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Equity market development in the Middle East and North Africa (MENA) region. An empirical analysis.

THOMAS LAGOARDE-SEGOT
TCD 2007
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**Thesis summary**

The objectives of this thesis are (i) to clarify the mechanisms uniting equity markets and economic development and (ii) to analyze the equity market development process in the Middle-East and North Africa (MENA) region. It is composed of seven chapters.

The introductory chapter sets out briefly to evoke the current development of emerging market finance research and attempts to situate our contribution within current knowledge.

The second chapter constitutes an overview of the theoretical and empirical mechanisms associated to equity market development policies. Overall, conclusions from this literature review suggest that the domestic development and international integration of equity markets have dissociated effects. At an internal level, policies seeking to maximize the growth-enhancing impact of equity markets should focus on reaching and maintaining adequate levels of institutional transparency. However, the optimal degree of international integration depends on a trade-off between cheaper capital and financial stability. These conclusions are summarized in an ‘equity market development triangle’. The empirical part of this thesis seeks to comparatively situate the MENA countries within this figure by undertaking a set of complementary investigations.

The third chapter attempts to situate the MENA markets within the emerging/frontier market classification. To do so, we generate indexes of market development and conduct a qualitative analysis. Our results underline that the average level of market emergence is pronounced in the MENA region in comparison to other emerging areas. Turkey, Israel, Jordan and Egypt appear to be converging towards developed standards. However, Lebanon, Tunisia and Morocco can still be considered as ‘frontier markets’. A probit regression also highlights that size and activity appear to be the most important variables for market emergence.

The objective of the fourth chapter is to measure informational efficiency in the MENA region and to establish a link with the theoretical underpinnings of market efficiency. To do so, we aggregate the results of random-walk tests and technical trade analysis into a single index. Our results suggest that efficiency ranks reflect emergence levels. Turkey, Israel and Jordan show the strongest evidence of market efficiency, and are followed by Tunisia, Egypt, Lebanon and Morocco.
In the fifth chapter, we aim to determine the extent of the MENA markets’ integration into global finance. Based on four co-integration techniques, we reject the hypothesis of a stable, long run bi-variate relationship between each of these markets and the EMU, the USA and a regional benchmark. A time-varying approach also suggests that the MENA capital markets tend to react heterogeneously to political, economic and financial shocks. Overall, this analysis suggests that the MENA region is still highly segmented form world influences.

The sixth chapter investigates the optimal composition and performance of a MENA inclusive portfolio by plugging five optimization models and two risk measures into a rolling block-bootstrap methodology, and assesses the performance of ex-post results by comparing Sharpe and Sortino ratios. The analysis highlights outstanding diversification benefits in the MENA region and suggests that an efficient MENA portfolio should be based on a risk minimization strategy.

Finally, the seventh chapter investigates levels of ‘shift-contagion’ vulnerability in the MENA area. We model the international shock transmission mechanism for the MENA markets during seven recent episodes of financial crises and aggregate the results of tests into a ‘vulnerability index’. Our results highlight that Turkey, Israel and Jordan are the most vulnerable MENA markets. They are followed by Tunisia, Lebanon, Morocco and Egypt. Overall, this suggests that international shock sensitivity depends on market development and global integration.

The conclusion of this thesis considers the intersection of these analyzes and suggests that the MENA markets can be divided into three groups within the equity market development triangle: Turkey and Israel are the most developed markets; Egypt and Jordan constitute an intermediate group, while Tunisia, Lebanon and Morocco are the sample’s most segmented, most inefficient and least vulnerable markets. We also suggest two alternative strategies for the pursuit of equity market development policies in the MENA region. Within the first, policies would be implemented at the national level, resulting in a different pace of international equity market integration across countries. An alternative strategy would be the progressive merging of the national MENA equity markets into a single ‘pan-oriental’ regional equity market.
The completion of thesis would never have been possible without the help and intellectual support of many people over the 2003-2006 period. In particular, I am grateful for the continuous academic and moral support of my supervisor Dr. Brian M. Lucey. I am also particularly indebted to Dr. Patricia Augier, for her continuous support. I would also like to thank following people (in chronological order): Pr. André Cartapanis, for raising my awareness on the topic of financial liberalization when I was an undergraduate student. Dr. Roland Rizoulières, for introducing me to teaching at the IEP d'Aix en Provence in 2003-2004, Dr. Svitlana Voronkova, for her endless patience in answering my econometric questions, Pr. Colm Kearney, for including me in the 2005 Debt Project. Dr. Charles Lai-Tong, for introducing me to the STATA software during the summer of 2005, Pr. Ali Kutan, editor of the journal Emerging Markets Finance and Trade, for his comments on the published versions of chapter 5 and chapter 7, Pr. Ike Mathur, editor of the Journal of International Financial Markets, Institutions and Money and of the Journal of Multinational Financial Management for his comments on the published version of chapter 6 and 8, Pr. Jeffrey Nugent and Pr. Adel Boughrara, for their invitation to present chapter 9 during the plenary session at the 5th Middle East Economics Association meeting in Sousse, Tunisia. I would also like to thank the audiences of the June 2005 ECOMOD meeting in Brussels, Belgium, the 2005 European FMA meeting in Siena, Italy, the 2005 Global Finance Conference in Dublin, Ireland and the 2006 FMA meeting in Salt Lake City, USA. This thesis is dedicated to my fellow PhD students in France and Ireland.
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List of abbreviations

ADR: American Depository Receipt
AIMR: Association for Investment Management and Research
ASE: Amman Stock Exchange
BSE: Beirut Stock Exchange
BSP: Bayes-Stein Portfolio
CAPM: Capital Asset Pricing Model
CETP: Certainty Equivalence Tangency Portfolio
CPI: Corruption Perception Index
CSE: Casablanca Stock Exchange
EMU: European Monetary Union
ESE: Egyptian Stock Exchange
EU: European Union
FEMISE: Euro-Mediterranean Forum of Economic Institutes
GCC: Gulf Cooperation Council
GDP: Gross Domestic Product
GNP: Gross National Product
IBVMT: Indice de la Bourse des Valeurs Mobilières de Tunis
ICRG: International Country Risk Guide
IFC: International Financial Corporation
IPI: Investor Protection Index
ISE: Istanbul Stock Exchange
LPM: Lower Partial Moment
MENA: Middle East and North Africa
MSCI: Morgan Stanley Capital International
MVP: Minimum Variance Portfolio
NASDAQ: National Association of Securities Dealers Automated Quotations
OECD: Organisation for Economic Co-operation and Development
P/E: Price-Earning Ratio
ROE: Return on Equity
S&P EMDB: Standard and Poor’s Emerging Markets Database
S&P/IFCG: S&P/IFC Global Index
S&P/IFCI: S&P/IFC Investable Index
S&P: Standard and Poors
SD: Standard Deviation
TASE: Tel-Aviv Stock Exchange
TSE: Tunis Stock Exchange
UK: United Kingdom
UNCTAD: United Nations Conference on Trade and Development
UNDP: United Nations Development Program
USA: United States of America
WFEMH: Weak Form Efficiency Market Hypothesis
WTO: World Trade Organization
Data per chapter

1. Introductory chapter
   - World Bank, World Development Indicators 2005, *Ecowin*

2. Equity market development: review of implications

3. Market emergence in the MENA region
   - S&P Emerging Market Database (EMDB), *Datasync International*
   - International Country Risk Guide Index, (ICRG), *Ecowin*
   - Corruption Perception Index (CPI), *Amnesty International*
   - Investor Protection Index (IPI), *World Bank Doing Business Database*

4. Informational efficiency in the MENA region
   - S&P/IFCG index, EMDB, *Datasync International*
   - BLOM Index, *Blominvest*
   - IBVMT index, *Tunis Stock Exchange*

5. Market integration in the MENA region
   - S&P/IFCG Index, EMDB, *Datasync International*
   - BLOM Index, *Blominvest*
   - IBVMT Index, *Tunis Stock Exchange*
   - MSCI World Free Index, *Datasync International*
   - MSCI EMU Index, *Datasync International*

6. International diversification: Is there a role for the MENA?
   - S&P/IFCI Index, EMDB, *Datasync International*
   - S&P 500 Index, *Datasync International*
   - MSCI EMU Index, *Datasync International*

7. Shift contagion vulnerability in the MENA region
   - S&P/IFCG Index, EMDB, *Datasync International*
   - BLOM Index, *Blominvest*
   - IBVMT Index, *Tunis Stock Exchange*
   - MSCI US Broad Market Index, *Datasync International*
   - S&P 500 Index, *Datasync International*
1. Introductory chapter

The purpose of this introductory chapter is (i) to define the research context of this thesis, (ii) to identify its objectives, (iii) to describe its motivation and (iv) to outline the particular contribution being made.

1.1 Research context: emerging market finance

The massive development and liberalization of equity markets in emerging countries has generated a great deal of research interest over the last two decades. In particular, research efforts were directed towards identifying the dimensions in which emerging markets differ from other markets. The analysis has focused on seven main themes including (i) the cost of capital, (ii) return volatility, (iii) capital flows, (iv) market microstructures, (v) financial crises (vi) political risk and (vii) international diversification.

1.1.1 The cost of capital

The equity market development process determines access to finance for a firm listed in an emerging market’s stock exchange. For instance, theory suggests that market liberalization leads to a temporary increase in market returns as domestic and foreign investors bid up local prices. By contrast, in the long run market integration expands diversification opportunities for domestic investors and hence negatively affects expected returns and the cost of capital (Stulz, 1999, Chari and Henri, 2004).

This phenomenon has been widely documented in empirical studies. For instance, using a panel of 10 emerging markets, Henry (2000) found that stock market indices experience abnormal returns of 4.7% per month during an eight-month window leading up to the implementation of liberalization. By contrast, Patro and Wald (2005) documented a long run decrease in the cost of capital. Their analysis highlighted an average change of −2.89% in emerging markets monthly returns three years after liberalization. Using a different measure for the cost of capital (dividend yields), Edison and Warnock (2003) also showed that the decrease in the cost of capital was sharper in countries that completed their liberalization program. Their estimates suggested that a full liberalization was associated with a 104-basis point decrease in
dividend yields whereas an incomplete liberalization resulted in an increase in dividend yields.

1.1.2 Return volatility

In theory, market integration exerts an ambiguous impact on emerging markets volatility. On the one hand, liberalization may diminish volatility if foreign institutional investors focus on fundamental valuation factors. On the other hand, it may increase volatility if these investors are subject to behavioural biases, while opening also introduces an external component into the domestic systemic risk. However, empirical studies attempting to examine the impact of liberalization on market volatility have yielded mixed results. For instance, Bekaert and Harvey (2000) documented a negative impact of market integration on volatility in 20 emerging markets, in a period ranging from 1976 to 1995. By contrast, Levine and Zervos (1998) tested for a structural break and a possible change in volatility at the liberalization date in the case of 16 emerging markets during the 1976-1993 period, and found that volatility tends to increase following liberalization. Jayasuryia (2005) provided an explanation for these contradictory findings by underlining the role of ‘initial conditions’ in market volatility. Investigating a panel of 18 countries, she detected a link between lower post-liberalization volatility levels and favourable market characteristics such as higher transparency, better investor protection, and lower levels of corruption.

1.1.3 Capital inflows

Net capital flows to emerging markets rose from US$ 12 billion in 1988 to 234 billion in 1996 but were halted by the emerging markets crises of the second half of the 1990s. Not surprisingly, a significant number of studies sought to develop an understanding of the causes, dynamic and consequences of capital flows to emerging markets. One type of study attempted to determine whether capital flows determine equity returns. In a seminal paper, Warther (1995) investigated the impact of aggregate international portfolio on stock and bond prices. His results suggested that a 1% increase in mutual fund equity assets resulted in a 5.7% increase in stock prices. Similarly, Clark and Berko (1996) examined Mexico during the late 1980s through
the crisis in 1993. They found that unexpected inflows of 1% of the market's capitalization drove prices up by 13%.

An alternative hypothesis was that international investors are 'return chasers'. For example, Bohn and Tesar (1996) found evidence that flows were positively correlated with lagged flows, and with contemporaneous and lagged measures of expected returns. More generally, Froot et al. (2001) considered the broader interactions by including capital flows and returns in a bivariate VAR model, using data from 44 countries for the 1994-1998 period. They found that shocks of one basis point on portfolio flows resulted in a 40 basis point increase in equity prices, while a shock of 100 basis points to returns resulted in about 0.05 basis points in additional inflows.

Another branch of relevant literature examined whether capital flows are 'pulled' by domestic factors in developing countries or 'pushed' by low international interest rates. This type of studies has yielded contrasting results. For instance, Fernandez-Arias (1996) showed that capital inflows in emerging economies are largely pushed by low international interest rates. By contrast, Bekaert, Harvey and Lumsdaine (2002) did not find a significant impact of world interest rates on capital flows to emerging markets. Finally, Taylor and Sarno (1997) suggested that global and country-specific factors were equally significant in short-run equity flows and long-run equity and bond flows.

1.1.4 Microstructures

It is commonly assumed that informational inefficiencies will be present in new and thin emerging equity markets. Conventional wisdom suggests that emerging markets stocks usually fail to react instantaneously to relevant types of economic announcements, and are subject to informational asymmetries. A number of studies have indeed highlighted that emerging market equity returns have higher serial correlations than developed market returns, and tend to depart from the assumption of normality for log returns distributions (Harvey, 1995). This is symptomatic of infrequent trading and slow adjustment to current information (Kawakatsu and Morey, 1999). Other studies have also detected departure from the weak-form efficiency through non-compliance with Fama's (1970) random-walk model of equity returns. These studies suggested that heterogeneous levels of informational efficiency
in emerging markets are correlated to market development levels (Lima and Tabak, 2004).

Low liquidity and high transaction costs constitute another specificity of emerging markets. Chuan (1992) highlighted that poor liquidity is commonly mentioned as one of the main reasons for foreign institutional investors not investing in emerging markets. A lack of reliable data has traditionally been an obstacle to liquidity studies in emerging markets. Recently though, Lesmond et.al (1999) developed a price-based methodology to measure transaction costs as the incidence of zero returns as measured from a limited dependent variable model. Applying this methodology, Lesmond (2005) found that emerging markets transaction costs ranged from 1% for the Taiwanese market to over 47% for the Russian market. Using a panel regression, he showed that variations in transaction costs appeared to be correlated to differences in investor protection, political risk and the rule of law.

1.1.5 Financial crises

Experience suggests that financial crises are more likely to burst in emerging markets (Agénor, 2003). Recent crises include the 1994–1995 Mexican crisis, the 1997–1998 East Asian crisis, the 1998 Russian crisis, the 2000 Brazilian crisis, the 2001 Turkish crisis and the 2002 Argentinean crisis. The financial outcomes of these events have been extremely significant. For instance, the average S&P 500 emerging market index displayed negative skewness during the crisis era from 1995 to 2003 (Bruner et.al, 2005).

Moreover, abnormally high correlations have often been detected between markets during these crises periods. It emerged that market turmoil was transmitted from one country to another irrespective of real economic linkages. This phenomenon was referred to as 'financial contagion' and generated a wide empirical research agenda. However, the estimation of contagious market spillovers has proven a very complex issue. For instance, Forbes and Rigobon (2002) initially proposed a test to distinguish between contagion and co-movement of stock index returns by comparing heteroscedasticity-adjusted correlation coefficients between tranquil and crisis periods. Their analysis rejected the contagion hypothesis during the Asian crisis, and suggested that the transmission of financial crises was due instead to normal interdependence between countries. Their approach was however subsequently
criticized by Corsetti et.al (2005). These authors developed an alternative methodology relying on an explicit model of cross-market link instability. They found evidence of contagion for five countries during the Asian crisis. Finally, using an asset-priced method, Bekaert, Harvey and Ng (2005) not only detected evidence of financial contagion, but also established a link between the extent of market integration and vulnerability to financial contagion. Overall, a consensus seems to have been reached on the existence of financial contagion. Nonetheless, further research may be needed in order to identify the factors driving the crisis transmission phenomenon.

1.1.6 Political risk

Another important characteristic of emerging markets is the presence of significant political risk. The latter may be described as the ‘risk that arises from the potential actions of governments and other influential domestic forces, which threaten expected returns on investment’ (Bilson et.al, 2002). Empirical evidence suggests that political risk decreases as countries implement liberalization policies. For instance, Bekaert and Harvey (2000) studied the behaviour of the International Country Risk Guide’s (ICRG’s) measures of political risk before and after liberalization within a panel of 20 emerging markets. Their results highlighted that the political risk rating increased by 10.8% in the two years that followed liberalization, indicating a significant drop in political risk. Using an alternative measure of political risk (the yield spread of dollar-denominated emerging market bonds relative to US Treasury bill yields) in the case of Mexico, Adler and Qi (2002) also suggested that political risk tended to decrease with market integration. Other things equal, successful market liberalization hence seems to be associated with decreased political risk.

Finance literature also suggests that political risk is a priced factor (Oijen and Perotti, 2001). For instance, Edison and Warnock (2003) investigated a panel of 29 countries and found that market integration was associated with a 104-basis point decrease in dividend yields in fully liberalized markets, while an opposite dynamic was true in incompletely liberalized markets. Similarly, Bekaert, Harvey and Lumsdaine (2002) documented an average decrease of about 1% in dividends in a panel of 20 emerging countries in the aftermath of market reforms, with significant variations depending on
the intensity of the liberalization program. Time-varying political risk levels may thus be reflected in the market risk premium.

1.1.7 *International diversification*

Finally, from a financial management point of view, the central characteristic of emerging markets is that they allow for the construction of low-risk portfolios. In a seminal study, Bekaert and Harvey (1995) showed that adding an emerging market component to a diversified portfolio could lead to a significant reduction in portfolio volatility without affecting returns. More recently, Phylaktis and Xia (2006) investigated the relevance of country-oriented as opposed to industry-based investment allocation strategies. Their analysis was based on 1893 firms in the MSCI global index from 1990 to 2002 from 37 countries. Their results showed that in contrast to developed markets, global and industry effects are still dominated by the country effects in emerging markets. In other words, international correlations of emerging market returns may be sufficiently low to provide important portfolio diversification benefits for international investors.

However, diversification benefits tend to diminish with the global integration of emerging markets. In theory, full market integration refers to a situation in which assets of identical risk command the same expected returns irrespective of their domicile. Certain empirical studies have highlighted a trend towards the integration of emerging markets with one another, and with global finance (Kearney and Lucey, 2004). This has direct consequences for asset allocation, as market pricing converges towards the international model of Sharpe (1965) and Lintner (1965). For instance, the correlation of the International Financial Corporation (IFC) composite index with the world return has doubled since 1990 (Bekaert and Harvey, 2003). One important consequence of this dynamic is that emerging equity markets are increasingly sensitive to intra and inter-regional spillovers in times of financial turmoil (Gębka and Serwa, 2006). Other problems with emerging market diversification include high transaction costs, low liquidity and investment constraints (Bekaert and Harvey, 2003).
1.2 Thesis objective

Over time, this wide range of investigations has gradually contributed to the establishment of ‘emerging market finance’ as an independent research area at the junction between economics, finance, and development studies. The creation of specialized journals constitutes a good indicator of the phenomenon. For instance, the journal Emerging Markets Finance and Trade, founded in 1965 (and originally focusing on centrally planned economies), was reoriented in 1990 towards the analysis of emerging markets. More recently, the creations of the Emerging Markets Review in 2000 and of the Journal of Emerging Markets Finance in 2002 constitute further examples of this trend. The present thesis is situated within this strand of knowledge.

The objective of this thesis is twofold. The first objective is to identify the financial and economic consequences of equity market development in emerging countries based on a succinct review of the relevant literature. The second objective is to empirically examine the properties of equity markets in seven Middle East and North Africa (MENA) countries (Morocco, Tunisia, Egypt, Jordan, Lebanon, Israel and Turkey). The intersection of these analyzes will allow us, in the conclusion of this thesis, to make suggestions for the pursuit of economic policy in this region.

In conducting the empirical analysis, we attempt to reach a high degree of robustness by relying on a battery of relatively innovative methodologies. For instance, our analysis of efficiency levels in chapter 4 is based on a variety of efficiency tests aggregated in a new ‘efficiency index’ that could be used or further developed in future studies. Similarly, our measures of equity market integration in chapter 5 encompass both standard co-integration methods and an extension of a dynamic integration score based on a risk decomposition model. Our analysis of portfolio diversification benefits in the MENA region in chapter 6 constitutes the first study of this sort focusing on the MENA region and employs a block-bootstrap method as well as downside risk measures in order to improve the robustness of our estimates. Finally, our tests of financial contagion in chapter 7 also constitute the first attempt in this direction in MENA markets research. This analysis relies on several recently developed methods to detect contagion, whose results are aggregated in a new ‘vulnerability index’ that could be useful for future investigations. One additional objective of this thesis is therefore to contribute to current knowledge by applying a
set of relatively recent econometric tests and research questions in the context of the relatively under-investigated MENA markets.

1.3 Thesis motivation

The choice of this particular sample of countries (Morocco, Tunisia, Egypt, Jordan, Lebanon, Israel and Turkey) is motivated by the current economic situation in the MENA region. The seven selected countries are indeed since the 1995 Barcelona Declaration engaged in a regional integration initiative\(^1\) whose objective is to create a Euro-Mediterranean entity through economic, political and social advances. In spite of the realisation of this transition program, this group of countries has failed to reposition itself favourably in the allocation system of global capital. As shown in figure 1, the MENA stock markets accumulated only $20 billion in foreign portfolio investment between 1995 and 2004, less than Sub-Saharan Africa ($55 billion). In fact, the MENA region remains by far ‘the world’s smallest recipient of foreign capital’ (Abed & Soueid, 2005).

Figure 1 Cumulative capital flows by region, 1990-2004

![Cumulative capital flows by region, 1990-2004](image)

Source: World Bank, World Development Indicators 2005 on CD-ROM.

\(^1\) The EuroMed member countries are Morocco, Tunisia, Algeria, Egypt, Lebanon, Jordan, Syria, Israel and Turkey. However, Algeria and Syria are excluded of the analysis due to data unavailability and equity market underdevelopment.
Figure 2 describes the cumulative capital inflows to the MENA region from 1990 to 2004, by type of resource and by country. The biggest single flow is US$36 billion of foreign aid for Egypt. This is followed by US$28 billion of FDI to Israel and US$25 billion of bank and trade-related lending in Turkey. The countries that have attracted the greatest foreign direct investment are Israel, Turkey, Egypt and Tunisia. Turkey, Lebanon and Tunisia are the most attractive countries for portfolio investment in bonds (US$24, 15 and 3 billion, respectively). Turning to portfolio equity flows, Turkey receives the highest share (US$5.18 billion), and is followed by Egypt (US$1.17 billion), Morocco (US$1.07 billion) and Tunisia (US$0.27 billion). Overall, not only does capital allocation to the MENA region seem very weak in comparison to other developing areas, but it is also concentrated within a few countries: Turkey, Israel and Egypt, which represent the region’s biggest economies in terms of absolute GDP.

It should be noted that capital resources for developing countries have changed significantly during the last two decades. As shown in figure 3, Official Development Assistance (ODA) funds have been stagnating since the end of the Cold War, and are increasingly being replaced by private sector flows, whose significance increased significantly.

Figure 2 Cumulative capital flows by country, 1990-2004

Source: World Bank, World Development Indicators, 2005 on CD-ROM.

2 Portfolio investment and bank related lending data were unavailable for Israel, but it is reasonable to expect that this developed country is performing relatively well for all criteria.
four-fold from 1990 to 2004 (from US$99 billion in 1990 to US$370 billion in 2004). The biggest source of foreign capital is foreign investment (US$211 billion in 2004). Also, since the packaging of ‘emerging markets’, portfolio investment in bonds and equities soared from US$58 billion in 1990 to over 126 billion in 2004 (World Bank Development Indicators, 2005). This is three times greater than the overall amount of international development assistance (US$43 billion in 2004). This change reflects the new tendencies of small savers and institutional investors in Western countries, who increasingly allocate their savings to mutual funds or shares of publicly traded companies rather than to commercial banks. Most observers now consider portfolio equity flows to be a major surging source of global private capital, while economists view international capital markets as an ‘imperfect, yet irreplaceable global resources allocation mechanism’ (Cartapanis, 2004).

Figure 3 Capital resources for developing countries, 1990-2004

In the future, the MENA capital markets may participate more significantly in this dynamic. While modern finance theory requires the selection of securities with low correlations in order to minimize portfolio risk (Markowitz, 1959), many observers have indeed underlined that the increased integration of emerging markets into global finance has started to offset the benefits of portfolio diversification (Gilmore et.al, 2005; Steeley, 2004). International banks and mutual funds are therefore in need of new markets. The segmented but emerging MENA capital markets may thus ‘fill a gap’ in global finance.
Nonetheless, in contrast to other emerging markets such as those in Latin America, Eastern Europe or South Asia, very little is known about the MENA capital markets, which have been left largely under-investigated by academics and practitioners. The main motivation for this thesis is therefore to provide useful information for investors and policy-makers involved in the MENA region by carrying an empirical investigation of these equity markets’ properties.

1.4 Thesis contribution

The first contribution of this thesis is to undertake a literature survey analysing the relationships uniting equity market development and economic growth. This analysis reveals that internal and external equity market developments exert separate economic effects. On the one hand, internal market development fosters the mobilization of financial resources and improves corporate governance, subject to satisfactory levels of informational efficiency. On the other hand, evidence highlights the ambiguous economic outcomes of equity market integration. The latter may indeed facilitate corporate financing, but impacts ambiguously on the dynamics of portfolio allocations, and increases the volatility of domestic financial systems.

