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Did Financial Market Integration Really Happen in MENA Region? – An Analysis

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This paper examines the characteristics and behavior of stock market equity indices of several Middle East and North Africa (MENA) countries. It also explores the cointegrating behavior of the MENA stock markets with the United States equity markets. Granger causality tests based on the VECM reveal strong bidirectional causalities between several of the MENA stock markets. The Granger causalities also indicate that stock market returns of Egypt, Jordan, Kuwait, Malta, Oman, Qatar, Saudi Arabia and Tunisia exhibit cointegrating behavior.

The results reveal significant weak exogeneity from the United States stock markets to all the MENA stock markets. The findings suggest that while MENA stock markets tend to co-move with the U.S. stock market. Furthermore, markets within the MENA region are not yet fully integrated with the U.S. However, market imperfections may preclude U.S. investors from entering MENA markets to take advantage of possible diversification benefits. The increased level of integration of markets within the MENA region does not necessarily reduce the potential of risk diversification for international portfolios.

Introduction

Over the last two decades, the Middle East and North Africa stock markets (MENA) have been regarded as one of the most promising investment opportunities in the world. This emerging market area provides significant portfolio diversification opportunities for investors. Financial liberalization has been implemented in a majority of MENA

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countries through structural adjustment programs and large-scale privatization. These programs helped to promote significant expansion of opportunities for worldwide investors. In addition, a large number of MENA nations adopted macroeconomic stabilization policies that are designed to ensure economic stability, low inflation, and reduced budget deficits. These policies help to attract and retain global investors. The confluence of liberalization reforms, oil revenue increases, excess liquidity, and petrodollar spillovers to adjoining countries has significantly increased market capitalizations, turnovers, IPOs and returns (Hammoudeh and Alesia, 2004). The region reflects growing stock market price movement interdependence. For example, the 2006 Dubai stock market collapse affected prices in varying degrees in Saudi Arabia, Oman, and Egypt (Hammoudeh and Alesia, 2004). Evidence of market integration within the MENA region would have practical importance to those who wish to invest in the region. If the markets within the MENA region tend to move together, an investor would be able to achieve his or her desired risk/return relationship by investing in any of the markets within the region.

The financial integration of the world's major stock markets has been extensively studied in the empirical financial economics literature (see for example, Kaminsky and Schmukler, 2002; Bekaert and Harvey, 2000 and Kim and Singal, 2000). Emerging markets have been emphasized in the literature because they present new opportunities for portfolio and money managers to maximize the return of their portfolios. Bekaert and Harvey (1997) find that stock market returns in emerging markets were high and predictable, but lacked strong correlation with U.S. or European markets. As emerging markets mature and integrate with the world markets, they become more sensitive to the volatility of stock markets elsewhere. Emerging market integration with world markets will decrease their ability to enhance and diversify international portfolios (Neaime, 2002).

Previous research focusing on the integration of stock markets in MENA nations with those in the rest of the world is limited. Neaime (2002) using the Engle-Granger (1987) cointegration approach, test for the integration of MENA markets with world stock markets over the period 1990 to 2000. He finds a weak integration among the MENA markets (Morocco, Egypt, Jordan and Turkey) and strong integration between MENA markets and developed markets (U.S., U.K. and France). The

studies of El-Erian and Kumar (1995), Darrat and Hakim (1997), Hakim and Neaime (2000), and Butler and Malaikah find similar results as Neaime (2002).

An area of interest requiring further investigation centers around the questions of whether MENA area stock markets offer: (1) potential diversification benefits and/or, (2) short run and long run market portfolio substitutability. In addition, we analyze the questions of whether influences from U.S. stock markets affect co-movement of stocks within MENA, and, if MENA markets affect diversification and portfolio substitutability as a hedge or safe haven in the long run. Understanding the dynamics and co-movements of MENA markets will assist individuals in making rational investment choices within the region.

In this paper, we explore the existence of cointegration to determine if MENA countries are segmented or linked to the U.S. stock market (the S&P 500 index). If substantial cointegration exists between the U.S. and MENA markets, we can conclude that inefficiencies in asset prices in one market may affect movements in another market (Roll, 1992). This paper contributes to the existing finance and economics literature by examining dynamic linkages of nine MENA nations among each other and the United States stock markets. To the best of our knowledge, this paper is the first to apply the cointegration testing methodology of Awokuse (2005, a) to investigate dynamic linkages between equity price indices in MENA countries and the U.S. S&P 500 index. Our paper enhances the body of the literature that pertains to financial integration and stock market movements in the MENA region.

The remainder of the paper is organized as follows: Section 1 provides an overview and summarizes the main characteristics and properties of stock markets within the MENA region. A brief summary of the relevant literature is presented in Section 2. Section 3 presents an empirical model to test whether MENA stock markets are integrated with each other. Section 4 employs a Vector Error Correction Model, Granger causality and TYDL tests to further explore the long and short-run dynamics of the stock market return series. Section 5 summarizes and concludes the paper.

