Risk & Return of Islamic Stock Market Indexes

Sam Hakim*
Manochehr Rashidian**

The Dow Jones Islamic market index - US (DJIMI) tracks the stocks of corporations compatible with Islamic law. A parallel and unrestricted counterpart of DJIMI is the Wilshire 5000 Index (W5000) which tracks the price performance of the largest 5000 US companies. Of that index, approximately 75% of the companies fail to meet the Islamic criteria, leaving only approximately 700 companies as potential candidates for inclusion in the DJIMI. Using cointegration techniques we place the DJIMI under analytical scrutiny and ask (1) how has this selection restriction affected the performance of Islamic investments represented by the DJIM index? (2) is the DJIM index less diversified than the DJW index? (3) if so, to what extent has the limited diversification affected its risk and return? (4) and finally, what dynamic correlation and long-term relationship exist between the two indexes over time.

***** Dept of Finance, Seaver College of Business, Pepperdine University, Malibu, CA and Energetix LLP, Los Angeles, CA USA. Email: sam.hakim@pepperdine.edu

** Corresponding author. Dept of Economics, California State University, Northridge, CA. Email: mrashidian@csun.edu

Risk & Return of Islamic Stock Market Indexes

Background & Objective

During the past decade, two trends have emerged in investment selection. First, both individual and institutional investors are placing more assets in 'socially responsible' portfolios particularly in the U.S. Between 1997 and 2000, the size of these funds almost doubled from $1.185 trillion to $2.16 trillion. Second, investors are increasingly interested in tying their assets to indexes rather than relying entirely on 'active' money management. For example, the size of pension funds tied to stock indexes in the US grew 30% between 1998 and 1999.

This change was dwarfed by the spectacular increase in the assets of Islamic financial institutions which grew 40 fold since 1982 to reach over $230bn today. The search for alternatives to Western style markets has been given added impetus in Muslim countries by the turmoil in Asian financial markets in 1997, the ensuing meltdown in emerging equity markets worldwide, and more recently the 'bear' market in US and European equities since March 2000. In response, many large Western financial institutions have established their own Islamic subsidiaries and offered Islamic financial instruments targeted directly at their Islamic clientele. One such product is the Dow Jones Islamic market index – US (DJIMI) which tracks the stocks of US corporations whose business and activities are compatible with Islamic law. The index is a basket of stocks acceptable to Islamic principles (shunning unethical or highly-indebted firms, or engaged in gambling, alcohol sales and other prohibited activities).

A parallel and unrestricted counterpart of the DJIMI is the Wilshire 5000 Index (W5000) which tracks the price performance of the largest 5000 US companies. Of that index, approximately 75% of the companies fail to meet the Islamic criteria, leaving only approximately 700 companies as potential candidates for inclusion in the DJIMI.

Placing the DJIMI under analytical scrutiny, we ask (1) how has this selection restriction affected the performance of Islamic investments represented by the W5000 index? (2) is the DJIM index less diversified than the DJW index? (3) if so, to what extent has the limited diversification affected its risk and return? (4) and finally, what dynamic correlation and long-term relationship exist between the two indexes.

The existing literature on Islamic investments is virtually non-existent despite their increasing popularity. The only reference we could trace is Naughton and Naughton (2000) who argue how the development of Islamic equities market faces significant challenges. While Islamic banking, based on the prohibition of interest, is well established throughout the Muslim world, the authors point that attention has now turned towards applying Islamic principles in equity markets. They suggest that while common stocks are legitimate instruments in Islam, many of the practices associated with stock trading are not. These practices include speculation, short selling, margin trading, and equity futures and options, all of which would be either severely restricted or unlikely to be acceptable within an Islamic market. They conclude that regulatory authorities in Muslim countries will therefore find a vast array of problems in attempting to structure a trading system that will be acceptable.

Against this limited research there is a vast literature (Ben Zion, 1996; Sinquefield, 1996; Bekaert and Harvey, 1997), which focuses on emerging markets (some of which with a Muslim majority population) and the diversification benefit they provide to international portfolios. For example, one line of research has investigated the efficiency and performance of stock markets in certain MENA countries (Butler and Malaikah, 1992; El-Erian and Kumar, 1995; Dahel and Laabas, 1998; Al Loughani, 1995). More recent evidence (Darrat et. al., 2000; Hakim and Neaime, 2000) has revealed an apparent segmentation from the leading stock markets in the US and Europe, consequently MENA stock markets may offer international investors diversification benefits unavailable elsewhere. All this research, however, overlooks Islamically oriented investments, the prime motive of this proposal.

