.8426 > 115.8500 (95% CV) which also implies the rejection of H0 and acceptance of H1. Hence, the study concludes that there exists only one statistically significant cointegrating relationship among the I(1) variables. Trace statistic also confirms the presence of one cointegrating relationship among the concerned variables. This implies the existence of a theoretical relationship among the variables. Though a variable movement may deviate from others in the short-run, they are in equilibrium in the long-run. An evidence of cointegration also implies that there exists a common force that brings each variable to equilibrium in the long term.

The cointegration can also be proven by virtue of the fact that in VECM there is at least one variable that is shown to be endogenous (the change in the variable is significantly related with the error correction term $et-1$). In LRSM, the study attempts to

quantify the theoretical relationship between the variables which enables us to compare statistical findings with theoretical expectations (Table 4). Using LRSM, we normalize our variable of interest, Dow Jones Islamic Index (LIS).

Table (4) Exact and Over Identifying

Variable	Coefficient	Std. Error	T-Ratio
<i>Exact Identifying</i>			
LIS	-	-	-
LCS	-1.3444*	0.28052	-4.7925
LIP	-2.9066	2.0991	-1.3846
LM2	4.3434	2.6853	1.6175
LT3	0.23787*	0.093987	2.5309
LCPI	-10.0750	6.0552	-1.6639
Trend	0.0073154	0.015127	0.4835
<i>Over Identifying</i>			
LIS	-	-	-
LCS	-1.2690*	0.24379	-5.207
LIP	-3.1053	2.1035	-1.476
LM2	5.1148*	2.4403	2.096
LT3	0.2328*	0.09047	2.573
LCPI	-8.4582*	4.4301	1.909
Trend	-	-	-
			CHSQ (1) = 0.25004[.617]
P-Value is higher than 10%; we accept that the coefficient of trend is zero.			
LIS	-	-	-
LCS	-1.6276*	0.12253	-13.283
LIP	-	-	-
LM2	2.3433*	0.72322	3.240
LT3	0.12072*	0.022419	5.384
LCPI	-3.7270*	1.5394	-2.421
Trend	-	-	-
			CHSQ (2) = 5.9909[.050]

P-Value is lower than 10%; we reject that the coefficient of LIP is zero. Thus, we rely on over identifying as our model.

Source: Author's computations.

In over identifying restriction, the coefficient of trend is set to zero. The Chi Square shows that the p-value is 61.7%. Thus, the null hypothesis is accepted; the coefficient of trend is zero. Another insignificant variable is LIP, where we put another restriction in which the coefficient of LIP is set to zero. However, the p-value of Chi Square is 5%; we reject the null hypothesis at the 10% significant level. Therefore, the coefficient of LIP is not statistically zero and we need to keep the LIP variable in our long-run equation.

4.3 Vector Error Correction Model (VECM)

The study utilizes VECM technique to identify the exogenous (leading) and endogenous (following) variables. The dependent variable is exogenous if the coefficient of the lagged ECT is insignificant, whereas it is endogenous if the lagged ECT coefficient is significant. In other words, an exogenous variable is not influenced by other variables' deviations whereas an endogenous one is impacted by other variables' deviations. Table (5) reveals that the exogenous variables are industrial production (IP), interest rate (T3), and consumer production index (CPI); whereas

Islamic stock index (IS), conventional stock index (CS), and money supply (M2) are endogenous variables. Therefore, when IP, T3, or CPI receives a shock, it will deviate from the equilibrium and transmit the shock to other variables. Whereas, if IS, CS, or M2 undergoes a shock, the long-run combination will correct it through the short-run adjustment to the equilibrium.

This finding is in line with Abdullah and Hayworth (1993, p. 57) who tried to explain the monthly stock price fluctuations by using the Standards & Poor's 500 stock price index as a representation of stock prices. Their findings strongly reject the view that stock prices are strictly exogenous. Likewise, Kwon and Shin (1999, pp. 79-80) examine whether stock prices in Korea are cointegrated with a group of macroeconomic variables consisting of foreign exchange rates, trade balance, production level, and money supply. Their findings revealed that the stock price indices are not a leading indicator for economic variables suggesting that the Korean market is more sensitive to international trading activities than to

inflation or interest rate variables. In India and China, Hosseini, Ahmad, and Lai (2011) investigated the relationship between stock market indices and four macroeconomics variables, namely crude oil price, money supply, industrial production, and inflation rate. Their findings support the existence of both long- and short-run linkages between macroeconomic variables and stock market index in each of these two countries. Another study on the Indian market by Pal and Mittal (2011, p. 94) found, similarly, that there is a long-run relationship between the Indian capital markets and key macroeconomic variables such as interest rates, inflation rate, exchange rates, and gross domestic savings.

