



Does the Euro-Mediterranean Partnership contribute to regional integration?

Faten Ben Slimane, Sabri Boubaker, Jamel Jouini

► To cite this version:

Faten Ben Slimane, Sabri Boubaker, Jamel Jouini. Does the Euro-Mediterranean Partnership contribute to regional integration?. Journal of Policy Modeling, 2020, 42 (2), pp.328-348. hal-02422726

HAL Id: hal-02422726

<https://hal.science/hal-02422726>

Submitted on 22 Aug 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

Does the Euro-Mediterranean Partnership contribute to regional integration?

Faten Ben Slimane

IRG, Université Paris-Est-Marne la Vallée, France

Sabri Boubaker

South Champagne Business School, France

IRG, Université Paris Est, France

Jamel Jouini*

College of Business Administration

King Saud University, Saudi Arabia

Abstract: The paper investigates whether Southern Mediterranean and Middle Eastern markets under the Euro-Mediterranean Partnership (Egypt, Lebanon, Morocco, Malta, and Turkey) have become more financially integrated with the European stock market over time. The findings suggest that the Turkish equity market is moderately integrated with the European market, while the other economies exhibit weak financial integration with Europe, supporting the idea that the partnership appears to have no effect on enhancing inter-market linkages for these economies. Therefore, these markets would be good destinations for international investors seeking attractive investment opportunities to diversify their equity portfolios. Structural changes in the cross-market integration do exist, which may be considered as a guide for international equity portfolio diversification over different subperiods. In addition, there is evidence of an increasing trend in conditional correlations for Egypt and Turkey, to varying degrees, over time, notably during the post global financial crisis of 2007–2008, thus revealing herding behavior during this period. Overall, investors should be wary of the variation of equity market integration over time before engaging in an investment at the level of portfolio management and diversification. Policymakers must be aware of the remoteness of the current achievements of the Euro-Mediterranean Partnership from the targets set in terms of financial development and economic growth.

Keywords: Euro-Mediterranean partnership; European market; financial integration; DCC-FIEGARCH; structural break; time-varying conditional correlation.

JEL classification: F36; F65; G01; G15.

* Department of Economics, College of Business Administration, King Saud University, P.O. Box 71115, Riyadh 11587, Saudi Arabia. Tel.: (+966) 11 46 74 151, Fax: (+966) 11 46 73 763, E-mail: jjouini@ksu.edu.sa.

1. Introduction

Scholars are devoting increased attention to the Euro-Mediterranean Partnership (EMP)¹ and the incentives that lead countries to negotiate bilateral and multilateral agreements within the region. Most of this literature focuses on the human, social, and political aspects of the partnership, by analyzing how it guarantees security and affects cultural and educational institutions (see FEMISE, 2011). A second research stream examines economic aspects of the EMP, especially how it affects macroeconomic stabilization, long-term productivity, competitiveness, and deregulation of economic activity (see Romagnoli and Mengoni, 2014). Most studies agree that the partnership encourages Southern Mediterranean and Middle Eastern (SMME) countries to adopt economic and structural reforms. However, efforts toward privatization and economic deregulation remain lethargic, which brings into question the economic benefits of the EMP (see Hoekman, 2005). Other studies focus on the EMP's impact on trade liberalization. Since commencement of the partnership, annual exports from (to) the South Mediterranean partners to (from) the European Union (EU) have increased. However, these southern countries have imported more from the EU than they have exported to it (see Behr, 2010). The EMP thus has delivered mixed results on economic growth and development in the region (see Kern and Salhi, 2011a).

We argue that, for this multilateral partnership to yield greater benefits, more attention should be paid to the financial sector, which the literature clearly links to economic development. Levine (2005), for instance, points out the positive effect of a developed financial sector on macroeconomic variables such as productivity, growth, and poverty reduction. Surprisingly, research that analyzes financial markets in the Euro-Mediterranean region and the implications of the EMP on these markets is scarce. How financial markets operate and compete is rapidly changing as competition increases. However, taking into account these changes and fostering a healthy and dynamic financial sector is one of the key factors in achieving economic growth and job creation in the Mediterranean region. Hence, researchers should devote greater attention to financial markets because of significant interdependence between financial development and economic growth in this region (see Pagano, 1993; Levine and Zervos, 1998; and El-Wassal, 2005).

¹ The EMP was re-launched in 2008 as the Union for the Mediterranean (UfM).

This paper examines whether the EMP affects inter-relations and integration of selected stock markets in the Euro-Mediterranean region. The present research is related to several strands in the theoretical and empirical literature. One implication of this research relates to the linkages and integration among stock markets. Due to the gradual liberalization of financial markets that contributes to creating more opportunities for global international investment, there is increasing interest in investigating relationships among financial markets. The main objective of this literature is to understand better the interrelationships among markets to recognize interesting investment opportunities, such that increasing integration among equity markets may decrease the advantages of international portfolio diversification. Numerous studies focus on developed markets, such as the US, Japan, and major European markets (see Baele, 2005; Bartram et al., 2007; van Ewijk and Arnold, 2015; Boubaker et al., 2016).

Other papers investigate integration and interdependence across emerging markets. Most of these studies focus on Central and Eastern European or Asian markets (see Bekaert and Harvey, 1997; Worthington and Higgs, 2004; Gjika and Horváth, 2013; Gan, 2014; Guidi and Ugur, 2014; Jouini, 2015). However, there is little interest shown in the literature in studying stock market behavior in the Euro-Med region, due to lack of data and to these markets' relatively recent opening to foreign investors. Maghyreh and Al-Zoubi (2004) use a VAR-EGARCH to examine dynamic interdependence among four stock markets (Egypt, Morocco, Jordan, and Turkey). Their results show strong linkages among these markets at the volatility level. Darrat et al. (2000) examine the pattern and the extent of interdependence of the markets of Morocco, Egypt, and Jordan. These authors find a high degree of co-movements among these stock markets. Integration among equity markets within the Middle East region is also documented by Darrat and Pennathur (2002). However, more recent studies show that regional dependence among most Middle East and North African (MENA) countries is weak. Alkulaib et al. (2009) use a state-space model to investigate the relationship among some MENA countries, notably Egypt, Jordan, Lebanon, Morocco, Tunisia, and Turkey, and find no linkages among North African financial markets. However, they show a bi-directional causality between the Turkish and Lebanese stock markets, while Jordan is not influenced by the other markets. Neaime (2002, 2012), and Lagoarde-Segot and Lucey (2007) confirm the weak linkages among most stock markets in the Euro-Med region.

Another strand of the literature investigates not only linkages among Euro-Med stock markets, but also with developed countries. Yu and Hassan (2008) use a multivariate GARCH model to examine the structure of interdependence and transmission of equity returns and volatility between seven MENA stock markets (including Jordan, Egypt, Morocco, and Turkey) and three major developed markets (the US, the UK, and France). These authors provide strong evidence of a long-run equilibrium relation between Euro-Med markets and the US market. Moreover, according to their results, the US stock market significantly affects the volatility of most of these markets. Cheng et al. (2010) find, however, less conclusive results, with Israel and Turkey the most strongly integrated with world financial markets. Graham et al. (2013) also find a modest degree of co-movements of stock returns between the US and Egypt and Jordan during the study period, but with an increasing trend of international capital market co-movements toward the end of the stock return series. Neaime (2012, 2016) focuses on the global financial crisis to assess its impact notably on some MENA stock markets. This author finds, especially, that Egypt, Jordan, Tunisia, and Morocco were the countries most affected by the 2007–2008 financial crisis due to their important exposure to the European and US financial sectors.

This study sets forth several significant improvements and extensions to the literature. In particular, it is the first, to our knowledge, to assess not only the dynamic integration of individual Mediterranean stock markets with the European stock market, but also the first to examine the potential effect of the EMP on these links. Moreover, contrary to previous works, our analysis uses a large sample of data. The present paper examines integration among five stock markets in the SMME region (Egypt, Lebanon, Morocco, Malta, and Turkey) with European markets during the period from January 1, 1998 through December 1, 2016. Studying these markets over the whole period offers a more complete picture of the evolution of the links of these markets to the European market, and allows us to examine whether the 2007–2008 global financial crisis affects the integration process. For this purpose, we use the DCC-FIEGARCH methodology² that has the advantage to allow past shocks to have asymmetric effects on conditional volatility, to capture the time-varying conditional correlations between stock returns, and to allow for long-range volatility dependence (see Conrad et al., 2011).