Literature Review

Integrated markets tend to move together over time. Bekaert and Harvey (1995) utilize a conditional regime-switching CAPM to study market integration over time. The authors find that several of the emerging markets within their sample became more integrated over time. Adler and Qi (2003) find that the Mexican market is partially integrated with the rest of North America. They also note that the degree of integration was time-varying; Mexico was more integrated with the rest of North America after market reforms were implemented as a response to the Mexican economic crisis.

Other studies that examine the degree of integration within emerging markets find similar results. Bekaert and Harvey (1997) and Carrieri et al. (2006) find that Asian and Latin American emerging markets are partially integrated with the world market and that the level of integration is time-varying. Since these studies rely on a time-varying, partially integrated CAPM, their results are dependent on a model that cannot be thoroughly tested (Roll, 1977).

Other studies utilize bivariate or multivariate cointegration techniques to examine integration in developed and emerging markets. Taylor and Tonks (1989) use Engle and Granger's (1987) bivariate cointegration technique to examine the level of integration between the U.K. stock market and several other developed markets around the world. Kasa (1992) employ Johansen's (1988) multivariate cointegration technique and find that markets in the U.S., U.K., Japan, Germany, and Canada share a long-run integrated relationship. Masih and Masih (1997) also use multivariate cointegration and find that several developed Asian markets are cointegrated with markets in Japan, the U.S., Japan, U.K., and Germany. Masih and Masih (1999) apply vector error-correction as well as level VAR models and find results similar to their aforementioned study.

Several other studies examine the dynamic causal linkages between international stock markets. Masih and Masih (2001) find interdependencies between developed OECD and emerging Asian markets. Lim et al (2003) utilize non-parametric cointegration techniques and find that a shared factor cointegrates Asian stock markets in the long-run. Wang and Nguyen Thi (2007) as well as Iwatsubo and Inagaki (2007) find similar results.

Research that focuses on the integration of stock markets within the MENA region with each other and the rest of the world is limited. Darrat et al. (2000) find that stock markets in Egypt, Jordan and Morocco are integrated, but segmented globally; the authors' note that Egyptian stock market appear to be the driving force within the region. However, Omran and Gunduz (2001) find no evidence of cointegration between stock markets in Turkey, Israel, Egypt, Morocco and Jordan. Hammoudeh and Aleisa (2004) study the stock markets of five Gulf Cooperation Council (GCC) nations and find long run integration relationships as well as short-term lead/lag feedback. Bley and Chen (2006) find that the degree of market integration among GCC nations had increased over time.

Bley (2007) examine the dynamic behavior for fourteen MENA stock markets and find that these markets have become more integrated over time. Neaime (2002) examine the impact of financial liberalization within the MENA region. He reports that Turkey, Egypt, Morocco, and Jordan are now integrated with financial markets in the rest of the world. The author notes that shocks to the U.S. and U.K stock markets are diffused to the MENA region, but not to GCC stock markets. Assidenou (2011) investigates the cointegration properties of major capital markets indices during the 2008-2009 financial crisis. He finds that major Asian markets indices are cointegrated with U.S. and European market indices. He concludes that Asian capital markets will be under the influence of non-Asian capital markets even in the extreme case of not being entirely open to international investors. Parsva and Lean (2011) use cointegration and causality tests between exchange rates and stock indices in six MENA countries. They find that those markets are cointegrated during the recent global financial crisis. Swamy and Sreejesh (2011) use dynamic correlation and cointegration techniques to study the degree of co-movement between commodity and equity market indices after the global financial crisis. They find that the two markets have significant cointegration and exhibit strong co-movement especially after 2008. Finally, Rengasamy (2012) uses weekly data of 5 GCC markets from April 2009 to March 2012 to examine long run cointegrating relationship between them. His results reveal that the markets are not cointegrated. However, based on the mean returns and correlation analysis, he concludes that investors can reduce their risk and earn higher returns by choosing their investments correctly among the five markets.

Previous research suggests that dependencies exist between developed stock markets and most emerging markets. The level of integration between developed and emerging markets appears to be time varying and dependent on several factors. The degree of financial liberalization and market controls that exist in an emerging market plays an important role in the level of integration that exists between it and developed markets.

Data and Empirical Analysis

DATA

This study incorporates weekly closing price series from January 2000 to February 2012 of several stock markets within the MENA region (Egypt, Israel, Jordan, Kuwait, Malta, Oman, Qatar, Saudi Arabia, and Tunisia). The S&P 500 index is used as a proxy of United States financial market for the same period. Compounded week-to-week returns are calculated as the natural logarithmic differences in prices: ln (Pt/Pt-1). All the price series are obtained from Datastream.