These mechanisms are summarized in figure 4 using a simple heuristic device. From each side of this ‘equity market development triangle’ runs a different axis representing a different facet of equity market development. The origins of these three axes are linked together to form a single triangle. This reflects the existing correlation between the different facets of equity market development.

From the top of this triangle runs a ‘resource allocation’ axis, which varies from ‘institutional underdevelopment’ to ‘informational efficiency’. This axis represents the impact of market development and informational transparency levels on the allocation of internally and externally mobilized resources. From the right side of this triangle runs a ‘resource mobilization’ axis, which varies from ‘market segmentation’ to ‘market integration’. This axis represents the impact of market development on the domestic financial sector, in which financing conditions vary from scarce and expensive capital to easier access to finance as equity markets develop and become integrated into global finance. Finally, from the left side runs a ‘financial vulnerability’ axis, which varies from ‘financial repression’ to ‘financial vulnerability’. This axis represents the pervasive effects of international market
integration, which may result in greater shock sensitivity, nonlinearities in capital inflows and a short-term bias in corporate governance.

**Figure 4 The equity market development triangle**

**Axis 1 : Resource allocation**
 *(Chapter 3, Chapter 4)*

- Market integration
- Institutional underdevelopment

**Axis 2 : Resource mobilization**
 *(Chapter 5, Chapter 6)*

- Financial vulnerability
- Informational efficiency

**Axis 3 : Financial vulnerability**
 *(Chapter 7)*

- Financial repression
- Market segmentation

We suggest that the objective of market development policies is to approach the equilibrium point, which is represented by the intersection of these three axes. At this point, market development and market integration result in a slackening of financial constraint at the cost of a reasonable level of financial vulnerability, while the economic efficiency of the additional investments is ensured by an adequate level of market efficiency.

Our empirical analysis can be interpreted as an attempt to situate the MENA countries on each axis of the equity market development triangle. We first focus on the ‘resource allocation’ axis. This implies measuring emergence levels (chapter 3) and market efficiency (chapter 4). Results suggest that taken as a whole, the MENA area is clearly on the path towards market emergence. However, our analysis also uncovers
significant heterogeneity in market emergence levels. Whereas Turkey, Israel, Egypt and Jordan seem to converge towards developed standards, Tunisia, Morocco and Lebanon are still clearly situated within the ‘frontier market’ category. Turning to informational transparency, our results suggest that Turkey and Israel are the most efficient markets of the region. These are followed by Jordan, Tunisia, Egypt, Lebanon and Morocco. In line with previous studies, our results suggest a positive association between efficiency levels and market development.

We then investigate the position of the MENA countries on the ‘resource mobilization’ axis. This is done by analyzing market integration levels (chapter 5), and by discussing the prospects of international diversification in the region (chapter 6). Overall, results suggest that the MENA countries are highly segmented from international markets and react heterogeneously to different categories of shocks. Turkey and Israel appear to be the region’s most internationally integrated markets, and are followed by Egypt, Morocco, Jordan, Lebanon and Tunisia. Turning to portfolio diversification, our results highlight good ex-post performance and suggest that the MENA markets may have a role to play in diversification strategies. However, portfolio allocations per country seem extremely sensitive to the optimization procedure utilized.

Finally, we assess levels of ‘financial vulnerability’ (chapter 7). This involves investigating the possibility of financial contagion in the MENA countries during several episodes of financial crises. We measure shift-contagion vulnerability in the MENA markets during seven recent episodes of financial crisis. As current theory suggests, vulnerability appears positively related to market development and international integration scores: Turkey and Israel were the most vulnerable markets over the study period, and were followed by Jordan, Tunisia, Morocco, Lebanon and Egypt.

Taken together, these analyses suggest that Turkey and Israel are the most advanced countries on each of the axes: ‘resource allocation’, ‘resource mobilization’ and ‘financial vulnerability’. Jordan and Egypt seem to constitute an intermediate group of countries. Finally, Lebanon, Tunisia and Morocco appear to be the region’s most segmented, least efficient and least vulnerable markets.
1.5 Thesis presentation

The remainder of thesis is structured as follows. The second chapter constitutes an overview of the theoretical and empirical mechanisms associated to internal and external equity market development policies. A paper based on this chapter has been accepted for publication in the book The Economics of Emerging Markets (Nova Publishers, New York, USA), as a contribution titled 'Equity markets and economic development: what do we know?'. The third chapter attempts to situate the MENA markets within the emerging/frontier market classification by means of international comparisons. A short version of this chapter has been accepted for publication in the journal Emerging Markets Finance and Trade under the title 'The MENA markets. Situation and characteristics'. In the fourth chapter, we investigate an additional criterion of internal equity market liberalization: the availability of transparent information and the dissemination of economic news. To do so, we measure informational efficiency in the MENA region and interpret our results in relation to the theoretical underpinnings of market efficiency. This chapter was presented at the 5th International Conference of the Middle East Economics Association in Sousse, Tunisia on March 12th, 2006 and was accepted for publication in the Journal of International Financial Markets, Institutions and Money as a paper titled 'Efficiency in emerging markets. Evidence from the MENA region'. The fifth chapter analyzes the extent of international integration in the MENA equity markets. We use various static and dynamic methodologies and investigate the impact of selected political, financial and economic events on international integration scores. This study was presented at the ECOMOD-MEEA conference on 'The MENA economies: Past Perspectives and Future Challenges' in Brussels, Belgium on June 1st, 2005 and at the Financial Management Association International Meeting in Siena, Italy, on June 11th, 2005. It was then accepted for publication in the journal Emerging Markets Finance and Trade under the title 'Capital market integration in the MENA region'. Significant evidence for segmentation leads us, in the sixth chapter, to formally investigate the optimal composition and performance of a MENA inclusive portfolio. This work was presented at the Financial Management Association International Meeting in Salt Lake City, USA on October 11th, 2006 and was then accepted for publication in the Journal of Multinational Financial Management as an article titled 'International diversification: is there a role for the MENA region?'. Finally, the seventh chapter
investigates shift-contagion vulnerability in the MENA equity markets in relation to equity market development and integration. This paper was presented during the plenary session at the 5th International Conference of the Middle East Economics Association in Sousse, Tunisia on March 11th, 2006, in which it was also awarded the best paper award. It was then submitted for publication to Economic Systems as a contribution titled 'Equity market development and shift contagion. Evidence from the MENA region'. Finally, the conclusion summarizes our findings and attempts to develop a policy message. It also suggests potential areas for future research.

\[\text{The work contained in these published manuscripts has benefited from the guidance of my research supervisor Pr. Brian M. Lucey.}\]
2. Equity market development: review of implications

Countries embarking on financial liberalization usually bear two objectives in mind: (a) raising the level of savings and investment; and (b) improving the allocation of investment resources in consistency with certain economic and social objectives. Nevertheless, equity market development constitutes a separate component of financial liberalization policies. The objective of this chapter is thus to review the main financial and economic consequences of this process. It is structured as follows. The first section reviews the internal effects of capital market reforms in emerging countries. The second section focuses on equity market integration and its associated effects. Finally, the conclusion summarizes our findings by considering the intersection of these analyses.

2.1 Review of internal implications

The objective of this section is to discuss the theoretical and empirical consequences of internal equity market development. It is structured as follows. The first sub-section discusses the impact of equity market development on financial systems and corporate governance. The second sub-section highlights the pivotal role played by market efficiency. The third sub-section is an overview of the empirical evidence.

2.1.1 The mobilization and allocation of financial resources

Developed in the early 1970s, the 'financial repression theory' states that domestic equity market development improves resource mobilization. More recent contributions have nonetheless suggested additional mechanisms through which equity markets may foster economic growth. These operate through the impact of market development on governance and economic structures.

2.1.1.1 The 'financial repression' paradigm

The pioneering work of Goldsmith (1969), Shaw (1973) and McKinnon (1973) underlined the role of finance in economic development. These authors argued that domestic financial liberalization would lead to higher savings, improved resource allocation and economic growth. However, in their work the emphasis was on the
liberalization of the commercial banking system, as opposed to equity markets. Their reasoning was based on the neoclassical assumption of an identity relationship between aggregate investment and aggregate savings, which in turn are positively correlated to interest rates.

To illustrate this point one can suppose a ‘financial repression’ situation in which interest rates ceilings prevail, so that the interest rate is \( r_l \) such as \( r_l < r^* \), where \( r^* \) is the natural equilibrium rate. This interest rate corresponds to a savings rate \( S_l < S^* \), which ultimately leads to an investment rate \( I_l < I^* \); where \( I^* \) and \( S^* \) are the equilibrium investment and savings rate, respectively. The direct consequence is that a fraction \( (I^*-I_l) \) of investment projects cannot be financed. Moreover, credit rationing may also lead banks to minimize risk and allocate savings to projects carrying a lower level of risk. As a consequence, the unsatisfied investment demand segment \( (I^*-I_l) \) tends to gather projects with the highest potential returns, i.e. the most socially useful projects. This magnifies the aggregate welfare loss for the economy.

By contrast, the increase in interest rates that result from financial liberalization may lead to an improved mobilization and allocation of domestic resources.

However, these initial models of ‘financial repression’ have been criticized for overlooking the possibility that endogenous constraints in the credit market may constitute obstacles to the allocative efficiency of investment (Stiglitz and Weiss, 1981). In a seminal model, Cho (1986) assumed that banks and equity investors have the same level of information about firms. In addition, information asymmetries in the credit market imply that although individual borrowers can be sorted according to their expected productivities, their degrees of risk are unknown, so that banks cannot identify the individual risk characteristics of firms. As a consequence, lenders aggregate borrowers into groups, and base their decisions on the expected variance in the distribution of risk for each group of borrowers.

In this context, the banking sector’s expected return is a function of a fixed interest rate \( r^* \) and of the default risk. The model further supposes that a group of firms \( j \) are innovative and highly productive while a group of firms \( i \) are less productive, but have established customer relations with banks. Other things equal, the bank’s subjective expected variance in the distribution of the risk of group \( j \) should be larger than the other group \( i \). As a consequence, the banks’ expected return from lending to group \( i \) may be higher than that of lending to group \( j \) (i.e., \( E\Pi_l^* > E\Pi_j^* \)), although
the expected productivity of the latter is higher than that of the former (i.e., \( R_i(R_j) \)). This results in a suboptimal allocation of savings.

However, equity market investors do not take default risk into account, as their expected returns \( EY_j^* \) are equivalent to the project’s expected return, i.e. \( EY_j^* = R_j \). In other words, shareholders make their investment decisions based on the comparison of expected productivities, which are known. This allows groups with more risk (such as group \( j \)) to obtain financing. Overall, the model suggests that equity market development is a necessary complement to reforms in the banking sector, as it contributes to better resource mobilization in the presence of information asymmetries in the credit market (Cho, 1986).

### 2.1.1.2 Institutions and resource allocation

Recent contributions in institutional economics have also highlighted a number of intuitive mechanisms through which market development may positively impact on the allocation of mobilized resources in developing countries. One argument is that banking systems in such countries are often characterized by a high ownership structure resulting in oligopolistic practices. As a consequence, the selection of investment projects based on expected operating results can be disturbed by strategic political interactions between agents, which ultimately results in suboptimal investment decisions and in a weak corporate sector. The poor allocative performance of the bank-based financial structure magnifies the relative advantages of equity markets (Henry and Springborg, 2004).

Other studies have underlined the liquidity-enhancing function of equity markets. For instance, the creation of a domestic stock market in developing countries may provide households with an additional instrument which may better meet their risk preferences and liquidity needs (Dailami and Atkin, 1990). Domestic stock investment may thus constitute an alternative to consumption, the purchase of land and real estate, or the seeking of more profitable investment abroad, and ultimately results in a better mobilization and allocation of savings (Oshikoya and Osita, 2003). Similarly, other authors have underlined the role of a large and active secondary market in mitigating the problem of the availability of long-term funds: investors and corporations tend to have conflicting concerns over the optimal degree of liquidity of financial transactions. Investors may indeed prefer high liquidity, whereas corporations need to
be assured of long-term credits to match their long term assets. Transactions in the secondary markets may permit the reconciliation of these conflicting concerns and allow new equity issues in the primary markets to be successful. In other words, equity market development may ease the tension between savers’ preference for liquidity and entrepreneurs’ need for long-term finance (Ndikumana, 2001).

Another line of reasoning suggests that the development of a security market helps to strengthen corporate capital structure and governance in developing countries. In the absence of viable equity markets, firms tend to rely heavily on internal finance and bank loans to finance fixed assets and working capital, which raises the debt-to-equity ratio. The resulting imbalanced capital structure increases the interest rate risk by creating maturity mismatches on balance sheets. This weakens the corporate sector in periods of economic downturn, where banks tend to squeeze credit and limit overdraft lines. By contrast, efficient stock markets increase the viability of investment projects by allowing all firms to compare the cost of various sources of finance and to pick up the most appropriate debt to equity mix (Oshikoya and Osita, 2003). Additionally, equity markets may improve corporate governance by mitigating ‘moral hazard’. Indeed, the interests of managers and owners may not coincide if their incomes depend on different factors. By contrast, stock market-induced governance ties the manager’s income to stock prices and reduces the incentive for imprudent actions, thereby increasing the firm’s long term value. Equity markets also improve managerial efficiency by promoting competition through effective takeover or threat of takeover (Jensen and Meckling 1976).

It should also be noted that foreign equity participation may promote further development of the domestic securities market. For instance, Errunza (1999) argued that foreign portfolio investment fosters managerial efficiency. There are five main mechanisms through which stricter governance rules are implemented following foreign equity investment (Stulz, 1999). First, firms tapping into foreign capital markets need to minimize agency problems and therefore tend to have an active board of directors that are independent of management. Second, international stock issuance requires managers to hire investment bankers. Such bankers have certain responsibilities within global capital markets, and thus play a key certification role in monitoring management. Third, globalization allows foreign shareholders to participate significantly in local firms. The introduction of foreign standards may be assimilated to a knowledge transfer from the foreign shareholder to the developing
country corporation, which may then spill over to the rest of the economy through job turnover. Fourth, opening up to foreign capital creates a market for corporate control, in which fear of takeover or effective takeover fosters managerial discipline and increases efficiency. Fifth, local firms cross-listed in countries that better protect minority shareholders may face legal action from foreign shareholders. This constitutes an incentive for the convergence of domestic legal systems towards the highest international standards.

Overall, it is expected that improved institutions, shareholder protection, disclosure standards, along with the active participation of foreign investors,- i.e., the emergence of a local ‘equity culture’- would instil confidence among local investors and contribute to further market development and greater managerial efficiency, ultimately resulting in higher economic growth.

2.1.1.3 Potentially pervasive effects

Nevertheless, there are also downsides to equity market development. More specifically, one problem with financial markets is that they tend to be biased towards the short run. This is magnified by the growing importance of institutional investors. Mutual funds managers who benchmark portfolio performance indeed tend to focus on market momentum rather than long-term prospects. In doing so, analysts prioritize quarterly as opposed to annual company reports (a situation described as a “quarterly report dictatorship” (Santiso, 1997)). This short-term bias is magnified by portfolio diversification: managers can easily cancel some of their positions when their other holdings are well balanced.

By contrast, the identification of sound investment opportunities by a company’s management requires a longer time horizon. The design and implementation of sound economic policy also requires a significantly slower pace. Overall, equity market development may favour shorter temporal horizons, in the economy, which may conflict with governmental and managerial timelines. Such a dynamic can be particularly harmful in developing countries, where economic challenges are extremely demanding.

Concurrently, while a lack of market liquidity is generally perceived as a fundamental cause of brutal variations in price, an informal view suggests that in some circumstances, too much liquidity can prove destabilizing. In the context of an
underdeveloped financial market, additional liquidity may positively affect price variation by fostering market participants’ ability to accommodate order flows. This positively impacts on the adjustment of prices to new information, and may generate a multiplier effect on volatility transmission in times of turmoil. Increased liquidity may induce a reciprocal loop between prices and orders, thereby amplifying market responses. This results in bubble-like booms in asset prices, and in magnified distress when the market plummets (Kenny and Moss, 1998). By contrast, the transmission of market effects is negligible where there are low levels of liquidity (Piesse and Hearn, 2001).

Besides, certain authors have questioned the impact of shareholder dominance on corporate governance. In a world of perfect capital mobility, the dominance of foreign shareholders may lead managers to focus on one-dimensional corporate performance measures (e.g. stock prices, return on equity). This tends to bias companies toward adaptive rather than innovative strategies. According to Lazonick and O’Sullivan (1996), shareholder dominance implies the pursuit of liquidity, which is incompatible with the financial commitment required by innovation. These authors do not recognize shareholders as ‘principals’ who benefit from residual revenue because ‘given their quest for liquidity, of all the stakeholders in the modern industrial corporation, shareholders are the ones with the least stake in a particular company as an ongoing entity because, via the stock market, shareholders have the easiest conditions for exit of any stakeholders’ (p.58). Rejecting projects whose returns fail to satisfy investor demand for rapid payoffs may result in a shift of research away from projects with longer-term payoffs. This impacts on innovation and weakens technological development. For example, according to a survey of US companies, the average length of research projects decreased from 21.6 months in 1991 to 16.7 months in 1996 (OECD, 1999).

The pressure to generate returns for shareholders may also be detrimental to other stakeholders, and tends to reduce corporate governance to the sole relationship between shareholders and management (Jeffers, 2005). Other groups, such as employees, customers and suppliers, the state and society in general, are not properly taken into consideration. Environmental issues constitute a good example. Environmental economics theory states that social and environmental sustainability requires companies to internalize all types of costs into their decision function. However, lenders’ portfolio decisions are solely based on the expected risk-return
characteristics associated with borrowers’ projects. Therefore, unless the existing regulatory regime causes product market capital-seekers to fully internalize all types of costs, the non-internalized costs and benefits of prospective investments will not figure into the capital suppliers’ decision function. This may result in a sub-optimal resource allocation and in negative social and environmental externalities (Goldstein, 2000). Some authors have also suggested that this problem might be aggravated by the dynamic of financial globalization. For instance, Kim and Wilson (1997) developed a theoretical model in which independent welfare-maximizing governments may regulate pollution emissions from production activities, and tax residential labour and mobile capital in order to finance public good expenditures. Their results suggested that intergovernmental competition for mobile capital may lead to inefficiently lax environmental and social standards. They concluded that financial globalization may lead to a social and environmental ‘race to the bottom’. Overall, these observations have led some economists to argue that equity markets constitute ‘costly irrelevances which (developing countries) can ill afford’ (Singh, 1997).

2.1.2 Informational efficiency

However, the mechanisms uniting equity market development and the allocation of investment appear more complex when one incorporates information costs and the informational requirements they impose on the individual equity investor. In line with the financial repression paradigm, proponents of market efficiency argue that financial markets collect and allocate savings to the most socially desirable economic projects. Nevertheless, the hypotheses underlying this reasoning are still the object of considerable debate.

2.1.2.1 Definition

In the broadest sense, market efficiency requires the simultaneous presence of three types of efficiency: risk-diversification efficiency, which states that markets fully diversify risks in line with the predictions of the Arrow-Debreu (1954) theorem; valuation efficiency, which refers to the market’s capacity to reflect the fundamental value of financial assets; and informational efficiency, which states that active
portfolio management strategies are ineffective. Within this framework, there is a
direct causality link between informational efficiency, valuation efficiency and
allocative efficiency (Aglietta, 2001). This has placed the notion of informational
efficiency at the forefront of finance research over the last three decades.

2.1.2.1 Strong, semi—strong and weak form informational efficiency

In a general sense, informational efficiency implies that the pricing of securities
reflects all available information that is relevant to their valuation. However, Fama
(1970) identified three types of market information and subsequently suggested three
forms of market efficiency: strong, semi-strong, and weak.

‘Strong form’ efficiency states that all public and private historical information is
entirely reflected in asset prices. This implies first, that private information (inside
information) is difficult to obtain due to the competition among active investors in the
market; and second, that even investors that manage to access private information are
unable to achieve abnormal rates of returns. This, however, is unlikely to happen in
reality, so that the strong form of efficiency is unlikely to hold.

The semi-strong form of efficiency states that current market prices reflect all publicly
available information, including both macroeconomic information (money supply,
exchange rate, interest rates...) and corporate information (announcement of
dividends, annual earnings, stock splits). In this form of market efficiency, market
prices instantaneously adjust to any good or bad news contained in such information
as they are revealed. As a consequence, market participants cannot make consistently
superior returns by analyzing publicly available information: only insiders may
achieve abnormal profits.

Finally, the weak form of efficiency constitutes the most restrictive definition of the
concept. It implies that asset prices reflect all past available information relevant to
their valuation, so that the analysis of past prices cannot help predicting future
patterns. Therefore, it is not possible for a trader to make abnormal returns based on
technical analysis. Rejecting the weak-form of efficiency automatically implies
rejecting the ‘semi strong’ and ‘strong’ forms. As a consequence, the weak-form
definition of market efficiency constitutes the main operational definition for
efficiency studies (Mobarek & Keasey, 2000). At the theoretical level, weak-form
efficiency can be related to the ‘random walk model’ developed by Fama (1970).
2.1.2.1.2 The random walk model

According to Fama (1970), under the weak form efficiency market hypothesis, share prices must reflect all past information which is relevant for the evaluation of a company's future performance. This ensures convergence towards valuation efficiency as the market price of a share is close to its intrinsic value. Any new information expected to change a company's future profitability, must be immediately reflected in the share price. By contrast, any delay in the diffusion of information to price would result in a deviation from efficiency, as some subsets of available information could be exploited to forecast future profitability. In an efficient market, price changes are thus necessarily a response to new information. Since information arrives randomly, prices must also fluctuate unpredictably. From a statistical point of view, this implies that the market follows a 'random walk': only an unknown event may modify prices instantaneously. This stochastic process may be characterized as follows:

\[ P_t = P_{t-1} + \varepsilon_t \]  

(1)

Where \( P_t \) is the asset price at time \( t \), \( P_{t-1} \) is the asset price at time \( t-1 \) and \( \varepsilon_t \) is a randomly distributed variable with 0 mean and variance \( \sigma^2 \). Assuming the absence of serial autocorrelation, we have:

\[
\begin{align*}
E[P_{t+1}/(\ldots, P_{t-1}, P_t)] &= E[P_t + \varepsilon_{t+1}/(\ldots, P_{t-1}, P_t)] \\
E[P_{t+1}/(\ldots, P_{t-1}, P_t)] &= E[P_t/(\ldots, P_{t-1}, P_t)] + E[\varepsilon_{t+1}/(\ldots, P_{t-1}, P_t)] \\
E[P_{t+1}/(\ldots, P_{t-1}, P_t)] &= E[P_t/(\ldots, P_{t-1}, P_t)]
\end{align*}
\]

(2)

According to (2), current prices constitute an appropriate expectation for the price in \( t+1 \). Assuming the absence of correlation between \( \varepsilon_{t+1} \) and \( P_t \), the variance of expected prices is given by:

\[
\begin{align*}
V[P_{t+1}/(\ldots, P_{t-1}, P_t)] &= V[P_t + \varepsilon_{t+1}/(\ldots, P_{t-1}, P_t)] \\
V[P_{t+1}/(\ldots, P_{t-1}, P_t)] &= V[P_t/(\ldots, P_{t-1}, P_t)] + V[\varepsilon_{t+1}/(\ldots, P_{t-1}, P_t)] \\
V[P_{t+1}/(\ldots, P_{t-1}, P_t)] &= V[\varepsilon_{t+1}]
\end{align*}
\]

(3)
As shown in (3), the variance of the expected price is equal to the variance of the random variable $\varepsilon_i$. As a result, only the variance of the error term can explain the time-varying pattern of asset prices, whose changes do not help to predict future values. Hence, the evolution of market prices cannot be forecasted based on the analysis of past equity trends. Prices follow a random-walk, and the efficiency condition is respected (Barhoumi, 2005).

2.1.2.2 The consequences of informational efficiency

The idea that a lack of informational efficiency may disturb the market-based system of incentives and affect the investment allocation process was originally popularized by J.M Keynes (1883-1946) in his description of the 'beauty contest'. Over the last decade however, a set of additional transmission mechanisms has been put forward to account for this phenomenon.