Data Requirements

Launched in February 1999, the DJIMI presents the first Islamic equity benchmark index created by an independent provider. Previously, Islamic funds sponsors established their own internal benchmarks to measure their Islamic funds performance raising doubts about potential conflicts of interest.

The DJIMI is a ‘low-debt, non-financial, social-ethical index’ in the broad sense. The index is aimed directly at the world 1.2 b Muslims who adhere to Islamic principles in how they

use and manage their investments. To become eligible for inclusion in the DJIM index, each US company must undergo three screening filters:

1. Its primary business must be halal (permissible according to Islamic law -- Shari'a), therefore companies engaged in gambling, alcohol, armaments, tobacco, pornography or pork are excluded,
2. A company must meet specific financial constraints[1]:
   - Its debt ratio must not exceed 33%
   - Accounts receivables to total assets must remain below 45%
   - Interest income should represent less than 5% of total revenue
3. Finally companies are continuously monitored according to these criteria. Whenever a company exceeds these limits, it is removed from the index and replaced by another.

The data consists of daily closing of the DJIM and the W5000 indexes. The data is available from Dow Jones Inc., the publisher of the two indexes. Continuously compounded daily returns are calculated as the natural log differences in prices: LOG (P_t/P_{t-1}). For an exogenous variable, we use the yield on three-month Treasury securities set at their weekly auction. Their yield corresponds to the best measurement of the risk-free rate and the investment alternative to equities for cash being set aside. The interest rate data can be obtained directly from Bloomberg.

Methodology and Results

We propose to meet our objective using a well-designed econometric study based on time series methods supported by cointegration analysis. The econometric analysis culminates in a multivariate autoregressive model to capture the short- and long-term dynamics of the DJIMI. To that end, we begin by examining the stochastic nature of each stock index. Furthermore, Johansen and Juselius (1990) provide appropriate maximum likelihood techniques for

[1] Once companies with unacceptable primary business activities have been eliminated from the universe, the remaining stocks are tested according to three "filters" designed to remove those with unacceptable financial ratios. The three filters are as follows:

- Exclude companies if Total Debt divided by Trailing 12-Month Average Market Capitalization is greater than or equal to 33%. (Note: Total Debt = Short-Term Debt + Current Portion of Long-Term Debt + Long-Term Debt)
- Exclude companies if the sum of Cash and Interest Bearing Securities divided by Trailing 12-Month Average Market Capitalization is greater than or equal to 33%.
- Exclude companies if Accounts Receivables divided by Total Assets is greater than or equal to 45%. (Note: Accounts Receivables = Current Receivables + Long-Term Receivables)

Companies that pass these screens are included in the Dow Jones Islamic Market Indexes investable universe, from which index components are selected.

investigating cointegration in time series models. The econometric analysis helps us to determine the degree to which the two stock indexes are integrated among themselves.

Table 1 shows the descriptive statistics of the data sample. On a return basis, the 3m Tbill dominates both the Islamic index and the Wilshire 5000 as the period of the study was marked by a significant decline in equity prices worldwide. On a risk basis (measured by the annualized standard deviation), the Islamic index appears less risky than the Wilshire 5000 (22% vs. 24%). This is a somewhat surprising result to the extent that one would regard the Wilshire 5000 as a more diversified market basket of stocks than the more restrictive Islamic index. This unusual result, is confirmed by computing the respective *Sharp ratio*, or risk per unit of return. Here again, the Islamic index seems to outperform not only the Wilshire 5000, but, surprisingly, ranks at par with the Tbill rate, even though the period under study has witnessed a significant volatility on a historical basis (including the events of September 11). Overall, these basic statistics indicate that the risk performance of the Islamic index has been relatively competitive, given that the Wilshire 5000 exhibits diversified risks measured by a Sharp Ratio that is 64% higher (118% vs. 194%).