Figure 1: The Graphical Display of the Equity Price Indices of the Selected MENA Countries and the S&P 500 over the period of January 2000 to February 2012

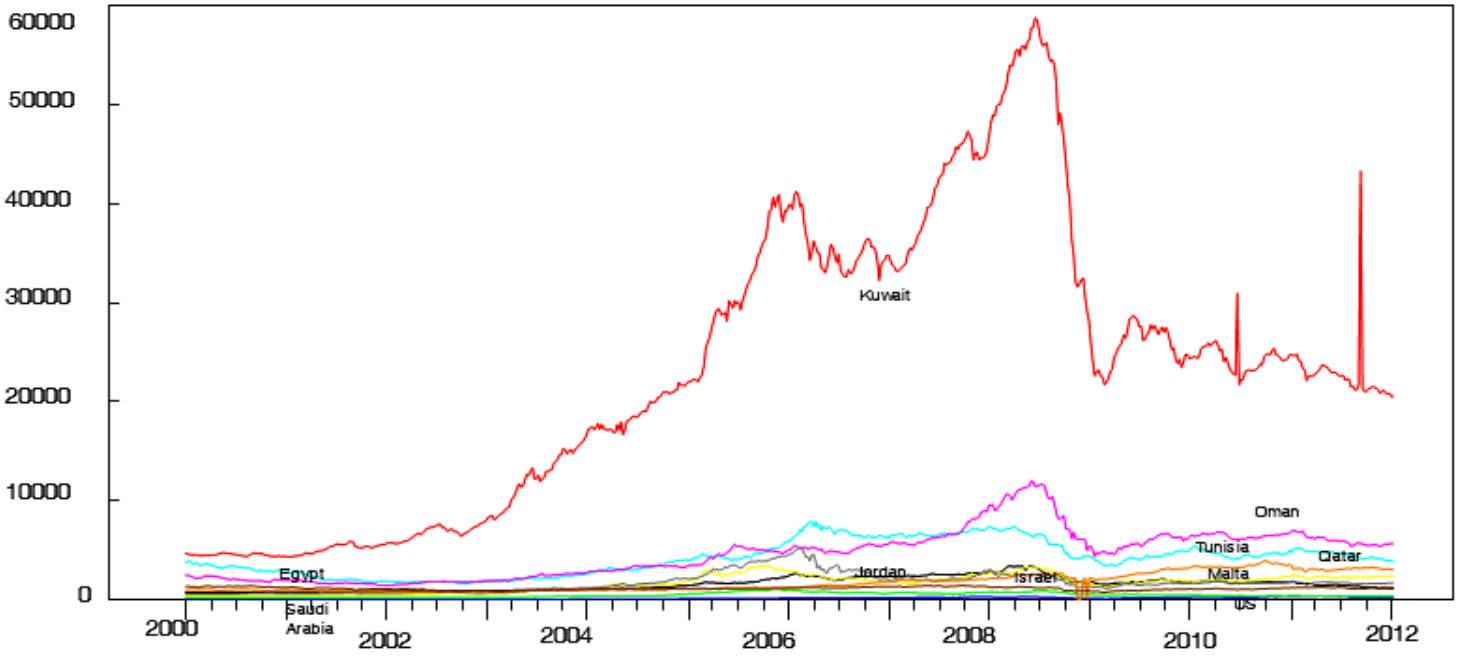

Figure 1 provides a graphical display of the behavior of the stock market indices of the selected nine MENA countries over the sample period. Figure 1 suggests cointegrating movements among these market portfolio price indices. The definition of the stock market indices is presented in Appendix A.

EMPIRICAL ANALYSIS

The Johansen (1988) cointegration test is implemented to test for the existence of a long run relationship between the MENA stock markets and the U.S. stock market. The augmented Dickey-Fuller (1979) and Phillip-Perron (1988) unit root tests are used to establish the non-stationarity of the series. The null hypothesis for both tests is that a unit root exists in the autoregressive representation of the series. The following regressions were employed:

$$P_t = \beta_1 + \beta_2 P_{t-1} + \sum_{i=1}^{k} \delta_i P_{t-i} + \varepsilon_t \qquad (1)$$

where β_i, δ_i, are constant parameters; and ε_t is a stationary stochastic process. The number of lags (k) is determined based on the Akaike Information Criterion. To determine the order of integration of the series, equation (1) is modified to include first differences. That is,

$$\Delta P_t = \beta_1 + \beta_2 P_{t-1} + \sum_{i=1}^{k} \delta_i \Delta P_{t-i} + \varepsilon_t \qquad (2)$$

To test for stationarity, the (ADF) and (PP) tests are applied to equations (1) and (2). The results are summarized in Table 1. The null hypotheses were $\beta_2 = 0$. Based on these results, it appears that the series are nonstationary in levels and are integrated of order one

The null hypothesis of an existence of a unit root in the MENA and U.S. price series could not be rejected at any conventional confidence level when equation (1) was utilized. When equation (2) was employed, the null hypothesis of a unit root was rejected at the 1 percent significance level for each MENA price series as well as the U.S. stock market. Thus, we conclude that weekly stock prices in the U.S. and MENA markets were I(1).