First, a firm may not be able to raise the outside funds necessary to undertake a worthy investment project if a manager cannot fully and credibly reveal information to outside investors and lenders (Myers and Majluf, 1984). Second, asymmetries of information between managers and outsiders may lead to diverging perceptions of asset pricing. For instance, given the alternative of financial leverage, managers may then issue new equity only if they assume that stock prices are overvalued. As a consequence, risk-averse investors may be reluctant to invest in new equity issues (Stiglitz, 1989; Franks and Mayer, 1990; Hubbard, 2000). Similarly, entrepreneurs may also hesitate to implement public offerings as a result of high transaction costs or the uncertainty of getting a fair price (Bekaert and Harvey, 1997). Third, inefficient markets are often characterized by the absence of reliable accounting standards and usually lack a regular, adequate and reliable disclosure of information. This magnifies the informational advantage of insiders, who are able to manipulate stock prices in order to make extra profits. For instance, better-informed investors may gain inside information about firm productivity. This advantage may be used to retain the high-productivity firms and to sell the low-productivity ones to partially informed savers, resulting in a misallocation of domestic savings (Razin, Sadka and Yuen, 1999). Fourth, market efficiency constrains the impact of stock market development on corporate governance. Tying the managers’ income to biased market prices would
result in a set of wrong managerial incentives, and would ultimately introduce disturbances in the corporate governance mechanism (Pollin, 2002). Fifth, market cycles tend to be particularly pronounced in inefficient markets. A lack of reliable information favours noise and herding behaviour among investors, increasing the probability of sudden opinion reversals (Singh, 1997). The negative consequences of market volatility are well known. The cost of capital for corporations may increase due to market fluctuations, which discourages risk-averse investors (Caporale, Howells and Soliman, 2004). Major booms and busts in the secondary market may also undermine the confidence of investors and affect the ability of companies to raise additional funds in the primary market. Sixth, speculative bubbles and crashes in the equity market may undermine the whole financial system and generate financial crises with very large economic and social costs (Agénor, 2003). It should also be noted that general equilibrium models have also underlined the positive relationship between informational efficiency and economic development (Capasso, 2004). Taken together, these intuitions constitute considerable backing for the idea that the market efficiency hypothesis largely conditions the economic impact of equity market liberalization policies.

2.1.2.3 Efficiency in emerging markets

In the context of developing markets, it should be noted that a number of specific factors may hinder the flow of information and imply departure from efficiency. Structural and institutional specificities, such as the fragmentation of capital markets, or the presence of political and economic uncertainties, may account for low efficiency (El-Erian and Kumar, 1995). Nonetheless, 'de jure' financial liberalization may not be a sufficient condition for informational efficiency. For instance, Kawakatsu and Morey (1999) investigated market efficiency before and after financial liberalization. They used two sets of dates and data from nine different countries, and found that market efficiency levels were unaffected by the selected events. However, 'de facto' levels of market development may exert a more significant impact on informational efficiency. The low degree of competition in thinly traded markets may indeed result in the presence of dominant players who can cause stock prices to deviate from their intrinsic value (Mobarek and Keasey, 2000). Such a phenomenon is likely to be accompanied by a lack of market transparency, as
reflected by corporate information scarcity, low auditing experience, lax disclosure requirements, and overall weak regulations, which together result in truncated fundamental information and favour insider strategies (Blavy, 2002). By contrast, an increase in market capitalization and in the number of listed firms generally results in an enlarged investor base, whose informational needs may foster the development of an individual stock and market-wide research industry.

Insufficient liquidity levels may also affect the market’s ability to accommodate orders, and hence weaken the link between prices and information. For instance, Brown and Zhang (1997) discussed the impact of liquidity on informational efficiency by comparing a dealer market and a limit-order book. In their theoretical model, dealers may be better informed than other traders, but the introduction of a limit-order book lowers the execution-price risk faced by speculators, and allows them to react more aggressively to information flows. The introduction of the limit order book thus simultaneously diminishes dealers’ profits and increases informational efficiency. More generally, the development of an ‘equity culture’ in emerging countries societies appears to be an overarching requirement for establishing the conditions of market efficiency (Aloui, 2003).

2.1.3 Empirical evidence

Empirical studies related to the theoretical processes discussed above can be divided into two main components: (i) financial development studies, and (ii) informational efficiency studies.

2.1.3.1 Financial development studies

As underlined in Demirgüc-Kunt and Levine (1996), the scarcity of data on stock markets in developing countries has led most research on the ties between financial development and economic growth to focus on the impact of the banking sector. For instance, King and Levine (1993) examined the relationship between financial intermediation and long-run economic growth in eighty countries from 1960 to 1989. They found that the level of financial intermediary development was strongly linked to long-run growth, even after controlling for many other factors associated with long run growth.
Turning to capital market development, Haber (1991), using a historical analysis, documented the positive impact of capital market reforms on competition and industrialization using evidence from Brazil, Mexico, and the United States during the nineteenth and early twentieth centuries. Atje and Jovanovic (1993) were the first to formally investigate the impact of stock market development on economic growth. Using a sample of forty countries over the 1980-1988 period, they reported a strong relationship between a stock market development indicator (value traded as a percent of GDP) and economic growth. Levine and Zervos (1998) constructed aggregated indexes of overall stock market development and found that stock markets remained positively and significantly correlated to long-run growth over the 1976-1993 period for a wide number of developing countries, even after controlling for development level and economic policy variables. More recent empirical work has also suggested that equity market liberalization is associated with higher real growth, in the range of one percent per annum for the average emerging nation (Bekaert, Harvey and Lundblad, 2001).

Other studies have attempted to compare the respective impact of banks and equity markets. For instance, Demirgüç-Kunt (1992) highlighted a positive and significant relationship between firm leverage and stock market development, suggesting that equity finance may increase the borrowing capacity of firms through risk sharing and raise the quality and quantity of bank lending through timely and systematic information flows. Demirgüç-Kunt and Levine (1995) underlined that the level of stock market development is highly correlated to the development of banks, nonbanks, insurance companies and private pension funds. Their results indicated that, as an economy develops, its aggregate debt-to-equity ratio tends to diminish. Along similar lines, Demirgüç-Kunt and Maksimovic (1998) explored the effect of stock market development on firms’ financing choices. Looking at a sample of thirty industrial and developing economies, they observed that the effect of stock market development on firm debt-to-equity ratios depends on the initial level of stock market development. These empirical studies echo Boyd and Smith’s (1996) theoretical model, which showed that the negative association between financial leverage and economic growth can be explained by rising aggregate investment monitoring costs. These are due to the adoption of more complex technology. In other words, the adoption of monitoring costs minimization strategies, as firms move up the value chain, may skew the economy’s aggregate financial structure towards equity rather
than debt. Recently, a few microeconomic investigations have also suggested that equity market liberalization leads to a modification of the pattern of corporate financing in emerging countries. For instance, Bekaert and Harvey (2000) investigated the impact of financial liberalization on asset pricing in a sample of 20 emerging countries and found that the cost of capital - as measured by dividend yields - always decreased after liberalization but that the effect was relatively weak (0.15%). Errunza and Miller (1998) used a sample of 126 firms from 32 countries and documented a reduction of 42.2% in long run returns as well as significant positive returns around the announcement of ADR offerings. More recently, Patro and Wald (2005) investigated a panel of 18 emerging markets and found an average decrease in returns of 2.88% per month during the 36 month period starting three and a half year after the liberalisation date, suggesting a significant decrease in the cost of capital. This result echoes that of Chari and Henry (2004), who used a similar dataset and an international asset pricing modelling framework to obtain similar results, while also underlining the role of firm-specific risk sharing characteristics in corporate valuation. This set of studies hence suggests that equity market development slackens the financial constraint in developing countries by inducing a significant decrease in the cost of capital.\footnote{The underlying theoretical mechanisms have been described by Stulz (1999).}

Overall, financial development studies have underlined that equity markets have a role to play in financial liberalization policies, as a necessary complement to the banking sector.

2.1.3.2 Informational efficiency

Informational efficiency studies have used various datasets and methodologies and can be divided into three main components. One first group of papers tested for the random walk hypothesis based on variance ratio and seasonality tests. A second group of papers directly examined the performance of technical trading rules in predicting price changes. Finally, a third group of papers investigated microstructures in emerging markets.
2.1.3.2.1 Variance ratio and seasonality tests

Market efficiency tests through the random walk constitute a voluminous amount of literature, which can be chronologically described as follows. In a seminal paper, Urrutia (1995) implemented variance ratio and run tests using monthly data for market indexes in Argentina, Brazil, Chile and Mexico during the 1975-1991 period and yielded contrasting results. Fawson (1996) implemented a wide battery of tests including autocorrelation tests, run tests and unit root analysis to test for the random walk hypothesis in the Taiwan Stock Exchange using monthly stock market returns for the 1967-1993 periods. He was unable to reject the weak form efficiency hypothesis. Similarly, Dockery and Vergari (1997) were unable to reject the weak form efficiency hypothesis in the case of the Budapest Stock Exchange, using weekly stock market indexes covering the 1991-1995 period.

By contrast, Grieb and Reyes (1999) implemented variance ratio tests in the Brazilian and Mexican stock exchanges during the 1988-1995 periods, and significantly rejected the weak form efficiency hypothesis for all market indexes and most individual stocks. Mobarek and Keasey (2000) also attempted to assess the behaviour of stock price movement in the Dhaka Stock Exchange in Bangladesh for the 1988-1997 period and reported market inefficiency based on a runs test, an autocorrelation test, an auto-regression test and an auto-regressive integrated moving average model. However, Chang and Ting (2000) implemented a variance ratio analysis using weekly, monthly, quarterly and yearly returns for the Taiwanese market index for the period from 1971 to 1996. They were unable to reject the random walk hypothesis for all series, except weekly series. Cheung and Coutts (2001) also investigated weak form efficiency in the Hong Kong stock exchange based on variance ratio analysis, using daily data over the 1985-1997 period. They were unable to reject the random walk hypothesis. However, Groenewold et.al (2003) implemented autocorrelation and unit root tests using daily return series for seven indices of the Shangai and Shenzen Chinese stock exchanges and significantly rejected the random walk hypothesis. Lima and Tabak (2004) also applied a variance ratio analysis to daily stock price indexes for Shangai, Shenzen, Hong Kong, and Singapore stock exchanges from 1992 to 2000 and rejected the null hypothesis of efficiency in the case of Singapore. Finally, Seddighi and Nian (2004) used autocorrelation, unit root and auto regressive conditional heteroskedasticity models and were unable to reject the null of a random
walk in the Shangai stock exchange using daily data from the market index and eight individual shares for the year 2000.

Concurrently, a few authors have tested for day-of-the-week effects in emerging markets. Aggarwal and Rivoli (1989) examined seasonal and daily patterns in equity returns in Hong Kong, Singapore, Malaysia and the Philippines using daily data for the 1976-1988 period. Their results suggested the presence of a robust January effect (higher returns) and Monday effects (lower returns) in all markets except the Philippines. Nath and Dalvi (2004) examined the anomaly in the Indian equity market for the period from 1999 to 2003 using high frequency and end of the day data, and found significant Monday and Friday effects. Finally, Basher and Sodorsky (2006) investigated the day-of-the-week effect in 21 emerging stock markets using daily data for the 1992-2003 period, and found significant support for such effects in the Philippines, Pakistan and Taiwan, Argentina, Malaysia, Thailand and Turkey. Overall, it appears that variance ratio and seasonality tests have raised very mixed results.

2.1.3.2.2 Technical trading rules

An alternative way to check for the random walk hypothesis is to examine the outcomes of technical analysis. The latter can be defined as the deliberate study of market price history, with a view to predicting price changes and enhancing trade profitability. In a seminal paper, Brock et al. (1992) demonstrated profitable moving average trading rules using the Dow Jones Industrials Average from 1897 to 1986. Bessembinder and Chan (1998) assessed whether technical analysis can predict stock price movement in Malaysia, Thailand, Taiwan, Hong Kong and Japan. They found that trading rules are successful in the least developed markets (Malaysia, Thailand and Taiwan), but have less explanatory power in the more developed markets (Hong Kong and Japan). Ratner and Leal (1999) applied technical trading rules to ten emerging equity markets in Latin America and Asia from January 1982 through April 1995. Their results suggested that trading strategies may be profitable in Taiwan, Thailand and Mexico, but not in other markets. Similarly, Parisi and Vasquez (2000) adopted a similar methodology using daily closing prices for the 1987-1998 periods in the Chilean stock market and provided strong support for the technical strategies. Finally, Chang et.al (2004) implemented a comprehensive technical trading analysis,
testing for different sub-samples and analyzing returns in bear and bull markets in 11 emerging markets for the 1991-2004 periods. Their results suggested that emerging equity indices do not resemble a random walk, as opposed to more developed markets such as the USA and Japan.

2.1.3.2.3 Efficiency in the MENA capital markets

It should be noted that while much academic research has been conducted on the properties of the Asian and Latin American countries, the MENA markets have remained rather neglected by researchers to this date. A few studies have focused on the GCC stock markets. Al-Loughani and Chappel (2001) and Moosa and Al-Loughani (2003) used GARCH modeling processes and found support for a day-of-the-week effect in the Kuwaiti stock exchange. This result was confirmed by Al-Saad and Moosa (2005) who used a structural dummy model and suggested the presence of a July-effect in that same market. Finally, Abraham et al (2002) used the Beveridge-Nelson decomposition of indices and found mixed support for efficiency in the markets of Kuwait, Saudi Arabia and Bahrain. Turning to the non-GCC MENA markets, Balaban (1995) reported that in the Turkish stock market for the period January 1988 to August 1994 the highest returns and the lowest standard deviations were on Fridays followed by Wednesdays. He also noted that the day of the week effects changed in direction and magnitude for various years. Mecagni and Sourial (1999) used four daily aggregate indices and a GARCH model for the Egyptian stock market for the period 1994-1997 and found evidence of a significant departure from the efficient market hypothesis. More recently, Smith and Jefferis (2005) used a variance ratio methodology for the African markets and found support for the random walk hypothesis in Israel, Jordan and Lebanon.

2.1.3.3 Institutions and efficiency

In light of current theory, authors have attempted to measure the impact of institutions on price patterns. For instance, one first group of studies documented a mutually reinforcing relationship between market efficiency and liquidity levels. Demirgüç-Kunt and Levine (1996) suggested a positive correlation between liquidity, institutional development and market efficiency using data for 41 emerging countries.
from 1986 to 1993. In developed markets, Jones (2001) assembled an annual time series of bid-ask spreads on Dow Jones stocks from 1900 to 2000, and showed that time varying spreads and turnovers are important determinants of conditional expected stock market returns.

It should also be noted that liquidity levels also have legal and political origins. Using a price-based measurement of liquidity, Lesmond (2005) underlined that countries with weak political and legal institutions have significantly higher liquidity costs than countries with strong political and legal systems: higher incremental political risk tends to be associated with a 10 basis point increase in transaction costs. In a similar vein, Khwaja and Mian (2005) investigated the relationship between poor regulatory environments and the presence of abnormal returns among brokers in Pakistan using trade level data. Their results highlighted a possible manipulation of stock prices by collusive brokers: when prices are low, brokers tend to trade amongst themselves in order to artificially raise prices and attract positive-feedback traders. Once prices have rised, the former exit and leave the latter to suffer the ensuing price fall. These authors underlined that brokers may earn annual rates of return that are 50-90 percentage points higher than those earned by outside investors. These large rents may explain why market reforms are hard to implement, and why emerging equity markets often remain marginal with few outsiders investing and little capital raised.

Another group of papers studied the bid-ask spread price patterns. Cajueiro and Tabak (2005) investigated the causes of long-range dependence in bid–ask prices for all stocks traded in the Brazilian financial market from January 1998 through November 2003. Their findings suggested that price patterns are not solely driven by fundamentals but also by other market characteristics such as capitalization measures (a proxy for liquidity), dividends payments, return on equity (ROE) and financial leverage. Speculative behavior (for example, technical analysis) and speculative bubbles in stock markets have important roles in the determination of prices. Finally, Gorkittisunthom et.al (2006) examined 104 stock splits that occurred in the Stock Exchange of Thailand during the 2000–2004 period and documented a negative and statistically significant relationship between insider ownership level and change in the percentage bid–ask spread. This further highlights the link between corporate governance structure and equity market efficiency in emerging countries. Overall, empirical investigations of efficiency have yielded mixed results.
Taken together, theoretical and empirical studies suggest that the economic impact of internal equity market development is ambiguous. On the one hand, standard transmission mechanisms include better mobilization and allocation of domestic financial resources, as well as improved corporate governance. Recent empirical macroeconomic and microeconomic models seem to confirm these theoretical intuitions. On the other hand, informational efficiency should be considered as a relative rather than absolute phenomenon, and is linked to institutional developments. Overall, the material reviewed in this section suggests that equity market development is an appropriate strategy to foster the mobilization and allocation of domestic financial resources in developing countries. However, such policies must simultaneously tackle insufficient levels of informational efficiency by setting up adequate institutions.

Nonetheless, the trend towards financial globalization generates a number of additional effects with powerful impact on domestic financial systems. These are discussed in the next section.

2.2 Review of external implications

The globalization of financial services has, over the last decade, given rise to a voluminous amount of academic work analyzing both the extent and the consequences of international market integration for financial systems in developing countries. The objective of this section is to discuss the main conclusions from this literature. It is structured as follows. The first sub-section defines equity market integration. The second sub-section derives its main theoretical consequences. The third sub-section reviews the associated empirical literature.

2.2.1 Equity market integration: definition

Although mostly used by empiricists, the concept of 'equity market integration' is embedded in asset pricing theory. Asset pricing models have highlighted three possible situations: full segmentation, mild segmentation and full integration of equity markets (Bekaert and Harvey, 1995).
2.2.1.1 Full market segmentation

Full equity market segmentation can be described based on the standard Capital Asset Pricing Model (CAPM), as developed by Sharpe (1964) and Lintner (1965). In this framework, the relevant risk faced by investors is the asset's contribution to the variance of a diversified portfolio within the domestic country. For any individual stock in the segmented stock market we have:

\[
\begin{align*}
E(R_i) &= r_f + \beta_i^{m} [E(R_m) - r_f] \\
[E(R_m) - r_f] &= \gamma(W) \sigma_m^2 \\
E(R_i) &= r_f + \gamma(W) COV(R_i, R_m)
\end{align*}
\]  

(1)

Where \( E(R_i) \) is the required rate of return on firm i's stock, \( r_f \) is the risk-free rate in the domestic market, \( \beta_i^{m} \) is the beta coefficient of firm i with the domestic market portfolio, and \( E(R_m) \) is the expected return on the domestic market. The aggregate risk premium can be established as the product of the coefficient of relative risk-aversion \( \gamma(W) \) by the variance of the domestic market portfolio \( \sigma_m^2 \). \( COV(R_i, R_m) \) is the covariance between the individual stock and the domestic portfolio.

2.2.1.2 Mild segmentation

Mild segmentation constitutes an intermediary situation which was initially described by Errunza and Losq (1985). In their analysis, under mild segmentation governments maintain one restriction on financial liberalization: while domestic investors are allowed to invest in the world market portfolio, foreign investors can only hold a subset of domestic equities. This corresponds to a hybrid CAPM in which assets are divided into freely tradable and restricted assets. Freely tradable assets are priced according to the world factor, which is the relevant source of systematic risk for foreign investors. The pricing of investible securities under mild segmentation is thus given by: \( E(R_i) = r_f + \beta_i^{m} [E(R_w) - r_f] \). However, the pricing of non-investible securities includes a 'super risk premium', which compensates domestic investors for bearing the risk associated with holding all of the non investible stocks. For any individual restricted stock, we have:
In equation (2), \( R_n \) and \( R_i \) are the returns on the portfolio non-investible and investible securities, respectively. The variable \( COV(R_i, R_n \mid R_i) \) represents the covariance of firm i's return with the return on the portfolio of non-investible stocks, taking the return on the investible securities as given. \( \gamma \) and \( \gamma_u \) are risk aversion coefficients for restricted international investors and unrestricted domestic investors, respectively.

2.2.1.3 Market integration

Finally, full integration means that the domestic equity market becomes a part of the global equity market. As a consequence, domestic assets are rewarded according to their covariance with the world portfolio, as the risk premium on any asset is proportional to its world beta. In other words, risk is measured through asset contribution to the world portfolio. The international version of the CAPM was proposed by Solnik (1974). For any local firm, we have:

\[
\begin{align*}
E(R_{i*}) &= r_{i*} + \beta_{iw} [E(R_w) - r_{w*}] \\
E(R_w) - r_{w*} &= \gamma(W) \sigma^2_w \\
E(R_{i*}) &= r_{i*} + \gamma(W) COV(R_{i*}, R_w)
\end{align*}
\]

Where \( \beta_{iw} \) denotes firm i's beta with the world market, \( E(R_w) \) denotes the required rate of return on the world equity market portfolio, \( \sigma^2_w \) denotes the variance of the return of the world portfolio and \( r_{w*} \) is the world risk-free rate. In other words, expected local returns \( E(R_i) \) in a fully integrated market depend solely on non-diversifiable international factors.
2.2.2 Main theoretical implications

From a theoretical point of view, equity market integration affects (i) the dynamics of international diversification opportunities, and (ii) the domestic market’s sensitivity to international shocks.

2.2.2.1 International diversification opportunities

Modern finance theory shows that including weakly correlated assets in a domestic portfolio reduces risk and maximizes long run yields (Markowitz, 1952, 1959). In this context, two main factors explain the attractiveness of international diversification for portfolio managers. First, the correlations between the returns of the securities that make up a portfolio are crucial in determining the associated level of risk. Generally, the lower the correlation between securities, the lower the portfolio risk, and risk-averse investors tend to select securities with low correlation (Markowitz, 1959). Second, the correlation between domestic and foreign returns is expected to be lower than that between purely domestic securities. This is due to the monetary, fiscal, and industrial policies varying from country to country, which add up to differing industrial compositions of stock market and countries and result in significant differentials in country returns dynamics. International diversification is thus beneficial to both value stability and long run yields because it facilitates the selection of foreign investment projects that exhibit very low correlation with the domestic portfolio.

The relationship uniting market integration, correlation and diversification has been recently formalized by Arouri (2003). The model proceeds from a dynamic representation of the International Asset Pricing Model risk premium (Solnik, 1974), and shows that the gains from international diversification are a negative function of the conditional correlation coefficient between the domestic portfolio and the global portfolio:

\[
E(R_i - R_i / \Omega_{t-1}) = \delta_{t-1} * (1 - p_{i,j,t-1}) * VAR(R_i, \Omega_{t-1})
\]  

(1)
In (1), I represents the international portfolio and i is the local portfolio. The left-hand side term thus represents the gain from international diversification. In addition, $\delta$ represents the price of market covariance risk and $p_i$ represents the correlation coefficient between the domestic and the global portfolio. $t$ denotes time and $\Omega$ represents the set of available information. This equation shows that the power of portfolio diversification is magnified in segmented markets where $p_{i,w,t-1}$ tends towards 0. The CAPM indeed shows that in such markets, returns tend to be predominantly determined by the systematic risk of each security in the context of the national portfolio, as opposed to the world beta. By contrast, the gains from international diversification are equal to zero under perfect integration; i.e. when the domestic portfolio is perfectly positively correlated to the global portfolio ($p_{i,w,t-1}=1$). This suggests that the gains from international diversification to emerging markets can considerable in the aftermath of liberalisation episodes. However, these gains may disappear in the middle-run as international cross-market correlations increase. This phenomenon may lead to nonlinearities in the dynamics of capital flows.

2.2.2.2 Financial contagion

The concept of ‘financial contagion’ is another important consequence of market integration and refers to the tendency of bear markets to move downwards in a synchronized fashion. The linkage between market integration and contagion has been formally described by Bekaert, Harvey and Ng (2005) within an empirical model. Their approach was to extend the traditional CAPM from a one-factor to a two-factor setting. To do so, they divided the world market into the United States (US) and a particular region (reg), and allowed for local factors to be priced. Letting $i$ and $j$ be two individual countries, and assuming that the idiosyncratic shocks to the US, regional and individual markets are non correlated, these authors have derived the following dynamic relation between covariances $h$, betas $\beta$ and variances $\sigma$.

\[
\begin{align*}
    h(i,us,t) &= \beta_{i,us,t-1} \times \sigma_{us,t}^2 \\
    h(i,reg,t) &= \left(\beta_{i,reg,t-1} \times \beta_{us,reg,t-1} \times \sigma_{us,t}^2 \right) + \left(\beta_{i,reg,t-1} \times \sigma_{reg,t}^2 \right) \\
    h(i,j,t) &= \left(\beta_{i,us,t-1} \times \beta_{j,us,t-1} \times \sigma_{us,t}^2 \right) + \left(\beta_{i,reg,t-1} \times \beta_{j,reg,t-1} \times \sigma_{reg,t}^2 \right)
\end{align*}
\]
Equation (1) has three several important implications. *First*, a market's covariance with the U.S. (regional) market return is positively related to its country-specific beta with the U.S. (or region). *Second*, provided that the country specific beta parameter is positive, higher volatility in the U.S. market induces higher return covariance between the U.S. and market $i$. *Third*, the covariance with the regional market or any other national market $j$ within the same region increases in times of high return volatility in the U.S. and/or the regional market. According to these authors, the direct implication of these relationships is the appearance of 'contagious bear markets' in times of financial turmoil.

2.2.3 Empirical evidence

Related empirical studies have addressed the three following themes: (i) measuring equity market integration, (ii) analyzing portfolio allocations and the dynamics capital flows and (iii) investigating the issue of financial contagion.

2.2.3.1 Equity market integration

The existing empirical literature on equity market integration may be divided into two components. The first component gathers studies that test for static equity market integration. The second component gathers studies that account for the time-varying nature of equity market integration.

