American University of Beirut
Institute of Financial Economics

Lecture and Working Paper Series No. 3, 2004

Portfolio Diversification and Financial Integration of MENA Stock Markets

Simon Neaime

American University of Beirut

AUB American University of Beirut
الجامعة الأميركية في بيروت

IFE Lecture and Working Paper Series

This series of guest lectures and working papers is published by the Institute of Financial Economics (IFE) at the American University of Beirut (AUB) as part of its role in making available ongoing research, at the University and outside it, related to economic issues of special concern to the developing countries. While financial, monetary and international economic issues form a major part of the institute's work, its research interests are not confined to these areas, but extend to include other domains of relevance to the developing world in the form of general analysis or country specific studies.

Except for minor editorial changes, the lectures are circulated as presented at public lectures organized by the institute, while working papers reflect on-going research intended to be polished, developed and eventually published. Comments on the working papers, to be addressed directly to the authors, are welcome.

Portfolio Diversification and Financial Integration of MENA Stock Markets

Simon Neaime
American University of Beirut

Abstract

This paper studies the properties and characteristics of the MENA stock markets and the prospects and implications of enhanced financial liberalization in the region. It also explores whether these markets can offer international investors unique risk and returns characteristics to diversify international and regional portfolios. Johansen cointegration tests reveal that the GCC equity markets still offer international investors portfolio diversification potentials through mainly mutual funds while other emerging MENA stock markets like those of Turkey, Egypt, Morocco, and to a lesser extent Jordan, have matured and are now integrated with the world financial markets. Granger causality tests and impulse response functions show that shocks to the US and UK stock markets are transmitted to the MENA region but not to the GCC stock markets. Shocks to the French market insignificantly affect the MENA stock markets. Our empirical results confirm that evidence of regional financial integration is still weak except among the GCC stock markets.

Introduction

Over the last decade the empirical finance literature has been concerned with the financial integration of the world major stock markets (see, for example, King and Wadhwani 1990, Joen and Von Furstenberg 1990, Arshanapalli and Doukas 1993, Eun and Shim 1989, and Kasa 1992). Recently there has been a shift in attention to the emerging markets of developing countries (Chowdhury 1994, Bekaert and Harvey 1997, DeSantis and Imrohoroglu 1997, Darrat and Hakim 1997, and Hakim and Neaime 2000). The new focus stems from the fact that these markets present portfolio and fund managers a new possibility to enhance and optimize their portfolios. For example Bekaert (1993), and Bekaert and Harvey (1997), found that stock market returns in emerging markets were high and predictable but lacked strong correlation with major markets. As emerging markets mature they are likely to become increasingly sensitive to the volatility of stock markets elsewhere. Their increasing degree of integration with world markets will diminish their ability to enhance and diversify international portfolios.

MENA (Middle East and North Africa) member countries do not treat international or even intra-regional capital investments uniformly. Financial integration remains a distant goal and has been overtaken by smaller more functional arrangements, such as the Gulf Cooperation Council (GCC).[1] This regional integration is important because the MENA stock markets as a group may be able to offer investment opportunities not

1. Gulf Cooperation Council countries are mainly the MENA oil-producing countries: Bahrain, Oman, Qatar, Kuwait, Saudi Arabia, and the United Arab Emirates. In this paper the GCC countries are Bahrain, Kuwait, and Saudi Arabia due to the lack of data for the rest of the GCC countries.

possible by one individual MENA market. Specifically, GCC countries have traditionally discriminated against non-GCC investors but the rest of the regional markets, particularly those of Amman, Cairo, Casablanca, and Turkey, are largely open to MENA investors. These markets offer capital-rich GCC equity investors unique diversification benefits associated with optimum portfolios with a balanced mix of domestic and international securities.

The concept of stock market integration is broad. This paper investigates how MENA equity markets display different co-movements over time. Greater degrees of co-movements generally reflect greater stock market integration (see Cheung and Mak 1994, Eun and Shim 1989, and Engle and Susmel 1993). This study reveals for the first time issues relating to regional and international integration and segmentation of seven emerging MENA equity markets. For example, in the context of the MENA region our research will address the question of whether the MENA capital market is segmented from the rest of the world. Questions of market integration are of concern both to MENA equity investors and to companies in the region that make capital budgeting decisions. Specifically, if segmentation exists and a firm is forced to raise capital locally, then its cost of capital is likely to be higher than that of a company with unrestricted access to the regional and international capital markets. Therefore one would expect the restriction to the local capital market to raise a firm's marginal cost of capital. This paper will measure the extent to which capital market segmentation imposes restrictions on the free mobility of capital in the MENA countries and the incremental costs a firm is forced to bear (Korajczyk 1996). Moreover, within the MENA countries, our results identify markets, which are regionally and/or internationally integrated; and diversification potentials these equity

markets offer investors. Overall these findings are expected to contribute to the understanding of the investment potentials offered by the equity markets in the MENA countries. In many ways the MENA stock markets remain somewhat unsophisticated. Better regulation and more transparency would help to strengthen their market fundamentals. However, as these countries liberalize their financial markets, their returns are likely to correlate more with the world markets. This would raise the question of whether their volatilities will suffer.