² To the best of our knowledge, this model has not been previously fitted to Euro-Med data.

The results indicate that the Turkish stock market is most integrated with the European market, and that the integration level remains relatively moderate over the study period. However, the integration level is considerably weak for the other stock exchanges, suggesting that the EMP, known as the UfM, appears to have no significant effect on these markets. Moreover, the results also show changes in the integration level over time, implying that international equity portfolio diversification is regime-dependent. For the Egyptian and Turkish markets, we find an increase in correlation during the period following the 2007–2008 global financial crisis, thus supporting contagion effects between these markets and the European market. The results have important implications for investors who seek good destinations to diversify their stock portfolios internationally, and for policymakers to manage contagion risks.

The paper proceeds by presenting, in Section 2, the EMP and a discussion of its implications for economic and financial integration within the region. Section 3 describes the empirical methodology used to assess the interactions between each of the SMME markets and the European stock market. Section 4 presents the data and discusses empirical results. Finally, Section 5 sets forth our conclusions and implications of the results.

2. EMP and market integration

The EMP, also known as the Barcelona Process, began in November 1995. It was introduced by the EU to establish privileged and preferential relations with the South Mediterranean countries. This partnership originally included the 15 member states of the EU (today 28) and the 12+1 partners from North Africa and the East (today 10+1 after Cyprus and Malta joined the EU).³

The Barcelona Process has three broad objectives: (i) create a common area of peace and prosperity where human rights and democratic principles are respected; (ii) establish a strong economic and financial partnership and a free-trade area on a longer-term horizon; and (iii) create a sound social, cultural, and human partnership among people across the Mediterranean Sea. The Barcelona process was reinforced by the launch in 2008 of the UfM,

³ Algeria, Cyprus, Egypt, Israel, Jordan, Lebanon, Malta, Mauritania, Morocco, Palestine, Syria, Tunisia, Turkey, and Libya, as an observer state. Note that negotiations with Libya are currently suspended as well as the signature of the initialed Association Agreement with Syria.

which added five coastal states to the EMP, namely Albania, Croatia, Bosnia and Herzegovina, Montenegro, and Monaco.

The UfM pursues the objectives of the Barcelona process by emphasizing multilateral rather than bilateral exchanges. It focuses on economic development with the idea that regional integration and economic cooperation are the necessary catalysts to reducing fragmentation and gaps in economic development between European and Mediterranean countries. In this sense, the Barcelona process/UfM identifies major economic efforts in line with its objectives. The first goal consists of liberalizing trade and facilitating the supply of services and investments. The second aims to strengthen economic cooperation by encouraging information exchange, providing technical assistance and expert services, and supporting alliances and joint ventures. The third consists of financial cooperation, especially provision of financial assistance to regional projects and granting aid to Mediterranean partner countries.

Moreover, according to International Monetary Fund and World Bank reports, the EU supports projects to reform the banks and financial systems of major Mediterranean partnership countries. Many governments of EMP countries opted for privatization of state-owned banks and reduction of barriers to international capital flows (World Bank, 2012). The literature suggests that these efforts positively affect regional economies and facilitate implementation of a stable macroeconomic framework. Nabli and Véganzone-Varoudakis (2004), for instance, find that, following macroeconomic reform efforts, inflation decreased substantially across the MENA region. Dodini and Krause (2005) underline the positive effects of the Barcelona process, especially on global trade integration efforts. Since 1995, the market share of Mediterranean countries in global trade has increased and most of these countries have attained a relatively high degree of macroeconomic stability. However, despite these achievements, the gap in income levels between countries on both sides of the Mediterranean Sea remains relatively high, due notably to the slowness of structural reforms.

Creane et al. (2006) confirm that MENA countries have reformed their banking systems and regulatory and supervisory frameworks. However, nonbank institutions in the financial sector have been neglected and need to be upgraded. Kern and Salhi (2011a) study the effects of the EMP on the financial systems of Mediterranean partner countries. These authors argue that the EMP has made reforms of banking and financial systems easier in the region, leading to an increase in the number of privatized banks and an acceleration in investment activity.

Kern and Salhi (2011b), however, point out weaknesses in regulatory and supervisory financial frameworks. These authors posit that good financial governance practices are a prerequisite to promoting sound Euro-Mediterranean financial cooperation (Kern and Salhi, 2011a, b).

The clear differences in economic structure, systems of governance, and human and social development within the MENA region and within the European market (FEMISE, 2011) are a source of problems for the EU, which should negotiate with Mediterranean partners that have heterogeneous preferences. Moreover, the interests and priorities of South Mediterranean governments generally differ from EU priorities; and this explains why some researchers describe the EMP as a *couscous bowl* of agreements (see Behr, 2010).

In addition to the difficulties described above, the Euro-Mediterranean region has faced an Arab revolution, the Arab Spring, beginning in late 2010 in Tunisia and followed by neighboring countries. The Arab Spring weakened the social and political setting of these countries and highlighted the fragility of their economic and financial frameworks.

3. Econometric approach

We first consider that each index return series, r_t , is generated by the following conditional mean equation:

$$r_t = \mu + \phi r_{t-1} + \varepsilon_t \quad (1)$$

$$\varepsilon_t = u_t \sqrt{h_t} \quad (2)$$

where μ is a constant term, ϕ is an autoregressive coefficient, ε_t is the error term from the mean equation, u_t is an independently and identically distributed (*i.i.d.*) random variable, and h_t is the conditional variance given by the following FIEGARCH(1, d , 1) model proposed by Bollerslev and Mikkelsen (1996):⁴

⁴ These authors argue that this fractionally integrated variance model is more flexible to properly understand the long-run dependency in the volatility process compared to other volatility processes in the literature that are found to be highly persistent and not-covariance-stationary (see Nelson, 1991; Engle and Lee, 1992; and Bollerslev et al., 1994). Based on information criteria, the FIEGARCH model is the well suited to model the volatility dynamics of the stock markets under study compared to other GARCH-type models.

$$\log(h_t) = \omega + \beta \log(h_{t-1}) + (1 + \alpha)(1 - L)^d g(u_{t-1}) \quad (3)$$

where the news impact function, $g(u_t)$, is defined as follows:

$$g(u_t) = \delta_1 u_t + \delta_2 [|u_t| - E(|u_t|)] \quad (4)$$

As seen, no constraints on the model coefficients are imposed to ensure the positivity of the conditional volatility. The usual GARCH coefficients α and β capture short-term dynamics, while the long-memory parameter d captures long-term dynamics.⁵ Regarding asymmetry, the sign effect is captured through the term $\delta_1 u_t$,⁶ while the magnitude effect is captured through the term $\delta_2 [|u_t| - E(|u_t|)]$.⁷ To summarize, the FIEGARCH model has the advantage to deal with two features, namely asymmetry in the responses of conditional volatility to positive and negative shocks, and long-memory, which generally characterize financial time series.

To compute the dynamic conditional correlations (DCC) among equity markets, we employ the DCC model developed by Tse and Tsui (2002),⁸ that opts for two stages to estimate the conditional covariance matrix H_t . The first stage consists in computing the estimations of $\sqrt{h_{ii,t}}$, $i = 1, 2, \dots, N$,⁹ by fitting a univariate FIEGARCH(1, d , 1) for each index return series. In the second stage, the standardized residuals obtained from the first stage ($u_{it} = \varepsilon_{it} / \sqrt{h_{ii,t}}$) are then used to compute the conditional correlation coefficients. Therefore, the conditional variance-covariance matrix is expressed as follows:

⁵ The readers are referred to Conrad et al. (2011) for the expression of the financial differencing operator $(1 - L)^d$.

⁶ Within this context, negativity of the coefficient δ_1 implies that negative innovations to stock prices have more impact on conditional volatility than positive innovations of the same absolute magnitude.

⁷ Bollerslev and Mikkelsen (1996) propose approximating the $E(|u_t|)$ term by the sample mean of the absolute standardized residuals.

⁸ Tse and Tsui (2002) claim that their developed model is a reliable alternative model that allows analysis of linkages among variables in a time-varying framework. Within this context, opting for a dynamic correlation structure enables us to draw more interesting insights on cross-market interrelations than does constant conditional correlation structure.