2.2.3.1.1 Static estimates of integration

One standard way to measure market integration is to derive a set of static measures based on time-series empirical models. Within this branch of the literature, a first type of study looked at integration through asset pricing models. For instance, one set of models directly tested for the hypothesis of perfect world equity market integration. Wheatley (1988) used an asset-pricing model in which a country level asset pricing line related a representative individual's expected real return on each asset to the covariance of this return with growth in the individual's real consumption. Using monthly data from January 1960 to December 1985, he was unable to reject the null hypothesis of equity market integration. Ferson and Harvey (1992) examined
multifactor asset pricing models for real and expected returns on 18 national equity markets, in which multiple betas were chosen to represent global economic risks. Their results showed that multiple betas, as opposed to world market betas, are able to better explain cross-sectional differences in average returns. Bekaert and Hodrick (1992) followed a slightly different approach. They first estimated the predictable component in excess rates of returns for the equity markets of the US, Japan, the UK and Germany, using lagged excess returns, dividend yields, and forward premiums as instruments. They then implemented vector autoregressive regressions in which constraints were derived from dynamic asset pricing theory. Their estimates suggested mixed evidence in favour of financial integration. However, the main weakness of these studies is that they identify the source of asset risk purely with the covariance of the local returns with the world market portfolio. By doing so, these studies directly test for the hypothesis of perfect world integration by implementing a binary framework in which local markets are either perfectly segmented from the world market, or represent an adequate proxy to the world market. Neither of these assumptions is inherently plausible. Not surprisingly, these studies have performed unspectacularly overall in empirical tests (Kearney and Lucey, 2004).

An alternative approach is to consider the competing hypotheses of integration, mild segmentation and segmentation, in line with the theoretical model of Errunza and Losq (1985). Directly testing this hypothesis for a group of emerging markets, Errunza, Losq and Padmanabhan (1992) provided evidence in favour of a non-polar structure, showing that equity markets are neither fully integrated nor completely segmented. More recently, Akdogan (1997) investigated different degrees of market segmentation across twenty-six large countries for two sub-sample periods (1970’s and 1980’s) based on an international risk decomposition model. The originality of his approach was to provide a precise segmentation/integration score. The latter also constitutes an operational tool for portfolio managers, who may then identify portfolio diversification opportunities by ranking countries according to their level of international integration.

Checking for co-integration relationships is another way to assess the degree of international integration in equity markets. The Johansen and Juselius (1988) co-integration analysis constitutes the most common approach. Integrated stock markets are expected to have a common stochastic trend with stationary error terms when the data are examined by applying multivariate co-integration analysis to a system of
nonstationary stock prices. According to Bernard (1991), the necessary condition for complete integration is that there be \( n-1 \) cointegrating vectors in a system of \( n \) indices. A voluminous number of studies are based on this approach.


2.2.3.1.2 Dynamic estimates of integration

However, one important line of criticism against static approaches is that they implicitly assume that the degree of integration remains constant over time (Kearney and Lucey, 2004). In doing so, they miss the important element of time variation in equity risk premiums. Taking this into account, a number of alternative approaches have been deployed over time.

In a seminal paper, Harvey (1989) presented strong evidence that conditional co-variances do change over time based on tests of asset pricing models that allow for time variation. Estimates of the expected excess return highlighted the standard Sharpe-Lintner CAPM's inability to capture the dynamic behaviour of asset returns. In an effort to improve existing results, Bekaert and Harvey (1995) investigated expected returns in countries that were segmented from world capital markets in one
part of the sample and become integrated later in the sample. Using a measure of capital market integration arising from a conditional regime-switching model, they found that a number of emerging markets exhibited time-varying integration. In turn, Hardouvelis, Malliaropoulos and Priestley (1999) examined the speed of integration among the EU equity markets by developing an explicit equilibrium asset-pricing model with a time-varying measure of integration. They found that the process of intra European equity market integration seems to have been completed by mid 1998. Along the same lines, Flood and Rose (2003) used an inter-temporal asset-pricing model, in which expected risk-free rates were allowed to vary freely over time, constrained only by the fact that they were equal across assets. Estimating and comparing expected risk-free rates across assets, they found that the S&P 500 and NASDAQ markets seemed to be well integrated, while the NASDAQ was poorly integrated with the S&P 500. Finally, Barari (2004) proposed a recursive version the Akdogan (1997) equity market integration score, thus providing a time-varying measure of equity market integration. Applying this extended methodology to a sample of six Latin American countries for the period of 1988-2001, she observed a trend towards increased regional integration relative to global integration until the mid-1990’s, followed by a significant increase in global integration during the second half of the 1990’s.

Parallel to these contributions is a branch of literature that examined the international integration of equity markets from the perspective of dynamic correlations between returns. The null hypothesis of no integration was rejected if the correlation matrix of international asset returns demonstrated instability over time. Early papers, such as Panton, Lessig, and Joy (1976) and Watson (1980) found stability. More recent work, however, indicated instability in the relationship. Koch and Koch (1991) estimated a simultaneous equation model over a number of contiguous sub-periods and found significant and increased linkages among world equity markets. Wahab and Lashgari (1993) implemented intertemporal stationarity tests of the variance-covariance matrix of monthly returns on seven international equity indices. Historical analysis revealed that pairwise covariances were invariably highly nonstationary over forecast intervals that varied in length between one month and five years, suggesting increasing integration. Longin and Solnik (1995) refined the analysis by estimating a multivariate general autoregressive conditional heteroskedasticity model with constant conditional correlation in order to capture the evolution in the conditional
covariance structure. They studied the correlation of monthly excess returns for seven major countries over the period 1960-90 and also found that the international covariance and correlation matrices were unstable over time, indicating increasing integration. More recently, Steeley (2006) plugged the system of bi-variate equity market correlations into a smooth transition logistic trend model in order to establish how rapidly the countries of Eastern Europe were moving away from market segmentation. She found that Hungary was the most rapidly integrating country. Recursive co-integration constitutes an alternative to the analysis of correlation coefficients. The idea is to plot the $\lambda_{\text{trace}}$ statistic (which is a general test to determine whether there is one or more co-integrating vectors) and the $\lambda_{\text{max}}$ statistic (which is a test to determine the precise number of co-integrating vectors) in order to examine how the nature of market integration changes over time. Rangvid (2001) used this approach, focusing on quarterly share indices for France, Germany and the UK over the 1960–1999 period. He found evidence of increasing convergence since 1982. Aggarwal, Lucey and Muckley (2004) also investigated the time-varying integration process within the EMU countries based on a recursive co-integration approach and highlighted increased integration through time with specific breaks around selected events. Another possibility is to use an alternative co-integration methodology that takes into account the dynamic component of the integration process. For instance, Voronkova (2004) investigated the existence of long-run relations between emerging Central European stock markets and the mature stock markets of Europe and the United States for the period ranging from September 7, 1993 through April 30, 2002. She implemented the Gregory and Hansen (1996) co-integration approach in an effort to consider the possibility of instability in long-run relations between time-series. She obtained evidence of increasing linkages and structural breaks between the Central European markets and between Central European and developed markets' indices. In turn, Davies (2006) followed suggestions detailed in Gabriel et al. (2002) and considered the possibility of multiple switches in the long run co-integrating relationship by implementing a co-integration model based on Markov-switching residuals. He documented significant evidence to support a two-regime long-run equilibrium for the MSCI total return index data during the period ranging from 1969 to 2005. In the same spirit, Lucey and Voronkova (2006) used an extensive set of co-integration techniques including a stochastic co-integration test by Harris, McCabe and Leybourne (2002) and the non-parametric co-integration method of Breitung
(2002). They focused on the Russian market and documented an increasing degree of co-movements of the Russian market with other developed markets in the aftermath of the Russian crisis of 1998, but not with Central European developing markets. Finally, other dynamic studies were based on GARCH methodologies. For instance, Fratzscher (2001) used a multivariate GARCH framework to examine financial market integration in Europe and found that the move towards EMU contributed to an increasing integration of financial markets. However, he found that the degree of financial market integration in Europe has been very unstable and volatile over time.

Gérard, Thanyalakpark and Batten (2003) modelled second moments and risk exposures using a bi-diagonal multivariate GARCH process and tested a conditional international asset pricing model with both world market and domestic risk included as independent pricing factors for five East Asian markets, the US and world markets. They found little evidence of market segmentation in East Asia over the 1985–1998 period. Kearney and Poti (2006) extended the multivariate dynamic conditional correlation (DCC-MV) GARCH model of Engle (2001) with the inclusion of a deterministic time trend. Their results confirmed a significant rise in the correlations amongst national stock market indexes, which they explained by a structural break shortly before the official adoption of the Euro.

2.2.3.1.3 Equity market integration in the MENA: what do we know?

It should be noted that in comparison with the voluminous amount of studies investigating the global integration of the Eastern European, Latin American or East Asian equity markets, there is relatively scant evidence for the MENA countries. One category of studies were based on standard co-integration analysis with vector error-correction modelling. For instance, Neaime (2002) investigated a mix of MENA and Gulf Cooperation Council countries (Egypt, Jordan, Morocco, Turkey, Bahrain, Kuwait and Saudi Arabia) over the 1990-2000 period, using weekly data in local currencies. He found that unlike the GCC markets, which remained segmented, financial integration of the MENA markets seemed to be accompanied by a strong sensitivity to unidirectional shocks flowing from the US and the UK. Johansen co-integration tests revealed that the MENA stock markets of Turkey, Egypt, Morocco, and to a lesser extent Jordan, have matured, and are now integrated with the world financial markets. However, he found no evidence of intra-regional financial
integration. This echoed Erdal and Gundunz (2001), who investigated the interdependence of the Istanbul Stock Exchange with the G-7 equity markets and with the stock markets of Israel, Jordan, Egypt and Morocco, before and after the Asian crisis. Based on Granger causality tests, they rejected the hypothesis of significant linkages among the MENA markets. They also found one co-integrating vector between the Istanbul Stock Exchange and the G-7 markets, but no lead-lag relationship. Another similar study was carried out by Gundunz and Omran (2001), in which the hypothesis of a common stochastic trend among the markets of Turkey, Israel, Egypt, Morocco and Jordan was rejected over the 1997-2000 period. The overall suggestion of this first generation of empirical investigations is that although the MENA capital markets still appear segmented from one another, they may be individually integrated into the global markets through the presence of stable bi-variate long run relationships.

There is, however, less evidence of time-varying international integration for the MENA countries. Girard, Omran and Zaher (2001) investigated relationships between market risk premium, time-varying variance and time-varying covariance in eleven Middle Eastern and North African (MENA) markets and eight developed markets from 1990 to 2001. Using a capital asset pricing model and implementing a state-dependent multivariate GARCH methodology to proxy for a risk-return relationship, they documented significant positive and negative relationships between risk premiums and conditional variance in MENA markets. They concluded that the MENA markets were highly segmented and provided diversification benefits for the global investor.

Another paper by Girard and Ferrera (2004) conducted a daily spill-over analysis on daily stock market index prices in order to investigate short-term market linkages for eleven MENA markets, throughout the period ranging from 1990 to 2001. They concluded that most MENA markets are segmented with the exception of Turkey and Israel, and also documented an increased sensitivity to intra-regional exogenous shocks, but not to inter-regional shocks. In turn, Alper and Yilmaz (2004) highlighted the presence of volatility spill-overs from major financial centres to the Turkish stock market from 1992 to 2004. Finally, Yu and Hassan (2006) employed an EGARCH-M model with a generalized error distribution in order to model both the leverage effect of negative shocks and leptokurtosis prevalent in Bahrain, Oman, Saudi Arabia, Jordan, Egypt, Morocco, and Turkey. Their results indicated that there were large and
predominantly positive volatility spillovers and volatility persistence in conditional volatility between the MENA and the world stock markets. However, own-volatility spillovers appeared generally higher than cross-volatility spillovers for all the markets.

Overall, there are a plethora of empirical studies investigating integration across international equity markets. This, in itself, is a good indicator of the importance of the phenomenon.

2.2.3.2 Portfolio allocations and capital flows

Empirical studies analyzing portfolio allocations and the dynamics of capital flows can be divided into three main components. One type of studies attempted to measure the gains from diversification. Other studies emphasized the presence of specific risks when diversifying into emerging markets. Finally, macroeconomic investigations highlighted nonlinearities in the allocation of portfolio flows to emerging countries in the aftermath of equity market liberalization.

2.2.3.2.1 The gains from diversification

As discussed above, financial theory suggests that the net impact of equity market integration on portfolio flows is proportional to changes in time-varying international co-variances. This has given rise to many empirical studies. Investigating developed markets, Sinquefield (1996) argued that the integration of world markets has led to a significant decrease in diversification gains when mixing U.S. domestic portfolios with the MSCI World Index. Arouri (2003) investigated ex ante benefits from world market diversification in 8 markets: the world market, 4 developed markets and 3 emerging markets over the 1973 to 2003 period. His results confirmed the presence of significant benefits from international diversification; however, gains appeared considerably larger for investors from segmented markets. More recently, Timmermann and Blake (2005) analyzed international equity holdings of a large panel of U.K. pension funds over the 1991-1997 period and found that conditional co-variances were not quite as important as own-market volatility in Japan North America, and Europe. The evidence thus appears in line with theoretical models in the case of developed markets.
A considerable body of literature has also underlined the role of emerging market diversification as a return-enhancing strategy for private investors. In a seminal paper, Errunza (1977) investigated the mean-variance implications of including developing countries in a panel of 29 countries for the 1957-1971 period and found that the small correlation of the least developed markets justified their inclusion into the optimal portfolio. Divecha, Drach and Sefek (1992) carried out a similar analysis using a dataset of 23 emerging markets over the 1986-1991 period. Their results suggested that including emerging markets in a global portfolio (up to a 20% threshold) would significantly improve the ex post risk-to-return ratio. Sappenfield and Speidell (1992) used data for 18 emerging markets and 18 developed markets over the 1986-1991 period and suggested that emerging market diversification could be useful during periods of global turmoil such as the 1987 krach, or the 1990 Kuwait invasion. Along the same lines, Diwan, Errunza and Senbet (1994) divided world markets into three components: a developed portfolio, an emerging portfolio and a mixed emerging/developed portfolio. Their simulations were based on the 1989-1991 period and suggested that optimal strategies were, in increasing order, the developed portfolio, the emerging portfolio, and the combined portfolio. Harvey (1995), investigating the 1986-1992 period, showed that adding an emerging market component to a diversified developed portfolio would result in a reduction of six percentage points in the portfolio's total volatility while the expected returns would remain unchanged. More recently, Gilmore et.al (2005) constructed Eastern European portfolios for both US and German investors using various optimization models and several risk measures over the 1995-2003 period. Their results showed that diversification benefits were statistically significant for US investors, but not for German investors.

2.2.3.2 Specific risks in emerging markets

There are, however, five specific risks associated with emerging market investment. Exchange risk constitutes the first category. It is related to the variability of cash flow generated in risky currencies. While studies have shown that the exchange risk decreases with firm size and export revenues (Kim and Sung, 2005), it is generally agreed that hedging strategies have partial results, so that conclusions drawn from an international capital asset pricing model that omits currency risk would be misguided.
(Madura, 1992; Phylaktis and Ravazzolo, 2002). In a seminal paper, Bailey and Chung (1995) suggested that currency fluctuations were a priced factor in cross-sections of emerging stock indexes converted in US dollars over the 1986-1994 period. Investigating the nature of the exchange risk premium in a sample of seven emerging markets for the 1976-2000 period, Carrieri, Errunza et.al (2006a) found that while exchange rate and domestic market risks were priced separately, the local currency risk was, on average, smaller than the domestic market risk but increased substantially during crisis periods, when it could be almost as large as the market risk. Exchange risk stemming from emerging market currencies also seems to be significantly priced in global equity returns, so that information about emerging market crisis episodes affects the prices of global risk factors (Carrieri, Errunza et.al, 2006b).

Political risk is another significant downside to emerging market investment. It includes various dimensions such as expropriation risk, firm nationalization, property seizing etc... There is growing consensus that political risk is a priced factor in emerging markets. For instance, Bilson et.al (2002) investigated the relation between political risk and stock returns within the context of 17 emerging markets and 18 developed markets over the 1984-1997 period. They highlighted the importance of political risk in explaining return variation in individual emerging markets, but not in developed markets. More particularly, they presented evidence to support a positive relation between political risk and ex-post returns in emerging markets. This echoes the conclusions of Perottu and Van Oijen (2001), who noted that political risk tends to have an effect on excess returns in emerging economies. Progress in privatization, however, is significantly correlated to improvements in perceived political risk. Finally, one important characteristic of political risk is that it can be considered 'binary': if it materializes, investors lose most of their expected gains. As a consequence, political risk is significantly associated with capital flights. Recently, Vu Le and Zaq (2006) estimated the equilibrium capital flight equation for a panel of 45 developing countries over 16 years. Their results highlighted that political instability, rather than economic risk, is the most important factor associated with capital flight from emerging markets.

Information asymmetries constitute another specific risk in emerging markets. This risk refers to potential difficulties in monitoring local managers due to cultural differences and inefficiencies in information systems (Lee and Kwok, 1988). Using a
market microstructure framework, Krishnamurti et.al (2005) investigated whether there are cross-sectional differences in effective spread, depth and the adverse selection component of spread in a sample of 55 firms originating from 15 emerging markets over the January-June 2000 period. Their results suggested the existence of an information premium for firms with an inferior quality of disclosure. Al-Khouri (2005) also explored the identity and concentration of different block holders and firm value for 89 industrial and service firms listed at the Amman Stock Exchange (ASE) over the 1998–2001 period. His findings indicated a positive and significant relationship between ownership concentration and firm value. Existing studies also suggest that corporate governance and stock market development are associated with lower informational asymmetries. For instance, Bunkanwincha et.al (2006) used firm-level panel data from listed companies from Thailand and Indonesia to analyze the firm’s corporate financing behaviours in connection with its corporate governance arrangements, and underlined that weaker corporate governance firms tend to have a higher debt level. Similarly, Black et.al (2006) found a strong correlation between governance and market value in Russia for the 1999-2006 period.

The global finance risk is another category of risk which refers to the transmission of financial crises into emerging markets. The period of financial turmoil that began with the Mexican ‘tequila’ crisis in January 1995, the Asian ‘flu’ crisis in August 1997 and the Russian default in 1998 have contributed both to an increase in return volatility and negative returns on the S&P/IFCI Composite Index over the 1994-2003 period (AIMR, 2005).

Finally, the ‘self-fulfilling’ risk refers to behavioural patterns among investors: by demanding higher returns from emerging markets investment, investors tend to automatically select projects with a higher degree of risk (Bancel and Perrotin, 2005). There are hence several risks associated with emerging market investment. However, the extent to which such risks may deter investors from entering emerging markets is difficult to measure. These risks may indeed be compensated by higher than average returns due to a faster rate of capital accumulation and faster economic growth than in developed countries (Bartram and Dunfey, 2001). They also need to be assessed on a case-by-case basis and depend on the country-context and on the investor’s psychology. The 2005 AIMR report summarized the residual uncertainties associated with emerging market investment by arguing that in the last resort, investing in a particular market comes down to ‘a bet on emergence’.
In line with theoretical models, empirical studies have shown that equity market liberalisation tends to be followed by a short-lived surge in capital flows. For instance, Bacchetta and Wincoop (1998) showed that aggregate portfolio flows rose from 0% to about 4% of emerging countries' GDPs during the 1980 to 1996 period. In a similar way, Bekaert and Harvey (2000) investigated a sample of 16 emerging markets and observed that American holdings increased on average from 6.2% to 9.4% of market capitalization from five years before liberalisation to five years after liberalisation. Empirical evidence also suggests that these capital flows are subject to sudden reversals. For instance, Bekaert and Harvey (2001) showed that equity capital flows to emerging markets increased by 1.4% of market capitalization on an annual basis after liberalisation, but were usually levelled out three years later.

The relationship between returns and capital flows can be traced back to Bohn and Tesar's (1995) empirical study. These authors indeed examined whether the expansion of US investment in foreign equities and the change in portfolio composition over time was consistent with models of international portfolio choice. Using monthly data on US equities and those of 22 countries over the 1980-1994 period, they found that foreign investors were mostly 'return chasers', i.e. that portfolio weights appeared to be mainly triggered by changing portfolio returns. Along the same lines, Froot, O'Connell and Seasholes (2001) explored the behavior of daily international portfolio flows into and out of 46 countries from 1994 through 1998. They found that flows increased following unexpectedly high returns in the host market. Turning to emerging markets, Nardari, Griffin and Stulz (2002), used daily data on net equity flows for nine emerging market countries over the 1996-2001 period, and confirmed the fact that a market experiences net equity inflow when its stocks earn unexpectedly high returns.

It has also been observed that capital flows simultaneously lead to higher returns by exerting pressure on local prices. For instance, Clark and Berko (1997) investigated the correlation between monthly foreign purchases of Mexican stocks and Mexican stock returns and found that a surprise foreign inflow equivalent to 1% of domestic market capitalization was associated with a 13% increase in Mexican stock prices. Along the same lines, L'Her and Suret (1997) defined the hyper-return period as a calendar year during which a cumulative geometric return in excess of 70% is
observed. Analyzing hyper-return periods from 1976 to 1994 for 20 emerging stock markets, their results also suggested a positive impact of financial liberalization episodes on returns. Finally, Calvo, Leiderman and Reinhart (1996) also documented a significant increase in emerging markets share prices in the period following equity market liberalization: the Argentinean index posted an annual return of 400% in 1991, while Chile and Mexico offered returns of about 100%.

This phenomenon results in a mutually reinforcing dynamic between portfolio adjustment and price pressure within the context of a portfolio-optimizing framework. However, the inevitable opinion reversal among investors often leads to sudden capital outflows and a sharp adjustment in returns. The re-adjustment can be destabilizing for the recipient economy. For instance, Calvo and Mendoza (2000) attempted to measure the consequences of capital account liberalization in the context of informational inefficiencies and multiple equilibriums. They developed a theoretical model in which investors acquire country-specific expertise at a fixed cost and incur variable reputation costs, in a context where information asymmetries give rise to herding behaviour and sudden opinion reversals. They also implemented numerical simulations in the case of Mexico. According to their estimations, a rumour that reduced the expected return on Mexican equity from the equity market forecast (22.4%) back to the level of the OECD mean return (15.3%) implied an outflow of about $20 billion, or a reduction in the share of the world portfolio invested in Mexico of 40%. The associated economic destabilization costs can be substantial in emerging countries which are often characterized by limited central bank foreign reserves. For instance, using a panel data set over 1975–1997 and covering 24 emerging-market economies, Hutchison and Noy (2006) found that the cumulative output loss of a sudden stop in capital flows amounts to around 13–15% of GDP over a 3-year period.

In line with this type of studies, Tobin (2000) underlined the speculative nature of financial globalization: according to his data, capital flows to emerging countries only represent US$150 billion a year, as opposed to US$1.5 trillion of overall foreign exchange transaction per business day, of which 90% are reversed within a week. The resulting international financial instability has led some authors to cast doubts on the usefulness of capital account liberalization for developing countries. Rodrik's (1998) empirical study is also widely cited. For a cross-section of East Asia, Latin America, and East Asian developing countries, and after controlling for per-capita income, education, institutional quality and regional dummies, he found no correlation
between capital account liberalization and growth over the 1975-1989 period. In a recent paper, Jeanne and Gourinchas (2005) also put forward an 'allocation puzzle’ in international capital flows: as opposed to neoclassical model assumptions, their theoretical model and estimates suggest that foreign investment has a tendency to flow ‘upstream’ from capital scarce to capital abundant countries.

2.2.3.3 Financial contagion

The issue of financial contagion was placed at the forefront of academic debate following the repeated episodes of financial crises that hit emerging markets. These crises include the 1997-1998 Asian crisis, the 1998 Russian crisis, the 1999 Brazilian crisis, the 2001 Turkish crisis, and the 2002 Argentinean crisis. The particularity of these crises is that turmoil originating in a particular market tended to extend to other markets. As a consequence, the term ‘contagion’ became popular, both in the press and in academic literature, to refer to this phenomenon.

A myriad of studies have empirically tested for financial contagion by modelling shock spillovers among international equity markets. Three salient facts emerge from an investigation of this literature. First, financial contagion is common to a vast geographical area and many crisis episodes. Second, the nature of the findings cannot be separated from an ongoing methodological debate among empiricists. Third, financial contagion interacts with the dynamics international portfolio flows, and destabilizes domestic economies.

2.2.3.3.1 Fundamental or shift contagion?

Edwards (2000) underlined that, in the tradition of epidemiological studies, contagion reflects a situation where the effect of an external shock is larger than which was expected by experts and analysts. However, according to Marais and Bates (2006), two types of contagion may be distinguished. Fundamental contagion is a mechanic phenomenon resulting from normal interdependencies among economies, both in tranquil and crisis periods. Within this framework, ‘monsoonal effects’ refer to the cross-country transmission of aggregate shocks that hit different countries and lead to simultaneous negative co-movements. These shocks can be real or financial, and include an increase in international interest rates, a decrease in international demand,
or sudden variations in the exchange rates of major currencies (Glick and Rose, 1999). Masson (1998) also argued that emerging market crises were triggered by major economic shifts in industrial countries, while Kaminsky and Reinhardt (2000) emphasized the role of real economic linkages, international bank lending, potential for cross-market hedging, and bilateral and third-party trade in the propagation of international financial shocks.

By contrast, *shift-contagion* is mainly a psychological phenomenon, which appears strongly related to behavioural patterns among investors in specific times of turmoil\(^5\). This phenomenon is usually explained by sudden opinion reversals among international investors in a situation characterized by informational asymmetries and the presence of multiple equilibriums (Chang and Velasco, 2001). The resulting *shift* in market expectations leads to a significant increase in cross-market linkages after a shock to an individual country or to a group of countries (Forbes and Rigobon, 2001). In other words, shift-contagion refers to the influence of excess returns in one country on the excess returns in another country *after* controlling for the effects of fundamentals. Shocks thus spread through a channel that does not exist during tranquil periods. Shift-contagion is thus a structural break producing both an intensification of relationships and discontinuities in the shock transmission mechanism during a period of turmoil.