This paper constitutes the first attempt at studying a broad number of stock markets in the MENA region (7 markets). Previous studies covered shorter periods of time and a smaller number of markets in this region. These include El-Erian and Kumar (1995), which covered five markets over the period 1992–94, Darrat and Hakim (1997) covering three markets and the period 1996–97, Hakim and Neaime (2000) the period 1995–98, and Butler and Malaikah covering two markets and the period 1985–90. The paper will also test for the existence of cointegration to determine whether the MENA countries are segmented or linked to the US stock market (S&P 500 Index), the UK (FTSE 100), and the Paris (CAC 30) stock markets, respectively. Should significant cointegration exist between MENA and other stock markets, one would conclude that inefficiencies in security prices in one market may affect movements in another country's market (Roll 1988).

The rest of the paper is divided as follows. Section two overviews the main characteristics and properties of the MENA stock markets. Section three presents an empirical model to test whether MENA stock markets are integrated with each other. In the same section we explore the interrelations these markets exhibit with respect to their counterparts in the US, UK, and France using The Johansen cointegration techniques. Section four employs a

Vector Error Correction Model, Granger causality tests, and impulse response functions to further explore the long- and short-run dynamics of the stock market return series. Section five summarizes and concludes the paper with some policy implications.

MENA Stock Markets

Stock market developments in the MENA region have been disappointing during the last decade. The GCC market capitalization has remained relatively low and did not grow by as much as its MENA counterparts. In Saudi Arabia market capitalization has grown only by 30 percent in between 1989–99. Similar growth performances are observed in Kuwait (see Table 1).

Table 1 Characteristics of MENA Stock Markets

	Number of Companies Listed		Market Capitalization (USD Billions)		Volume Traded (USD Millions)		Turnover Ratio (%)	
	1989	1999	1989	1999	1989	1999	1989	1999
Bahrain	–	41	–	7.15	–	558	–	12.82
Egypt	510	989	1.71	32.83	91	7660	18.80	4.29
Jordan	106	152	2.16	5.82	652	538	3.32	10.83
Morocco	41	55	0.62	13.69	16	3294	38.81	4.16
Saudi Arabia	59	73	40.90*	60.44	6194*	12670	6.60	4.77
Turkey	50	285	6.78	112.71	798	68.802	8.50	1.64
Kuwait	–	66**	11.31	20.00	14.2	18.00**	–	127**
Total MENA	796	1595	18.09	232.64	1571.2	93522	76.03	38.51
Iran	169*	242**	6.55*	14.87**	741*	1389**	8.84	10.70
Greece	119	281	6.37	204.21	549	155256	11.61	1.32
Israel	262	644	8.22	63.82	3909	16446	2.10	3.88

Source: World Bank Group, IFC, Arab Monetary Fund 2000.

Notes:
1. Number of companies listed: year-end totals, excluding listed investment funds where possible.
2. Stock market capitalization: year-end total market values of listed domestic companies.
3. Volume traded: year-end total value traded of listed domestic company shares.
4. Turnover ratio: calculated by dividing the value of total shares traded by market capitalization for the year.
5. *1995 **1998

This can be attributed to the 1991 Gulf war and to the fact that these markets have remained closed and fairly illiquid. The share of ownership of the respective governments in these markets has rendered the role of private firms rather limited in scope. This scenario is quite different when one looks at the remaining MENA stock markets. Record market capitalization growth rates can be noted in Egypt, Morocco, and Turkey, and to a lesser extent in Jordan, over the same period. This is due to the massive privatization plans introduced in Morocco, Egypt, and Turkey; the extensive sale of government assets to private firms; and the considerable efforts devoted recently toward enhancing the efficiency, depth, and liquidity of the three stock markets. MENA performance relative to other Middle Eastern stock markets has also been disappointing and has cast doubt on the performance of MENA stock markets during the last decade. While liquidity ratios have remarkably improved in between 1989–99 in Morocco, Turkey, and Egypt, they have remained relatively low in Jordan, Saudi Arabia, and Kuwait. The turnover ratio has declined in Egypt, Jordan, Morocco, and Turkey. This can be attributed to the considerable increase in the market capitalization in each one of these markets.

Table 2 indicates that while GCC stock markets are fully accessible to GCC investors they have remained relatively closed to international foreign investors; even non-GCC MENA countries face restrictions on portfolio investment in these stock markets. Various restrictions still exist in the face of the MENA portfolio flows and the removal of these restrictions is expected to improve and enhance growth and liquidity in these markets, and reduce the costs of raising capital in the local market. Table 2 also indicates that international investors have complete access to the Morocco, Cairo, and

Istanbul stock markets and a little less access to the Jordanian stock market. Although the open access to foreign investors has contributed significantly to the growth performances of the MENA stock markets, this is expected to gradually lower their diversification potentials that used to be offered to international investors.