⁹ Note that N is the number of market index return series.

$$H_t = D_t R_t D_t \quad (5)$$

where $D_t = \text{diag}(\sqrt{h_{11,t}}, \sqrt{h_{22,t}}, \dots, \sqrt{h_{NN,t}})$, and $R_t = (1 - \theta_1 - \theta_2)R + \theta_1 \Psi_{t-1} + \theta_2 R_{t-1}$. Moreover, θ_1 and θ_2 are non-negative parameters satisfying $\theta_1 + \theta_2 \leq 1$, $R = \{\rho_{ij}\}$ is a time-invariant $(N \times N)$ symmetric positive definite matrix of parameters with $\rho_{ii} = 1$, and Ψ_{t-1} is the $(N \times N)$ correlation matrix of ε_τ for $\tau = t - M, t - M + 1, \dots, t - 1$ where the (i, j) th element is as follows:

$$\psi_{ij,t-1} = \frac{\sum_{l=1}^M u_{i,t-l} u_{j,t-l}}{\sqrt{\left(\sum_{l=1}^M u_{i,t-l}^2\right) \left(\sum_{l=1}^M u_{j,t-l}^2\right)}}, \quad 1 \leq i < j \leq N \quad (6)$$

The positivity of the matrix Ψ_{t-1} and hence of R_t is ensured when $M \geq N$. Moreover, R_t is a correlation matrix if its one-lagged matrix R_{t-1} is also a correlation matrix. Under these conditions, the conditional correlation coefficient between two index return series i and j is given by $\rho_{ij,t} = (1 - \theta_1 - \theta_2)\rho_{ij} + \theta_1 \psi_{ij,t-1} + \theta_2 \rho_{ij,t-1}$. The maximum likelihood method is applied to estimate the model.

4. Data and empirical results

We investigate the extent to which individual SMME stock markets (Egypt, EGCSE30; Lebanon, LBBLOMI; Morocco, MSMORCL; Malta, MALTAIX; and Turkey, TKNAT30) are integrated with the European equity market (STOXX EUROPE 600 E).¹⁰ The individual SMME equity markets are selected due to their geographical positions and their commitments with Europe. Egypt, Lebanon, and Morocco are members of the Euro-Mediterranean Free Trade Area; Turkey is a candidate member to the European Union (EU); and Malta is a EU member state. We thus consider three market classifications: frontier (Lebanon, Morocco, and Malta), emerging (Egypt and Turkey), and developed (Europe). Data is weekly and covers the period from January 1, 1998 through December 1, 2016 (988 observations),¹¹ and

¹⁰ The Stoxx Europe 600 E index represents 75% of European equity market capitalization.

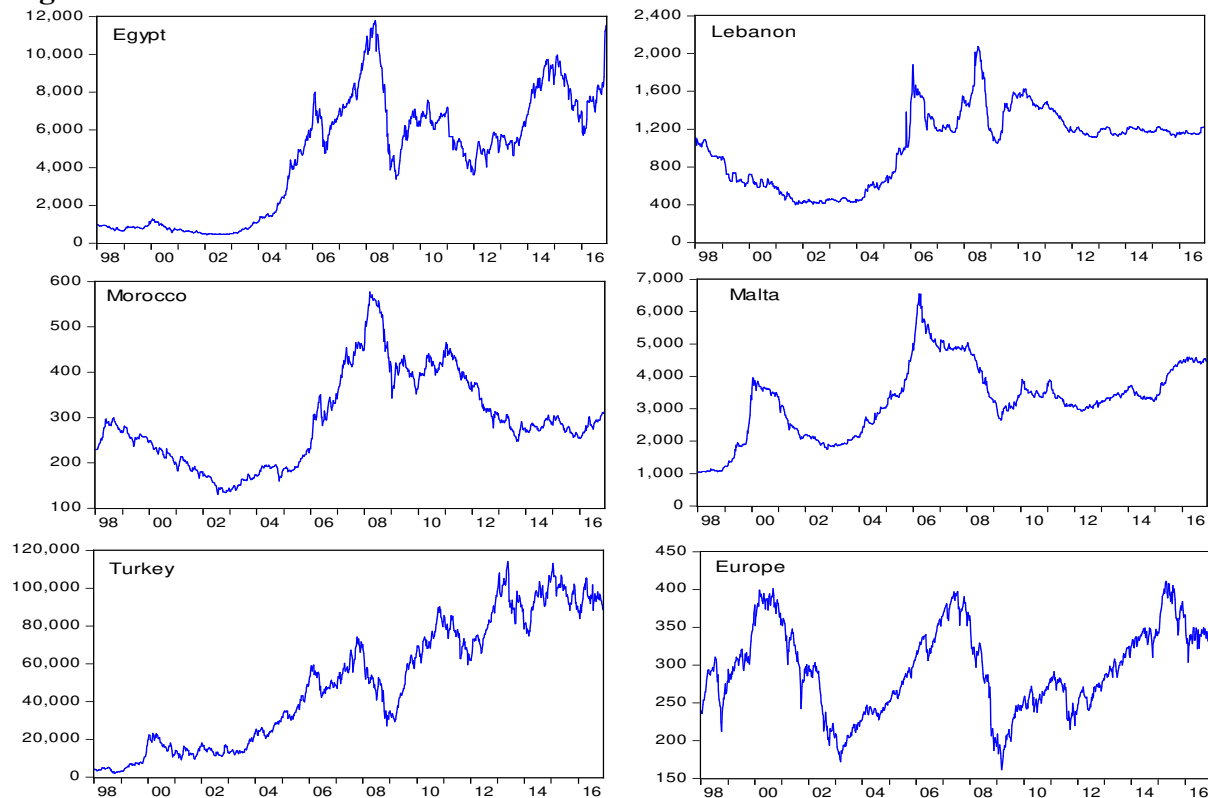
¹¹ We believe that the study period is sufficient to address cross-market integration in a time-varying framework. In this dynamic context, a small number of observations may lead to inefficiency.

are gathered from Datastream. Weekly returns are computed as the difference in the logarithm of two successive index prices.

4.1. Preliminary data analysis

Time-variations of equity market indices are illustrated in Figure 1. There is evidence of similar trending behavior (downward or upward) over various periods, especially at the time of the 2008 stock market crash, where we observe significant drops in stock levels. Slight declines are also recorded in the Egyptian market at the time of the revolution in early 2011. All these facts may be helpful in drawing some evidence on integration of the selected economies with Europe, and the influence of the global recession provoked by the subprime and financial crises on equity market comovements.

Figure 1. Time-variations of stock market indices



Summary statistics for stock market returns are depicted in Table 1 (Panel A). The average values of the returns are all positive, and range from $8.9E-5$ for Lebanon to $3.1E-3$ for Turkey. The European index experiences low mean returns that are comparable to those of Morocco. In addition to showing the best performance in terms of returns, the Turkish stock index is the most volatile, as shown by the standard deviation. However, the Maltese equity market presents the lowest volatility compared to the other markets. The skewness coefficient

is negative for four out of six equity markets, indicating that large positive returns are likely to be observed less than large negative returns for these markets. All equity returns are leptokurtic (fat tails), as indicated by the kurtosis coefficient, which exceeds 3. The highest value is observed for the Lebanese stock market index, which means that this equity market exhibits more frequent extreme changes. These values refer to the non-normality of all examined stock market returns, which is confirmed by the Jarque–Bera test results. This supports the use of the Student's-t distribution to model the conditional fat-tail property of the market index returns when estimating the model by the maximum likelihood method.