Table 1: The Augmented Dickey-Fuller (1979) and Phillip-Perron (1988) test results on MENA indices and the S&P 500 from January 2000 to February 2012.

Country	ADF unit root test		PP unit root test	
	Unit root $I(1)$?	*t-statistic*	Unit root $I(1)$?	*t-statistic*
Egypt	Yes	-22.211	Yes	-22.7075
Israel	Yes	-26.4148	Yes	-26.5096
Jordan	Yes	-24.1651	Yes	-24.7171
Kuwait	Yes	-36.0900	Yes	-34.2638
Malta	Yes	-15.2048	Yes	-25.9482
Oman	Yes	-6.0402	Yes	-9.3284
Qatar	Yes	-24.6711	Yes	-24.9933
Saudi Arabia	Yes	-23.0951	Yes	-23.9933
Tunisia	Yes	-12.0233	Yes	-42.2785
United States	Yes	-26.8431	Yes	-26.8291

All estimated t-statistics shown in this table are significant at the 1% level.

After establishing the existence of a unit root for each MENA market in the sample as well as the U.S. market, we then test for cointegration. The presence of a shared unit root between two price series implies the existence a long-run relationship between the series.

In order to apply the augmented VAR[k+d(*max*)] model, developed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996) (TYDL thereafter), the lag order of the original VAR*(k*) and the order of cointegration, *d(max*), must be determined. As to the maximum order of integration of the time series in question, *d(max*), we already conducted the ADF and PP unit root tests and the results are shown in Table 1. The lag order of the original VAR model, *k*, can be determined by using several lag order selection criteria such as the sequential modified LR test statistic (LR), final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC), and Hannan-Quinn information criterion (HQ). The results of the lag selection procedure are summarized in Table 2. The SIC and HQ collectively suggest using a lag of two. We will use VAR with lag length *k*=2 in the subsequent analysis.

Table 2: Maximum lag length results on MENA indices and the S&P 500 over the period of
January 2000 to February 2012.

Lag	Log L	LR	FPE	AIC	SIC	HQ
0	-44503.72	NA	6.86e+49	143.1309	143.2022	143.1586
1	-35334.81	18013.53	1.49e+37	113.9704	114.7544*	114.2751
2	-35097.15	459.2692	9.55e+36	113.5278	115.0245	114.1095*
3	-34929.95	317.7257	7.70e+36	113.3117	115.5211	114.1704
4	-34822.76	200.2583	7.53e+36	113.2886	116.2106	114.4243
5	-34739.30	153.2297	7.95e+36	113.3418	116.9765	114.7544
6	-34617.40	219.8816	7.43e+36	113.2714	117.6188	114.9610

LR denotes the sequential modified LR test statistic (each test at 5% level). FPE is the final prediction error. AIC, SIC and HQ denotes the Akaike information criterion, Schwartz information criterion, and Hannan-Quinn information criterion, respectively.

Engle and Granger (1987) showed a long-run equilibrium relationship may exist between two series that are integrated of order one, I(1). A brief review of cointegration and error correction is provided here (for a more complete overview, see Engle and Granger, 1987; Johansen and Juselius, 1990; Banerjee et al., 1993). Johansen and Juselius' (1990) multivariate cointegration model is based on the error correction representation given by:

$$\Delta X_t = \mu + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-1} + \Pi X_{t-1} + \varepsilon_t \qquad (3)$$

where X_t is an (*n x 1*) column vector of p variables, μ is an (*n x 1*) vector of constant terms, Γ and Π represent coefficient matrices, Δ is a difference operator, k denotes the lag length, and $\varepsilon_t \sim N(0,\Sigma)$. The impact matrix, Π, contains information about the long-run relationships. We calculate the trace test and the maximum eigenvalue test statistics using the residuals obtained from estimating equation (3). These tests are used to find the number of cointegrating vectors that exist in the data. We report the results in Table 3.

Table 3: Johansen and Juselius (1990) test results on MENA indices and the S&P 500 over the period of January 2000 to February 2012.

Number of cointegrating vectors	Trace Statistics	Max-Eigen Statistics
r≤ 0	335.9342**	104.4688**
r≤ 1	231.4654**	78.8183**
r≤ 2	152.6471	47.3899
r≤ 3	105.2572	31.9897
r≤ 4	73.2675	23.3769

** denotes significance at the 5% level.

The trace and maximum eigenvalue tests shown in Table 3 suggest the existence of, at most, one cointegrating vector. These results imply the existence of eight independent common, stochastic trends in a system of nine variables.

The TYDL model supplements the VECM technique because it allows for causal inference based on an augmented level VAR with integrated and cointegrated processes. We examine the dynamic causal relationships among the stock market indices of MENA countries and the U.S. by using the following VAR in level specification:

$$X_t = \mu + \sum_{i=1}^{p-1} \Gamma_i X_{t-k} + \varsigma_t \qquad (4)$$

Where X_t is an (*n x 1*) column vector of p variables, μ is an (*n x 1*) vector of constant terms, Γ represents coefficient matrices, k denotes the lag length, and ς_t is *i.i.d.* and *p*-dimensional Gaussian error with mean zero and variance matrix Λ.