Turning to the stochastic properties of the series, we report in Table 2 the results of a standard unit root test (Augmented Dickey Fuller). As expected the test confirms that the DJIMI in a non-stationary process, whereby the movements of the index over time are purely random and unpredictable (white noise). In the stock market literature, this is generally interpreted as a sign of market efficiency. Note that the Wilshire 5000 and the Tbill rate have been widely tested for their stochastic properties using a variety of unit root tests. Our results here simply confirm earlier results, uniformly accepted in the literature on the efficiency of the stock and interest rate markets[2]. For the three series, our results clearly reject the null hypothesis of unit root in the differences but not in the levels. We therefore conclude that DJIMI, W5000, and the Tbill rate become stationary after differencing them once (i.e. ~ I(1)).

Having determined the stochastic properties of the series, we now turn to their links over time. The traditional approach to investigate this question is to use regression analysis where one evaluates the correlation of returns among the series. However, this approach is inappropriate here since it presumes that the time series being examined are stationary (in levels). We rely

[2] See for example, Bradley and Lumpkin (1992).

instead on the theory of cointegration discussed in Engle and Granger (1987) and use the testing procedure developed by Johansen and Juselius (1990).

We investigate the cointegrating relations between the three series in a trivariate and bivariate models using Johansen's full information maximum likelihood procedure. The systems we examine are:

Trivariate: {DJIMI, W5000, Tbill}

Bivariate: {DJIMI, W5000}, {W5000, Tbill}, {DJIMI, Tbill}.

Since the results from cointegration tests may be sensitive to the lag structure chosen, we determine the proper lag profile on the basis of the Akaike Information Criterion (AIC) procedure, which suggests that we settle on 28 lags, or trading days. The null hypothesis of no cointegration suggests that the relationship between the series is spurious. The results are available in Table 3. In the trivariate case, it appears that there exists a single and significant cointegrating vector connecting the three series. The null hypothesis is rejected at better than 5% (the likelihood ratio is 37.3 and the 5% critical value is 34.9). Further light on this issue is provided in the pairwise tests which reject any link between the DJIMI and the W5000, or the DJIMI and the Tbill. Only the W5000 seems to exhibit a long-term stable link with the interest rate (the null hypothesis is also rejected at better than 5%, the likelihood ratio = 15.6 and the 5% critical value = 15.4). The absence of a stochastic link between the Islamic index and interest rate should not be a surprise but a natural consequence of the selection criteria of the stocks which comprise the index. Perhaps the more interesting finding is the absence of cointegration between the Islamic index and the W5000, a broad market index which incorporates all of the stocks included in the DJIMI. To elaborate on this observation, we note that while the two indexes may be temporarily correlated, the evidence suggests they are not cointegrated. To better understand this point, one can think of exogenous variables which may impact one index but not the other. Here are two examples.

1. By construction, interest rates are likely to have much less impact on the DJIMI to the extent that the latter excludes all companies which derive more than 5% of their revenue from that variable. At the same time, the interest rate is likely to have a significant effect on the W5000 based on the observation that stock prices are inversely related to the cost of capital.
2. Conversely, there are variables which may have more of an impact on the DJIMI than the W5000. For example, higher personal income for DJIMI investors is likely to lead to a

greater demand for stocks that fit the Islamic restriction than to stocks in general. The latter are influenced by higher personal incomes worldwide including, but not exclusively, those of Shari' a-conscientious investors.

Consequently, there is a variety of factors which may lead the two indexes to move independently of each others over time, a sufficient condition for the lack of cointegration.

The presence of cointegration among the three series implies[3] that causality must exist among these series in at least one direction. Our test for causality helps us to determine whether changes in any series can be explained by the other two. To our knowledge, this represents the first time that the Islamic index has been subjected to a similar causal investigation. To explain the test briefly, we note that if ΔY and ΔX are two stationary series, the causality tests is equivalent to the question of whether the *current* ΔX is linearly informative about the *future* of ΔY, in which case X is said to 'cause' Y. This would require that the *lagged* values of ΔX help in the forecast of the *current* value of ΔY. In effect, the test boils down to the statistical significance of the lagged values of ΔX used as independent variables in a regression where ΔY is the dependent variable.