Table 1. Descriptive statistics, unit root, and long-memory results for index returns

	Egypt	Lebanon	Morocco	Malta	Turkey	Europe
Panel A: Statistics						
Mean	2.5E-3	8.9E-5	3.1E-4	1.5E-3	3.1E-3	3.7E-4
Std. Dev.	0.043	0.029	0.022	0.021	0.057	0.026
Skew.	-0.453	1.130	-0.306	0.970	-0.141	-0.490
Kurt.	6.551	32.934	9.734	8.020	7.421	5.581
JB	552.404 [0.000]	37059.540 [0.000]	1880.555 [0.000]	1191.005 [0.000]	807.174 [0.000]	313.584 [0.000]
LB	24.941 [0.015]	30.186 [0.003]	18.419 [0.104]	113.190 [0.000]	21.868 [0.039]	22.399 [0.033]
LB ²	95.332 [0.000]	204.40 [0.000]	45.438 [0.000]	412.070 [0.000]	329.560 [0.000]	275.890 [0.000]
Corr.	0.237 [0.000]	0.117 [0.000]	0.052 [0.103]	0.074 [0.019]	0.401 [0.000]	- -
Panel B: Unit root						
ADF	-29.187 [0.000]	-32.307 [0.000]	-30.798 [0.000]	-9.866 [0.000]	-32.365 [0.000]	-32.950 [0.000]
Panel C: Long-memory						
GPH method						
Returns	0.084 [0.011]	0.037 [0.255]	0.049 [0.138]	0.106 [0.001]	-0.018 [0.576]	-0.008 [0.816]
Squared returns	0.088 [0.008]	0.369 [0.000]	0.097 [0.003]	0.272 [0.000]	0.220 [0.000]	0.221 [0.000]
GSP method						
Returns	0.067 [0.003]	0.018 [0.433]	0.039 [0.085]	0.102 [0.000]	-0.001 [0.968]	-0.013 [0.563]
Squared returns	0.092 [0.000]	0.292 [0.000]	0.100 [0.000]	0.217 [0.000]	0.201 [0.000]	0.215 [0.000]

Notes: JB is the Jarque-Bera normality test; LB is the Ljung-Box test for autocorrelation of order 12 applied to returns; LB² is the Ljung-Box test for autocorrelation of order 12 applied to squared returns; Corr. denotes the unconditional correlation of European returns with individual returns; ADF is the unit root test; GPH is the log-periodogram regression test; and GSP is the Gaussian semi-parametric test. The values in brackets are the *p*-values of the tests.

The Ljung–Box test shows evidence of autocorrelation for all equity index returns, except for Morocco, at the conventional levels. In order to take into consideration such serial dependence, the mean of the estimated models is parameterized as an unrestricted AR(1) process. All index returns exhibit ARCH effects, as evidenced by the Ljung–Box test applied

to squared returns, thus supporting the use of GARCH-type approach to investigate the equity volatility dynamics. The unconditional correlations show positive moderate dependence of the Turkish market with the European index. However, the other equity markets are weakly interrelated with the European market, as indicated by the low correlation coefficients.¹² The ADF (see Said and Dickey, 1984) unit root test concludes in favor of stationary index returns (Panel B, Table 1), which is suitable for long-range dependence tests.

We now perform long-memory tests on returns and squared returns (volatility proxy) to determine whether there is long-range dependence in the mean equation and in the variance equation, respectively. To do so, we implement the log-periodogram regression test of Geweke and Porter-Hudak (1983) (GPH), and the Gaussian semi-parametric test of Robinson and Henry (1998) (GSP). The test results, set forth in Table 1 (Panel C), show evidence of long-memory in mean for three out of five individual equity markets. The Europe index does not exhibit long-range dependence in mean. For the variance equation, all equity markets show evidence of highly significant long-memory based on squared returns. A notable feature is that long-memory is more pronounced in the variance than in the mean for all markets, as shown by the estimated persistence degree. Almost all long-memory coefficients are between 0 and 0.5, indicating stationary series with slow decrease in lagged autocovariance. The exception is the Turkish and European markets, where the estimated persistence degree is negative for returns regardless of the method used, suggesting that the process generating these variables is a short-memory process. These results point to the importance of adequately specifying the long-memory values economically. Overall, an autoregressive model and a fractionally integrated process appear to be suitable to govern the mean and volatility proxies, thus supporting recourse to the AR-FIEGARCH process to capture the dynamics of the considered stock index returns.

4.2. Estimation results

We proceed to estimate five bivariate AR(1)-DCC-FIEGARCH(1, d , 1) models, each containing the returns for an individual equity market: Egypt, Lebanon, Morocco, Malta, Turkey, and the European index.¹³ The obtained results are reported in Table 2. For the mean

¹² The correlation coefficients are statistically different from zero, except for Morocco.

¹³ We choose the bivariate specification based on the likelihood ratio tests, and the AIC and SIC information criteria. In addition, these criteria are employed to select the lag order of the AR-FIEGARCH process. In most cases, we find that the bivariate AR(1)-FIEGARCH(1, d , 1) process seems to be the best-suited model.

equation (Panel A), the constant term is statistically significant for only the Egyptian equity market. The AR coefficient is significantly positive for the stock markets of Egypt, Lebanon, and Morocco, thereby reflecting the rapid transmission of pertinent market information to equity market prices. However, this coefficient is significantly negative for the European stock market index. These insights indicate some predictability for the corresponding equity market returns.

Table 2. Estimation results of the AR(1)-DCC-FIEGARCH(1, d, 1) model

	Egypt	Europe	Lebanon	Europe	Morocco	Europe	Malta	Europe	Turkey	Europe
Panel A: Mean equation										
μ	0.003*** (0.001)	2.6E-4 (0.001)	-2.3E-4 (5.3E-4)	2.6E-4 (0.001)	8.0E-4 (8.0E-4)	2.6E-4 (0.001)	0.001 (7.0E-4)	2.6E-4 (0.001)	6.5E-5 (0.002)	2.6E-4 (0.001)
ϕ	0.121*** (0.039)	-0.063* (0.036)	0.111** (0.050)	-0.063* (0.036)	0.068* (0.040)	-0.063* (0.036)	0.059 (0.045)	-0.063* (0.036)	0.003 (0.034)	-0.063* (0.036)
Panel B: Variance equation										
ω	-6.139*** (0.165)	-7.270*** (0.548)	-5.723*** (1.147)	-7.270*** (0.548)	-7.240*** (0.276)	-7.270*** (0.548)	-7.397*** (0.208)	-7.270*** (0.548)	-4.656*** (0.122)	-7.270*** (0.548)
d	0.365*** (0.101)	0.471*** (0.080)	0.694*** (0.087)	0.471*** (0.080)	0.556*** (0.164)	0.471*** (0.080)	0.453*** (0.057)	0.471*** (0.080)	0.751*** (0.087)	0.471*** (0.080)
α	0.312* (0.174)	0.360** (0.175)	0.246 (0.496)	0.360** (0.175)	0.877* (0.486)	0.360** (0.175)	0.903** (0.322)	0.360** (0.175)	-0.284 (0.373)	0.360** (0.175)
β	-0.357** (0.168)	-0.203 (0.230)	-0.393 (0.257)	-0.203 (0.230)	-0.366* (0.197)	-0.203 (0.230)	-0.640*** (0.157)	-0.203 (0.230)	-0.242 (0.222)	-0.203 (0.230)
δ_1	-0.132*** (0.049)	-0.254*** (0.056)	0.180*** (0.051)	-0.254*** (0.056)	-0.068** (0.028)	-0.254*** (0.056)	0.080* (0.041)	-0.254*** (0.056)	-0.165** (0.070)	-0.254*** (0.056)
δ_2	0.362*** (0.099)	0.250*** (0.072)	0.245** (0.102)	0.250*** (0.072)	0.264*** (0.090)	0.250*** (0.072)	0.423*** (0.072)	0.250*** (0.072)	0.189** (0.083)	0.250*** (0.072)
Panel C: DCC estimates										
ρ	0.227*** (0.042)		0.123*** (0.046)		0.074* (0.041)		0.081*** (0.024)		0.472*** (0.058)	
θ_1	0.005 (0.008)		0.008 (0.011)		0.107 (0.119)		0.004 (0.004)		0.027* (0.014)	
θ_2	0.978*** (0.033)		0.965*** (0.056)		0.379 (1.001)		0.995*** (0.003)		0.949*** (0.032)	
df	6.255*** (0.658)		4.905*** (0.377)		6.837*** (0.782)		5.686*** (0.527)		7.384*** (0.967)	
Panel D: Diagnostic tests										
LB	19.840 [0.070]	6.021 [0.915]	19.326 [0.081]	5.979 [0.917]	17.174 [0.143]	6.869 [0.866]	40.355 [0.000]	6.225 [0.904]	12.313 [0.421]	6.827 [0.869]
LB ²	26.458 [0.009]	14.933 [0.245]	2.768 [0.997]	16.184 [0.183]	9.592 [0.652]	15.312 [0.225]	2.690 [0.997]	16.538 [0.168]	6.292 [0.901]	8.640 [0.733]

Notes: LB is the Ljung-Box test for autocorrelation of order 12 applied on standardized residuals; and LB² is the Ljung-Box test for autocorrelation of order 12 applied on squared standardized residuals; and ρ denotes the average dynamic conditional correlation of European market with individual markets. The values in parentheses

Therefore, such specification is employed for all pairs to preserve comparability between them (the results are not reported for reasons of brevity).

are the standard errors and in brackets are the p -values of the diagnostic tests. ***, ** and * stand for statistical significance at the 1%, 5% and 10% levels, respectively.