The TYDL procedure uses a modified Wald test for the restriction on the parameters of the VAR(*k*) model (Awokuse, 2005-a). This test has an asymptotic chi-squared distribution with *k* degrees of freedom in the limit when a VAR[*k+d(max)*] is estimated, where d(max) is the maximum order of integration for the series in the system. Awokuse (2005-b) further explains the usefulness of the TYDL approach noting that prior knowledge about cointegration and testing for the existence of

a unit root are not necessary once the extra lags, i.e., d(*max*) lags, are included. Given that VAR(*k*) is selected, and the order of integration d(max) is determined, a level VAR can then be estimated with a total of p=[k+d(*max*)] lags. Finally, the standard Wald tests are applied to the first *k* VAR coefficient matrix (but not all lagged coefficients) to make a Granger causality inference.

Based on the above, we determine appropriate lag length *k =2* and the *d(max) = 1*, the Granger causality test results using both the VECM and the augmented level VAR specifications are reported in Table 4. The p-values obtained from Granger causality tests using the VECM specification are presented in Table 4.

Table 4: Granger causality test results obtained using vector error correction specification on MENA indices and the S&P 500 over the period of January 2000 to February 2012.

Dep. Variable	ΔEG	ΔIS	ΔJO	ΔKU	ΔMA	ΔOM	ΔQA	ΔSA	ΔTU	ΔUS
ΔEG	-	.074	.034	.216	.118	.014	.007	.093	.674	.067
ΔIS	.278	-	.632	.436	.640	.112	.166	.195	.804	.000
ΔJO	.089	.607	-	.012	.172	.000	.060	.128	.000	.018
ΔKU	.027	.007	.939	-	.647	.000	.241	.026	.029	.000
ΔMA	.018	.981	.305	.300	-	.939	.935	.000	.726	.000
ΔOM	.045	.240	.226	.063	.003	-	.004	.090	.000	.000
ΔQA	.045	.405	.091	.025	.626	.768	-	.229	.246	.000
ΔSA	.154	.825	.123	.415	.040	.038	.000	-	.344	.002
ΔTU	.848	.237	.161	.274	.666	.012	.049	.614	-	.025
ΔUS	.092	.834	.454	.560	.119	.522	.522	.166	.735	-

These results are obtained using the VECM specification. The null hypothesis is the independent series does not Granger cause the dependent series. The first column represents the dependent series used in each test. Each subsequent column represents independent series. For example, the p-value of .278 suggests that the change in the value of the Egyptian index (ΔEG) does not Granger cause changes in the value for the Israeli index (ΔIS).

Based on the p-values, the empirical results of the VECM reveal strong bidirectional Granger causalities between changes in equity indices or returns on market portfolios in (i) Oman and Egypt, (ii) Qatar and Egypt, (iii) Saudi Arabia and Malta, (iv) Tunisia and Oman. Bidirectional Granger causalities where the causality from the first country is stronger than the reverse direction exist between (i) Jordan and Egypt, (ii) US and Egypt, (iii) Oman and Kuwait, (iv) Oman and Saudi Arabia. Marginal causality exists between (i) Qatar and Jordan. These bidirectional Granger causalities indicate that returns on market portfolios in these countries are cointegrated, i.e., their movements affect one another, directly or otherwise.

Judging from the p-values, the results reveal strong unidirectional Granger causality or strong weak exogeneity from changes in equity indices or returns on market portfolios from the first to the second country of the following pairs: (i) Kuwait to Jordan, (ii) Oman to Jordan, (iii) Tunisia to Jordan, (iv) Egypt to Kuwait, (v) Israel to Kuwait, (vi) Saudi Arabia to Kuwait, (vii) Tunisia to Kuwait, (viii) Egypt to Malta, (ix) Malta to Oman, (x) Qatar to Oman, (xi) Kuwait to Qatar, (xii) Qatar to Saudi Arabia, (xiii) Qatar to Tunisia. The results also indicate weak causality from (i) Israel to Egypt, (ii) Saudi Arabia to Egypt.

Pairwise Granger causality estimation results between equity returns in each of the nine MENA countries and the U.S. S&P 500 stock price index indicate significant weak exogeneity from the return of the U.S. S&P 500, except for weak bidirectional Granger causality between equity markets in the U.S. and Egypt.

Table 5: Granger causality test results obtained using the TYDL specification on MENA indices and the S&P 500 over the period of January 2000 to February 2012.