Increased financial integration within the MENA region is expected to bring considerable benefits to the MENA investors. A more liquid capital market offers lower borrowing costs for the MENA firms wishing to raise funds locally. Moreover, international financial institutions will be willing to diversify their portfolios by tapping the MENA financial markets, which will benefit from portfolio capital inflows, if the convergence of asset returns

Table 2 Accessibility of MENA Stock Markets to Foreign and Other Arab Investors

Bahrain	- open to GCC nationals
	- foreigners resident in Bahrain for at least three years may own up to 1% of the capital of a single company
	- foreigners can trade shares in only four of the 41 listed companies
Egypt	- unrestricted access to foreign investors
	- repatriation of capital and dividends allowed
Jordan	- foreign investors can hold up to 50% of a company's capital
	- repatriation of capital and dividends allowed
Kuwait	- open to GCC nationals
	- non-Kuwait residents are allowed to own shares through mutual funds only
Morocco	- unrestricted access to foreign investors
	- repatriation of capital and dividends are allowed
Saudi Arabia	- open only to GCC nationals who can own up to 25% of listed companies other than banks
	- shares traded over the counter through banks
	- opened recently to foreign investors through mutual funds only
Turkey	- open to foreign investors with 49% ownership constraint in any listed or unlisted companies

Source: Author's estimates.

in the world markets leads international investors to increase their MENA markets holdings in order to diversify across countries with a wide range of risk and returns.

Data and Empirical Model

Our data consists of weekly closing price series up to December 2000 for the MENA stock markets of Bahrain, Kuwait, Saudi Arabia, Jordan, Egypt, Morocco, and Turkey. For the world main financial markets we use the US, the UK, and the French stock markets. The paper divides the MENA stock markets into two groups. The first consists of the GCC member countries: Bahrain, Kuwait, and Saudi Arabia. The second includes Egypt, Jordan, Morocco, and Turkey. Compounded week-to-week returns are calculated as the natural logarithmic differences in prices: $\ln (P_t/P_{t-1})$. Older stock markets in the MENA region,as for example Amman and Istanbul, are tracked as early as 1990, while Morocco is tracked since 1992. More recent additions like Saudi Arabia and Egypt are analyzed since 1993, Bahrain since 1995, and Kuwait since 1994 due to the Gulf war.

Unit Root Tests for Stationarity. We start by testing the existence of a long-run relationship between the MENA stock markets as a group (Egypt, Jordan, Turkey, and Morocco); the GCC stock markets as a group (Saudi Arabia, Bahrain, and Kuwait); and between both MENA and GCC markets on one hand and the UK, the US, and the French stock markets on the other. For this purpose the Johansen (1991, 1995) cointegration test will be used after establishing non-stationarity of the series by applying both the Phillips-Perron (PP) and the Augmented Dickey-Fuller (ADF) Unit Root Tests.[2] It is common for time-series data to demonstrate signs of non-

stationarity; typically both the mean and variance of macroeconomic variables trend upward over time. In any case tests for non-stationarity are carried out as a preliminary step to explore the possibility of a significant long-run relationship between the variables concerned, i.e., cointegration tests.

The following regressions are carried out:

(1)

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

where Δ is the first-difference operator; β_i, and δ_i, are constant parameters; and ε_t is a stationary stochastic process. The number of lags (k) will be determined based on the Akaike Information Criterion (AIC).

To determine the order of integration of the series, model (1) is modified to include second differences on lagged first and k lags of second differences. That is,

(2)

$$\Delta^2 P_t = \lambda_1 \Delta P_{t-1} + \sum_{i=1}^{k} \mu_i \Delta^2 P_{t-i} + \varepsilon_{1t},$$

2. Cointegration tests involve two steps. First, each time series is examined to determine its order of integration. This involves unit root tests based on the work of Fuller (1976), Dicky and Fuller (1979, 1981), and Phillips and Perron (1988). These tests involve the calculation of t-statistics for $\rho = 1$ in OLS regressions of the form: $X_t = \rho X_{t-1} + u_t$ (1), where X_t is the variable of interest and u_t is independent and identically distributed (iid), N $(0,\sigma^2)$. The t-statistic does not have the standard t distribution; critical values under the null that $\rho = 1$ are found in Fuller (table 8.5.2). If u_t violates the iid assumption, modifications to (1) must be implemented in conducting the test. The Augmented Dickey-Fuller (ADF (p)) test supplements (1) with p lagged changes in the dependent variable as additional regressors. Alternatively, the Phillips-Perron test involves the estimation of equation (1), coupled with a non-parametric correction of the t-statistic for general forms of autocorrelation in the errors. Equation (1) is often expressed in an alternative form as $\Delta X_t = (\rho - 1) X_{t-1} + u_t = \delta X_{t-1} + u_t$, where $\delta = (\rho - 1)$ and where Δ is the first difference operator. This equation is equivalent to equation (1), however, now the null hypothesis is that $\delta = 0$. This is the line followed in the paper.

where, $\Delta^2 P_t = \Delta P_t - \Delta P_{t-1}$,; λ_i, and μ_i, are constant parameters; and ε_{1t} is a stationary stochastic process. The k lagged difference terms are included so that the error terms ε_t and ε_{1t} in both equations are serially independent. To test for stationarity, the ADF and PP tests are applied to equations (1) and (2) and the results are summarized in Table 3. The null hypotheses are $\beta_2 = 0$, and $\lambda_1 = 0$ respectively, i.e., a unit root exists in P_t and ΔP_{t-1} implying that the series are non-stationary.