We now turn to the variance equation (Panel B). The intercept is statistically different from zero for all specifications at the 1% significance level. The ARCH coefficient α is statistically significant and positive for three out of five individual equity markets and the European stock market at the conventional levels, implying the sensitivity of the conditional volatility of these stock markets to past unexpected shocks. Regarding past own volatility, the findings show evidence of significantly negative effect, as evidenced by the GARCH coefficient β , for the same individual stock markets that react to past own news. However, the European equity market does not respond significantly to its past own volatility, as the GARCH coefficient is not statistically different from zero. The coefficient δ_1 , that represents the asymmetric relation between changes in conditional volatility and past unexpected return shocks, is significant and negative for three out of five individual stock markets (Egypt, Morocco, and Turkey) and the European equity market, revealing that conditional volatility of these markets reacts more to negative shocks than to positive shocks of the same absolute magnitude. However, for the markets of Lebanon and Malta, the coefficient δ_1 is significantly positive, showing evidence of more important responses of conditional volatility to good than to bad innovations of the same absolute magnitude. The coefficient δ_2 related to the magnitude effect is statistically significant and positive for all stock markets. All equity markets exhibit significant fractional differencing parameter d , suggesting the presence of long-memory in the examined equity markets. The intensity of the long-range dependence varies across individual stock markets. Another notable feature is that the persistence degree of the individual stock markets is higher than that of the European equity market, except for the specifications that include the Egyptian and Maltese stock markets. The long-memory behavior in the equity markets indicates hyperbolic decay of the effects of shocks on conditional stock market volatilities. Overall, the findings outline the relevance of the FIEGARCH process to analyze the conditional volatility dynamics of the selected stock index returns.

The DCC estimates depicted in Table 2 (Panel C) indicate that the coefficients θ_1 and θ_2 are statistically significant and positive for most cases, suggesting that the conditional correlations are significantly time-varying. Moreover, the sum of the θ_1 and θ_2 parameter estimates is close to unity, except for Morocco, indicating that the conditional volatilities are

slow to attain the normal equilibrium state and the conditional correlations are highly persistent. The average conditional correlations given by the coefficient ρ are moderately high only for Turkey, and low for the other countries.¹⁴ Therefore, Turkey is more integrated financially with Europe than the other economies, thus showing an evident lack of international financial integration. These results are in line with previous studies that show evidence of integration of Turkey with developed stock markets (see Pukthuanthong and Roll, 2009). The diagnostic tests (Panel D) applied to standardized and squared standardized residuals reveal, in general, no serial correlation and no remaining ARCH effects, which supports the evidence of no statistical misspecification. Therefore, the AR(1)-DCC-FIEGARCH(1, d, 1) model passes the diagnostic checks, implying that it is suitable for analyzing the return and volatility patterns of all examined equity markets.

4.3. Dynamic stock market comovements

The patterns of the time-varying conditional correlations between the European index and each individual equity market computed from the estimation of the AR(1)-DCC-FIEGARCH(1, d, 1) model are illustrated in Figure 2. For the stock markets of Lebanon, Morocco, and Malta, the graphs show an almost steady pace around zero,¹⁵ thus suggesting weak integration of these economies with the European market throughout the sample period. However, there is evidence of an increasing trend in conditional correlations for Egypt and Turkey, to varying degrees, over time. Moreover, the conditional correlations for the latter countries experience an upward shift over the 2008 stock market crash, which supports herding behavior during this period. From the beginning of the recent financial turmoil that started in mid-2007, these correlations appear to be greater than the average value, while they were lower than the average for the period prior to mid-2007.¹⁶ This suggests that Egypt and Turkey have become more integrated financially with the European market; however, there is evidence of declining international diversification gains when European investors diversify

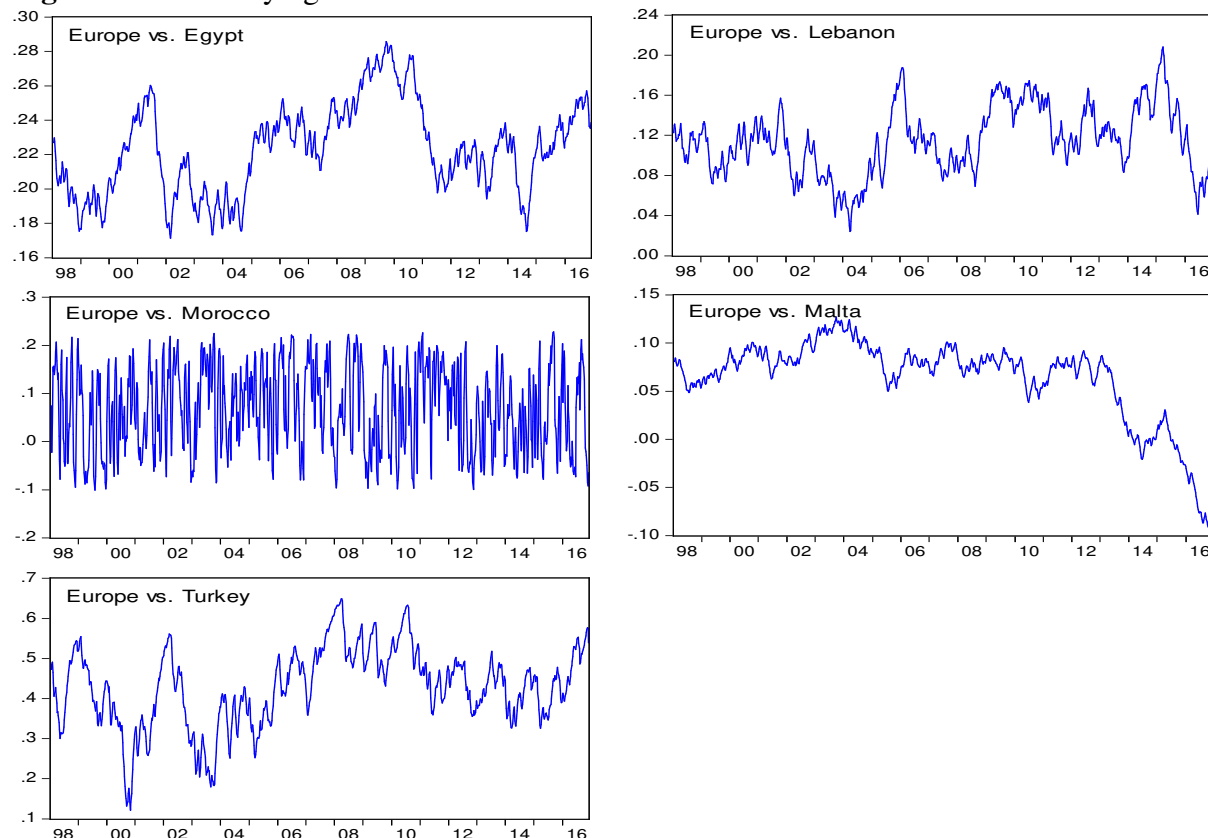
¹⁴ These average values are close to the unconditional empirical correlations presented in the preliminary analysis (see Table 1).

¹⁵ The correlations between the European and Moroccan stock markets are more volatile than those between the European market and the other individual markets.

¹⁶ This implies that contagion effects are higher when there is a fall in stock indices (negative returns) than when there is a rise in these stocks (positive returns).

their portfolios by including assets from these markets.¹⁷ These results support the notion that global investors should exercise caution when diversifying their equity portfolios in international markets at times of shock.

Figure 2. Time-varying cross-market correlations



In the same context, Gjika and Horváth (2013) find increased cross-market co-movements between Central and Eastern European economies and the Eurozone during the global financial crisis, thus showing evidence of herding behavior during the stock market turmoil of 2008. Moreover, the results comply with Ang and Bekaert (2002) who outline that the cross-market correlations increase over bearish periods. Further, Forbes and Rigobon (2002) provide evidence of upward-biased equity market correlations during more volatile periods. Connor and Suurlaht (2011) find evidence of significant and higher correlations among European stock markets, and link the observed higher correlations to higher average GDP growth. Amira et al. (2011) find a significant asymmetric effect of volatility on correlation between the stock markets of the US, the UK, and France, but this effect vanishes when the effect of returns is introduced. Chiang et al. (2007) show an increase in correlation among

¹⁷ Although there is an increase in the correlation between the Egyptian and European stock markets since mid-2007, the linkages among the markets are weak over the entire analysis period, as found earlier.