Dep. Variable	EG	IS	JO	KU	MA	OM	QA	SA	TU	US
EG	-	.013	.030	.123	.174	.004	.012	.095	.506	.064
IS	.436	-	.552	.553	.485	.382	.036	.210	.562	.000
JO	.230	.766	-	.384	.312	.000	.022	.919	.000	.003
KU	.000	.006	.990	-	.916	.001	.381	.344	.006	.000
MA	.046	.215	.595	.559	-	.757	.518	.000	.479	.000
OM	.004	.320	.119	.491	.002	-	.002	.053	.000	.001
QA	.036	.183	.120	.048	.609	.693	-	.351	.094	.000
SA	.679	.720	.083	.810	.053	.035	.038	-	.236	.000
TU	.802	.027	.346	.429	.688	.001	.062	.135	-	.049
US	.168	.787	.539	.791	.105	.536	.521	.537	.808	-

The table shows the p-values obtained from the TYDL procedure. The null hypothesis is that the independent series does not Granger cause the dependent series. The first column represents the dependent series used in each test. Each subsequent column represents independent series. For example, the p-value of .436 suggests that the Egyptian index (EG) does not Granger cause the Israeli index (IS).

The cointegration tests based on augmented VAR model (TYDL procedure) using the levels of the equity indices [see Table 5] indicate that the Granger causality of equity indices in (i) Qatar to Jordan, (ii) US to Egypt and (iii) Oman to Kuwait were weakly exogenous from the first to the second country rather than bidirectional. Moreover, the TYDL procedure did not detect any Granger causality between (i) Kuwait to Jordan and (ii) Saudi Arabia to Kuwait. However, the cointegration tests based on the augmented VAR model and using the equity index levels reveal significant unidirectional causalities from (i) Qatar to Israel (ii) Jordan to Saudi Arabia, (iii) Israel to Tunisia, which establish their unidirectional Granger causalities. Additionally, the TYDL procedure also reveals bidirectional Granger causality between Tunisia and Qatar instead of a unidirectional causality as indicated by the VECM in Table 5.

Appendix A
Definition and Sources of the Data

Stock Market Index	Abbreviation	Source
Egypt	ΔEG	Thomson-Reuters Datastream Professional
Israel	ΔIS	Thomson Reuters Datastream Professional
Jordan	ΔJO	Thomson Reuters Datastream Professional
Kuwait	ΔKU	Thomson Reuters Datastream Professional
Malta	ΔMA	Thomson Reuters Datastream Professional
Oman	ΔOM	Thomson Reuters Datastream Professional
Qatar	ΔQA	Thomson Reuters Datastream Professional
Saudi Arabia	ΔSA	Thomson Reuters Datastream Professional
Tunisia	ΔTU	Thomson Reuters Datastream Professional
United States	ΔUS	Thomson Reuters Datastream Professional

CONCLUSION

The MENA region is home to some of the oldest stock exchanges in the world: Turkey (1866), Egypt (1890), Lebanon (1920) and Morocco (1929). Nevertheless, stock exchanges within MENA nations are best classified as emerging markets. MENA exchanges are still in their respective formative stages as reflected by market maturity, investor participation, institutional development and regulatory oversight. The combination of the 2007-08 financial crisis and political instability has served to further delay the development of the region's stock markets.

Our study analyzes the equity market indices and market portfolio returns in nine MENA nations and the U.S. for the presence of cointegration. Data from weekly MENA market indices is utilized to employ VECM and the augmented level VAR model with integrated and cointegrated processes of arbitrary orders developed by Toda and Yamamoto (1995) and Dolado and Lütkepohl (1996). Granger causality tests based on the VECM suggest strong bidirectional Granger causalities between changes in equity indices or returns on market portfolios in (i) Oman and Egypt, (ii) Qatar and Egypt, (iii) Saudi Arabia and Malta, (iv) Tunisia and Oman; bidirectional Granger causalities where the causality from the first country was stronger than the reverse direction in (i) Jordan and Egypt, (ii) U.S. and Egypt, (iii) Oman and Kuwait, (iv) Oman and Saudi Arabia; and marginal causality in (i) Qatar and Jordan. These bidirectional Granger causalities indicate that returns on market portfolios in these selected countries were cointegrated, i.e., their movements affected one another, directly or otherwise.

Our results indicate strong unidirectional Granger causality from changes in equity indices or returns on market portfolios from the first to the second country of the following pairs: (i) Kuwait to Jordan, (ii) Oman to Jordan, (iii) Tunisia to Jordan, (iv) Egypt to Kuwait, (v) Israel to Kuwait, (vi) Saudi Arabia to Kuwait, (vii) Tunisia to Kuwait, (viii) Egypt to Malta (ix) Malta to Oman, (x) Qatar to Oman, (xi) Kuwait to Qatar, (xii) Qatar to Saudi Arabia, (xii) Qatar to Tunisia. The results also indicate weak causality from (i) Israel to Egypt, and (ii) Saudi Arabia to Egypt.

Pairwise Granger causalities between equity returns in each of the nine selected MENA countries and the U.S. S&P 500 stock price index

indicate significant weak exogeneity from the returns of the U.S. S&P 500, except for weak bidirectional Granger causality between the equity market in the U.S. and Egypt. The Granger causality test based on the augmented VAR procedure yield largely similar results as VECM.