In a nutshell, this empirical finding implies that investors in the US stock market shall prioritize monitoring the movements of real output, interest rate, and inflation. Hence, if one of these exogenous variables (i.e., IP, T3, and CPI) receives a shock, it will severely impact both Islamic and conventional equity prices.

Table (5) VECM

Variable	Coefficient	Implication
LIS	0.079960*	Endogenous
LCS	0.098709*	Endogenous
LIP	0.0064741	Exogenous
LM2	-0.0089807*	Endogenous
LT3	-.14550	Exogenous
LCPI	.0025030	Exogenous

Source: Author's computations.

The coefficient of $et-1$ shows how long it takes to go back to equilibrium if a variable received a shock. For instance, ECT coefficients of IS and CS are 2.88 and 3.79, respectively. This implies that when these indices receive a shock, it would take on average 1.13 months for IS and 1.26 months for CS to get back to equilibrium. In other words, the Islamic stock index recovers faster than its conventional counterpart. However, before deriving any useful information, we need to evaluate the response of each variable to the shock in order to observe the relative exogeneity/endogeneity amongst variables.

4.4 Variance Decompositions (VDCs)

Though VECM indicates the endogeneity/exogeneity of variables, it does not reveal the relative degree of

endogeneity/exogeneity and the study, therefore, utilizes VDCs technique to explore the variables' relative degree of endogeneity/exogeneity. Table 6 represents Orthogonalized VDCs results. The most exogenous variable is explained mostly by its own past. The rows in the table represent the variance of forecast error percentage of each variable into proportions due to shocks from other variables. The columns denote the variable's contributions in explaining other variables' observed changes. The diagonal line of cells represents the relative exogeneity. Accordingly, the ranking of variables by the degree of exogeneity is presented in Table 7.

Table (6) Orthogonalized VDCs

Variable	LIS	LCS	LIP	LM2	LT3	LCPI
<i>10 Months Forecast Errors</i>						
LIS	73.84%	6.70%	7.20%	0.33%	3.35%	8.54%
LCS	69.96%	1.60%	74.54%	0.30%	9.46%	11.30%
LIP	13.25%	0.35%	74.54%	1.94%	6.56%	3.33%
LM2	4.21%	3.12%	5.95%	56.25%	18.40%	12.04%
LT3	7.58%	0.50%	14.47%	2.36%	69.77%	5.29%
LCPI	6.82%	1.69%	4.29%	3.23%	20.71%	63.23%
<i>20 Months Forecast Errors</i>						
LIS	64.93%	8.36%	6.48%	0.30%	4.47%	15.44%
LCS	57.55%	1.47%	5.57%	0.21%	12.52%	22.66%
LIP	11.4%	0.93%	65.34%	2.12%	9.90%	10.29%
LM2	1.99%	4.25%	3.06%	45.92%	20.97%	23.78%
LT3	9.57%	0.34%	17.95%	1.40%	63.47%	7.25%
LCPI	7.05%	3.39%	4.27%	4.34%	30.54%	50.38%

Source: Author's computations.

Table (7) Ranking of Variables by Degree of Exogeneity (Orthogonalized VDCs)

Variable	Rank
LIP	1
LIS	2
LT3	3
LCPI	4
LM2	5
LCS	6

Source: Author's computations.

The results are somehow puzzling since LIS was found to be endogenous in the previous VECM analysis. According to VDCs, LIS is ranked number 2 in terms of relative exogeneity whereby all other results are consistent with VECM results. However, this is not particularly surprising if we consider the limitations of orthogonalized VDCs, which assumes that all other variables are switched off when a particular variable is shocked. Moreover, the generated numbers rely on the VAR order of variables which mainly led to our biased ranking of LIS. In general, the first variable in order reports the uppermost percentage and becomes the most exogenous. However, in our case, it was ranked as the second due to its high dependence on its own past as well as being the most exogenous.