The PP and ADF test results indicate that the MENA and the world stock markets series are non-stationary in the levels (equation 1). However, unit roots in the first differences of the stock prices (equation 2) are rejected at the 1 percent significance level, suggesting that returns (or stock

Table 3 Unit Root Test Results

	PP (L) Levels	PP (L) First Difference	ADF (L) Levels	ADF (L) First Difference
Bahrain	0.50(2)	-12.32(2)**	0.39(2)	-5.40(2)**
Egypt	-1.63(4)	-10.41(4)**	-1.89(4)	-6.32(4)**
Jordan	-1.23(4)	-16.37(4)**	-1.27(4)	-8.76(4)**
Kuwait	-0.09(2)	-7.00(2)**	-0.09(2)	-4.77(2)**
Morocco	-0.17(2)	-7.05(2)**	-0.25(2)	-4.61(2)**
Saudi Arabia	2.06(5)	-10.01(5)**	1.54(5)	-3.40(5)**
Turkey	-2.23(5)	-15.71(5)**	-2.53(5)	-7.58(5)**
MENA index	-0.89(4)	-11.82(4)**	-1.18(4)	-5.90(4)**
Paris	0.09(3)	-15.63(3)**	-0.17(3)	-8.69(3)**
UK	-1.06(2)	-17.38(2)**	0.85(2)	-9.21(3)**
US	1.76(2)	-18.27(2)**	1.35(2)	-11.20(2)**

Source: Author's estimates.

Notes:
1. PP is the Phillips-Perron test and ADF is the Augmented Dickey-Fuller test.
2. The MENA index is a market capitalization based weighted index constructed for Egypt, Jordan, Turkey, and Morocco.
3. The numbers in parentheses are the proper lag lengths based on the Akaike Information Criterion (AIC).
4. An * indicates rejection of the null hypothesis of non-stationarity at the 5% level of significance, while ** indicates a stronger rejection at the 1% level.

price changes) are stationary. We conclude that weekly stock prices in the world and the MENA regions are I (1). That is, the first-differenced series do not exhibit a unit root, i.e., the series are stationary. The ADF and PP tests indicate that each variable achieves stationarity only if converted to first-differences. Thus, each variable is integrated of the first-order I (1). Since the ΔP_t series are stationary, they are an I (0) stochastic processes, which means the P_t series are I (1) time series; essentially they are random walks (non-stationary stochastic processes).[3]

Cointegration Tests. Our next task is to check whether the series are cointegrated. Specifically, having established the presence of a unit root in the levels of each variable, we need to test whether the series in each country have different unit roots (non-cointegrated), or share the same unit root (cointegrated). Cointegrated variables, if disturbed, will not drift apart from each other and thus possess a long-run equilibrium relationship. Testing for the existence of cointegration among economic variables has been widely used in the empirical literature to study economic interrelationships. Its existence would imply that the two series would never drift too far apart. A non-stationary variable, by definition, tends to wander extensively over time, but a pair of non-stationary variables may have the property that a particular linear combination would keep them together; that is, they do not drift too far apart. Under this scenario the two variables are said to be cointegrated, or possess a long-run (equilibrium) relationship.[4]

3. A time series is integrated of order d (denoted as I(d)) if it must be differenced d times in order to induce stationarity.

4. Examples of possibly cointegrated economic variables are short-term and long-term interest rates; prices and wages; prices and money supply; and, consumption and income. Equations estimated with stationary variables but without regard to the underlying cointegration are also inappropriate due to the model misspecification (e.g., an omitted-variable bias).

The Johansen (1991,1995) efficient maximum likelihood test is used to examine the existence of a long-term relationship between the individual MENA sub-groups (MENA and GCC) on one hand, and between MENA and GCC and the world markets on the other, at the 5 and 1 percent levels of significance respectively.[5] It is applied using alternative lag lengths in the vector autoregression (VAR). More specifically, consider a VAR of order z:

(3)

$$X_t = A_1 X_{t-1} + ... + A_z X_{t-z} + \varepsilon_t ,$$

where X_t is our y-vector of the non-stationary I (1) weekly stock market price series, and ε_t is a vector of innovations. We can rewrite the VAR as

(4)

$$\Delta X_t = \theta\ X_{t-1} + \sum_{i=1}^{z-1} \lambda_i \Delta X_{t-i} + \varepsilon_t ,$$

where $\theta = \sum_{i=1}^{z} A_i - I_i$ and $\lambda_i = -\sum_{j=i+1}^{z} A_j .$

Granger's representation theorem asserts that if the coefficient matrix θ has reduced rank r<y, then there exist y x r matrices ω and Ω each with rank r such that $\theta = \omega\Omega'$ and $\Omega' X_t$ is stationary. r is the number of cointegrating relations (the cointegrating rank) and each column of Ω is the cointegrating vector. The elements of ω are known as the adjustment parameters in the vector error correction model. Johansen's method is to

5. Studies by Cheung and Lai (1993) and Gonzalo (1994), among others, provide ample evidence supporting the use of the Johansen approach over alternative tests.

estimate θ matrix in an unrestricted form, then test whether we can reject the restrictions implied by the reduced rank of θ. We report the values of r (the number of cointegrating relations) in the following tables.

Table 4 Johansen Cointegration Likelihood Ratio Test for the GCC Stock Markets

Hypothesis			Critical Values	
Null	Alternative	Test Statistics	(5%)	(1%)
r=0	r≥1	34.97*	29.68	35.65
r≤1	r≥2	10.24	15.41	20.04
r≤2	r=3	1.86	3.76	6.65

Source: Author's estimates.