Our results indicate that the MENA markets appear to be cointegrated. We can attribute this level of cointegration to MENA region policy efforts to remove capital flow barriers and to provide financial market integration. The cointegration level can also be partly attributable to similarities in MENA country economic structure. Many of the countries within the region possess dominant oil and gas sectors with fixed exchange rate systems. This may lead to similar risk/return relationships within the region. Our findings also suggest that while MENA stock markets tend to co-move with the U.S. stock market, exchanges within the MENA region are not yet fully integrated with the U.S.

The lack of MENA-U.S. market integration is partly explained by the substantial differences in economic structure and economic policy which exist between the U.S. and the MENA region. Financial and political turmoil in the MENA region has also contributed to the lack of integration between the respective markets.

It should be noted that the database used for this study carries some limitations which may reduce the strength of the conclusions. The study uses end-of-week transactions price data as opposed to daily price data. Different MENA countries define "end-of-week" differently, i.e., the end-of-week may mean Thursday or even Wednesday as opposed to Friday for developed markets. Thus, market prices may be responding to different sets of information and different shocks on different dates. The empirical results may be strengthened with the use of daily market data on returns and dividends.

It should also be noted a high level of market co-movement does not imply that two markets are conintegrated. The economies of two countries could have no common trade or investment/financial links and still exhibit co-movement within their stock exchanges if both countries are exposed to common world or regional shocks. It does not necessarily follow that the same markets will be integrated. This explains the results showing significant co-movement and little or no integration between MENA stock markets and U.S. markets.

The international investor should understand that increased MENA market integration (between MENA region countries) will not always be beneficial to the investor. This financial integration will not always decrease the potential risk diversification for international portfolios. Investors should always consider the risk/return characteristics of their portfolios, including country or industry effects, and the extent of market co-movement over the course of the business cycle. In addition, low levels of integration with U.S. markets do not imply that domestic assets will enter international investor portfolios in order to achieve risk diversification. Market access may be limited due to significant remaining foreign investment barriers including cost of access, cost of information, and taxation. Competition from other markets with better risk/return characteristics may dominate low integration markets.

This study can be further extended to future projects designed to identify barriers to regional capital market integration. The elimination of these barriers will help the MENA stock markets to achieve sufficient minimum size, depth, and liquidity.

Reference

Adler, M. and Qi, R. (2003), Mexico's integration into the North American capital market, *Emerging Economic Review*, 4: 91-120.

Assidenou, K.E. (2011), Cointegration of Major Stock Market Indices during the 2008 Global Financial Distress, *International Journal of Economics and Finance*, 3, 2: 212-222.

Awokuse, T.O. (2005-a), Exports, Economic Growth and Causality in Korea. *Applied Economics Letters*, 12: 693–696.

Awokuse, T.O. (2005-b), Export-Led Growth and the Japanese Economy: Evidence from VAR and Directed Acyclic Graphs, *Applied Economics Letters*, 12: 849–858.

Bekaert, G., and Harvey, C. (1995), Time Varying World Market Integration, *Journal of Finance*, 50(2), pp. 403-44.

Bakaert, G., and Harvey, C. (1997), Emerging Equity Market Volatility. *Journal of Financial Economics*, 43: 29–77.

Bakaert, G., and Harvey, C. (2000), Capital Flows and the Behavior of Emerging Equity Market Returns, *Capital Flows and the Emerging Economics: Theory, Evidence and Controversies*, Editor: Sebastian Edwards, NBER, 2000, 159-194.

Bley, J. (2007), How Homogeneous are the stock markets of the Middle East and North Africa? *Quarterly Review of Business and Economics* 46 (3), 3-26.

Bley, J. and Chen, K. H. (2006), Gulf Cooperation Council (GCC) stock markets: The dawn of a new era. *Global Finance Journal* 17: 95-71.

Banerjee, A., Dolado, J.J., Galbraith J. W. and Hendry, D. F. (1993), *Co-integration, Error Correction, and the Econometric Analysis of Non-Stationary Data.* Oxford University Press, Oxford.

Bulter, K. C. and Malaikah, J. (1992), Efficiency and Inefficiency in Thinly Traded Stock Markets: Kuwait and Saudi Arabia. *Journal of Banking and Finance,* 16: 197-210.

Carrieri, F., Errunza, V. and Hogan, K., (2007), Characterizing world market integration through time, *Journal of Financial and Quantitative Analysis,* 42, 915-941.

Darat, A. F. and Hakim, S. R. (1997), Price linkages, Efficiency, and Integration of Emerging Stock Markets in the Middle East, *Paper presented at the ERF Fifth Annual Conference on Regional Trade, Finance and Labor Markets in Transition,* Beirut, Lebanon, 7-9 October.

Darrat, A., Elkhal, K. and Hakim, J. (2000), On the integration of emerging stock markets in the Middle East. Journal of Economic Development 25, 61-78.