Asian stock markets with a shift in variance during the crisis period. This feature of correlation intensity among stock market indices reduces the benefit of international diversification. Jouini (2015) provides evidence of decreasing linkages between the Saudi stock market and international equity markets during the 2007–2009 global financial crisis period, putting forward no herding behavior during such period.

All the above insights imply that the hypothesis of constant conditional correlation is not suitable in this context, which is confirmed by the Lagrange Multiplier test of Tse (2000) applied to test the null of correlation constancy versus the alternative of time-varying correlation. The obtained findings lead us to conduct a further analysis of the dynamic conditional correlations to draw new insights on the interrelation between the European index and each individual stock market.

4.4. Time-trend regressions

Our starting point consists of regression of the conditional correlations on a linear time trend to highlight whether such correlations are time-varying. The regression results presented in Table 3 reveal that the conditional correlations of Egypt, Lebanon, and Turkey exhibit an increase across the sample period, as indicated by the significantly positive time trend coefficient. Therefore, integration of these individual markets with the European market increases through time. However, for Morocco and Malta, the time trend coefficient is negative, but statistically different from zero only for Malta. These results may explain the high volatility and the no time trend evidence in the correlations of the Moroccan market and the decrease of the correlations of the Maltese market through time, as evidenced by the correlation graphs reported in Figure 2. The constant term is highly significant and positive for all equity markets, implying that these markets exhibit a positive level of stock market integration with the European market.

To assess the observed increase and decrease in the correlations, we compute the difference between the last and first fitted values ($\Delta\hat{\rho}$). The results provided in Table 3 indicate an evident rise in the conditional correlations between the European index and the stock markets of Egypt (0.032), Lebanon (0.038), and Turkey (0.109), suggesting increasing integration between these markets and the European market during the considered sample period. For the equity markets of Morocco and Malta, there is evidence of negative values, implying decreasing integration between these two economies and the European stock

market. These findings reflect the shapes of the conditional correlations between the European equity market and the examined individual stock markets.

Table 3. Results of the cross-market integration through time

Country	Correlation			Structural break tests		
	Constant	Trend	$\Delta\hat{\rho}$	Constant and trend	Trend only	Constant only
Egypt	0.207*** (0.002)	3.2E-5*** (2.7E-6)	0.032	17/2/2011 [0.000]	20/1/2011 [0.000]	17/2/2011 [0.000]
Lebanon	0.096*** (0.002)	3.9E-5*** (3.6E-6)	0.038	7/7/2005 [0.000]	30/6/2005 [0.000]	23/10/2008 [0.000]
Morocco	0.073*** (0.006)	-8.4E-6 (9.8E-6)	-0.008	14/6/2012 [0.000]	10/5/2012 [0.000]	14/6/2012 [0.000]
Malta	0.111*** (0.002)	-9.6E-5*** (3.7E-6)	-0.095	13/6/2013 [0.000]	10/10/2013 [0.000]	17/10/2013 [0.000]
Turkey	0.373*** (0.006)	1.1E-4*** (1.0E-5)	0.109	24/11/2005 [0.000]	3/11/2005 [0.000]	24/11/2005 [0.000]

Notes: $\Delta\hat{\rho}$ is the difference between the last and first fitted conditional correlations. The values in parentheses are the standard errors and in brackets are the p -values of the structural break test. *** stands for statistical significance at the 1% level.

4.5. Structural break analysis

The above time-trend regressions assume constant changes in the integration rate through time for a given stock market index. To overcome this shortcoming, we allow for structural breaks in the model. Within this context, the changes in the intercept of the regression reveal shifts in the integration level, but the changes in the time trend coefficient capture changes in the integration rate.¹⁸ The first step in this process is to find the break dates in the correlation pairs by employing the Quandt-Andrews approach, which determines endogenously an unknown break point. For this purpose, we consider three regressions in which we allow for changes in both the intercept and the time trend, in the time trend only, and in the intercept only. The results reported in Table 3 indicate that the structural change tests are highly significant for all stock markets in the three regressions, suggesting that financial integration patterns exhibit breaks in their structure. For Egypt, Morocco, Malta, and Turkey, the changes in correlations occur at close dates for each country regardless of the examined break model. For Lebanon, the identified break date depends on whether there is a time trend in break model. The break dates may be linked to the 2008 financial turmoil and other domestic and international economic events. Using a structural break approach, Bekaert et al. (2002) attempt to determine segmentation and integration periods by fitting structural change

¹⁸ Berger et al. (2011) stress that the change in international financial integration across periods may be explained by investment restrictions or formation of economic unions.

models, and find that integration behavior may be described as a gradual process. Moreover, these authors show evidence of cross-market integration following the official liberalization dates.

We next extend the analysis of financial integration by accounting for the detected break dates to highlight how the level and rate of integration vary during the two phases separated by the break dates. This allows us to check whether there is evidence of decreasing or increasing financial integration of the individual economies into the European market over the two identified subperiods. To that effect, we augment the time-trend regressions with a dummy variable D_t that is equal to zero for all observations prior to the detected break date, and equal to 1 otherwise.¹⁹ Under these conditions, the new time trend regressions, which allow description of the behavior of conditional correlations over time, are analytically expressed as follows:

$$\begin{aligned}\rho_{ei,t} &= a_0 + a_1 D_t + b_0 t + b_1 t D_t + u_t \\ \rho_{ei,t} &= a_0 + b_0 t + b_1 t D_t + u_t \\ \rho_{ei,t} &= a_0 + a_1 D_t + b_0 t + u_t\end{aligned}$$

where the variable $\rho_{ei,t}$ is the pairwise conditional correlation coefficient between the European stock market and the individual equity markets ($i = 1$ for Egypt, $i = 2$ for Lebanon, $i = 3$ for Morocco, $i = 4$ for Malta, and $i = 5$ for Turkey). The first regression allows for shifts in both the intercept and time trend, the second specification allows for changes in the time trend only, and the last model allows for shifts in the intercept only. The statistical significance of the dummy parameters a_1 and b_1 provides evidence of structural changes in the intercept and the time trend, respectively. More precisely, a significantly positive constant dummy coefficient suggests that the correlation level during the second subperiod differs from its level during the first subperiod, thus supporting contagion effects between the considered individual equity market and the European stock market. However, a significantly negative coefficient shows evidence of decrease in the conditional correlations among the corresponding markets during the second subperiod, suggesting that the economies become less integrated financially. Otherwise, the considered individual equity market is isolated. Moreover, a significant time-trend dummy parameter shows that the integration rate during

¹⁹ By doing so, we believe that the dummy variable corresponds to two subperiods that are identified based on a statistical approach, i.e., the structural break approach.

the second phase differs from the rate of the first phase, thus indicating increasing or decreasing integration of the examined individual economy with the European market according to the sign of the sum of the two integration rates before and after the selected break date.

Table 4. Results of the structural break models of cross-market integration

	a_0	a_1	b_0	b_1
Panel A: Break date in constant and time trend				
Egypt	0.189*** (0.001)	-0.047*** (0.011)	1.0E-4*** (3.7E-6)	-9.6E-6 (1.3E-5)
Lebanon	0.121*** (0.003)	0.010* (0.006)	-1.3E-4*** (1.3E-5)	1.4E-4*** (1.4E-5)
Morocco	0.056*** (0.006)	-0.166** (0.072)	5.6E-5*** (1.4E-5)	1.2E-4 (8.4E-5)
Malta	0.086*** (0.001)	0.443*** (0.022)	-1.1E-5*** (2.6E-6)	-5.9E-4*** (2.4E-5)
Turkey	0.413*** (0.008)	0.178*** (0.016)	-2.4E-4*** (3.2E-5)	7.3E-5* (3.8E-5)
Panel B: Break date in time trend				
Egypt	0.188*** (0.001)	-	1.1E-4*** (3.8E-6)	-6.7E-5*** (2.8E-6)
Lebanon	0.124*** (0.002)	-	-1.4E-4*** (1.1E-5)	1.5E-4*** (8.9E-6)
Morocco	0.054*** (0.006)	-	5.9E-5*** (1.5E-5)	-6.9E-5*** (1.1E-5)
Malta	0.088*** (0.001)	-	-1.8E-5*** (2.9E-6)	-1.0E-4*** (2.4E-6)
Turkey	0.455*** (0.007)	-	-4.0E-4*** (3.1E-5)	4.2E-4*** (2.4E-5)
Panel C: Break date in constant				
Egypt	0.189*** (0.001)	-0.055*** (0.002)	1.0E-4*** (3.6E-6)	-
Lebanon	0.112*** (0.002)	0.052*** (0.004)	-3.9E-5*** (6.3E-6)	-
Morocco	0.054*** (0.006)	-0.061*** (0.009)	5.9E-5*** (1.4E-5)	-
Malta	0.089*** (0.001)	-0.089*** (0.002)	-2.1E-5*** (3.0E-6)	-
Turkey	0.402*** (0.005)	-0.202*** (0.010)	-1.9E-4*** (1.7E-5)	-

Notes: The values in parentheses are the standard errors. ***, ** and * stand for statistical significance at the 1%, 5% and 10% levels, respectively.