To conduct the causality test, each series is represented as a vector autoregression and regressed on its own lags and the lags of other variables. To examine the causal linkages among these cointegrated markets, we specify and estimate a vector error-correction model (VECM) of the form (the subscript t and higher order lags on the right hand side are omitted for convenience):

(1) $\Delta(\text{DJIMI}) = a_0 + a_1 \text{ L } \Delta(\text{DJIMI}) + a_2 \text{ L } \Delta(\text{W5000}) + a_3 \text{ L } \Delta(\text{Tbill}) + a_4 \text{ L EC} + e_1$

(2) $\Delta(\text{W5000}) = b_0 + b_1 \text{ L } \Delta(\text{DJIMI}) + b_2 \text{ L } \Delta(\text{W5000}) + b_3 \text{ L } \Delta(\text{Tbill}) + b_4 \text{ L EC} + e_2$

(3) $\Delta(\text{Tbill}) = c_0 + c_1 \text{ L } \Delta(\text{DJIMI}) + c_2 \text{ L } \Delta(\text{W5000}) + c_3 \text{ L } \Delta(\text{Tbill}) + c_4 \text{ L EC} + e_3$

where L is the lag operator (i.e. $LZ = Z_{t-1}$), EC is the error-correction term from Johansen's efficient estimations, e's are disturbance terms, and Δ denote first-differences required to induce stationarity for the corresponding variables.

One advantage of specifying and estimating the above VECM is that two sources of causality can be identified. First, there is the traditional channel of causality through the lagged

[3] See Granger's Representation Theorem (1991).

independent variables (representing short-run causality) and there is also additional causality through the error-correction channel (representing long-run causality).

Table 4 reports the t-statistics we obtain from estimating the preceding VECM [equations (1)-(2)]. For simplicity, we only report the results of the first two equations since we are not trying to explain the movements of the US Tbill rate over time. For consistency we use the same number of lags as before. For simplicity, we only report the t-statistics of the significant exogenous variables (the detail of the complete lag results are available from the authors upon request).

The results indicate that neither the Wilshire 5000 nor the 3m Tbill are significant in explaining the changes in the Islamic index. The same is true for the error correction term (EC) representing the impact of the cointegrating equation on the daily change in the Islamic index. However, a completely different picture emerges for the Wilshire 5000. Specifically, the null hypothesis that the Tbill rate does not cause significant changes in the Wilshire 5000 is soundly rejected at better than the 5% level of significance (for lags 7, 13, and 22, the t stats = -2.59, -2.12, and -2.70 respectively; the critical 5% value = -1.96). A similar verdict is revealed for the impact of the cointegrating vector which captures the adjustment in the Wilshire 5000 to its long-term relation with the Tbill rate (t-stat = 2.89; the critical 5% value = -1.96).

Taken together, the VECM results suggest that, despite a 100% composition of US stocks, the Islamic index has no apparent stable link with the broad US stock market or the Tbill rate (a proxy for the risk-free rate). It is interesting to note that Dow Jones Inc., the publisher of the Islamic index boasts a 92% to 94% statistical correlation between the index and the rest of the market. Based on the evidence we have, whatever correlation may exist between the index and the Wilshire 5000 (and the risk-free rate for that matter) must be spurious and not stable in nature. One would have to conclude that the index is influenced by entirely independent factors.

Significance

One important implication of the preceding econometric analysis is that, because the two indexes are not cointegrated, there is an additional diversification benefit that Muslim investors reap by placing their funds in the DJIMI as it is likely to change independently of the broad market index and interest rates.

Gains from stock index diversification is generally predicated on the belief that there exists low correlation among the returns of different stock indexes. These correlations are generally assumed to vary inversely with the level of differential social and economic factors which affect each stock index. The wide array of mutual funds is testimony that sector-specific stocks (technology, banks, commodity) are influenced by different variables. The existing empirical evidence has shown that significant linkages between stock indexes limit the potential benefits from diversification (Sinquefield, 1996; Ben Zion et al., 1996),

Theoretically, the absence of cointegration among stock market indexes implies differential risk premia. That is, because the DJIM and W5000 indexes are independent from each other in the long-term, then the risks associated with each index bear different prices. This is evident from Table 1 where the risk per unit of return on the broader Wilshire 5000 index is markedly higher than on the Islamic index. Clearly, despite its diversification, the Islamic index is presenting investors with unique characteristics reflected in risk-return tradeoffs that are not available in a broad market basket of stocks. Based on the limited observation period we have since its recent introduction to the market, it appears that investors in the DJIMI have been relatively more immune from the turmoil in the equity markets.