This second definition has the advantage of emphasizing the important role played by indiscriminating investors and speculators during a crisis. It is thus a more restrictive definition than the "monsoonal effect", fundamental definition. The concept of shift contagion is also particularly appropriate for statistical analysis, as the structural break can be modelled as a shift in international linkages (AIMR, 2005). Finally, within this definition, *financial vulnerability* refers to the probability that a country will be affected by shift-contagion. Whereas shift-contagion deals with country-to-country crisis transmission within the framework of a specific crisis, vulnerability considers the broader financial interactions within a longer time period (Serwa and Bohl, 2005).

\(^5\) For instance, Eichengreen, Rose, and Wyplosz (1995) highlighted that the countries that came under speculative attack during the ERM crisis had heterogeneous macroeconomic fundamentals: only in some cases could the attack be justified by the degradation of fundamentals.
2.2.3.3.2 A wide geographical coverage

Many empirical studies have revealed the wide spread nature of the contagion phenomenon. In developed markets, King and Wadhani (1990) modelled volatility spillovers between the US, the UK and Japan by estimating time-varying correlations between equity returns. They found a significant increase in correlations following the October 1987 stock market crash. Using a similar approach, Lee and Kim (1993) extended the analysis to 12 developed markets and documented further evidence of financial contagion.


The debate surrounding the integration of Central and European Economies into the European Union has also drawn attention to the question of contagion in those countries. For instance, Serwa and Bohl (2005) investigated contagion in 17 Eastern and Western European stock markets in the wake of 7 big financial shocks between 1997 and 2002. Their results documented stronger evidence of structural breaks in cross-market linkages in Eastern Europe than in Western Europe. Darvas and Szapary (2000) examined the spillover effects of the global financial crises of 1997-1999 on the Czech Republic, Greece, Hungary, Israel and Poland. They found significant evidence of contagious spill-over. Likewise, Gelos and Sahay (2001) examined financial market co-movements across European transition economies and compared their experience to that of other regions using high-frequency data. Their results suggested that the pattern of high-frequency spillovers during the Russian crisis was similar to that observed in other regions during turbulent times.

2.2.3.3 An ongoing methodological debate

The analysis of financial contagion is also indissociable from the ongoing methodological debate on the appropriate means to estimate contagion spillovers. For instance, Forbes and Rigobon (2002) used daily data for stock indices of 28 developed and emerging countries to test for evidence of contagion during the 1987 U.S. stock market crash, the 1994 Mexican peso crisis, and the 1997 Asian crisis and found that most shocks were transmitted through non-crisis-contingent channels after addressing the problem of heteroscedasticity in correlation coefficients.

However, Favero and Giavazzi (2002) extended the measure to a full information framework capturing all nonlinearities in shock transmission and rejected the null of normal interdependency among seven European countries over the 1988-1992 periods. In a similar way, Pesaran and Pick (2002) developed a canonical model of contagion that allowed them to overcome the crisis identification bias inherent to correlation-based analysis. Their results suggested contagion in the European markets during the 1988–1992 period.


2.2.3.3.4. Contagion and international portfolio investment

The fundamental rationale for international portfolio diversification is that it expands investment opportunities beyond those available through domestic securities. However, the impact of financial contagion on international correlations could lead to a paradox: diversification works the least efficiently when it is most needed.
For instance, Gerlach et.al (2006) analyzed diversification benefits in four East Asian markets using weekly price returns from the 1993-2001 period. Their results showed the existence of significant linkages among these markets and highlighted that fund managers diversifying in East Asia should not ignore the impact of short-term turmoil on portfolio performance when examining the impact of globalization. Similarly, Butler and Joaqui (2002) assessed the benefits of international portfolio diversification by investigating correlations between US, UK, Japanese, Australian and European stock market indices and the corresponding MSCI world-ex-domestic index (that is, world market return excluding the domestic return) over the 372 months from January 1970 through December 2000. Their results suggested that equally weighted portfolio returns in the most extreme bear markets average about 2% less than predicted by a normal distribution. Finally, Schwebach et.el (2002) examined the correlations and volatility of 11 developed and emerging markets and revealed that potential diversification benefits changed dramatically following the devaluation of the baht in Thailand in July of 1997, causing the efficient portfolio set to shift downward and to the right in the Markowitz mean–standard deviation space. Overall, these empirical results echo Das and Uppal’s (2004) theoretical model, which suggested that systemic risk reduces the gains from diversification and penalizes investors for holding levered positions.

In turn, the portfolio rebalancing process might also aggravate the contagion wave. Many authors have indeed sought to explain international financial contagion based on portfolio choice mechanisms. In a seminal paper, Schinasi and Smith (2000) argued that elementary portfolio theory offers key insights into financial contagion. They presented a model in which portfolio diversification explains why an investor would find it optimal to significantly reduce all risky asset positions when an adverse shock impacts on just one asset, thereby creating contagious spillovers through the ‘contagious selling’ of financial assets.

Kodres and Pritsker (2001) also showed how investors may respond to shocks in one market by optimally readjusting their international portfolios, thereby transmitting shocks and generating contagion. In this model, the extent of contagion is worsened in the presence of information asymmetries, which exaggerate price movements due to a bias in the information underlying the order flow.

In a similar vein, Lagunoff and Shreft (2001) developed a model in which agents hold diversified portfolios that link their financial positions to those of other agents in
tranquil periods. Shocks at the initial crisis date cause some portfolio losses, to which agents who incur losses respond by reallocating their portfolios. Two related types of financial crisis occur in response: a gradual crisis, occurring as losses spread, and an instantaneous crisis, occurring when forward-looking agents pre-emptively shift to safer portfolios to avoid future losses resulting from contagion.

From an empirical point of view, Ang and Bekaert (2002) investigated the portfolio allocation consequences of increasing correlations and volatilities in bear markets. They modelled the time-varying investment opportunity set using a regime-switching process in which correlations and volatilities increased in bad times. Their results highlighted the significant impact of changing regimes on portfolio weights. More recently, Broner et.al (2006) argued that the impact of past gains and losses on international investors' risk aversion is an important factor in the propagation of financial shocks throughout countries. They examined the behaviour of international mutual funds by monitoring the geographic asset allocation of hundreds of equity funds with a focus on emerging markets, for the 1996-2000 period. Their results suggested that the tendency of mutual funds to respond to relative losses by moving closer to the average portfolio may exacerbate the effect of crises by creating both financial contagion and momentum trading at the country level. Overall, there appears to be a reciprocal relationship between portfolio rebalancing and waves of international contagion.

2.2.3.3.5 Contagion and economic instability

Finally, it should be underlined that the recent episodes of financial crisis have highlighted the economic costs associated with financial contagion: during the 1995-2003 periods, the return on the S&P/IFCI Composite Index (a widely used benchmark of emerging market returns) was negative and volatility increased (AIMR, 2005). Adelman and Yeldan (2000) investigated the impact of the East Asian contagion cycle on economic output in the developing world within the framework of an inter-temporal computable general equilibrium model. Their experiments suggested that the affected area's fixed investment declined by 7.9% while its GDP declined by 7.8% upon contagion impact, while the long term effects of the crisis were also felt severely as a consequence of deceleration in the rate of capital accumulation.
Not surprisingly, the issue of contagion vulnerability has become of particular concern for policy making in emerging countries. Some have wondered whether an optimum point between market segmentation and integration might exist, where countries could reap the benefits of financial integration without enduring the costs of contagion (Collins and Biekpe, 2002).

2.3 Conclusion

We will now summarize the main findings from this literature review. At an internal level, current theory suggests equity markets may improve the mobilization and allocation of resources through ‘financial development’ and improved economic structures. Recent empirical models seem to confirm these theoretical intuitions. On the other hand, some authors have underlined the presence of possible pervasive effects associated to these processes, while departure from informational efficiency may hinder the smooth functioning of the positive transmission mechanisms. Empirical work also suggests that informational efficiency is a relative concept and is correlated to institutional development.

At an external level, most empirical studies have underlined a general trend towards equity market integration over the last decades. However, the financial and economic impact of this process seems ambiguous for developing emerging countries. On the one hand, market integration seems to be associated with additional capital inflows, which suggests slackened financial constraint in capital-scarce economies. On the other hand, nonlinearities in the international capital allocation process have been documented: portfolio flows tend to overshoot in the aftermath of equity market liberalization. Moreover, investigations of financial contagion have highlighted that market integration induces a destabilization risk in emerging economies in times of global turmoil.

Taken together, these conclusions may have the following implications for policy making. We suggest that domestic equity market development strategies could be undertaken in an effort to foster the mobilization and allocation of domestic financial resources. However, in order for these positive outcomes to be reached, such policies must simultaneously tackle insufficient levels of informational efficiency. Empirical studies suggest that this may be achieved by introducing sound corporate governance regulations, and by increasing the equity market’s size and liquidity. Turning to
external effects, equity market integration may be beneficial for emerging economies, but also seems to be associated with a number of specific costs. Market integration policy decisions hence seem to depend on a trade-off between capital abundance and financial stability.
3. Market emergence in the MENA region

The objective of this chapter is to assess the capital market reforms undertaken by the MENA countries by comparing their emergence levels with those of other emerging markets areas. It is structured as follows. The first section discusses the context of economic reforms in the MENA countries. The second section describes the organisation of the MENA markets. The third section defines the concept of ‘market emergence’ and reviews its driving theoretical factors. The fourth section proceeds with an intra-regional and inter-regional comparison of equity market emergence within the MENA region. The fifth section presents our conclusions.

3.1 Economic reforms in the MENA region

Development gaps between the two shores of the Mediterranean are staggering. As shown in table 1, in 2003, the total GDP of Egypt, Morocco, Tunisia, Jordan, Lebanon, Turkey and Israel was $613 million, a striking figure when one considers that a country such as Spain has a GDP of $836 million.

Table 1 2003 Gross Domestic Product - current US$, millions.

<table>
<thead>
<tr>
<th>European Union</th>
<th>2004 Accession Countries</th>
<th>Mediterranean partner countries (MENA)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>1747973</td>
<td>Poland</td>
<td>209563</td>
</tr>
<tr>
<td>Germany</td>
<td>2400655</td>
<td>Hungary</td>
<td>82805</td>
</tr>
<tr>
<td>Ireland</td>
<td>148553</td>
<td>Czech</td>
<td>85438</td>
</tr>
<tr>
<td>UK</td>
<td>1794858</td>
<td>Slovakia</td>
<td>31868</td>
</tr>
<tr>
<td>Italy</td>
<td>1465895</td>
<td>Cyprus</td>
<td>11385</td>
</tr>
<tr>
<td>Spain</td>
<td>836100</td>
<td>Malta</td>
<td>3870</td>
</tr>
<tr>
<td>Portugal</td>
<td>149454</td>
<td>Slovenia</td>
<td>26284</td>
</tr>
<tr>
<td>Belgium</td>
<td>302217</td>
<td>Estonia</td>
<td>8383</td>
</tr>
<tr>
<td>Netherlands</td>
<td>511556</td>
<td>Lithuania</td>
<td>18213</td>
</tr>
<tr>
<td>Denmark</td>
<td>212404</td>
<td>Latvia</td>
<td>9671</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>26228</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>173045</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>251456</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>300795</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>161549</td>
<td><strong>Total 10</strong></td>
<td><strong>487480</strong></td>
</tr>
<tr>
<td><strong>Total 15</strong></td>
<td><strong>10482738</strong></td>
<td><strong>Total EU</strong></td>
<td><strong>10970218</strong></td>
</tr>
</tbody>
</table>

Furthermore, Turkey and Israel represent half of the area's GDP. If we remove these two countries, and consider the Arab countries alone, their GDP is equivalent to that of Belgium ($271 million). The MENA countries' GDP still represents approximately one half of that of the 2004 Eastern European accession countries, in a context where strategic rents (oil and arms transfer) are gradually disappearing and constitute a threat to future economic growth. Not surprisingly, according to the World Bank, the Mediterranean is by far the "world's most unequal frontier" (Moisseron, 2005).

As a result, the MENA countries are today facing greater pressure than ever to adopt the Washington Consensus as a basis for the formulation of national economic policy. From a theoretical point of view, economists generally conceptualize economic transition as a process involving five distinct phases. During the initial 'macro-stabilization' phase, the primary objective is to refocus macroeconomic goals onto good budgetary and monetary management (Gomulka, 2000). In the second phase, goods and services markets and the current account are liberalized in an attempt to replace the distorted domestic price system with the international system of relative prices (Ickes et.al, 2004). Legal and regulatory issues must be dealt with during the third phase, the aim of which is to create a favourable business climate through a series of institutional improvements (Jefferson, 2002). Finally, the last step of economic transition involves financial liberalization and the partial transferring of the resource allocation function to the stock market. The success of the reform program ultimately depends on the subsequent integration of the capital market into global markets through the attraction of foreign portfolio investment (Reiffers and Radwan, 2005). The Euro-Med partnership implied that the MENA countries benefited from structural adjustment facilities and technical assistance aid from the European Union to achieve their transition program. These various sources of funding represented over €1 billion over the 1995-2001 period (Moisseron, 2005).

Ten years after the launching of the transition program, significant achievements have been made in the area of macroeconomic stabilization. As shown in table 2, the implementation of tight monetary and budgetary discipline has kept inflationary tendencies and budget deficit under control. The average inflation rate was 2.8% in 2004 versus 7% in 1995-1998 and 6.4% in other emerging countries, while the area’s budgetary deficit has been maintained below 5%. In addition, these countries have been able to better manage debt: the cost of servicing debt as a percentage of exports
has diminished from 18.5% to 18% on average, with spectacular achievements in the case of Algeria (from 33% to 18%) and Morocco (from 28% to 14.2%).

Table 2 Macro-stabilization indicators

<table>
<thead>
<tr>
<th></th>
<th>Inflation (%)</th>
<th>Budget Balance (% GDP)</th>
<th>Debt Service (% exports)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>16.1</td>
<td>3.8</td>
<td>-1.4</td>
</tr>
<tr>
<td>Egypt</td>
<td>7.9</td>
<td>5.2</td>
<td>0.9</td>
</tr>
<tr>
<td>Israel</td>
<td>8.9</td>
<td>-0.3</td>
<td>-5</td>
</tr>
<tr>
<td>Jordan</td>
<td>4.1</td>
<td>3</td>
<td>0.3</td>
</tr>
<tr>
<td>Lebanon</td>
<td>7.7</td>
<td>2</td>
<td>-18.3</td>
</tr>
<tr>
<td>Morocco</td>
<td>3.2</td>
<td>2</td>
<td>-5.6</td>
</tr>
<tr>
<td>Syria</td>
<td>4.3</td>
<td>4</td>
<td>-4.2</td>
</tr>
<tr>
<td>Tunisia</td>
<td>4.2</td>
<td>2.5</td>
<td>-3.2</td>
</tr>
<tr>
<td>Turkey</td>
<td>84.7</td>
<td>12</td>
<td>-4.1</td>
</tr>
<tr>
<td>Average</td>
<td>7.05</td>
<td>2.78</td>
<td>-4.51</td>
</tr>
</tbody>
</table>

Source: FEMISE, 2005. Note: Average inflation and debt service are without Turkey.

Gradual trade liberalisation is also under way. There are two main transmission mechanisms uniting real integration and economic welfare. First, it is hoped that the increase in allocative efficiency arising from a more competitive exposure to world markets will in turn lead to greater technical efficiency (increase in productivity). Second, it is assumed that the greater integration into the world economy will encourage substantial flows of foreign investment which serve to further improve these countries’ productivity and hence their per capita GDP (Gasiorek and Augier, 2000). In addition to the Euro-Mediterranean trade liberalisation agreement, which entered into effect in all countries in 2004, a number of South-South initiatives have therefore been implemented, such as the Agadir Agreements, which established a common free trade area for Jordan, Egypt, Tunisia and Morocco in 2004. Israel, Morocco and Jordan have also signed trade agreements with the USA (in 1992, 1999 and 2002 respectively). As a consequence, the straightforward average of customs duty in industry fell by about 11 points from 1992 to 2003 (FEMISE, 2005). If we consider the weighted average of custom duty, trade protection in the MENA region is now comparable to that of Asian countries, and the differences compared to the European Union New Member States and Latin America are only 3.5% and 2.8%, respectively (FEMISE, 2005).

The MENA countries’ ability to benefit from free-trade can be assessed by observing the extent to which they are engaged in intra-industry trade. A disaggregated view of
the intra-industry trade index shows substantial increases in certain manufacturing categories such as chemical products, soaps, plastics, electrical distributing machines, aluminium, lead, leather, clothing and footwear (Havrylyshin and Kunzel, 1997). However, real economic integration is still very weak. As shown in table 3, the average openness rates increased from 49.56% to 54% in 1990-2003. At the level of individual countries however, it only improved in Israel, Morocco, Algeria and Turkey. Out of these four countries, three are atypical. Israel is a developed country, Algeria exports mainly hydrocarburates, and Turkey has engaged a pre-adhesion process with the EU. By contrast, openness rates seem to have decreased in Egypt, Jordan, Lebanon and Tunisia since 1995. Overall, real economic integration remains a distant goal.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>35</td>
<td>48</td>
<td>58</td>
</tr>
<tr>
<td>Egypt</td>
<td>34</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>Israel</td>
<td>52</td>
<td>52</td>
<td>60</td>
</tr>
<tr>
<td>Jordan</td>
<td>91</td>
<td>81</td>
<td>78</td>
</tr>
<tr>
<td>Lebanon</td>
<td>67</td>
<td>53</td>
<td>46</td>
</tr>
<tr>
<td>Morocco</td>
<td>41</td>
<td>40</td>
<td>51</td>
</tr>
<tr>
<td>Syria</td>
<td>30</td>
<td>61</td>
<td>50</td>
</tr>
<tr>
<td>Tunisia</td>
<td>73</td>
<td>74</td>
<td>72</td>
</tr>
<tr>
<td>Turkey</td>
<td>23</td>
<td>34</td>
<td>49</td>
</tr>
<tr>
<td>Average</td>
<td>49.56</td>
<td>52.00</td>
<td>53.89</td>
</tr>
</tbody>
</table>


The success of the economic transition program critically depends on the effectiveness of legal reforms. For instance, Dyck (2001) showed that resources are more likely to correspond to promising investment projects when information flows to outsiders are timely, credible and accurate. In other words, effective institutions ensure that resources are always targeted towards their most efficient uses by responsibilising insiders. The mechanisms uniting external governance mechanisms (the legal system) and productivity have also been empirically investigated. For instance, Ben Naceur et.al (2006) underlined that private firms become more productive in environments where property rights are better protected and enforced and suggested that environment variables are important determinants for the output changes following economic liberalization. Similarly, Boubakri et.al (2005) showed that corporate governance variables drive the performance improvements of newly
privatized firms in developing countries. More particularly, their estimates suggested that the existence of an adequate institutional environment that ensures the protection of property rights and law enforcement is an important determinant for corporate performance changes. Overall, this suggests that institutional development is a key component of the economic transition program and that efforts in this domain should be sustained throughout the reform sequence.

Institutional reforms have also commenced in the MENA region. All countries are enforcing a pro-business legal framework, which explicitly encourages foreign participation (Reiffers & Handoussa, 2001). However, country achievements are contrasted. As shown in table 4, the rigidity of the employment index and the cost of registering property in the MENA region are comparable to other emerging countries such as Poland, Indonesia and Chile. The cost of getting credit is very volatile and ranges from 0% in Algeria to 62% in Morocco. The Investor Protection Disclosure Index ranges from 0 to 7 and increases with corporate transparency. This index is also very volatile and ranges from 1 in Lebanon and Syria to 7 in Israel. Finally, the number of days necessary to enforce a contract ranges from 27 in Tunisia to 721 in Lebanon. Interestingly, this is in all cases inferior to that required in Poland, a country widely cited for the successful management of its transition program (1000 days).

Table 4 Business environment indicators, 2005.

<table>
<thead>
<tr>
<th>Rigidity of employment</th>
<th>Registering property (% of property value)</th>
<th>Getting credit (collateral as % of per capita income)</th>
<th>Investor Protection Disclosure Index</th>
<th>Enforcing contracts (Time-days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>55</td>
<td>9</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Egypt</td>
<td>53</td>
<td>7</td>
<td>53</td>
<td>2</td>
</tr>
<tr>
<td>Jordan</td>
<td>34</td>
<td>10</td>
<td>56</td>
<td>3</td>
</tr>
<tr>
<td>Lebanon</td>
<td>28</td>
<td>6</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Morocco</td>
<td>70</td>
<td>6</td>
<td>62</td>
<td>4</td>
</tr>
<tr>
<td>Syria</td>
<td>37</td>
<td>30</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Tunisia</td>
<td>54</td>
<td>6</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>Israel</td>
<td>33</td>
<td>6</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Turkey</td>
<td>55</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Comparator countries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>19</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Indonesia</td>
<td>57</td>
<td>11</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Poland</td>
<td>34</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Although incomplete, a structural modification of the MENA region economies is therefore under way. The growing awareness of the disadvantages of ‘financial repression’ have also encouraged the MENA countries to reform their capital markets (Henry & Springborg, 2004).

3.2 The MENA equity markets

The Egyptian Stock Exchange (ESE) is one of the oldest in the world and comprises two exchanges, the Alexandria Stock Exchange (officially established in 1888), and Cairo Stock Exchange (established in 1903). The ESE was the fifth most active exchange in the world prior to the adoption of central planning policies in the early 1950s, which left the financial markets dormant for the next three decades. The reactivation of the ESE took place within the broader context of deregulation and privatisation policies, which started in the 1990s. The 1992 Capital Market Law was a key event in the process. It defined the regulatory framework for financial intermediaries, and established the Capital Market Authority as an independent regulatory agency for the securities industry. It also strengthened investor rights and financial disclosure requirements. These reforms have led to a significant market expansion, with a trend development in size and liquidity. For instance, market capitalisation grew from 7.7% of GDP in 1997 to 33.7% in 2003. In 2003 the ESE displayed the highest number of listed companies among the Barcelona Process countries. Traded value also increased significantly over the period, and market liquidity doubled.

The Jordanian Amman Stock Exchange (ASE) is also one of the most developed and sophisticated markets in the region. In 1997, a new Securities Law was approved to improve the structure of the stock market. Capital account transactions in capital markets securities and money market instruments were also liberalized. The stock market capitalization to GDP amounted to 110% percent in 2003, and the number of listed companies totalled 161. However, the corporate bond market remains underdeveloped owing to the absence of a secondary market for such issues, and banks make up almost 50% of market capitalization. Jordan’s banking system is also highly concentrated, with the three largest banks accounting for 90 percent of total assets. The Arab Bank dominates the sector with 60% of all assets and the Housing Bank is the second largest, with the most extensive branch network.
The Israeli Tel-Aviv Stock Exchange (TASE) was established in 1953 although regular trading in equities dates back to the Tel-Aviv Securities Clearing House in 1935. Israel is a developed country, and not surprisingly the TASE is the most advanced equity market in the region. It has a large market capitalisation (67.2% of GDP), large market liquidity, as well as a high number of listed companies. There is also a significant US-$ denominated investment by foreigners, who own 12% of stock. In October 2000, a dual-listing law was enacted which enabled US traded companies to list their shares on the TASE with no additional regulatory requirements and at no cost. The market was the first in the region to move to a screen-based electronic trading system in 1997, and trade occurs within a relatively sophisticated financial sector.

The Beirut Stock Exchange (BSE) is the smallest market in terms of capitalisation considered here (7% of GDP). It is also one of the least liquid. The BSE was established by government decree in 1920 and initially attracted investment from France, Syria and Lebanon. The market was largely unregulated until the 1950’s. It closed in 1983 as a result of the war and re-opened on January 22, 1996. One company, Solidere, dominates the market and in 2000 accounted for approximately 78% of total value traded. Trading is largely carried out by Lebanese investors due to a lack of interest from foreign institutional investors. Finally, the efficiency of the market is constrained by a 15% price fluctuation limit relative to the previous day’s closing price.

The Casablanca Stock Exchange in Morocco is the third oldest stock exchange in Africa. It was established in 1929 and in 2003 had 52 listed securities, with a total market capitalisation of 29.3%. The exchange is relatively modern, having experienced legal reform in 1993. It has an electronic trading system. There are plans to implement a central scrip depository. There are no restrictions on foreign investment on the Casablanca Stock Exchange, nor on foreign ownership of companies. There is however a 10% tax on dividends, which applies to both local and foreign investors. There is nonetheless no capital gains tax. The Association Professionnelle des Sociétés de Bourse formulates the rules and procedures for trading and the Conseil Déontologique des Valeurs Mobilières performs a monitoring function.

The Tunis Stock Exchange in Tunisia was established in 1969 and the number of listed companies has since increased from over 21 in 1994 to 45 in 2003 as the result
of a privatization program. However, market capitalisation has stagnated at around 10% of GDP for the 1994-2003 period, and the Tunis market is the least liquid in our sample. However, there is no tax on dividends or capital gains tax. Foreigners can buy up to 10% of a company on the Tunis Stock Exchange and up to 30% of an unlisted company without central bank approval. Financial companies such as Banque de l’Habitat, Amen Bank and Biat dominate the index.