In the same context, Dimitriou et al. (2013) opt for similar specifications that allow for structural breaks in mean and/or variance of the dynamic conditional correlation coefficients between BRICS (Brazil, Russia, India, China, and South Africa) stock markets and the US equity market. To that effect, these authors create dummy variables corresponding to

different phases of global financial analysis that are identified based on economic and statistical approaches. The results are mixed since they do not show evidence of contagion effects for most BRICS equity markets during the early phases of the 2007-2008 stock market turmoil. However, some co-movements and spillover effects reappeared after the Lehman Brothers bankruptcy. In addition, there is evidence of increased linkages between all BRICS markets and the US market beginning early 2009. A similar investigation on major foreign currencies is conducted by Dimitriou and Kenourgios (2013). Their results reveal correlation decreases during the global financial crisis and the Eurozone sovereign debt crisis. All currencies show some stability during the early stages of the stock market crash period. However, the correlations exhibit decreases during the first stage of the Eurozone sovereign debt crisis that started at the fall of 2009. Arruda and Valls Pereira (2013) test the contagion effect hypothesis amongst different sectors within the US economy during the subprime crisis. They also investigate the possibility of structural breaks in dependency series during the considered period. Their results show evidence of contagion effect within all sector indices in the US with structural breaks identified in the dependency structure in 2007 and 2008.

Our regression results are depicted in Table 4. For the first time trend regression (Panel A), the coefficient estimate of a_1 is significant for all equity markets, but positive only for Lebanon, Malta, and Turkey, revealing changes in the integration level for all individual countries following the identified break date and providing evidence of contagion effects for Lebanon, Malta, and Turkey. Therefore, gains from international equity portfolio diversification decrease. For Egypt and Morocco, the coefficient is significantly negative, implying that these economies become less integrated financially into the European market. A most striking feature of our findings is that there is evidence of relatively high dependence between the Maltese and Turkish, and European stock markets after the detected break date, as indicated by the sum of the a_0 and a_1 estimate coefficients (0.529 for Malta, and 0.591 for Turkey). This indicates that the two markets become quite highly integrated into the European market, thus leading to reduction in the benefits of international equity portfolio diversification. However, the other markets are weakly integrated financially with the European market, as the sum of the a_0 and a_1 coefficient estimates is relatively low.²⁰ Accordingly, global investors can still reap earnings from diversifying their equity portfolios

²⁰ The sum is 0.142 for Egypt, 0.131 for Lebanon, and -0.110 for Morocco.

in these markets. The b_0 parameter estimate is highly significant for all stock markets, with mixed signs across economies. Moreover, we find evidence of increasing integration for Egypt and Morocco, and decreasing integration for the other countries until the corresponding detected break date, as evidenced by the sign of the coefficient b_0 . The coefficient estimate of b_1 is statistically different from zero for three out of five equity markets, with mixed signs. It is thus found that, following the identified break point, the integration rate is positive for Lebanon and Turkey, and negative for Malta. The sum of the integration rates before and after the detected break date is positive for Egypt, Lebanon, and Morocco, suggesting that they exhibit increasing integration following the selected break date. However, the sum is negative for the Maltese and Turkish markets, showing evidence of decreasing integration following the detected break point.

The results of the regression with changes in the time trend only (Panel B) indicate that all coefficients are statistically significant for all examined countries at the 1% level. All countries, except Egypt and Morocco, exhibit negative integration rates, as measured by the estimate coefficient of b_0 prior to the corresponding break date, thereby indicating decreasing integration. However, the b_1 parameter estimate takes the opposite sign of the b_0 coefficient estimate, except for Malta. The estimates suggest negative (positive) integration rates for Egypt, Morocco, and Malta (Lebanon and Turkey) following the break date. Egypt, Lebanon, and Turkey exhibit increasing integration subsequent to the identified break date, since the sum of the b_0 and b_1 coefficient estimates is positive for each country, while Morocco and Malta exhibit decreasing integration.

The results of the regression with changes in the constant term only (Panel C) reveal evidence of negative subsequent shifts in the integration level for all countries (except Lebanon), as evidenced by the a_1 coefficient estimate. The magnitude of shifts is particularly greater for Turkey compared to the other countries. The results also indicate that the integration changes across time, as shown by the significant time-trend coefficient, b_0 .

Analysis of time-trend regressions under structural changes generates evidence of contagion effects between most individual markets and the European stock market index, since the integration level registers some increase following the detected break date. Further, the results show subsequent variation (increasing or decreasing) in stock market integration

among economies, as indicated by the significance of the integration rate of the identified second subperiod.

In summary, the above three time-trend regressions subject to shifts appear to be helpful in drawing interesting insights on financial integration among economies. Therefore, the correlation analysis under regime-shifts may be considered as a guide for international equity portfolio diversification over different subperiods.

5. Conclusion and implications

This paper analyzes the effect of the EMP (re-launched in 2008 as the UfM) on the time-varying correlations of selected SMME markets with the European market. It considers a sample of weekly index returns over the period from January 1, 1998 to December 1, 2016, and employs the AR-DCC-FIEGARCH model that captures asymmetry and long-memory features, and hence provides many advantages over other existing empirical methodologies.

The main results of the study indicate that the integration level remains relatively low for all countries, except for Turkey, suggesting that the Barcelona process has failed to achieve or improve integration between the South Mediterranean and European financial markets. We also find that the inter-market linkages exhibit structural changes, implying a dissimilarity of stock portfolio diversification gains across subperiods. Moreover, we observe an increasing trend of integration between the Egyptian and Turkish markets and the European market, particularly after the onset of the 2007–2008 global financial crisis, providing evidence of herding behavior during this period.

Our results are of interest and have important implications for both investors and policymakers. Indeed, the Turkish equity market exhibits a moderate level of international market integration, while the other individual economies are weakly integrated financially with the European market. Indeed, the financial markets in these non-European economies are still underdeveloped in spite of the efforts undertaken to modernize them. Additionally, a limited range of financial assets is available in these markets, with high acquisition costs. Further actions need to be taken to foster financial integration, including the harmonization of payment systems and the boost of cooperation between players in different financial sectors and markets. The markets of such economies would then be good destinations for foreign investors seeking beneficial opportunities to diversify their equity portfolios.

Investors should consider the time-varying character of the degree of financial integration between South Mediterranean and European financial markets in making investment decisions, mainly at the level of portfolio management and diversification. Policymakers also should be aware that the current achievements of the EMP are far from the targets set in terms of financial development and economic growth.

The determination of the causes of the failure of the EMP to attain its objectives would help decision makers implement the required action plan to improve the current situation. Considering the revolutions and political and social tensions in many countries bordering the Mediterranean Sea, examining the impact of such events on financial integration of these countries with Europe would be of great interest to countries on both sides of the Mediterranean Sea, particularly for individual investors, firms, and countries. Individual investors are interested in new financial assets available in these countries. Firms would like to seize the opportunity to engage in new investments in countries with new reconstruction plans that are expected to unfold over the few coming years.

Acknowledgments

The authors are grateful to the Editor and anonymous referees for their valuable suggestions. Jamel JOUINI would like to thank the Deanship of Scientific Research at King Saud University represented by the research center at College of Business Administration for supporting this research financially.