Conclusion

Introduced in 1999, the Dow Jones Islamic Market Index - US, has rapidly gained a large response from Muslim investors worldwide. The index caters to the needs of investors seeking Shari'a-compliant stocks. At the same time, the index gives investors a benchmark to judge how their Islamic funds/portfolios perform against an Islamic Index, where better-performing managers are rewarded (new money coming in) and under-performing managers are penalized (redemptions). As such, the index should be perceived as further step in the maturity process of Islamic financial markets estimated today at US$ 230 billion. Yet, despite its appeal, the stochastic properties of the DJIMI remain unexplored, primarily due to the absence of academic research. Hence, the objective of this study.

To construct the Islamic market index, any industry group deemed incompatible with Islamic lines of business are excluded. Companies classified in other industry groups also may be excluded if they are deemed to have a material ownership in or revenues from prohibited business activities. Once companies with unacceptable primary business activities have been

eliminated from the universe, the remaining stocks are tested according to three "filters" designed to remove those with unacceptable financial ratios. This paper examined the added cost / benefit that investors had to bear for these filters.

We began by examining the stochastic properties of the Islamic index and determined that, like other indexes, its movements over time are purely random. We then turned to investigate the relation between the DJIMI and the broad stock market represented by the Wilshire 5000 index. Using cointegration analysis, we found no discernible link between the two indexes over time. The same conclusion also applied when we focused our attention on the relation between the DJIMI and the risk-free rate proxied by the 3-m Tbill. By contrast, the same rate has a strong stochastic impact on the Wilshire 5000 as documented in a large number of studies on the US equity market, a result we were easily able to replicate in this study.

To elaborate on the cointegration analysis, we examined the causality between the Islamic index, the Wilshire 5000 and the Tbill rate. Our results indicate that the Islamic index is influenced by factors independent from the broad market or interest rates. This finding provides a different perspective to the claim by Dow Jones Inc., the publisher of DJIMI, that the index exhibits significant high correlation with the broad market. Our evidence suggests that such correlation is merely temporary and spurious. However, our findings also suggest that the Islamic index presents unique risk-return characteristics, an observation reflected in a risk profile significantly different from the Wilshire 5000. This result is even more important given the fact that the Wilshire 5000 index is considerably more diversified than the Islamic index. It appears however that the filtering criteria adopted to eliminate Shari'a-non-compliant companies has resulted in a subset of unique companies and have not adversely affected the performance of the Islamic index in relation to the broad equity market.

Three immediate implications emerge from our study. Our findings (1) help investors evaluate the performance of the most popular Islamic index available today vs. the rest of the market, (2) motivate money managers to look beyond interest rates and the broad market in an attempt to identify the drivers for the fluctuations in the Islamic index, and (3) reveal that on a risk-return basis, there is no loss from the restriction criteria that the Muslim index requires. Consequently, Muslim investors are no worse off investing in an Islamic basket of stocks than a much larger basket of stocks.

Table 1 - Descriptive Statistics			
	DJ Islamic Mkt Index	**Wilshire 5000**	**3m Tbill**
Annualized Mean	-19%	-12%	-0.01%
Annualized Median	-7%	-4%	0.00%
Daily Maximum	10.3%	5.2%	0.01%
Daily Minimum	-9.5%	-6.7%	-0.01%
Annualized Std. Dev.	22%	24%	0.02%
Sharp Ratio	-118%	-194%	-194%
Number of Obs.	702	702	702

Table 2

Tests for Unit Roots

Period: 10/12/1999 - 9/4/2002, N=674, 28 lags

ADF Test Statistic	levels	1st-differences	5% Critical Value	10% Critical Value
DJIMI	-0.022	-12.619	-2.866	-2.569
W5000	-0.572	-12.404	-2.866	-2.569
Tbill	0.453	-14.468	-2.866	-2.569