Notes:
1. The Johansen cointegration likelihood ratio test is based on the trace of the stochastic matrix.
2. The test allows for a linear deterministic trend in the data.
3. r represents the number of cointegrating vectors. Maximum lag 4 years in VAR.
4. An ** and * indicate significance at the 1% and 5% level of significance, respectively. The asymptotic critical values are from Osterwald-Lenum (1992).

Table 5 Johansen Cointegration Likelihood Ratio Test for the MENA Stock Markets

Hypothesis			Critical Values	
Null	Alternative	Test Statistics	(5%)	(1%)
r=0	r ≥1	43.30	47.21	54.46
r ≤1	r ≥2	19.84	29.68	35.65
r ≤2	r ≥3	5.57	15.41	20.04
r ≤3	r =4	0.03	3.76	6.65

Source: Author's estimates.

Notes:
1. The Johansen cointegration likelihood ratio test is based on the trace of the stochastic matrix.
2. The test allows for a linear deterministic trend in the data.
3. r represents the number of cointegrating vectors. Maximum lag 4 years in VAR.
4. An ** and * indicate significance at the 1% and 5% level of significance, respectively. The asymptotic critical values are from Osterwald-Lenum (1992).

Table 6 Johansen Cointegration Likelihood Ratio Test for the GCC Stock Markets and the World

Hypothesis			Critical Values	
Null	Alternative	Test Statistics	(5%)	(1%)
r=0	r ≥1	92.53	94.15	103.18
r ≤ 1	r ≥2	61.96	68.52	76.07
r ≤ 2	r ≥3	40.75	47.21	54.46
r ≤ 3	r ≥4	23.03	29.68	35.65
r ≤ 4	r ≥5	10.25	15.41	20.04
r ≤ 5	r =6	1.53	3.76	6.65

Source: Author's estimates.

Notes:
1. The Johansen cointegration likelihood ratio test is based on the trace of the stochastic matrix.
2. The test allows for a linear deterministic trend in the data.
3. r represents the number of cointegrating vectors. Maximum lag 4 years in VAR.
4. An ** and * indicate significance at the 1% and 5% level of significance, respectively. The asymptotic critical values are from Osterwald-Lenum (1992).

Table 7 Johansen Cointegration Likelihood Ratio Test for the MENA Stock Market Index and the World

Hypothesis			Critical Values	
Null	Alternative	Test Statistics	(5%)	(1%)
r=0	r ≥1	56.96*	53.12	60.16
r ≤ 1	r ≥ 2	30.83	34.91	41.07
r ≤ 2	r ≥ 3	14.87	19.96	24.60
r ≤ 3	r = 4	7.093742	9.24	12.97

Source: Author's estimates.

Notes:
1. The Johansen cointegration likelihood ratio test is based on the trace of the stochastic matrix.
2. The test allows for a linear deterministic trend in the data.
3. r represents the number of cointegrating vectors. Maximum lag 4 years in VAR.
4. An ** and * indicate significance at the 1% and 5% level of significance, respectively. The asymptotic critical values are from Osterwald-Lenum (1992).

Table 8 Johansen Cointegration Likelihood Ratio Test for the MENA Index and the GCC Markets

Hypothesis			Critical Values	
Null	Alternative	Test Statistics	(5%)	(1%)
r=0	r ≥ 1	47.01	54.64	61.24
r ≤ 1	r ≥ 2	20.24	34.55	40.09
r ≤ 2	r ≥ 3	5.09	18.17	23.46
r ≤ 3	r = 4	1.50	3.74	6.40

Source: Author's estimates.

Notes:
1. The Johansen cointegration likelihood ratio test is based on the trace of the stochastic matrix.
2. The test allows for a linear deterministic trend in the data.
3. r represents the number of cointegrating vectors. Maximum lag 4 years in VAR.
4. A ** and * indicate significance at the 1% and 5% level of significance, respectively. The asymptotic critical values are from Osterwald-Lenum (1992).

The Likelihood Ratio Test in Table 4 indicates one cointegrating vector at the 5 percent significance level between the GCC stock markets. This is not surprising since GCC countries have made substantial efforts to integrate their financial markets and have removed all the barriers to the flow of capital between member countries.[6] The scenario is not quite similar for the remaining MENA stock markets. While individual MENA countries have devoted significant efforts toward opening and liberalizing their financial markets they still seem to be segregated as a group, casting doubt on the question of whether MENA stock markets are regionally integrated. Table 5 indicates no cointegrating vector at both levels of significance. While GCC markets appear not to be integrated with the world major stock

6. Since 1997 Bahrain and Kuwait have linked their stock markets by allowing the cross listing of local stocks. Financial markets that are located in the same geographical area and have identical cohorts of investors are bound to have stock markets which react to various shocks in the same way. In addition, when a stock is cross-listed in more than two markets, then a shock in one market is likely to be transmitted to the other because investors will tend to react to various financial shocks in a similar way.

markets (Table 6), the remaining MENA financial markets have matured and are now integrated with the world financial markets (Table 7). Thus GCC stock markets can enhance and diversify the portfolios of the remaining MENA region investors through mainly mutual funds. This is also true for international investors seeking diversification in emerging markets. The MENA stock markets offer the equity reach GCC countries diversification potentials not offered by other regional financial markets. Table 8 indicates no cointegrating vectors between all the MENA stock markets (GCC and non-GCC) providing more robust evidence against regional financial integration.