Finally, the Istanbul Stock Exchange (ISE) is, with Tel-Aviv, the region’s most developed stock market. It was inaugurated in the beginning of 1986. Currently the ISE Members consist of 131 brokerage houses and 73 banks. The ‘National Market’ comprises 285 companies, 100 of which are included in the ISE National-100 Index. The ISE members have the opportunity to engage in short-selling transactions in stocks that figure in the ISE National-100 Index. Besides the National Market, Regional Markets, New Companies Market and the Watch List Companies Market are available for the trading of companies, which do not fulfil the listing requirements and lack the necessary qualifications for trading on the National Market. There are no restrictions on foreign portfolio investors trading in the Turkish securities market. Stock and bond markets are open to foreign investors, without any restrictions on the repatriation of capital and profits. The market was however strongly affected by the 2001 crisis, which saw market capitalisation fall from 49% of GDP in 1994 to 29% of GDP in 2003.

Table 5 gathers additional information for each of these equity markets. At first glance, all the MENA countries are now endowed with organized, functional and internationally open equity markets. All countries participate in American Depository Receipts (ADR) programs since the last decade. However, settlement is electronic in all countries except Morocco and Egypt, and ranges from T+1 in Israel to T+5 in Tunisia. There is no foreign participation restriction except in Tunisia, where ownership is limited to 49% of capitalisation. Market segments do not follow a unified framework and differ in each country.
<table>
<thead>
<tr>
<th><strong>Table 5 The Euro-Mediterranean Equity Markets</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date of creation</strong></td>
</tr>
<tr>
<td><strong>Market Regulator</strong></td>
</tr>
<tr>
<td><strong>Clearing &amp; Settlement</strong></td>
</tr>
<tr>
<td><strong>Settlement Cycle</strong></td>
</tr>
<tr>
<td><strong>Foreign Participation</strong></td>
</tr>
<tr>
<td><strong>Trading System</strong></td>
</tr>
<tr>
<td><strong>Central Depository</strong></td>
</tr>
<tr>
<td><strong>Trading Days</strong></td>
</tr>
<tr>
<td><strong>Trading Hours</strong></td>
</tr>
<tr>
<td><strong>Tax Rates</strong></td>
</tr>
</tbody>
</table>

Trading days are Monday to Friday in Tunisia, Turkey, Lebanon and Morocco, and Sunday-Thursday in Egypt, Israel and Jordan. The tax rates is zero in Tunisia, Lebanon and Jordan, but dividends, interest and capital gains are taxed to different extents in Egypt, Morocco, Israel and Turkey. Finally, all countries have ratified the International Accounting and Auditing Standards, but the report frequency varies from one country to another. Reports and audits are due every quarter in Israel and Turkey; twice a year in Egypt, Tunisia and Morocco, and annually in Jordan, while there is still no mandatory implementation in Lebanon.

3.3 Descriptive analysis

The concept of 'market emergence' constitutes a useful tool to analyze 'de facto' levels of development. The generic term 'emerging markets' was first employed by the International Finance Corporation (IFC) and was subsequently more rigorously defined by the notation agency Standard and Poor's (S&P), who completed purchase of the IFC's database in 2002. According to S&P, an equity market is characterized as 'emerging' if it meets at least two of the following criteria:

- Being a low, lower-middle or upper-middle-income economy as defined by the World Bank for at least three consecutive years. This three-year period was introduced in 1995 in order to control for the bias induced by the dollar denomination of national incomes in a context of unstable exchange rates.
- Having a low investable market capitalization to GDP ratio relative to other emerging markets. Investable market capitalization refers to the market segment immediately available to investors, and excludes large restricted block holdings. A market can be reclassified as 'developed' if its investable market capitalization to GDP ratio reaches the top 25% of the emerging market universe for three consecutive years.

Following these criteria, 53 out of the 150 low, lower-middle and upper-middle income countries as calculated by the World Bank were considered to be 'emerging markets' in 2005. Within this emerging market universe, the S&P notation agency makes a distinction between smaller markets and others through the construction of

---

6 The threshold was $9,075 per capita in 2002.
‘global’ and ‘frontier’ indexes. The global index includes each emerging market’s most active stock, i.e. stocks which represent between 60% and 75% of the market’s overall capitalization. The frontier index represents the evolution of the most active stocks in the smallest, least liquid emerging markets – although there is no exact threshold between emerging and frontier markets. Stock selection criteria include firms’ book values and development prospects. Finally, an ‘investable’ index is calculated for all markets, reflecting the activity of stocks directly accessible to foreign investors. In 2005, 23 countries belonged to the S&P ‘emerging market’ universe and 20 were ‘frontier’ markets. Within the MENA region, 5 markets (Turkey, Israel, Egypt, Jordan, and Morocco) were coined as ‘emerging markets’ and 2 (Lebanon and Tunisia) as ‘frontier markets’.

From an economic point of view, cross-country differences in levels of market emergence are due to divergent local political and economic dynamics, which result in heterogeneous rates of economic growth and market capitalization. In other words, market emergence is primarily driven by a local dynamics resulting in various financial and socioeconomic structures. Measures of market emergence thus generally involve both quantitative and qualitative elements. The quantitative elements have been described by Kumar and Tsetsekos (1999) and include levels of market size, market activity and the pricing mechanism. The qualitative elements determine the availability of economic information and the perception of country risks. These include levels of transparency, competitiveness and corruption (AIMR, 2005).

3.3.1 Market size

Observing the size of capital markets constitutes one obvious way to assess levels of market emergence. Market size indicators include market volume, market depth and the number of actively traded equities.

3.3.1.1 Market volume

Market volume, as measured by the overall dollar market capitalization, is the simplest indicator of market size. It generally reflects the level of maturity of a market (Fuss, 2002). As shown in figure 5, market volume permits a clear distinction between emerging and frontier markets. Not surprisingly, China, South Africa and India appear as the sample’s largest markets. Turkey and Israel are the largest markets within the
MENA region. They have reached similar sizes and are comparable to Indonesia, Chile and Thailand. Egypt ranks third within the MENA region and can be compared to Argentina or the Philippines. Jordan and Morocco have reached similar sizes and can be compared to Peru or Hungary. Finally, Tunisia and Lebanon, the two frontier markets, are clearly lagging behind and can be compared to Bangladesh or Bulgaria.

3.3.1.2 Market depth

The concept of 'financial depth' provides more refined insight into capital market size. It is defined as the ratio of market capitalization to GDP and expresses stock market size as a percentage of the total national product of an economy. Scores are shown in figure 6 and do not seem to reflect a clear distinction between frontier and emerging markets. For instance, Bulgaria, a frontier market, has the highest market capitalization to GDP ratio in our sample (136%), well ahead of South Africa (37%) and China (38%). The figure also shows that financial depth is very heterogeneous across MENA markets. Egypt ranks first among emerging markets (103%). The second MENA market is Jordan (79%), with a financial depth similar to Argentina (78%). Turkey comes third and can be compared to the Czech Republic (65%). Lebanon, a frontier market, can be compared to Slovenia (55%). The markets of the MENA region displaying the least depth include Israel (32%), which is located above Ecuador (31%), and Morocco (24%) which ranks close to Venezuela (19%). Finally, Tunisia (10%) is located between Malaysia (12%) and Croatia (3%).
Note: Market capitalization of listed companies (logarithmic scale), USD.

Source: Based on data from S&P’s EMDB
Figure 6 Market capitalization (%GDP) in emerging markets, 2005

Note: Market capitalization of listed companies (% of GDP), USD

Source: Based on data from S&P’s EMDB.
Figure 7 Number of actively traded equities, 2005

Note: Number of equities included in the S&P/IFCG and S&P/IFCF indexes, respectively.

Source: Based on data from S&P’s EMDB.
3.3.1.3 Number of actively traded equities

The number of actively traded equities constitutes our third measure of market size. We report the number of equities included in the S&P/IFCG or S&P/IFCF index in figure 7. Inspection of the figure suggests that the number of firms reflects a clear distinction between emerging and frontier markets. China displays the highest number of equities (181), and is followed by Korea (105) and Taiwan (68). Turning to the MENA countries, Israel comes first with 34 active stocks, a number similar to Indonesia. Next is Turkey, which with 26 active stocks ranks equal to Mexico. Egypt (15 firms), Jordan (13 firms), Tunisia (10 firms) and Morocco (9 firms) constitute a rather homogeneous group. Lebanon (5 firms) is lagging behind and can be compared to Slovakia (4 firms).

3.3.2 Market activity

Market activity can be assessed by simultaneously observing the return on the S&P/IFC Investable index and market liquidity as measured by turnover ratios.

3.3.2.1 Return on the S&P/IFC Investable index

The percentage return on the annual S&P Investable index constitutes an obvious measure of market activity. It highlights the performance of the most open and active firms segment of the stock exchange. As shown in figure 8, this indicator discriminates well between frontier and emerging markets, with the exceptions of Jamaica (133%) and Trinidad (118%). Among the MENA countries, Israel performed best in 2005 (75%), followed by Egypt (41%), Morocco (40%) and Turkey (30%). Tunisia and Lebanon, the two frontier markets, are lagging behind (10% and 9%, respectively).

3.3.2.2 Turnover ratios

The tendency towards illiquidity in emerging markets is, in theory, one of the primary factors that differentiate them from developed countries. Lack of liquidity significantly affects the ability of market participants to accommodate order flows, resulting in a de-synchronization between market opportunities and the execution of market decisions. This implies higher holding costs for investors (Fuss, 2000).
Another inconvenience of market illiquidity is that it allows possible disadvantageous price effects when a large trade is made by a single investor. The extent of liquidity in an emerging market can be expressed simply through the 'turnover ratio', which is calculated as the annual value traded divided by the average market capitalization of the last two consecutive years. A high turnover ratio means that a large number of the outstanding shares were traded. As shown in figure 9, turnover ratio seems to discriminate well between emerging and frontier markets. While Pakistan appears as the sample's most liquid market (398%), the greatest turnover ratio of the frontier universe is obtained by Bangladesh, and does not exceed 30%. Turning to the MENA countries, Turkey ranks very well, having one of the sample's most liquid markets (176%), just behind Pakistan and Saudi Arabia. Next are Israel and Jordan (59% and 50%, respectively), which have liquidity levels similar to those of Russia (46%) and the Czech Republic (63%). Egypt seems to be as liquid as Mexico (25%); Lebanon is comparable to Romania (15%), while Tunisia and Morocco display the same liquidity level as Chile (11%).
Figure 8: Annual returns on the S&P/IFCI index, 2005

Note: S&P/IFC investable index (annual % change), USD.
Source: Based on data from S&P's EMDB.
Figure 9 Turnover ratios in emerging markets, 2005

Note: Stocks traded, turnover ratio (%), USD

Source: Based on data from S&P’s EMDB.
3.3.3 Market pricing

Market pricing indicators reveal the investor's anticipation and include price-earning ratios, dividend yields, and the annual percentage change in market capitalisation.

3.3.3.1 Price-earning ratios

The valuation of market profits is dependent on dividend payout ratio, potential profit growth, and risk of return. These factors are incorporated into the P/E ratio, which reflects the degree of confidence that investors have in the market's future performance. As shown in figure 10, P/E are rather homogeneous across countries (apart from Romania). Another interesting feature is that frontier markets can clearly outperform emerging markets. For instance, frontier markets such as Romania (322%), Lithuania (35%) and Lebanon (32%) are within the top ten. Within the MENA region, highest ratios are obtained by Jordan (50%), Egypt (36%) and Lebanon (32%), reflecting higher growth prospects. Israel (25%) and Morocco (22%) come next, while Tunisia (15%) and Turkey (12%) are lagging behind.

3.3.3.2 Dividend yields

The dividend yield equals the index's annual dividend payment divided by the stock price, and simultaneously measures the income components of stock returns for stockholders and the cost of capital for the listed firms. The highest yields seem to be found in frontier markets, such as Botswana (5%), Kenya (5%) or Côte d'Ivoire (4%). This suggests that investors in these markets have to be compensated for higher risks and the resulting uncertainty of capital gains. This also suggests a highest firm level growth rate, as fast growing firms are generally expected to have higher payouts (Megginson & Smart, 2005). Finally, it suggests that the cost of capital is higher in these theoretically segmented markets, in line with the mechanisms presented in the previous chapter. As shown in figure 11, the highest MENA dividend yields are obtained by Tunisia and Morocco (4%). This can be compared to the frontier markets of Namibia and Ecuador (4%). Turkey and Jordan (3%) and are ranked equally to the Czech Republic and Slovakia. Finally, Israel (2%) is comparable to Mexico, Egypt (1%) is comparable to Russia; and Lebanon (0%) is comparable to Croatia.
Figure 10 P/E ratios in emerging markets, 2005

Note: Stocks traded, USD.

Source: Based on data from S&P’s EMDB.
Figure 11 Dividend yields in emerging markets, 2005

Note: Stocks traded, USD.
Source: Based on data from S&P’s EMDB.
3.3.3.3 Percentage change in market capitalization

The last pricing indicator analysed here is the annual percentage change in market capitalization, which is a proxy for the variation in the value of company shares owned by stockholders. As shown in figure 12, the highest value is observed in Bulgaria, a frontier market (125%), while Latvia, another frontier market, ranks third (101%). We also observe that most of the negative values are obtained by frontier markets such as Estonia (-56%) or Ghana (-37%). Such a divergence reflects the uncertain financial and economic trajectory of frontier markets. Jordan is the fastest developing MENA market (90%) and ranks third in the whole sample, just above Russia (86%). Lebanon, a frontier market, is also growing fast (51%), just above Brazil (48%) and Egypt (48%). Turkey is ranked equally with Ukraine and Korea (43%). Israeli market capitalization is growing relatively slowly (17%) and can be compared to Ecuador (18%) and South Africa (20%). Finally, Morocco (12%) and Tunisia (11%) are lagging behind, and are close to the Czech Republic (13%).

3.3.4 Transparency, competitiveness and corruption

Finally, transparency levels are of critical importance for assessing the level of market emergence. A plethora of indicators emanate from various sources. We focus here on the International Country Risk Guide (ICRG) index, the Corruption Perception Index (CPI) and the Investor Protection Index (IPI).

3.3.4.1 The International Country Risk Guide (ICRG) index

The ICRG index provides a single measurement of country risk which aggregates factors of political, economic and financial risk. The index ranges from 0 to 100, with a higher value indicating a higher country risk. Inspection of figure 13 suggests that country risk is independent from classification as an emerging or frontier market. Morocco appears to be the country with the highest risk in the region (75) and can be compared to Poland. Then come Tunisia and Israel (73). According to the ICRG classification, the least risky MENA countries are Jordan (71), Egypt (66), Turkey (63) and Lebanon (56).
Figure 12 Variation (%) in total market capitalization, 2005

Note: % change in total market capitalization.
Source: Based on the S&P/IFC database
3.3.4.2 The Corruption Perception (CPI) index

The non-governmental organization Transparency International calculates an annual ‘corruption perception index’ which increases with the degree of corruption as documented in country surveys. The index ranges from 0 to 10, with a higher value indicating a lower corruption level. As shown in figure 14, the level of corruption does not seem to affect classification as an emerging or frontier market. According to this figure, Israel ranks third within the whole sample, and appears to be the most transparent MENA country (7). It is followed by Jordan (6), Tunisia (5) and Turkey (4). According to this index, the most corrupt MENA countries are Egypt (3) and Lebanon (3).

3.3.4.3 The Investor Protection Index (IPI)

The World Bank’s Doing Business database provides an overall investor protection index which aggregates survey-based measurements of shareholder protection, information disclosure and company management liability (Djankov et.al 2005). The index goes from 0 to 10, a higher value indicating better investor protection. As shown in figure 15, the index value seems to be homogeneously distributed across frontier and emerging markets. Within the MENA group, the highest ranking countries are Israel (9), Turkey (5), Lebanon (4), Egypt (4), Morocco (4), Jordan (4), which constitute a homogeneous group, while Tunisia (3) is lagging behind.
Figure 13 ICRG country risk index in emerging markets, 2005

Note: ICRG composite risk rating (0=highest risk to 100=lowest)

Source: Based on data from S&P’s EMDB
Figure 14 Corruption perception index in emerging markets, 2005

Note: Corruption Perception Index, Transparency International.
Source: Based on data from S&P's EMDB.
Figure 15 Investor protection index, 2005

Note: Investor Protection Index (0=lowest to 10=highest)

Source: Based on the World Bank’s Doing Business database.
3.4 Numerical analysis

The objective of this section is to analyze the factors driving the market emergence process by conducting a qualitative data analysis. We first generate a set of market emergence indexes reflecting the underlying components of market emergence. We then investigate the impact of each of these on the emergence/frontier market classification using a probit model. Finally, we use a simple cluster analysis in order to situate the MENA markets within the emerging markets universe.

3.4.1 Bootstrapped emergence indexes

In this section, we generate a set of synthetic emergence indexes reflecting the four theoretical pillars of the market emergence, as presented in the previous section: market size, market activity, market pricing and market transparency. These indexes can be described as follows:

\[
\begin{align*}
\text{SIZE}_i &= \alpha_i \text{CAP}_i + \beta_i \text{CAPGDP}_i + \chi \text{NE}_i, \\
\text{ACTIVITY}_i &= \alpha \text{TURNOVER}_i + \beta_i \text{%IFCI}_i, \\
\text{PRICING}_i &= \alpha_i \text{PER}_i + \beta_i \text{DY}_i + \chi_i \Delta \text{MC}_i, \\
\text{TRANSPARENCY}_i &= \alpha_i \text{ICRG}_i + \beta_i \text{CPI}_i + \chi_i \text{IPI}_i,
\end{align*}
\]  

Each index is defined as the weighted average of the underlying variables. Each index is defined as the weighted average of the underlying variables. The derivation of weights is based on a nonparametric bootstrap technique, which can be described as follows. For each index, we first generate 10,000 random combinations of uniformly distributed weights adding up to unity in the interval [0,1]. The corresponding indexes are calculated for each of these combinations, and the selected index value corresponds to the 50th percentile of the associated cumulative distribution. As compared to other intuitive indices (such as a simple average across all elements), this methodology allows us to derive a significance level for the index without relying on strong distributional assumptions.

In calculating the transparency index, we log-normalized the ICRG index for scale consistency purposes. Country values are reported in table 6. We observe the greatest ‘size’ index for China (83.53) and the smallest for Venezuela (3.02). The most and least ‘active’ emerging markets are Pakistan (205.8) and Namibia (4.93), respectively.
Turning to ‘pricing’ aspects, the extreme values are obtained for Romania (118.53) and Estonia (-12.72). Finally, the most and least ‘transparent’ emerging markets are Israel (5.92) and Ukraine (2.81), respectively. Averaging the index values at the regional level allows us to make some comparisons. Looking first at the size index, the MENA region (30.69) is ranked after Asia (38.76) but before emerging Europe (27.37) and Latin America (30.22). Within the MENA region, the ranking is Egypt (47.25), Turkey (38.66), Jordan (38.41), Israel (30.60), Lebanon (27.05), Morocco (18.96) and Tunisia (13.91). Turning to the activity index, the MENA region (48.9) is also ranked second, after Asia (77.39) but before emerging Europe (37.04) and Latin America (27.35). Within the MENA region, activity levels in decreasing order are Turkey (100.97), Jordan (93.26), Israel (67.41), Egypt (32.89), Morocco (25.82), Lebanon (11.93) and Tunisia (10.30). Interestingly, when looking at the pricing index the MENA region ranks first (23.39), before Latin America (20.11), Asia (13.83) and emerging Europe (12.71). This reflects strong capital market growth in the region. At the intra-MENA level, the ranking is Jordan (48.65), Egypt (28.96), Lebanon (28.27), Turkey (19.97), Israel (15.11), Morocco (12.8) and Tunisia (9.98). Finally, the MENA region also ranks first in terms of the transparency index. Its average score is 4.06 versus 4.04 for Latin America, 3.97 for Asia and 3.70 for Eastern Europe. This somewhat surprising result may be due to the very high level of transparency attained in Israel (5.92), which ranks first among emerging markets. The rest of the intra MENA ranking is Turkey (4.09), Jordan (4.08), Lebanon (3.96), Egypt (3.60), Tunisia (3.53) and Morocco (3.24).
<table>
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Table 7 reports the correlation matrix among the four dimensions of market emergence. We find a significant correlation between size and activity (0.32), and between transparency and activity (0.28). The relationship between market size and market activity is obvious, while the significant coefficient uniting transparency and activity echoes Capasso’s (2004) theoretical model presented in chapter 3.

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<td>(0.3919)</td>
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Note: P-values are reported between brackets. (*) indicates significance at the 5% level.

3.4.2 Probit analysis

In this section we use a probit analysis to investigate whether our four indexes may explain the classification of countries as emerging or frontier markets. Our dependent variable takes a value of 1 if the country is classified as emerging and 0 otherwise, and the regressors include the four indexes. As shown in table 8, the SIZE and ACTIVITY models are appropriately fitted as observed from the likelihood ratio statistics, as well as the model including all four indicators. This suggests that our indicators appropriately reflect the dimensions of market emergence. Looking at coefficients, SIZE and ACTIVITY have both positive signs and explanatory power and thus seem to be the most important dimensions of market emergence. ACTIVITY seems to have the strongest impact on market emergence, as it is also significant in the four variables model. By contrast, PRICING and TRANSPARENCY do not appear to have explanatory power in determining market classification.

In figure 16, we show the probability of a particular country being classified as an emerging market based on our four indicators. Inspection of the figure suggests that in spite of specific cases such as Jamaica or Trinidad (which are ranked above most emerging markets), our model discriminates well among emerging and frontier markets. Observing probabilities for the MENA countries, our model suggests that...
Turkey and Jordan have a 99% chance of being classified as emerging markets. Then come Egypt (78%), Israel (75%) and Morocco (63%). Tunisia and Lebanon, the two frontier MENA markets, have the lowest probability of being classified as emerging markets (34% and 36%, respectively); which confirms the intuition from the S&P classification. According to our model this is primarily due to small size and a lack of activity in these markets. Finally, computing the average probabilities by region, we find that with all countries taken together the MENA region has the second highest probability of being classified as emerging (69%), after Asia (83%) but before Latin America (57%) and Emerging Europe (54%). However, the associated standard deviations are the highest for the MENA region (26.8%), above Asia (23%), Latin America (23%) and Europe (19%). This suggests that the average emergence of the MENA stock markets is explained by the presence of the well developed markets of Turkey, Jordan, Egypt and Israel, but that the region is remains rather heterogeneous in comparison to other emerging areas, which can be explained by the presence of the two frontier markets of Tunisia and Lebanon.

Table 8 Probit analysis

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<td>PRICING</td>
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<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRANSPARENCY</td>
<td>0.09</td>
<td>-0.47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-0.58</td>
<td>-0.62*</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of obs</td>
<td>49</td>
<td>49</td>
<td>49</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td>LR chi2(12)</td>
<td>3.84</td>
<td>13.79</td>
<td>0.11</td>
<td>0.12</td>
<td>16.43</td>
</tr>
<tr>
<td>Prob &gt; chi2</td>
<td>0.04</td>
<td>0.0002</td>
<td>0.74</td>
<td>0.72</td>
<td>0.0025</td>
</tr>
</tbody>
</table>

Note: P-values are reported between brackets. (*) indicates significance at the 5% level.
Figure 16 Probit analysis
3.4.3 Cluster analysis

In this section, we use a simple hierarchical cluster analysis based on Ward’s (1963) linkage in order to further situate the MENA markets within the emerging market universe both at the regional and country level. Within this framework, the squared Euclidean distance is used as a measure of dissimilarity. The recurrence formula is the following:

\[
d_{k(i,j)} = \frac{\eta_i + \eta_k}{\eta_i + \eta_j + \eta_k} d_{ik} + \frac{\eta_j + \eta_k}{\eta_i + \eta_j + \eta_k} d_{ij} - \frac{\eta_k}{\eta_i + \eta_j + \eta_k} d_{ij}
\]

(2)

Where \( \eta_i, \eta_j, \eta_k \) are the numbers of observations contained in groups i, j and k, respectively. \( d_{ij} \) is the distance between cluster i and cluster j, \( d_{k(i,j)} \) is the distance between cluster k and the new cluster formed by joining clusters i and j. The optimal number of clusters is identified based on the pseudo F index (Calinski and Harabasz, 1974) which is defined as \( F = \frac{\text{Trace}[B/(k-1)]}{\text{Trace}[W/(n-k)]} \) where n is the number of observations in a sample, K is the number of clusters, B is the between cluster sum of squares and cross product matrix, and W is the pooled within cluster sum of squares and cross products matrix. Using this method, the optimal number of clusters is determined by plotting the F index against the number of clusters. Finally, an inspection of the repartition of clusters across the scatterplot matrix provides insight into their respective characteristics.

Beginning the analysis at a regional level, we divide our sample into four blocks corresponding to the regional averages ASIA, LATIN AMERICA, EUROPE and MENA. Implementing Ward’s algorithm, we find that the maximum F-statistic (9.45) is obtained with 3 clusters. The first cluster contains ASIA, the second cluster contains MENA, and the third cluster contains LATIN AMERICA and EUROPE. As shown in figure 17, the ASIA block scores best in terms of market size and activity. Levels of market transparency are evenly distributed across the four regions. The MENA area clearly comes second in activity (after ASIA), and first in pricing. These two dimensions of market emergence are the most sensitive to annual variations and market anticipation. Therefore, our results suggest that contemporaneous market
emergence is a more dynamic process in the MENA region than in Latin America and emerging Europe. This echoes previous results from the probit analysis.