**MacKinnon critical values for rejection of hypothesis of a unit root.*

Table 3

Tests for Cointegration

Period: 10/12/1999 - 9/4/2002, N=674, 28 lags

H_0=Number of Cointegrating Vectors	*Trace Stat*	*95% CV*
Cointegrating System: {DJIMI, W5000, Tbill}		
None *	37.35	34.91
At most 1	18.24	19.96
At most 2	3.23	9.24
Cointegrating System: {DJIMI, W5000}		
None	7.14	12.53
At most 1	1.69	3.84
Cointegrating System: {DJIMI, Tbill}		
None	4.37	12.53
At most 1	0.85	3.84
Cointegrating System: {W5000, Tbill}		
None *	15.57	15.41
At most 1	0.03	3.76

Table 4

VECM and Test of Causality

Period: 10/12/1999 - 9/4/2002, N=674, 28 lags

t-stats reported for each variable

Cointegration Equation:

DJIMI = -125.8 + 0.148*(W5000) + 5.6*(Tbill)

Variable	D(DJIMI)	D(W5000)
Coint Equation	-0.8	-2.88
D(Tbill(-7))	-1.58	-2.59
D(Tbill(-13))	-1.26	-2.12
D(Tbill(-22))	-1.68	-2.7

Bibliography

Al Loughani N.E.: Random Walk in Thinly Traded Stock Markets: The Case of Kuwait, *Arab Journal of Administrative Sciences*, 3, pp 189-209, 1995.

Ben Zion, U.: The price linkages between country funds and national stock markets: evidence from cointegration and causality tests of Germany, Japan, and UK funds. *Journal of Banking & Finance* 1996.

Bradley, M. G. and Lumpkin S.A.: The Treasury Yield Curve as a Cointegrated System. *Journal of Financial & Quantitative Analysis*, 27(3) (Sept 1992).

Butler, K.C., Malaikah, S.J.: Efficiency and inefficiency in thinly traded stock markets: Kuwait and Saudi Arabia. *Journal of Banking & Finance*, Feb 1992 vol. 16 n 1, p.197.

Dahel R. and Laabas B.: The Behavior of Stock Prices in the GCC Markets. *Economic Research Forum*, 5th Annual Conference, Tunis, Tunisia 1998.

Darrat, A F, Elkhal K., and Hakim, S R: On the Integration of Emerging Stock Markets in the Middle East. *Journal of Economic Development*, Fall 2000.

El-Erian, M.A., and M.S. Kumar, "Emerging Equity Markets in Middle Eastern Countries" *IMF Staff Papers* 42 (June 1995): 313-343.

Engle, R. T. and C. W. J. Granger (1987), "Cointegration and Error Correction: Representation, Estimation and Testing." *Econometrica* **55**, 251-276.

Granger, C. W. J. (1988), "Some Recent Development in the Concept of Causality." *Journal of Econometrics* **16**, 199-211.

_____ (1991), "Developments in the Study of Cointegrated Economic Variables." in *Long-Run Economic Relationships: Readings in Cointegration*, edited by R. F. Engle and C. W. J. Granger. New York: Oxford University Press.

Hakim S R, and Neaime S: Prospects on the Integration of Financial Markets in the MENA Region, *Global Financial Markets & Development*, APF Press, Toronto, Canada, 2000, pp. 202-217.

Hakim S R, and Neaime S: Mean-Reversion Across MENA Stock Markets: Implications for Portfolio Allocations, *International Journal of Business*, forthcoming 2002.

Johansen, S. and K. Juselius (1990), "Maximum Likelihood Estimation and Inference on Cointegration with Application tot he Demand for Money."*Oxford Bulletin of Economics and Statistics* **52**, 169-210.

Korajczyk, Robert: A measure of stock market integration for developed and emerging markets: *The World Bank Economic Review* Vol 10, No. 2 May 1996.

MEED: Allied Asset Advisors Funds. *Middle East Economic Digest*, Sept 1, 2000 v44 i35 p21.

Naughton Shahnaz and Tony Naughton: Religion, Ethics and Stock Trading: The Case of an Islamic Equities Market. *Journal of Business Ethics*, Jan 2000 vol 23 No. 2 p145 (15).

Sinquefield Rex: Where are the gains from international diversification*? Financial Analysts Journal* Vol 52, No.1, Jan 1996.