Based on the previous discovery, the study utilizes Generalized VDCs instead of Orthogonalized VDCs analysis since the former does not depend on the particular ordering in the VAR nor makes such an assumption of switching all the variables off. Table 8

represents Generalized VDCs results. However, interpreting these results necessitates performing further calculations because, unlike Orthogonalized VDCs, the numbers do not add up to one. Thus, the numbers of each row are aggregated and subsequently each variable is divided by the computed total. Table 9 summarizes the ranking of variables based on their degree of exogeneity. We observe from Table 9 that the Generalized VDCs results are consistent with the VECM (LIP, LCPI, and LT3 are exogenous whereas, LIS, LCS, and LM2 are endogenous); the relative ranking of exogeneity is somehow stable (there is only one change in the ranking between 10 and 20 months where LCPI and LT3 switch positions but they still rank among the first three variables which again emphasizes their exogeneity); and finally, the variation of exogeneity level among the variables is unsubstantial except in the case of LCS (the most endogenous) which shows to be less dependent on its past (41.34% in 10 months and 38.23% in 20 months) and more dependent on other variables.

Table (8) Generalized VDCs

Variable	LIS	LCS	LIP	LM2	LT3	LCPI
<i>10 Months Forecast Errors</i>						
LIS	50.39%	40.17%	5.07%	0.28%	2.91%	1.14%
LCS	44.36%	41.34%	4.59%	0.25%	8.04%	1.39%
LIP	13.58%	12.06%	66.49%	0.27%	4.73%	2.83%
LM2	5.79%	3.35%	6.62%	58.86%	19.33%	6.01%
LT3	7.37%	6.92%	13.85%	3.65%	65.84%	2.34%
LCPI	7.13%	5.29%	3.91%	1.67%	15.86%	66.11%
<i>20 Months Forecast Errors</i>						
LIS	50.01%	38.34%	5.17%	0.17%	3.76%	2.52%
LCS	42.79%	38.23%	4.01%	0.14%	10.89%	3.90%
LIP	12.97%	10.72%	61.72%	0.48%	7.22%	6.86%
LM2	3.27%	1.71%	3.74%	52.29%	24.33%	14.63%
LT3	9.68%	8.66%	17.55%	2.71%	59.27%	2.09%
LCPI	7.83%	5.30%	4.01%	2.53%	21.95%	58.35%

Source: Author's computations.

Table (9) Ranking of variables by degree of exogeneity (Generalized VDCs)

Variable	Rank	
	10 Months	20 Months
LIP	1	1
LCPI	2	3
LT3	3	2
LM2	4	4
LIS	5	5
LCS	6	6

Source: Author's computations.

4.5 Impulse Response Functions (IRFs) and Persistence Profile (PP)

IRFs portray the dynamic response path of a variable due to one standard deviation (SD) shock to another variable. We normalize IRFs in which zero represents the steady state value of the response variable. In

other words, IRFs illustrate the response of all variables owing to a shock to a specific variable. IRFs look into the impact of a variable-specific shock on the long-run relationships. Figure 1 illustrates IRFs when the shock is directed to each variable in order to observe the impact on other variables.

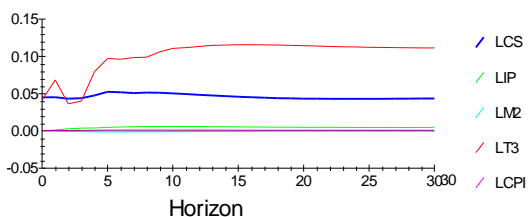
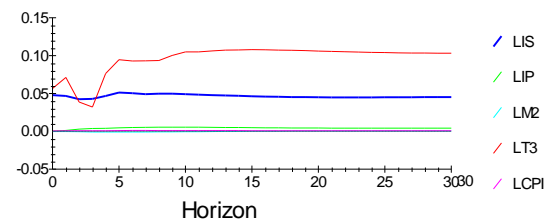
Figure 1(a) Generalized Impulse Responses to One S.E. Shock in The Equation for LIS**Figure 1(b) Generalized Impulse Responses to One S.E. Shock in The Equation for LCS**

Figure 1(c) Generalized Impulse Responses to One S.E. Shock in The Equation for LIP

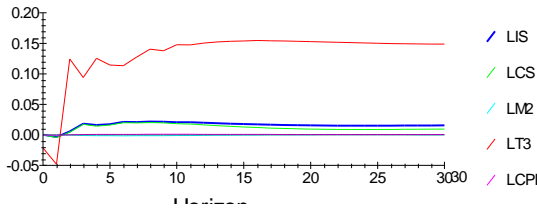


Figure 1(e) Generalized Impulse Responses to One S.E. Shock in The Equation for LT3