**Figure 17 Regional analysis: radar plot**

We now turn to a country level analysis within the MENA region. We find that the F-statistic (15.20) is optimized with a number of 6 clusters. Levels of market emergence thus appear very heterogeneous across the MENA capital markets. This confirms our intuitions from the previous section. Each individual country constitutes an optimal cluster, except Tunisia and Morocco, which constitute a joint cluster. Figure 18 is skewed towards the North-East, which suggests that despite being divergent, Turkey, Jordan, Egypt and Israel seem to have reached higher market size and activity than Lebanon, Tunisia and Morocco. Morocco’s capital market is more active than Lebanon’s, but this is counterbalanced by higher transparency and pricing in the latter. Tunisia is lagging behind. Since Tunisia and Morocco constitute a joint cluster, this suggests that Lebanon is ahead of Morocco when complementing the S&P emergence criteria by market pricing and transparency.
3.5 Conclusion

The objective of this chapter was to assess the reform program in the MENA countries by comparing levels of market emergence in the region to other markets. We first discussed the various components of market emergence and drew comparisons between the MENA region and other countries. We then aggregated these observations into four bootstrapped indexes: SIZE, ACTIVITY, PRICING and TRANSPARENCY. We analyzed the factors leading to market emergence with a probit model and found that market emergence appeared to be primarily explained by the SIZE and ACTIVITY indexes. Country level probabilities and a cluster analysis also highlighted that the MENA area markets are the second most developed after Asia, but before Latin America and Eastern Europe. However, development levels also appear very heterogeneous. Whereas Turkey, Israel, Egypt and Jordan have now almost fully matured, Tunisia, Morocco and Lebanon can still be characterized as frontier markets. This is an important result since the previous chapters have
suggested that smaller markets tend to perform less in mobilizing internal and external financial resources. This issue is further analyzed in the next chapter, which focuses on informational efficiency.
4. Informational efficiency in the MENA region

The objective of this chapter is to analyze the MENA markets’s ability to allocate resources efficiently. To do so, we conduct an empirical analysis of weak-form efficiency in relation to its theoretical underpinnings. The chapter is structured as follows: the first section contains a description of our data. The second section presents our methodology. The third sub-section is a discussion of our results. Finally, the fourth section presents our conclusions.

4.1 Data

Following current literature, we use daily data ranging from 1/1/1998 to 1/1/2005. Our sample includes stock market price indices from Morocco, Tunisia, Egypt, Lebanon, Jordan, Turkey and Israel. Where available, we use the S&P/IFCG index in order to get a homogenized set of indices. The S&P/IFCG is the widest and most reliable source of information for emerging markets. However, the latter is unavailable on a daily basis for Tunisia and Lebanon. For Lebanon, we thus rely on the daily weighted market-value BLOM Stock Index compiled by Blominvest Bank. In the case of Tunisia, we rely on the national IBVMT index. This index reflects the market’s average price by including all companies admitted to the stock market with a frequency of quotation of more than 60%. Tests are computed both in dollars and in national currencies.

4.2 Methodology

Standard empirical testing of the WFEMH can be divided into two sub approaches. One method is to determine the existence of predictability using past return series or price information. The other is to verify whether technical trading rules can be exploited as a profit making strategy. Our study encompasses both methodologies. Finally, we aggregate our results into an efficiency index.
4.2.1. Unit root analysis

The presence of a unit root in the time-series supports the random walk hypothesis, implying market efficiency. The most common framework for such an investigation relies on Dickey-Fuller (1979,1981) methodology. However, according to Lee et.al. (2000), the way the null hypothesis for the augmented Dickey-Fuller test is tested is not very informative regarding the presence of a unit root, and the test is not very powerful against relevant alternative hypotheses. We therefore begin our analysis with the Kwiatkowski et al. (1992) procedure (hereafter KPSS), which has the advantage of being specifically designed to test the null hypothesis of stationarity and a unit root as the alternative hypothesis.

The test statistic is calculated as:

$$\eta_i = T^{-2} \sum_{t=1}^{T} \frac{S_t^2}{S^2(L)}$$  \hspace{1cm} (1)

Where $L$ is the lag parameter, $S_t$ is the cumulative sum of residuals ($e_t$) from a regression of the series on a constant a linear trend (i.e, $S_t = \sum e_t, t = 1,2,...,T$) and where:

$$S^2(L) = T^{-1} \sum_{t=1}^{T} e_t^2 + 2T^{-1} \sum_{s=1}^{L} \frac{(1-s)}{(L+1)} \sum_{t=s+1}^{T} e_t e_{t-s}$$  \hspace{1cm} (2)

The null hypothesis of stationarity is rejected in favour of the unit root alternative if the calculated statistic exceeds the critical values presented in Kwiatkowski et.al (1992).

4.2.2 Individual variance ratio analysis

Studies have shown that unit root tests do not uniformly detect departures from a random walk, and are consequently insufficient in testing the WFEMH.

The variance ratio test introduced by Lo and MacKinlay (1988) is often used to test the hypothesis that a given time-series follows a martingale difference sequence. The test is based on the observation that the variance of a martingale difference sequence
increases linearly with each observation interval. In other words, the variance of a \( k \)-sum is equal to \( k \) times the variance of the underlying series, so that the variance ratio is equal to one:

\[
VR(k) = \frac{Var(x_t + x_{t-1} + \ldots + x_{t-k+1})}{k} = \frac{1}{k} \]

\[ (1) \]

In order to test this hypothesis, Lo and MacKinlay (1988) have introduced a test statistic based on an estimator of \( VR(k) \), in which the numerator is an unbiased estimator of \( 1/k \) of the variance of the \( k \)th differenced series, and the denominator is an unbiased estimator of the variance of the first-differenced series. For a series with \( T \) observations and \( k \geq 1 \):

\[
\hat{VR}(k) = \frac{\hat{\sigma}^2(k)}{\hat{\sigma}^2(1)} \]

\[
\hat{\sigma}^2(k) = \frac{1}{k(T-k+1)} \left( \frac{1}{T} \sum \left( x_t + x_{t-1} + \ldots + x_{t-k+1} - k \hat{\mu} \right)^2 \right) \]

\[
\hat{\mu} = \frac{1}{T} \sum x_t \]

When series \( x \) display heteroscedasticity, and for a given value for \( k \), the variance ratio hypothesis can be tested by using the following statistic:

\[
Z(k) = \sqrt{T} \left( \hat{VR}(k) - 1 \right) \left( \frac{\sum_{j=1}^{k} \left( \frac{2(k-j)}{k} \right)^2 \delta_j}{\sum_{i=1}^{T} \left( x_i - \hat{\mu} \right)^2} \right)^{-1/2} \]

\[
\delta_j = \frac{T \left( \sum_{i=j+1}^{T} \left( x_i - \hat{\mu} \right)^2 \left( x_{i-j} - \hat{\mu} \right)^2 \right)}{\left[ \sum_{i=1}^{T} \left( x_i - \hat{\mu} \right)^2 \right]^2} \]

\[ (3) \]
$Z(k)$ is asymptotically standard normally distributed. The null hypothesis that $x$, can be described by a martingale difference sequence is rejected at the 5% level of significance if the calculated value of the statistic exceeds the standard critical value 1.96.

### 4.2.3 Multiple variance ratio analysis

As stressed by Chow and Denning (1993), under the null hypothesis any variance ratio must be equal to one, and consequently, the exogenous choice of block length $k$ constitutes one limitation to the Lo and MacKinlay (1988) testing framework. Chow and Denning (1993) proposed a multiple variance ratio test in which all selected variance ratios are compared with unity. The test is based on the idea that the decision regarding the null hypothesis can be made according to the maximum absolute value of the individual variance ratio statistics. Letting $k_i$ be any integer greater than one, Chow and Denning reformulated the null hypothesis as $H_0: VR(k_i) = 1$ for $i = 1, 2, ..., m$, and define their statistic as:

$$MV(m) = \max_{1 \leq i \leq m} |Z(k_i)|$$

(1)

This statistic follows the studentized maximum modulus (SMM) distribution. At the $\alpha$ level of significance, the confidence interval can be calculated from the standard normal distribution as $SMM(\alpha, m) = Z_{\left[1-\frac{\alpha}{2}\right]}$, where $\alpha^* = 1 - (1 - \alpha)^{1/m}$. The calculated critical values are 2.23 and 2.79, respectively.

However, both Lo and MacKinlay's (1988) and Chow and Denning's (1993) methodologies require an exogenous choice of block length. However, the optimal block length is unknown, and the test can yield different inferential outcomes for different choices of block length. Bootstrapping constitutes a possible solution. Following Kim (2006), we apply a wild bootstrap to the Chow and Denning statistic $MV(m)$. The wild bootstrap test of $MV^*$ is conducted in three steps:

1. A bootstrap sample is formed from $T$ observations $X^*_{t} = \eta_t X_t$, $(t = 1, ..., T)$ where $\eta_t$ is a random sequence with $E(\eta_t) = 0$ and $E(\eta_t^2) = 1$. 

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2. $MV(m)$ is calculated. This is the Chow-Denning statistic obtained from the bootstrap sample generated in stage 1.

3. Stages 1 and 2 are sufficiently repeatedly many, say $m$, times to form a bootstrap distribution of the test statistic $\{MV^{*j}\}_{j=1}^m$. The bootstrap distribution $\{MV^{*j}\}_{j=1}^m$ is used to approximate the sampling distribution of the $MV_1$ statistic. The $p$-value of the test can be calculated as the proportion of $\{MV^{*j}\}_{j=1}^m$ greater than the sample value of $MV(m)$.

4.2.4 Non-parametric variance ratio analysis

In the end, non-parametric test statistics may be more powerful in rejecting the random-walk hypothesis in the case of non-normal time series, as they allow one to derive specific critical values by simulating the exact sampling distribution. Wright (2000) proposes an alternative based on non-parametric rank, which he shows outperform both parametric and non-parametric statistics based on signs. Let $r(x_i)$ be the rank of $x_i$ among $x_1, x_2, \ldots, x_T$, and the corresponding standardized (zero-mean, unit variance) series $r_{i\tau}$ given by:

$$r_{i\tau} = \frac{r(x_i) - \frac{T+1}{2}}{\sqrt{\frac{(T-1)(T+1)}{12}}}$$ (1)

Wright (2000) substitutes $r_{i\tau}$ to $x_i$ in the definition of the test statistic $Z(k)$ so that the proposed test statistic is:

$$R_i(k) = \left( \frac{\sum_{k=1}^{T} (r_{i\tau} + r_{i\tau-1} + \ldots + r_{i\tau-k+1})^2}{k \sum_{\tau=1}^{T} r_{i\tau}^2} - 1 \right) \times \left( \frac{2(2k-1)(k-1)}{3kT} \right)^{-\frac{k}{2}}$$ (2)
Under the martingale difference sequence, $r(x, \pi)$ is a particular permutation of numbers $1, 2, ..., T$, each having the same probability of realization. As a consequence the exact distribution of $R_i(k)$ can be approximated by a bootstrap method. The idea is to calculate $R_i(k)$ for 1000 permutations of $r(x, \pi)$ and to observe the empirical distribution of the obtained series. The null hypothesis of a random walk is rejected if the initial value of the test statistic is greater than the 95% percentile of this empirical distribution.

### 4.2.5 VMA technical trading rules

The rationale for using technical trading simulations in efficiency analysis is that the derived rules may pick up some of the hidden patterns that are not detected by linear models (Chang et al, 2004). Starting with the variable moving average (VMA) rule, an investor takes a long position if the short-term VMA is above the long-term VMA, and stays short otherwise:

$$I_t = \begin{cases} 
1 & \text{if } \frac{1}{S} \sum_{s=1}^{S} P_{t-s} \geq \frac{1}{L} \sum_{l=1}^{L} P_{t-l} \\
0 & \text{otherwise} 
\end{cases}$$

In (6), $S$ and $L$ stand for short and long-term, respectively. Following Brock et al. (1992), we select 1_50, 1_150, 5_150, 1_200 and 2_200 as VMA rules, where 1, 2 and 5 represent the number of days in the short-term moving average and 50, 150 and 200 the number of days in the long-term moving average. We adopt a ‘double or out’ strategy framework for profit simulations. When a ‘buy’ signal is generated, the investor borrows at the risk-free interest rate, and double her equity investment in the market. In response to sell signals, the investor sells the shares, and invests in the risk free interest rate. We assume that the borrowing and lending rates are the same and that the risks during buying and selling periods are the same. We use the average yield of the 3-months US Treasury bill as proxy for the risk-free interest rate. The return for this strategy is given by

$$\mu_{t+1} = I_t \left( \frac{P_{t+1}}{P_t} - 1 \right) - I_{t-1} \left( I_t - 1 \left( \frac{P_{t+1}}{P_t} - 1 \right) \right).$$

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Following Brock et al (1992), the t-statistic is:

$$BS = \frac{\mu_h - \mu_s}{\sqrt{\frac{\sigma^2}{n_h} + \frac{\sigma^2}{n_s}}}$$  \hspace{1cm} (2)

With \(\mu_{b,s} = \frac{1}{n_{b,s}} \sum_{t=0}^{a+1} R_{t+1} I_t\), and \(\sigma^2_{b,s} = \frac{1}{n_{b,s}} \sum_{t=0}^{a+1} (R_{t+1} - \mu_{b,s})^2 I_t\).

### 4.2.6 TRB technical trading rules

The other technical rule used in this paper is a trade range breaking (TRB) trading rule, in which investors receive a buy signal if prices penetrate the resistance level, i.e., go above a local maximum and a sell signal is given if prices fall below a local minimum (support level). If prices remain in the intermediate range then one maintains the original position. This rule can be defined as:

$$I_t = \begin{cases} 
1 & \text{if } P_{t-1} = \text{Max}[P_{t-1}, P_{t-2}, ..., P_{t-h}] \\
0 & \text{if } P_{t-1} = \text{Min}[P_{t-1}, P_{t-2}, ..., P_{t-h}] \\
I_{t-1} & \text{if } P_{t-1} \in (\text{Min}[P_{t-1}, P_{t-2}, ..., P_{t-h}], \text{Max}[P_{t-1}, P_{t-2}, ..., P_{t-h}])
\end{cases} \hspace{1cm} (3)$$

In (3), \(h\) stands for the number of days that is used in the TRB trading rule. We use the same computation methodology as for the VMA analysis.

### 4.2.7 The efficiency index

These various approaches are synthesized through the construction of an efficiency index. The objective is to rank the MENA markets according to their relative informational efficiency. Our process is the following. For each country and category of test (variance ratio and technical trade), we create a result matrix in which columns represent one of the various methodologies. The elements of these two matrices are dummy variables, having a value of 1 when the WFEMH is not rejected and 0 if rejected. The arithmetic averages of elements of these matrices constitute the two components of our efficiency index. A higher component indicates stronger evidence.
in favour of market efficiency. The last issue is to determine the appropriate weights of each component. As in chapter 3, we rely on a simple nonparametric bootstrap in order to derive a significance level for our index. We thus generate 10,000 random combinations of uniformly distributed weights adding up to unity in the interval (0,1), calculate the index for each of these combinations, and select the value corresponding to a 50% cumulative distribution function of the obtained series. Our final index can therefore be described as follows:

\[ \text{INDEX}_i = \frac{\sum_{m=1}^{M} VRATIO_i}{M} + \frac{\sum_{m=1}^{M} TRADE_i}{M} \]  \hspace{2cm} (1)  

Where M is the number of methodologies, VRATIO\(_i\) are the variance ratio dummies for country I and TRADE\(_i\) are the technical trade dummies for country i. \(\alpha\) and \(\beta\) are the bootstrapped weights for each component of the index.

4.3 Empirical results

Our empirical results can be divided into three components. The first component gathers findings from the variance ratio analysis. The second component focuses on results from the technical trading rules. The third component discusses the efficiency index.

4.3.1 Variance ratio results

We begin with the unit root analysis. As expected, the null hypothesis of stationarity is rejected in all markets when the KPSS test is performed on levels. Table 9 shows results for the series taken in first difference. Across all model specifications, the null is accepted for Jordan (C/T model in US dollars, C and C/T models in local currency), Turkey (all models), Lebanon (C/T model, both in US dollars and local currency), Israel (all models) and Morocco (C model in local currency). Taken together, these results constitute preliminary evidence of a rejection of the random-walk hypothesis in the MENA markets.
Table 9 KPSS unit root tests

<table>
<thead>
<tr>
<th>Model</th>
<th>Egypt</th>
<th>Jordan</th>
<th>Turkey</th>
<th>Lebanon</th>
<th>Israel</th>
<th>Morocco</th>
<th>Tunisia</th>
</tr>
</thead>
<tbody>
<tr>
<td>C, US$</td>
<td>1.14**</td>
<td>0.87**</td>
<td>0.11</td>
<td>0.47*</td>
<td>0.09</td>
<td>0.18*</td>
<td>0.27**</td>
</tr>
<tr>
<td>C/T, US$</td>
<td>0.27**</td>
<td>0.10</td>
<td>0.07</td>
<td>0.03</td>
<td>0.08</td>
<td>0.18*</td>
<td>0.17*</td>
</tr>
<tr>
<td>C, local currencies</td>
<td>1.40**</td>
<td>0.93</td>
<td>0.07</td>
<td>0.54*</td>
<td>0.08</td>
<td>0.34</td>
<td>0.56*</td>
</tr>
<tr>
<td>C/T, local currencies</td>
<td>0.20*</td>
<td>0.11</td>
<td>0.07</td>
<td>0.03</td>
<td>0.08</td>
<td>0.25**</td>
<td>0.24**</td>
</tr>
</tbody>
</table>

Note: This table presents results for the KPSS test with a constant (C) and with a constant and a trend (C/T), using data on stock returns taken in dollars and local currencies. 5% and 1% critical values are 1.463 and 0.739 for the test including a constant; and 0.146 and 0.216 for the test including a constant and a trend. (***) and (*) indicate that the null hypothesis of stationarity is rejected at the 1% and 5% levels, respectively.

Turning to the individual variance ratio analysis, table 10 shows that when using the data in dollars, the random walk hypothesis is rejected only for Egypt and Morocco. When examining the series in local currencies, the WFEMH is rejected for Egypt, Morocco, and Lebanon.

Table 10 Individual variance ratio tests

<table>
<thead>
<tr>
<th>Model</th>
<th>Egypt</th>
<th>Morocco</th>
<th>Jordan</th>
<th>Lebanon</th>
<th>Israel</th>
<th>Tunisia</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>k=2, US$</td>
<td>1.73</td>
<td>5.23**</td>
<td>0.19</td>
<td>-1.61</td>
<td>1.4</td>
<td>-0.06</td>
<td>-0.53</td>
</tr>
<tr>
<td>k=5, US$</td>
<td>3.09**</td>
<td>5.45**</td>
<td>0.4</td>
<td>-0.87</td>
<td>1.56</td>
<td>-0.36</td>
<td>-0.39</td>
</tr>
<tr>
<td>k=10, US$</td>
<td>2.73**</td>
<td>5.28**</td>
<td>0.49</td>
<td>-0.54</td>
<td>0.64</td>
<td>-0.49</td>
<td>-0.65</td>
</tr>
<tr>
<td>k=30, US$</td>
<td>2.74**</td>
<td>4.77**</td>
<td>1.07</td>
<td>-0.27</td>
<td>1.22</td>
<td>-0.11</td>
<td>0.35</td>
</tr>
<tr>
<td>k=2, local currencies</td>
<td>2.42**</td>
<td>4.6**</td>
<td>0.26</td>
<td>4.12**</td>
<td>1.16</td>
<td>-0.06</td>
<td>-0.17</td>
</tr>
<tr>
<td>k=5, local currencies</td>
<td>3.81**</td>
<td>4.31**</td>
<td>0.41</td>
<td>4.56**</td>
<td>1.33</td>
<td>-0.29</td>
<td>0.02</td>
</tr>
<tr>
<td>k=10, local currencies</td>
<td>3.61**</td>
<td>4.21**</td>
<td>0.51</td>
<td>3.89**</td>
<td>0.68</td>
<td>-0.44</td>
<td>-0.27</td>
</tr>
<tr>
<td>k=30, local currencies</td>
<td>3.84**</td>
<td>4.25**</td>
<td>1.06</td>
<td>2.61**</td>
<td>1.34</td>
<td>0.2</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Note: * indicates rejection of the random walk hypothesis at the 5% level, ** indicates rejection of the random walk hypothesis at the 1% level.

As shown in table 11, the multiple variance ratio analysis does not modify results from the previous multiple variance ratio tests: the null hypothesis of a random walk is rejected only in the case of Egypt, Morocco and Lebanon. Finally, results from the non-parametric analysis are shown in table 12. We reject the null of a random walk in two supplementary markets: Tunisia and Jordan. At the end of the variance ratio investigation, we have thus rejected the random walk hypothesis in all countries: four times in Morocco and Lebanon, three times in Egypt, twice in Jordan and once in Tunisia, Israel and Turkey.
### Table 11 Multiple variance ratio tests

<table>
<thead>
<tr>
<th>Model, Currency</th>
<th>Egypt</th>
<th>Morocco</th>
<th>Jordan</th>
<th>Lebanon</th>
<th>Israel</th>
<th>Tunisia</th>
<th>Turkey</th>
<th>MENA</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV1, US$</td>
<td>2.95**</td>
<td>5.91**</td>
<td>1.05</td>
<td>3.24**</td>
<td>1.77</td>
<td>0.82</td>
<td>0.82</td>
<td>3.96**</td>
</tr>
<tr>
<td>MV1*, US$</td>
<td>0.007**</td>
<td>0.001**</td>
<td>0.61</td>
<td>0.003**</td>
<td>0.19</td>
<td>0.81</td>
<td>0.82</td>
<td>0.001**</td>
</tr>
<tr>
<td>MV1, local currencies</td>
<td>4.07**</td>
<td>4.72**</td>
<td>1.04</td>
<td>3.43**</td>
<td>1.41</td>
<td>1.03</td>
<td>0.85</td>
<td>3.96**</td>
</tr>
<tr>
<td>MV1*, local currencies</td>
<td>0.001**</td>
<td>0.001**</td>
<td>0.56</td>
<td>0.001**</td>
<td>0.36</td>
<td>0.56</td>
<td>0.82</td>
<td>0.001**</td>
</tr>
</tbody>
</table>

Note: MV1 is the heteroskedastic-robust version of the Chow-Denning test; MV1* is its bootstrap version. The entries for MV1 test are the test statistics, while those for MV1* are the p-values of the test. * indicates significance at the 10% level; ** significance at the 5% level. The 5% and 10% values for the MV1 test are 2.79 and 2.22, and the k vector = (2,5,10,30).

### Table 12 Non parametric variance ratio tests

<table>
<thead>
<tr>
<th>Model, Length</th>
<th>Egypt</th>
<th>Morocco</th>
<th>Jordan</th>
<th>Lebanon</th>
<th>Israel</th>
<th>Tunisia</th>
<th>Turkey</th>
<th>MENA</th>
</tr>
</thead>
<tbody>
<tr>
<td>k=Max(R1), US$</td>
<td>7.58**</td>
<td>14.63**</td>
<td>4.14**</td>
<td>-0.84**</td>
<td>2.28**</td>
<td>8.34**</td>
<td>0.82</td>
<td>5.44**</td>
</tr>
<tr>
<td>k=Max(R2), US$</td>
<td>6.57**</td>
<td>14.46**</td>
<td>3.37**</td>
<td>-0.93*</td>
<td>1.92</td>
<td>9.18**</td>
<td>0.8</td>
<td>5.51**</td>
</tr>
<tr>
<td>k=Max(R1), local currencies</td>
<td>8.18**</td>
<td>7.58**</td>
<td>4.23**</td>
<td>6.89**</td>
<td>1.85</td>
<td>10.84**</td>
<td>-0.41</td>
<td>5.44**</td>
</tr>
<tr>
<td>k=Max(R2), local currencies</td>
<td>7.26**</td>
<td>7.62**</td>
<td>3.53**</td>
<td>7.35**</td>
<td>1.89</td>
<td>11.98**</td>
<td>-0.64</td>
<td>5.51**</td>
</tr>
</tbody>
</table>

Note: In each case we report the value corresponding to block length k that maximizes the Rj statistic. (k=2, 5, 10, 30). * indicates rejection of the random-walk hypothesis at the 5% level, ** indicates rejection of the random walk hypothesis at the 1% level. For the MENA benchmark, we report results in the international currency (US dollars) in both instances.

### 4.3.2 Technical trading rules

Table 13 displays results for the 1_50, 1_150, 5_150, 1_200 and 2_200 VMA rules. Testing five rules for seven MENA countries, we analyze a total of 35 rules. We first observe that the number of buy signals is greater than the number of sell signals in the case of Egypt, Jordan, Israel and Lebanon. We find the opposite for Turkey, Morocco and Tunisia. Overall, our results underline the presence of patterns, since the t-statistic for the Buy-Sell difference appears significant 31 times out of 35 cases: 4 times in Egypt, 4 in Israel, 5 in Morocco, Tunisia, Jordan and Lebanon and 3 in Turkey.