Dickey, D. A., and Fuller, W. A. (1979), Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association,* 74: 427–431.

Dolado, J. J., and Lutkepohl, H. (1996), Making Wald Tests Work for Cointegrated VAR Systems, *Econometric Reviews,* 15: 369–386.

El-Erian, M., and Kumar, M. (1995), Emerging Equity Markets in Middle Eastern countries, *International Monetary Fund Staff Papers*, Vol. 42(2), 313-343.

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

Hakim S., and Neaime S. (2000), Perspectives on the Integration of Financial Markets, In Paraskevopoulos, C.C., et al (Eds.). *Global Financial Instability and Economic Development*, APF Press, Toronto, Canada.

Hammoudeh, S. and Alesia, E. (2004), Dynamic relationships among GCC stock markets and NYMEX oil futures. Contemporary Economic Policy 22, 250-269.

Iwatsubo, K. and Inagaki, K. (2007), Measuring Financial Market Contagion Using Dually-Traded Stocks of Asian Firms, *CEI Working Paper Series*, n°14, Institute of Economic Research, Hitotsubashi University.

Johansen, S. (1988), "Statistical Analysis of Cointegrating Vectors." *Journal of Economic Dynamicsand Control*, vol. 12, 231–54.

Johansen, S. and Juselius, K. (1990), Maximum likelihood estimation and inference on cointegration: With applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52, 169 - 210.

Kaminsky, G. and Schmukler, S.L. (2002), Emerging Market Instability: Do Sovereign Ratings Affect Country Risk and Stock Returns?" *World Bank Economic Review*, World Bank Group, vol. 16(2), pages 171-195, August.

Kasa, K., (1992), Common Stochastic Trends in International Stock Markets, *Journal of Monetary Economic*s, 29, 95-124.

Kim, E.H. and Singal, V. (2000), Stock market openings: experience of emerging economies. *Journal of Business* 73(1) 25-66.

Lim, K., Lee, H. and Liew, K. (2003), International diversification benefits in Asian stock markets: a revisit, *Mimeo, Lebuan School of International Business and Finance*, Universiti Malasya Sabbah y Faculty of Economics and Management, University Putera Malaysia.

Masih, A. and Masih, R. (1997), A Comparative analysis of the propagation of stock market fluctuations in alternative models of dynamic causal linkages", *Applied Financial Economics*, 7, pp. 59-74.

Masih, A. and Masih, R. (1999), Are Asian stock market fluctuations due mainly to intraregional contagion effects? Evidence based on Asian emerging stock markets, *Pacific-Basin Finance Journal*, 7, pp. 252-82.

Masih, A., and Masih, R. (2001), Long and short term dynamic causal transmission amongst international stock markets, *Journal of International Money and Finance*, 20, pp. 563-587.

Neaime, S. (2002), Liberalization and financial integration of MENA stock markets, a paper prepared at the *ERF's 9th annual conference on "Finance and Banking*", United Arab Emirates.

Omran, M. and Gunduz, L. (2001), Stochastic trends and stock prices in emerging markets: The case of Middle East and North Africa region. *Istanbul Stock Exchange Review* 5, 3-7.

Parsva, P., and Lean, H.H. (2011), The Analysis of Relationship between Stock Prices and Exchange Rates: Evidence from Six Middle Eastern Financial Markets. *International Research Journal in Finance and Economics*, 66, 157-171.

Phillips, P. C. B., and Perron, P. (1988), Testing for a Unit Root in Time Series Regression. *Biometrika*, 75: 335–346.

Phylaktis, K., and Ravazzolo, F. (2000), Stock prices and exchange rate dynamics, *Mimeo*, City University Business School.

Rengasamy, E. (2012), On the Return Patterns and Cointegration of GCC Stock Indices, W*orking Paper*, The British University in Dubai.

Roll, R. (1977), A critique of the asset pricing theory's tests Part I: On past and potential testability of the theory, *Journal of Financial Economics* 4 (2): 129–176.

Roll, R. (1992), Industrial Structure and The Comparative Behavior of International Stock Market Indices, *Journal of Finance*, 47, 1, 3-41.

Swamy, V. and Sreejesh, S. (2011), Inter-Linkage between Commodity Markets and Capital Markets during the Global Financial Crisis:

Application of Likelihood-Based Cointegration Approach, *Economics, Management and Financial Markets* 6,3: 66-85.

Taylor, M. P. and Tonks, I. (1989), The Internationalization of Stock Markets and the Abolition of U.K. Exchange Control, *The Review of Economics and Statistics*, MIT Press, Vol. 71(2), pp. 332-36, May.

Toda, H. Y., and Yamamoto, T. (1995), Statistical Inference in Vector Autoregressions with Possibly Integrated Processes. *Journal of Econometrics*, 66: 225–250.

Wang, K. M. and Nguyen Thi, T. B. (2007), Testing for contagion under asymmetric dynamics : Evidence from the stock markets between US and Taiwan", *Physica*, A 376: 422-432.