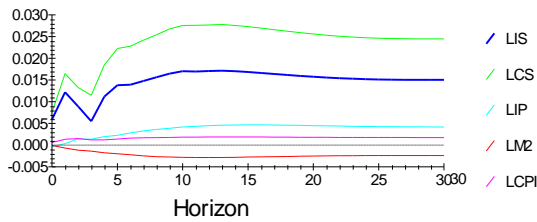


Figure 1(d) Generalized Impulse Responses to One S.E. Shock in The Equation for M2

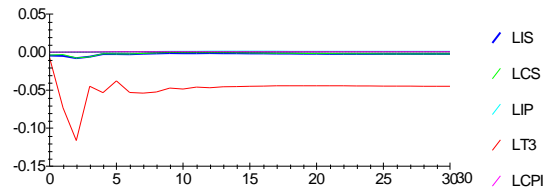
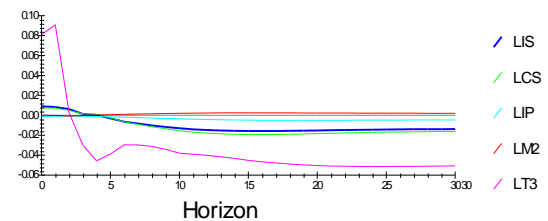


Figure 1(f) Generalized Impulse Responses to One S.E. Shock in The Equation for LCPI



Source: Author's computations.

Figure 1 is revealing in several ways. First, LIS is endogenous and ranks number 5 in VDCs. Theoretically, when an endogenous variable undergoes a shock, the impact on other variables is relatively low. However, LCS and LT3 are still influenced by such a shock which can be explained based on the overall impact on the stock market. Second, LCS is endogenous and ranks number 6 in VDCs (most endogenous). Third, LIP is exogenous and ranks number 1 in VDCs (most exogenous). Thus, the relative impact on other variables is high when LIP receives a shock. However, it is apparent from the figure that when there is a shock to LIP, the effect is higher on LIS than it is on LCS, which is consistent with the theory that Islamic finance is highly associated with real economic activities such as manufacturing, agriculture, telecommunication, etc. In summary, this result supports the notion that Islamic investment is concentrated in the real sector of the economy. Fourth, LM2 is endogenous and ranks number 4 in VDCs. This finding hints that the significant monetary policy indicator in the US market is interest rate rather than money supply. Therefore, investors shall prioritize focusing on interest rate developments rather than money supply in light of the fact that the former is a leading variable whilst the latter is a following one. Fifth, LT3 is exogenous and ranks number 3 in VDCs. To illustrate further, when one SD shock is

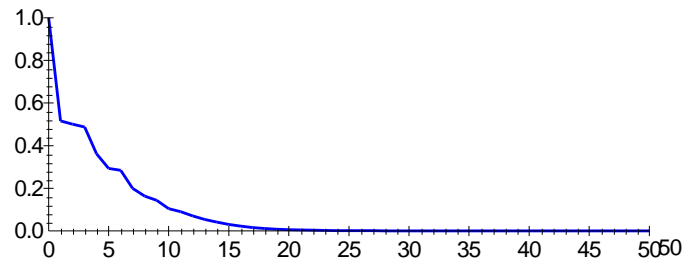
directed to LT3, LCS deviates from its equilibrium by 0.025 SD, whereas LIS only deviates by 0.015 SD, which is in line with the theory that conventional finance is highly associated with interest rate, compared to Islamic finance. Overall, when there is a shock to interest rate, the whole stock market of both conventional and Islamic equities is severely influenced. Though, in theory, Islamic finance shall not be linked to interest-bearing activities, the relatively tiny size of US Islamic equities compared to their conventional counterpart has contributed to this finding. Finally, LCPI is exogenous and ranks number 2 in VDCs. Hence, when LCPI receives a shock, the impact on the other variables is relatively high (Chen, Roll, & Ross, 1986, p. 395). However, the impact on LIS is relatively lower than that on LCS. This is not surprising considering the stocks listed on the Islamic and conventional indices. The Islamic index has removed some firms with substantial market capitalization that may perform well during the high inflation regime especially in bullish markets.

We proceed with PP test that indicates the time horizon required for all variables to get back to equilibrium when a system-wide shock occurs. The main difference between PP and IRFs is that the former traces out the effect of a system-wide shock whereas the latter focuses on the impact of a variable-specific

shock on the long-run relations. In PP test, we shock our whole equation in which the shock is caused by an external factor outside our equation or system. Figure 2 shows that when there is a system-wide

external shock, all variables will deviate from their cointegrating equilibrium and it will take them 20 months to get back to equilibrium.