Vector Error Correction Model

After establishing that the MENA countries as a group and the world main stock markets are cointegrated, i.e., there exists a long-run relationship between the two groups, we next employ a Vector Error Correction Model (VECM) to tie the short-run behavior of each series to its long-run values. VECM was first introduced by Sargan (1984) and later popularized by Engle and Granger (1987). Engle and Granger have shown that a system of cointegrated variables can be represented by a dynamic error-correction model (ECM) by invoking the Granger's Representation Theorem. We introduce the lagged residuals (called the error correction (EC) term) to the model with stationary variables obtained from the long-run relationship. The coefficient on this EC term reflects the adjustment of the dependent variable in the short run to its long-run position.

Engle and Granger's two-step method is used to estimate the following multivariate error-correction model:

(5)

$$\Delta P_t = \alpha_0 + \alpha_1 EC_{t-1} + \alpha_2 \Delta P^*_{t-1} + \sum_{m=1}^{3} \alpha_m \Delta P_{t-m} + \varepsilon_t$$

where Δ denotes first differences, and ε_t is the error term with the usual properties. Regression (5) relates the change in P_t (MENA Index)[7] to its first lag and that of P^*_t, where P^*_t represents the series of the world financial markets. In this equation ΔP^*_{t-1}, and ΔP_{t-m}, capture the short-run disturbances in P_t whereas the error correction term EC_{t-1} captures the adjustment toward the long-run equilibrium.

Model (5) assumes a unidirectional relationship from the world stock markets to stock markets in the MENA region. To examine the possibility of a bi–directional relationship between the respective series, the error–correction model is re–estimated after switching the place of ΔP_t and ΔP^*_t.

(6)

$$\Delta P^*_t = \alpha_0 + \alpha_1 EC_{t-1} + \alpha_2 \Delta P_{t-1} + \sum_{m=1}^{3} \alpha_m \Delta P^*_{t-m} + \varepsilon_{1,t}$$

To examine the short-run dynamics of the series we also perform Granger causality tests by running models (5) and (6) without the error correction term resulting in standard Granger causality tests. The Granger causality tests, which are summarized in Table 9, suggest that the four variables are significantly related in the short-run. Specifically, the null hypothesis that the US stock market does not Granger cause MENA is soundly rejected at the 1 percent level of significance. Also the null

7. The MENA Index is a market capitalization based weighted index constructed for Egypt, Jordan, Turkey, and Morocco.

hypothesis that the UK stock market does Granger cause MENA is rejected at the 15 percent level of significance. This suggests that there exist strong unidirectional linkages flowing from the world major stock markets (US and UK) to the MENA region. The Paris stock market appears, however, not to have any significant impact on the MENA region, but the reverse hypothesis that MENA does not Granger cause the Paris market cannot be rejected. The highly significant F-Statistics on the VECM model are consistent with our earlier findings. Specifically, the highly significant F statistics in both models (5) and (6) provide an additional support for the existence of a strong cointegrating relationship between the MENA markets and the world in the long run.

We next turn to explore how the MENA markets would react to shocks in the world financial markets. For this purpose impulse response functions trace the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variable. In other words, a shock to the j-th variable directly affects the j-variable and is also transmitted to all of the endogenous variables through the dynamic structure of the VECM. More specifically, a change in ε_t in equation 5 will immediately change the value of the current MENA index series. It will also impact all future values of the MENA index and the change in the world indices since the lagged MENA index appears in both equations 5 and 6. The impulse response functions shed light on the dynamics of the variables included in the VECM system as a result of shocks to either one of these variables. The tests show that shocks to both the US (S&P) and the UK (FT) stock markets affect significantly the MENA index but not the other way round (see Figure 1). Specifically, a one standard deviation positive shock to the S&P seems to affect significantly the MENA stock markets permanently

and for a period larger than 10 weeks. The effects of the UK market on the MENA markets seems to die out after 8 weeks but that of Paris (P) seems to be insignificant. This can be attributed to the fact that cultural, financial,