References

- Alkulaib, Y., Najand, M. and Mashayekh, A. (2009) Dynamic linkages among equity markets in the Middle East and North African countries, *Journal of Multinational Financial Management*, **19**, 43–53.
- Amira, K., Taamouti, A. and Tsafack, G. (2011) What drives international equity correlations? volatility or market direction?, *Journal of International Money and Finance*, **30**, 1234–63.
- Ang, A. and Bekaert, G. (2002) International asset allocation with regime shifts, *Review of Financial Studies*, **15**, 1137–87.
- Arruda, B. P. and Valls Pereira, P. L. (2013) Analysis of the volatility's dependency structure during the subprime crisis, *Applied Economics*, **45**, 5031–41.
- Baele, L. (2005) Volatility spillover effects in European equity markets, *Journal of Financial and Quantitative Analysis*, **40**, 373–401.
- Bartram, S., Taylor, S. and Wang, Y. (2007) The Euro and European financial market, *Journal of Banking and Finance*, **51**, 1461–81.
- Behr, T. (2010) Regional integration in the Mediterranean moving out of the deadlock? Notre Europe Research Report, 77, available at: <http://www.eng.notre-europe.eu/011-2065-Regional-Integration-in-the-Mediterranean-Moving-out-of-the-Deadlock.html> (Access, July 27th, 2014).
- Bekaert, G. and Harvey, C.R. (1997) Emerging equity market volatility, *Journal of Financial Economics*, **43**, 29–77.
- Bekaert, G., Harvey, C. and Lumsdaine, R. (2002) Dating the integration of world equity markets, *Journal of Financial Economics*, **65**, 203–48.
- Berger, D., Pukthuanthong, K. and Yang, J. (2011) International diversification with frontier markets, *Journal of Financial Economics*, **101**, 227–242.
- Boubaker, S., Jouini, J. and Lahiani, A. (2016) Financial contagion between the US and selected developed and emerging countries: The case of the subprime crisis, *The Quarterly Review of Economics and Finance*, **61**, 14–28.

Cheng A., Jahan-Parvar, M. and Rothman, P. (2010) An empirical investigation of stock market behavior in the Middle East and North Africa, *Journal of Empirical Finance*, **17**, 413–27.

Chiang, T. C., Jeon, B. N. and Li, H. (2007) Dynamic correlation analysis of financial contagion: evidence from Asian markets, *Journal of International Money and Finance*, **26**, 1206–28.

Connor, G. and Suurlaht, A. (2011) Dynamic stock market covariances in the Eurozone, *Journal of International Money and Finance*, **37**, 353–70.

Conrad, C., Karanasos, M. and Zeng, N. (2011) Multivariate fractionally integrated APARCH modeling of stock market volatility: a multi-country study, *Journal of Empirical Finance*, **18**, 147–59.

Creane, S., Goyal, R., Mobarak, A. M. and Sab, R. (2006) Measuring financial development in the Middle East and North Africa: a new database, *IMF Staff Papers*, **53**, 479–511.

Darrat, F. A., Elkhail, K. and Hakim, S. R. (2000) On the integration of emerging stock markets in the Middle East, *Journal of Economic Development*, **25**, 119–29.

Darrat, A-F. and Pennathur, A. (2002) Are the Arab Maghreb countries really integrable? some evidence from the theory of cointegrated systems, *Review of Financial Economics*, **11**, 79–90.

Dimitriou, D., and Kenourgios, D. (2013) Financial crises and dynamic linkages among international currencies, *Journal of International Financial Markets, Institutions and Money*, **26**, 319–32.

Dimitriou, D., Kenourgios, D. and Simos, T. (2013) Global financial crisis and emerging stock market contagion: a multivariate FIAPARCH-DCC approach, *International Review of Financial Analysis*, **30**, 46–56.

Dodini, M. and Krause, G. (2005) Ten years of the Barcelona process: economic and social development since 1995, *European Economy Occasional Papers*, 17.

El-Wassal, A. K. (2005). Understanding the growth in emerging stock markets, *Journal of Emerging Market Finance*, **4**, 227–261.

Forbes, K. and Rigobon, R. (2002) No contagion, only interdependence: measuring stock market comovements, *The Journal of Finance*, **57**, 2223–61.

Forum Européen des Instituts de Sciences Economiques (FEMISE) (2011) Towards a new MED region: achieving fundamental transitions. Marseille, France.

Gan, P.-T. (2014) The precise form of financial integration: Empirical evidence for selected Asian countries, *Economic Modelling*, **42**, 208–219.

Geweke, J. and Porter-Hudak, S. (1983) The estimation and application of long memory time series model, *Journal of Time Series Analysis*, **4**, 221–238.

Gjika, D. and Horváth, R. (2013) Stock market comovements in Central Europe: evidence from the asymmetric DCC model, *Economic Modeling*, **33**, 55–64.

Graham, M., Kiviaho, J., Nikkinen, J. and Omran, M. (2013) Global and regional comovement of the MENA stock markets, *Journal of Economics and Business*, **65**, 86–100.

Guidi, F. and Ugur, M. (2014) An analysis of South-Eastern European stock markets: Evidence on cointegration and portfolio diversification benefits, *Journal of International Financial Markets, Institutions and Money*, **30**, 119–136.

Hoekman, B. (2005) From Euro-Med partnership to European neighborhood: deeper integration à la carte and economic development, ECES Working Paper No. 103.

Jouini, J. (2015) New empirical evidence from assessing financial market integration, with application to Saudi Arabia, *Economic Modelling*, **49**, 198–211.

Kern, A. and Salhi, A. (2011a) The Euro-Mediterranean partnership: a macroeconomic governance perspective, *Journal of Common Market Studies*, **49**, 871–894.

Kern, A. and Salhi, A. (2011b) Financial market governance and the Euro-Mediterranean partnership, *EuroMed Journal of Business*, **6**, 253–271.

Lagoarde-Segot, T. and Lucey, B. M. (2007) Capital market integration in the Middle East and North Africa, *Emerging Markets Finance and Trade*, **43**, 34–57.

Levine, R. (2005) Finance and growth: theory and evidence, in *Handbook of Economic Growth*, (Eds) P. Aghion and S. N. Durlauf, Elsevier, pp. 865–934.

Levine, R., and Zervos, S. (1998) Stock markets, banks, and economic growth, *American Economic Review*, **88**, 536–558.

Maghyereh, A. and Al-Zoubi, H. (2004) Modeling the dynamic interdependence of MENA stock markets: A multivariate analysis, *Journal of Economic Research*, **9**, 239–70.

Nabli, M. K. and Véگانzonès-Varoudakis, M.-A. (2004) Reforms and growth in MENA countries: New empirical evidence, *MENA Working Paper* No. 36.

Neaime, S. (2002) Liberalization and financial integration of MENA stock markets, *International Review of Comparative Public Policy*, **13**, 63–86.

Neaime, S. (2012) The global financial crisis, financial linkages and correlations in returns and volatilities in emerging MENA stock markets, *Emerging Markets Review*, **13**, 268–282.

Neaime, S. (2016) Financial crises and contagion vulnerability of MENA stock markets, *Emerging Markets Review*, **27**, 14–35.

Pagano, M. (1993) Financial markets and growth: An overview, *European Economic Review*, **37**, 613–622.

Pukthuanthong, K. and Roll, R. (2009) Global market integration: An alternative measure and its application, *Journal of Financial Economics*, **94**, 214–232.

Robinson, P. M. (1995) Log-periodogram regression of time series with long range dependence, *Annals of Statistics*, **23**, 1048–1072.

Romagnoli, A. and Mengoni, L. (2014) The economic development process in the Middle East and North Africa, Routledge Eds.

Said, S. and Dickey, D. A. (1984) Testing for unit roots in autoregressive-moving average models of unknown order, *Biometrika*, **71**, 599–607.

Tse, Y. K. (1998) The conditional heteroscedasticity of the Yen-Dollar exchange rate, *Journal of Applied Econometrics*, **13**, 49–55.

Tse, Y. K. (2000) A test for constant correlations in a multivariate GARCH model, *Journal of Econometrics*, **98**, 107–127.

Tse, Y. K. and Tsui, A. K. C. (2002) Multivariate generalized autoregressive conditional heteroscedasticity model with time-varying correlations, *Journal of Business and Economic Statistics*, **20**, 351–362.

van Ewijk, S. E. and Arnold, I. J. M. (2015) Financial integration in the euro area: Pro-cyclical effects and economic convergence, *Economic Modelling*, **44**, 335–342.

World Bank. (2012) Doing Business 2012: Doing Business in the Arab World 2012, Technical report, World Bank, Washington DC.

Worthington, A. and Higgs, H. (2004) Transmission of equity returns and volatility in Asian developed and emerging markets: a multivariate GARCH analysis, *International Journal of Finance and Economics*, **9**, 71–80.

Yu, J. and Hassan, K. (2008) Global and regional integration of the Middle East and North African (MENA) stock markets, *The Quarterly Review of Economics and Finance*, **48**, 482–504.