Figure (2) Persistence Profile of The Effect of a System-wide Shock to CV'(s)



Source: Author's computations.

5. Summary and Conclusions

This study investigates the influence of macroeconomic environment on US Islamic and conventional equity indices. Considering the difference in nature between the two equity classes, it is assumed that macroeconomic factors may affect them differently. The findings of the study confirm the existence of a theoretical relationship among the variables. Thus, the variables move together in the long-run and each variable contains information to predict another variable when they are cointegrated. In other words, there exists a common force that brings each variable to equilibrium in the long term.

The empirical results show that interest rate, industrial production, and inflation are leading variables. Among these leaders, industrial production is the most leading variable followed by interest rate and inflation, which are switching places between second and third ranking in different time horizons (10 and 20 months). Considering the two variables used as proxies for monetary policy that are interest rate and money supply, the results show that interest rate is exogenous while money supply is endogenous. Accordingly, policymakers and investors shall prioritize focusing on interest rate as an indicator for monetary policy.

The findings of the study also reveal that money supply, Islamic Dow Jones index, and conventional Dow Jones index are endogenous variables. Among

these variables, conventional index is the most endogenous. Remarkably, the results demonstrate that Islamic and conventional indices are not similarly influenced by changes in the macroeconomic environment. For instance, the impact of industrial production is higher on the Islamic index in comparison with its conventional counterpart, whilst the response of the Islamic index to changes in interest rate is considerably lower than that of the conventional index. This can be explained based on the fact that, firstly, Islamic finance is highly concentrated in the real sector of the economy (e.g. manufacturing, agriculture, telecommunication, etc.) and, secondly, Islamic finance activities and transactions are subjected to a filtering process of Shari'ah screening which ensures that listed firms strictly avoid impermissible activities and transactions.

In a nutshell, the empirical results of this study report that Islamic and conventional equity are concentrated in different sectors of the economy. This lends support to the notion that Islamic and conventional finance have major differences based on empirical evidence in the US market. It is recommended that future research focuses on conducting a comparative analysis with other developed and efficient stock markets and tests whether the discovered relationship in the US equity market does exist in emerging markets, which may further assist the investors and policymakers to comprehend and recognize the similarities and differences among various equity classes.

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تأثير العوامل الاقتصادية الكلية على الأسهم الإسلامية والتقليدية الأمريكية

مظهر حلاق فنطقي

محاضر، كلية إدارة الأعمال، جامعة كوالالمبور، ماليزيا

المستخلص. يقوم هذا البحث بدراسة تأثير العوامل الاقتصادية الكلية على كل من الأسهم الإسلامية والتقليدية في سوق الأوراق المالية في الولايات المتحدة الأمريكية من خلال تطبيق طرق مختلفة لتقنيات السلاسل الزمنية التي تشمل الفترة من يناير ١٩٩٦م إلى سبتمبر ٢٠١٣م. وتظهر النتائج التجريبية أن المتغيرات الخارجية هي الإنتاج الصناعي، ومعدل الفائدة ومؤشر الإنتاج الاستهلاكي؛ في حين أن مؤشر الأسهم الإسلامية ومؤشر الأسهم التقليدي وعرض النقود هي متغيرات داخلية. وبناءً على ذلك، فإنه عندما يتلقى الإنتاج الصناعي أو معدل الفائدة أو مؤشر الإنتاج الاستهلاكي صدمة خارجية، فإنه ينحرف عن التوازن وينقل الصدمة إلى متغيرات أخرى، بينما لا ينطبق ذلك على مؤشر الأسهم الإسلامية أو مؤشر الأسهم التقليدي أو عرض النقود. كما تكشف النتائج التجريبية عن تأثير أكبر للإنتاج الصناعي وتأثير أصغر لسعر الفائدة على الأسهم الإسلامية مقارنةً بالأسهم التقليدية. وتتفق نتائج هذا البحث مع النظرية المبينة على أن التمويل الإسلامي أكثر انتشارًا في القطاع الاقتصادي الحقيقي وأقل ارتباطًا بالأنشطة القائمة على الفائدة بسبب عملية الرقابة الشرعية الفعالة.

الكلمات الدالة: الأسهم الإسلامية، سوق الأوراق المالية الأمريكية، الاقتصاد الكلي، الإنتاج الصناعي.

تصنيف JEL: Z12, G10, G15

تصنيف KAUIE: I43, L43, H3