Table 9 Return Dynamics Between MENA Stock Markets and the World

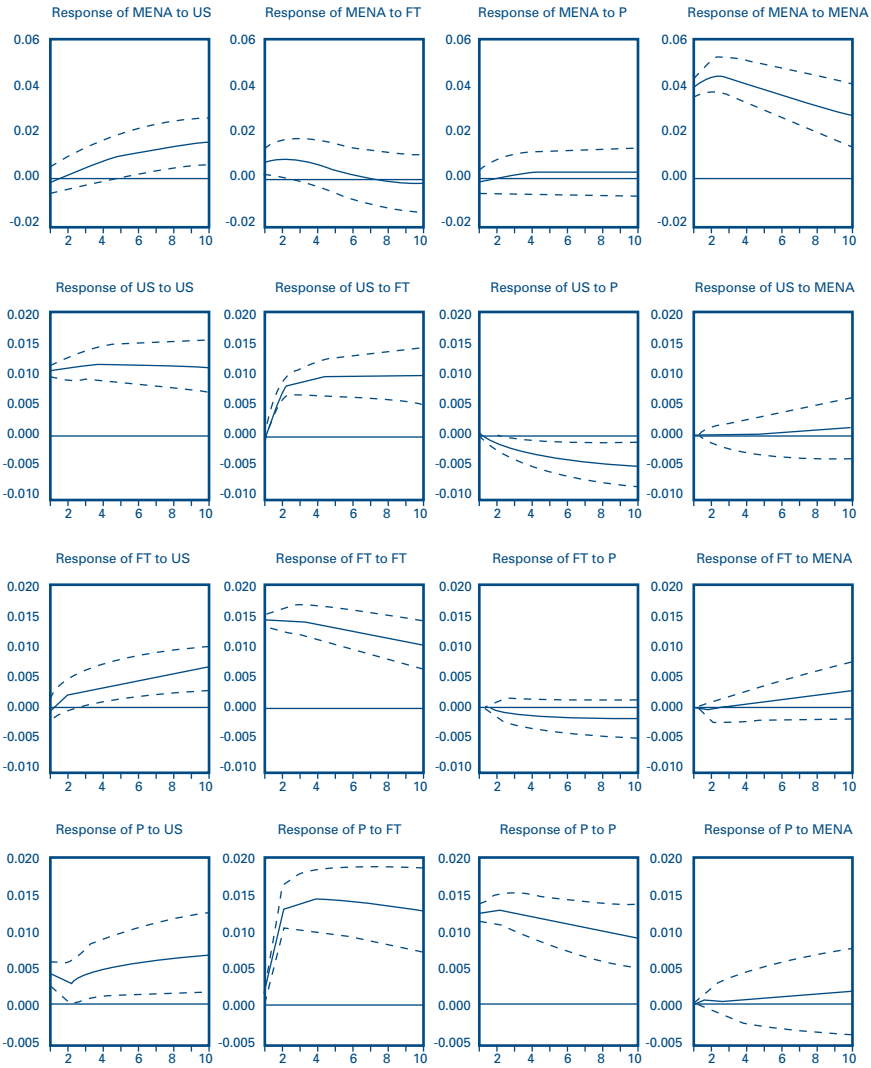
Short-Run Granger Causality			
Null Hypothesis	Observations	F-Statistics	Probability
P does not Granger Cause MENA	317	1.03	0.35
MENA does not Granger Cause P		5.49	0.004
US does not Granger Cause MENA	317	4.12	0.017
MENA does not Granger Cause US		1.55	0.21
FT does not Granger Cause MENA	317	1.86	0.15
MENA does not Granger Cause FT		0.75	0.47
US does not Granger Cause P	379	4.28	0.014
P does not Granger Cause US		2.55	0.078
FT does not Granger Cause P	379	37.21	1.8 E-15
P does not Granger Cause FT		2.16	0.11
FT does not Granger Cause US	429	18.87	1.4E-08
US does not Granger Cause FT		8.29	0.00029
Vector-Error Correction Model			
Long-Run VECM	Number of weeks		F-Statistics
VECM Equation (5)	317		4.48**
VECM Equation (6)	317		
US Dependent Variable			27.97**
UK Dependent Variable			2.95*
Paris Dependent Variable			31.17**

Source: Author's estimates.

Notes:
1. An * indicates significance at the 5% level.
2. An ** indicates significance at the 1% level.

Figure 1 Impulse Response Functions

Response to One S.D. Innovations ± 2 S.E.



and economical relations between the US and the UK are much more important with Egypt, Turkey, and Jordan than they are with Morocco, the only country with important ties with France. Since Morocco's share in total MENA market capitalization is much smaller than its remaining counterparts, the French stock market seems to affect insignificantly the MENA markets.

Conclusions and Policy Implications

This paper highlighted some important aspects of financial integration in the MENA region and between MENA and the rest of the world. After exploring the main characteristics of the MENA financial markets the paper used a dynamic model to empirically study the implications of financial integration both at the regional and international levels. The issue of financial market integration has received considerable attention in the finance literature after portfolio managers realized that emerging financial markets offer diversification potentials not offered by more mature markets. Our empirical results confirmed that while the stock markets of Egypt, Turkey, Jordan, and Morocco have matured and are cointegrated with the world financial markets, evidence of regional financial integration is still weak except among the GCC stock markets. Although the GCC stock markets appear to be segregated from the rest of the world, they can still offer diversification potentials to international and regional investors through mainly mutual funds.

Next, we turned our attention to the examination of linkages and spillover effects among MENA stock markets and between them as a group and the world markets. Our findings showed that the main stock markets of the MENA region reacted to their world counterparts but that smaller GCC markets were isolated from the rest of the world. This finding took us a step further in confirming that the non-GCC MENA stock markets were maturing

and becoming integrated with the world stock markets. While integration is generally a goal of any emerging market, it offers little reward to international investors seeking diversification. If all stock markets were fully integrated, investors would not find the diversification benefits they desire by tapping into emerging markets. Our results suggest that the stock markets of Istanbul, Cairo, Jordan, and Casablanca appear already integrated with the rest of the world markets. In addition to this long-run linkage, there is also strong evidence of important short-run Granger causality effects flowing unidirectionally from the world main stock markets to the MENA markets and shocks to the US and the UK markets appear to significantly affect the MENA region and for long periods of time.

The removal of the restrictions and barriers to the flow of capital into the GCC region's financial markets is expected to improve and enhance economic growth and development in these countries. The finance literature has shown that there exists a strong link between financial liberalization and economic growth. Increased inter-MENA liberalization will not only increase allocative efficiency within MENA, as the experience of the developed economies shows, but will also provide MENA investors with greater opportunities to diversify their portfolios and reduce risks. Increased financial liberalization within the MENA region is expected to enhance regional intermediation of resources through close integration of financial markets and increased access of MENA residents to the region's financial markets to finance investment. In addition, MENA investors will have access to a variety of risks adjusted rates of return to enhance the efficiency of portfolio allocation and diversification, which will foster the efficiency of MENA's financial markets. Increased liberalization within the MENA region is expected to attract important portfolio and direct investments to the region.

References

Akdogan, H., and E. Elgar.1995. The integration of international capital markets. Working Paper. Bilkent University and Boston University.

Arshanapalli, B., and J. Doukas. 1993. International stock market linkages: Evidence from the pre- and post-October 1987 period. *Journal of Banking and Finance* 17:193–208.

Bekaert, G., and C. R. Harvey. 1997. Emerging equity market volatility. *Journal of Financial Economics* 43:403–44.

Bekaert, G. 1993. Market integration and investment barriers in emerging equity markets. *Portfolio Investment in Developing Countries*. The World Bank.

Bulter, K. C., and J. Malaikah. 1992. Efficiency and inefficiency in thinly traded stock markets: Kuwait and Saudi Arabia. *Journal of Banking and Finance* 16:197–210.

Cheung, Y. W. 1993. Finite sample sizes of Johansen's likelihood ratio test of cointegration. *Oxford Bulletin of Economics and Statistics* 55:313–28.

Cheung, Y., and S. Mak. 1992. A study of international transmission of stock market fluctuations between the developed markets and the Asia-Pacific markets. *Applied Financial Economics* 2:1–5.

Chowdhry, A. 1994. Stock market interdependence: Evidence from the Asian NIEs. *Journal of Macroeconomics* 16, no. 4:129–651.

Darrat, A. F., and S.R. Hakim. 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.

De Santis, G., and S. Imrohoroglu. 1997. Stock returns and volatility in emerging financial markets. *Journal of International Money and Finance* 16, no. 4:561–79.

De Santis, G., and B. Gerard. 1997. International asset pricing and portfolio diversification with time varying risk. *Journal of Finance* 5, no. 52:18–81.

Dickey, D., and W. Fuller. 1979. Distribution of the estimators for autoregressive time series

with a unit root. *Journal of the American Statistical Association* 74:427–31.

_____. 1981. Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica* 49:1057–72.

El-Erian, M., and M. Kumar. 1995. Emerging equity markets in Middle Eastern countries. *International Monetary Fund Staff Papers* 42, no. 2:313–43.

Engle, R. F., and R. Susmel. 1993. Common volatility in international equity markets. *Journal of Business and Economic Statistics* 11, no. 2:167–76.

Engle, R. F., and C. W. Granger. 1987. Granger: Cointegration and error-correction representation, estimation, and testing. *Econometrica* 55:251–76.

Eun, C., and S. Shim. 1989. International transmission of stock market movements. *Journal of Financial and Quantitative Analysi*s 24:241–56.

Gonzalo, J. 1994. Five alternative methods of estimating long-run equilibrium relationships. *Journal of Econometrics* 60:203–23.

Granger, C. W. 1968. Investigating causal relationships by econometric models and cross-spectral methods. *Econometrica* 37, no. 3:424–38.

_____. 1986. Developments in the study of cointegrated variables. *Oxford Bulletin of Economics and Statistics* 48, no. 3:213–28.

Hakim S., and S. Neaime. 2000. Perspectives on the integration of financial markets in the MENA region. In *Global Financial Markets and Economic Development*, ed. C. C. Paraskevopoulos, A. A. Kintis, and T. Georgakopoulos. Toronto, Canada: APF Press.

International Monetary Funds: *International Financial Statistics.* Various issues.

Johansen, S. 1991. Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica* 59, no. 6:1551–80.

_____. 1995. *Likelihood-based inference in cointegrated vector autoregressive models.* NY: Oxford University Press, 45–66.

Joen, B. N., and G. M. Von Furstenberg. 1990. Growing international co-movement in stock price indexes. *Quarterly Review of Economics and Business* 30, no. 3:15–30.

Kasa, K., 1992. Common stochastic trends in international stock markets. *Journal of Monetary Economics* 29, no. 1:95–124.

King, M. A., and S. Wadhwani. 1990. Transmission of volatility between stock markets. *Review of Financial Studies* 3, no. 1:5–33.

Korajczyk, R. 1996. A measure of stock market integration for developed and emerging markets. *The World Bank Economic Review* 10, no.2:12–33.

Osterwald-Lenum, M. 1992. A note with quantiles of the asymptotic distribution of the maximum likelihood cointegration rank test statistics. *Oxford Bulletin of Economics and Statistics* 54, no. 3:461–72.

Papaioannou, M., and G. Tsetsekos. 1997. *Emerging Markets Portfolios*. Chicago: Irwin.

Phillips, P. C. B., and P. Perron. 1988. Testing for a unit root in time series regression. *Biometrika* 75, no. 2:335–46.

Sargan, J. D. 1984. Wages and prices in the United Kingdom: A study in econometric methodology. In *Econometrics and Qualitative Economics*, ed. D. F. Hendry and K. Wallis, 275–314. Oxford: Basil Blackwell.