From a portfolio standpoint, the average excess return is positive within these rules in Israel (four times), Tunisia (five times), Jordan (five times) and Turkey (once). This also underlines these markets’ potential for active investment strategies. However, if we average the returns of these VMA rules, we find an average excess return of 3.15%, which is small in comparison with 16.88% for Latin American and East-Asian emerging markets (see Chang et.al (2004)).
Table 13 Variable moving average (VMA) results

<table>
<thead>
<tr>
<th>VMA</th>
<th>Egypt</th>
<th>Israel</th>
<th>Morocco</th>
<th>Tunisia</th>
<th>Jordan</th>
<th>Turkey</th>
<th>Lebanon</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1.50)</td>
<td>2.2402**</td>
<td>3.7907**</td>
<td>7.6077**</td>
<td>4.0890**</td>
<td>2.4459**</td>
<td>3.1326**</td>
<td>-2.019**</td>
</tr>
<tr>
<td></td>
<td>-2.3815</td>
<td>2.6979</td>
<td>-3.3804</td>
<td>0.6568</td>
<td>4.8653</td>
<td>-0.2275</td>
<td>-2.9415</td>
</tr>
<tr>
<td>(1.150)</td>
<td>3.0960**</td>
<td>3.2323**</td>
<td>7.1288**</td>
<td>4.0255**</td>
<td>3.0678**</td>
<td>2.4205**</td>
<td>-2.2077</td>
</tr>
<tr>
<td></td>
<td>-1.374</td>
<td>2.3244</td>
<td>-4.2019</td>
<td>0.8195</td>
<td>4.2141</td>
<td>-0.0843</td>
<td>-2.3683</td>
</tr>
<tr>
<td>(5.150)</td>
<td>3.4031**</td>
<td>1.0029</td>
<td>5.2347**</td>
<td>1.7184*</td>
<td>2.1176*</td>
<td>0.7852</td>
<td>-1.85*</td>
</tr>
<tr>
<td></td>
<td>-1.374</td>
<td>3.3083</td>
<td>-4.2019</td>
<td>0.8195</td>
<td>4.2141</td>
<td>-0.6671</td>
<td>-1.6728</td>
</tr>
<tr>
<td>(1.200)</td>
<td>3.2852**</td>
<td>3.1727**</td>
<td>7.1044**</td>
<td>3.3182**</td>
<td>2.7929**</td>
<td>2.5547**</td>
<td>-2.1315</td>
</tr>
<tr>
<td></td>
<td>-0.9214</td>
<td>4.107</td>
<td>-4.2595</td>
<td>0.3058</td>
<td>4.6798</td>
<td>4.4004</td>
<td>-4.0423</td>
</tr>
<tr>
<td>(2.200)</td>
<td>4.2902**</td>
<td>1.7284*</td>
<td>5.9297**</td>
<td>1.9136*</td>
<td>2.4688**</td>
<td>1.636</td>
<td>-1.6687</td>
</tr>
<tr>
<td></td>
<td>-0.9214</td>
<td>4.107</td>
<td>-4.2595</td>
<td>0.3058</td>
<td>4.6798</td>
<td>4.4004</td>
<td>-3.8172</td>
</tr>
<tr>
<td>N(Buy)</td>
<td>4231</td>
<td>4269</td>
<td>3734</td>
<td>3964</td>
<td>3979</td>
<td>4057</td>
<td>4348</td>
</tr>
<tr>
<td>N(Sell)</td>
<td>3994</td>
<td>3957</td>
<td>4491</td>
<td>4261</td>
<td>4246</td>
<td>4168</td>
<td>3326</td>
</tr>
</tbody>
</table>

Note: For each country, we report the results for the various VMA rules. In each cell, the first row gives the t-statistic for the buy-sell difference. (*) and (**) indicate significance at the 5% and 1% level, respectively. The second row gives the average return derived from the adopted rule. The last two rows give the number of buy and sell signals generated, respectively.

Results from the trade range breaking (TRB) analysis are shown in table 14. The number of buy signals is greater than the number of sell signals in the case of Egypt, Morocco and Lebanon. We find the opposite for Israel, Tunisia, Jordan and Turkey. This is sensibly different from the numbers obtained under the VMA analysis. It underlines that different trading rules can lead to different market orders.

Table 14 Trade range breaking (TRB) results

<table>
<thead>
<tr>
<th>TRB</th>
<th>Egypt</th>
<th>Israel</th>
<th>Morocco</th>
<th>Tunisia</th>
<th>Jordan</th>
<th>Turkey</th>
<th>Lebanon</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>-1.851*</td>
<td>1.2651</td>
<td>5.979**</td>
<td>3.275**</td>
<td>-0.238</td>
<td>0.6868</td>
<td>-0.0</td>
</tr>
<tr>
<td></td>
<td>-1.5676</td>
<td>2.5607</td>
<td>-0.7423</td>
<td>0.6143</td>
<td>5.7004</td>
<td>-0.5338</td>
<td>-6.5</td>
</tr>
<tr>
<td>5</td>
<td>-0.517</td>
<td>2.7559**</td>
<td>6.515**</td>
<td>4.037**</td>
<td>0.692</td>
<td>1.9851*</td>
<td>-0.0</td>
</tr>
<tr>
<td></td>
<td>0.6842</td>
<td>-0.8108</td>
<td>-0.4221</td>
<td>2.6383</td>
<td>2.4128</td>
<td>4.4763</td>
<td>-5.1</td>
</tr>
<tr>
<td>10</td>
<td>1.161</td>
<td>1.3454</td>
<td>6.244**</td>
<td>3.306**</td>
<td>1.268</td>
<td>1.7347</td>
<td>-2.4</td>
</tr>
<tr>
<td></td>
<td>-0.3572</td>
<td>-0.8498</td>
<td>-0.4705</td>
<td>1.1158</td>
<td>2.1583</td>
<td>-1.6983</td>
<td>-5.2</td>
</tr>
<tr>
<td>25</td>
<td>0.516</td>
<td>0.1091</td>
<td>5.575**</td>
<td>1.896*</td>
<td>1.2</td>
<td>1.299</td>
<td>-3.1</td>
</tr>
<tr>
<td></td>
<td>0.5449</td>
<td>-1.4507</td>
<td>0.2818</td>
<td>0.1704</td>
<td>0.5949</td>
<td>-4.3296</td>
<td>-4</td>
</tr>
<tr>
<td>50</td>
<td>-1.281</td>
<td>0.4662</td>
<td>5.052**</td>
<td>0.654</td>
<td>0.246</td>
<td>1.5781</td>
<td>-2.4</td>
</tr>
<tr>
<td></td>
<td>0.2476</td>
<td>-1.1849</td>
<td>0.1458</td>
<td>-0.0462</td>
<td>0.3381</td>
<td>-3.8466</td>
<td>-1.2</td>
</tr>
<tr>
<td>N(Buy)</td>
<td>1310</td>
<td>1241</td>
<td>1340</td>
<td>1301</td>
<td>956</td>
<td>1242</td>
<td>32</td>
</tr>
<tr>
<td>N(Sell)</td>
<td>1278</td>
<td>1290</td>
<td>1322</td>
<td>2866</td>
<td>982</td>
<td>1294</td>
<td>32</td>
</tr>
</tbody>
</table>

Note: For each country, we report the results for the various TRB rules. In each cell, the first row gives the t-statistic for the buy-sell difference. (*) and (**) indicate significance at the 5% and 1% levels, respectively. The second row gives the average return derived from the adopted rule. The last two rows give the number of buy and sell signals generated, respectively.

The Buy and Sell difference appears significant 15 times out of 35: Egypt (once), Israel (once), Morocco (five times), Tunisia (four times), Turkey (once) and Lebanon (three times). From a portfolio standpoint, the average excess return is found to be
positive within these rules in Morocco (twice), Tunisia (four times) and Turkey (once). The average excess return of TRB significant rules is 0.91%. This is also small in comparison with 13.08%, the average found by Chang et.al (2004) in other emerging markets. We also find that the TRB seems less efficient than the VMA trading rule, with a difference of 2.24% in average excess returns. This echoes Chang et.al (2004) who found a difference of 3.8% for Latin American markets. Overall, we find that technical rules have some predictive power, which confirms the conclusions from the variance ratio analysis.

4.3.3 Efficiency index

Efficiency indices are shown in Table 15. Turkey and Israel show the strongest evidence of weak-form efficiency. These markets are followed by Jordan, Tunisia, and Egypt, with Lebanon and Morocco lagging behind. These results are rather intuitive. Turkey and Israel are endowed with more liquid and capitalized stock markets and have well-developed financial systems. Strong capitalization in Jordan is counterbalanced by the fact that banks represent 50% of market capitalization and by the absence of a secondary market. Tunisia, Egypt, Lebanon and Morocco constitute smaller markets, although one limitation of these results is that they do not fully incorporate the recent developments in the Cairo Stock Exchange.

Table 15 Efficiency index

<table>
<thead>
<tr>
<th></th>
<th>Egypt</th>
<th>Morocco</th>
<th>Jordan</th>
<th>Lebanon</th>
<th>Israel</th>
<th>Tunisia</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>VRATIO</td>
<td>0.6</td>
<td>0.55</td>
<td>0.8</td>
<td>0.65</td>
<td>0.85</td>
<td>0.85</td>
<td>0.95</td>
</tr>
<tr>
<td>TRADE</td>
<td>0.7</td>
<td>0.5</td>
<td>0.75</td>
<td>0.6</td>
<td>0.75</td>
<td>0.65</td>
<td>0.8</td>
</tr>
<tr>
<td>INDEX</td>
<td>0.65</td>
<td>0.52</td>
<td>0.77</td>
<td>0.62</td>
<td>0.80</td>
<td>0.70</td>
<td>0.87</td>
</tr>
</tbody>
</table>

Note: The first and second rows give the variance ratio (VRATIO) and technical trade (TRADE) components of the efficiency index, respectively. The third row reports the value of the efficiency index for each country.

4.4 Conclusion

The objective of this chapter was to investigate market efficiency in relation to its theoretical underpinnings in the MENA stock markets. We first constructed an ‘efficiency index’ for each market based on results from twenty statistical tests including various random-walk tests and technical trade analysis. We uncovered heterogeneous degrees of market efficiency among the studied markets. Turkey and
Israel appear as the region’s most informationally efficient markets, and are followed by Jordan, Tunisia, Egypt, Lebanon and Morocco. This ranking is reminiscent of the market emergence results of chapter 5. These conclusions could have implications for policy making. In accordance with the theory and evidence presented in chapter 2, our results suggest that policies seeking to increase the role of equity markets in domestic financial systems should aim at developing market size and market liquidity. Regulatory structure improvement also appears important, while a specific emphasis should be placed on managerial liability and shareholder protection. Nonetheless, chapter 3 has also underlined that the economic impact of equity market development is determined by international integration levels. These are analyzed in the next chapter.
5. Equity market integration in the MENA region

The objective of this chapter is to conduct an empirical investigation of equity market integration in the MENA region by relying on a set of complementary econometric methodologies. We first assess the presence of static and time-varying co-integration relationships between the MENA markets and several international benchmarks. In doing so, we complement the Johansen-Juselius (1990) framework with more recent approaches. These include Gregory-Hansen’s (1996) test for co-integration with a structural break, Harris, McCabe and Leybourne’s (2002) test for stochastic co-integration, and Breitung’s (2001) test for nonparametric co-integration. In terms of time varying asset-pricing based measures of integration, we implement a new recursive methodology developed by Barari (2004). We also develop an extension of this methodology which allows us to assess the impact of selected financial, economic and political events on the process of market integration. Finally, we adjust the integration scores by levels of relative market capitalization in order to discuss the implications of the financial liberalization process for the allocation of international portfolios. What follows is a description of our dataset, followed by an outline of the methodologies employed and finally a commentary on the results obtained.

5.1 Data

Our data were obtained from Datastream International. There are several possible sources for MENA data: MSCI, IFC, and national indexes. We take the point of view of the international investor and our dataset relies on the S&P/IFCG index. However, we use national indices for Tunisia and Lebanon since these countries are not included in the S&P database. We use standardized exchange converted US dollar equity indices rather than local prices since previous studies have argued that using a common currency is preferable when it comes to cross-markets analysis (Hassan et al, 2003). In line with current literature, we use daily time series in order to capture market interactions contained in high frequency series (Voronkova, 2004). One inconvenient to this approach, however, is that lack of liquidity in emerging markets can make daily intervals more subject to stale pricing and time-varying heteroskedasticity. The period ranges from 1/1/1998 until 1/1/2005.
We investigate equity market integration with respect to the European Monetary Union (EMU), the extended Arabic region (i.e. the MENA countries plus the Gulf Countries), and the rest of the world. The regional benchmarks are also taken from the S&P IFC database. For the World markets we take the MSCI World Free Index, which also proxies for the US stock market. Finally, market capitalization indexes are obtained from the Arab Monetary Fund for individual countries and from MSCI for the regional benchmarks. By transforming the series in logarithm difference, we are able to report descriptive statistics for the MENA markets in Table 16. The average daily rate of return for all countries in the sample (0.014%) is lower than the EMU’s (0.037%) and than the regional benchmark (0.036%), but higher than that of the rest of the world (0.009%). Turning to measures of risk, the sample’s average standard deviation (1.44%) is also lower than the EMU’s (1.75%) but higher than that of the rest of the world (0.96%). The Jarque-Bera tests reject the hypothesis of normality in all markets. The world and the EMU are left-skewed. In most countries, market performance as measured by Sharpe and Jensen ratios is lower than in the EMU, but higher than in the MSCI-world index. Lebanon and Morocco are exceptions. This might be due to the fact that these two countries display negative mean returns (along with Turkey). On the other end of the spectrum, we find the highest returns in Jordan and Tunisia (0.045%). These are followed by Israel (0.035%) and Egypt (0.015%). Overall, these results suggest that the MENA stock markets are rather volatile and promise relatively high returns, which echoes usual observations concerning emerging markets (Bekaert and Harvey, 1995, 1997; Goetzamann et al., 2000).

<table>
<thead>
<tr>
<th>Country</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev.</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Jarque-Bera</th>
<th>Jensen ratios</th>
<th>Sharpe Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>0.0155</td>
<td>0</td>
<td>1.322</td>
<td>0.199</td>
<td>6.829</td>
<td>1108.43</td>
<td>-0.021</td>
<td>-0.072</td>
</tr>
<tr>
<td>Israel</td>
<td>0.0356</td>
<td>0</td>
<td>1.289</td>
<td>-0.190</td>
<td>6.159</td>
<td>757.15</td>
<td>-0.004</td>
<td>-0.069</td>
</tr>
<tr>
<td>Jordan</td>
<td>0.0456</td>
<td>0</td>
<td>0.879</td>
<td>0.532</td>
<td>17.875</td>
<td>16625.67</td>
<td>-0.015</td>
<td>-0.109</td>
</tr>
<tr>
<td>Lebanon</td>
<td>-0.0343</td>
<td>0</td>
<td>1.128</td>
<td>0.421</td>
<td>7.143</td>
<td>1336.30</td>
<td>-0.028</td>
<td>-0.162</td>
</tr>
<tr>
<td>MENA</td>
<td>0.0368</td>
<td>0.083</td>
<td>1.000</td>
<td>-0.991</td>
<td>9.858</td>
<td>3809.66</td>
<td>-0.004</td>
<td>-0.068</td>
</tr>
<tr>
<td>Morocco</td>
<td>-0.0015</td>
<td>0</td>
<td>0.678</td>
<td>0.792</td>
<td>12.463</td>
<td>6881.71</td>
<td>-0.023</td>
<td>-0.191</td>
</tr>
<tr>
<td>Tunisia</td>
<td>0.0455</td>
<td>0</td>
<td>1.080</td>
<td>-1.599</td>
<td>80.659</td>
<td>451580.70</td>
<td>-0.017</td>
<td>-0.109</td>
</tr>
<tr>
<td>Turkey</td>
<td>-0.0079</td>
<td>0</td>
<td>3.741</td>
<td>-0.009</td>
<td>8.499</td>
<td>2260.53</td>
<td>-0.01</td>
<td>-0.04</td>
</tr>
<tr>
<td>World</td>
<td>0.00</td>
<td>0.057</td>
<td>0.967</td>
<td>-0.063</td>
<td>4.631</td>
<td>200.091</td>
<td>-</td>
<td>-0.125</td>
</tr>
<tr>
<td>EMU</td>
<td>0.037</td>
<td>0.0352</td>
<td>1.757</td>
<td>-0.437</td>
<td>5.924</td>
<td>696.55</td>
<td>-0.001</td>
<td>-0.052</td>
</tr>
</tbody>
</table>

Note: Jensen and Sharpe ratios are calculated using the US T-Bill monthly rate as a proxy for the risk-free rate. The world market is the reference market for Jensen ratios.
5.2 Empirical methodology

We adopt a three step empirical methodology. We first investigate static and time-varying co-integration relationships between the MENA markets and several international benchmarks. To do so, we rely on the Johansen-Juselius (1990) framework as well as on other more recent approaches. These include the Gregory-Hansen’s (1996) test for co-integration with a structural break, the Harris, McCabe and Leybourne’s (2002) test for stochastic co-integration, and the Breitung’s (2001) test for nonparametric co-integration. Second, we investigate the time varying nature of equity market integration through a recursive and event-based analysis of a new version of the Barari (2004) and Akdogan (1995, 1997) financial integration score. Third, we adjust the latter by market capitalisation ratios. This allows us to assess the portfolio allocation implications of the global market integration process in the selected countries.

5.2.1 Johansen and Juselius (1990) co-integration methodology

The common method for assessing long-run relationships was developed by Johansen and Juselius (1990). The process involves applying the maximum likelihood procedure to determine the presence of co-integrating vectors in a set of non stationary time series. The null hypothesis is that there is no co-integration among the series. If the system of stock prices is to return to the long-run equilibrium, the movement of at least some variables must respond to the magnitude of the disequilibria (error-correction). Johansen provides an unrestricted error-correction model:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \ldots + \Gamma_{k-1} \Delta Y_{t-k+1} + \pi Y_{t-k} + \mu + \epsilon_t$$  \hspace{1cm} (1)$$

In (1), $Y_t=(p \times 1)$ is a vector of stock prices, $\pi=(p \times p)$ is a parameter matrix, and $\mu=(p \times 1)$ are intercept terms. The parameter matrix $\pi$ indicates whether the vector of stock prices ($Y_t$) has a long-run dynamic relationship or not. If the rank of $\pi$ equals the number of variables ($n$), i.e. if $\pi$ has full rank, the long-run equilibrium is given by $n$ independent equations and all the stock price series are stationary in levels. If rank of $\pi$ is zero, the stock price series ($Y_t$) are unit root processes, there is no error correction and thus no cointegration. Cointegration is suggested if the rank of $\pi$ is between zero
and the number of stock price series \( n \). For example, if the rank of \( \pi \) is equal to 1, there is a single cointegrating vector among the \( n \) series examined. Following Aggarwal, Lucey and Muckley (2004), we allow for drift in the long-term equilibrium relationships and include an intercept term in the cointegrating equations.

Advances in econometric theory have further refined the concept of co-integration, and our literature review has highlighted the need for time-varying estimates of international integration. In order to fully assess the presence of common stochastic processes in our sample, we thus complement the Johansen analysis with alternative techniques.

5.2.2 **Gregory and Hansen (1996) structural break co-integration**

Gregory and Hansen (1996) have developed single equation regression models which allow for co-integration with structural change. Assume that the observed data is \( y_t = (y_{1t}, y_{2t}) \). Under the standard model of co-integration we have:

\[
y_{1t} = \mu + \alpha^T y_{2t} + e_t,
\]

\( y_{2t} \) is I(1), \( e_t \) is I(0), and the constant parameters \( \mu \) and \( \alpha \) describe the hyper-plane towards which vector \( y_t \) tends over time. In this model \( \mu \) and \( \alpha \) are invariant and co-integration is a stable long run equilibrium. However, it might be useful to think of co-integration as holding over some period of time, and then shifting to a new relationship. This is the idea behind the Gregory-Hansen model, which allows for a structural change in the co-integration relationship. This implies changes in the intercept \( \mu \) and/or changes in the slope \( \alpha \). The structural change is modelled through the dummy variable:

\[
\theta_{it} = \begin{cases} 0, & \frac{t}{n} \leq [n\tau] \\ 1, & \frac{t}{n} > [n\tau] \end{cases}
\]

The unknown parameter \( \tau \in (0,1) \) denotes the relative timing of the change point. Structural change can take three forms. In the first case there is a level shift in the co-
integration relationship, which can be modelled as a change in the intercept $\mu$. This is referred to as the level shift model, denoted by $C$.

$$y_{1t} = \mu_1 + \mu_2 \theta_{1t} + \alpha^T y_{2t} + e_t$$  \hspace{1cm} (3)

In the equation above, $\mu_1$ represents the intercept before the shift and $\mu_2$ represents the change in the intercept at the time of the shift. Another possibility is to introduce a time trend into the level shift model. This level shift with trend model is denoted as $C/T$ and can be described as:

$$y_{1t} = \mu_1 + \mu_2 \theta_{1t} + \beta_t + \alpha^T y_{2t} + e_t$$  \hspace{1cm} (4)

Finally, it is also possible to allow the slope vector to shift as well, which allows the equilibrium relation to rotate as well as shift parallel. This regime shift model is denoted as $C/S$ and is represented as follows:

$$y_{1t} = \mu_1 + \mu_2 \theta_{1t} + \alpha_1^T y_{2t} + \alpha_2^T y_{2t} \theta_{1t} + e_t$$  \hspace{1cm} (5)

Where $\mu_1$ and $\mu_2$ are the same as in the shift model, $\alpha_1$ denotes the slope coefficient before the regime shift and $\alpha_2$ denotes the change in the slope coefficients. In the standard model of co-integration described in equation (1), the usual method for testing the null hypothesis of no co-integration is to estimate the model by ordinary least square and to apply a unit root test to the regression errors. However, the approach is rendered more complex for testing models (2) to (4) by the fact that the timing of the regime shift $\tau$ is unknown. It is thus necessary to calculate the co-integration test statistic for every possible regime shift $\tau \in T$ and to take the smallest value across all possible break points. Following Zivot and Andrews (1992), we calculate the statistic on each break point of the interval $T = ([0.15n], [0.85n])$. Finally, the computation of the test statistic can be described as follows. For each $\tau \in T$, the models (2)-(4) are estimated by OLS, yielding the residual $e_{1\tau}$. The augmented Dickey-Fuller (ADF) statistic is then obtained by regressing $\Delta e_{1\tau}$ upon $e_{t-1\tau}$ and

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\[ \Delta e_{t}, \ldots, \Delta e_{t-K} \] for chosen lag \( K \). The ADF statistic is the t-statistic for the regressor \( e_{t-1} \), which is usually denoted as \( ADF(\tau) = tstat(e_{t-1}) \).

5.2.3 Harris, McCabe and Leybourne (2002) stochastic co-integration.

A general assumption made in co-integration analysis is that series must be stable enough to be stationary when taken in first difference, i.e. to be I(1), or 'integrated at order one'. However, it has been shown that some economic time series are not compatible with this framework. In particular, higher frequency data such as daily bond and stock market prices tend to display excessive volatility and may therefore not lend themselves well to standard co-integration analysis. In an effort to overcome this bias, Harris, McCabe and Leybourne (2002), hereafter HML, have developed a co-integration test in which the stationary requirement of first difference of individual series and co-integrating error terms is replaced by a more flexible condition that these are free of I(1) stochastic trends. The rationale behind this is to allow for the presence of a non-linear form of heteroscedasticity that induces volatile behaviour within the first difference of the series. The HML process can be outlined as follows:

\[
\begin{align*}
    y_t &= \alpha + k_t + \beta x_t + u_t \\
    u_t &= e_t + q' w_t + v' w_t
\end{align*}
\]

In (1), \( y_t \) is a scalar, \( k_t \) and \( x_t \) are \( m \times 1 \) vectors, and \( w_t \) is a vector integrated process. The regression error term \( u_t \) is composed of a stationary term \( e_t \), an integrated term \( q' w_t \), and a nonlinear component \( v' w_t \) that is heteroscedastic through its dependence on the \( I(1) \) process \( w_t \). Within this framework, the null hypothesis of stochastic co-integration against the alternative of no co-integration can be expressed as \( H_0 : q = 0 \) and \( H_1 : q \neq 0 \). To derive the test statistics, HML adopt a semi parametric approach which does not rely on distributional assumption. They use an asymptotic instrumental variable estimator (AIV) developed in Harris, McCabe and Leybourne (2002). The test statistic for the null hypothesis of stochastic co-integration is given by:
In (2), the lag \( k \) is allowed to increase with \( T \). Under the co-integration null hypothesis the test statistic is asymptotically \( N(0,1) \). HML derive the asymptotic distribution of the statistic by using the following standardization:

\[
S_{nc} = \frac{T^{-\frac{1}{2}} \sum_{t=k+1}^{T} \hat{\mu}_t \hat{\mu}_{t-k}}{\hat{\omega}(\hat{\mu} \hat{\mu}_{t-k})}
\]  

\( \hat{\omega} \) is an estimator of the long run variance.

5.2.4 Breitung’s (2002) nonparametric co-integration

Traditional estimators for unit root and co-integration processes require the specification of short-run dynamics or the estimation of nuisance parameters. Breitung (2002) suggested the following nonparametric procedure. Let \( y(t), t = 1, ..., n \), be a 2-dimensional unit root process, such that:

\[
y(t) = y(t - 1) + m + u(t)
\]  

(1)

In (1), \( u(t) \) is a zero-mean stationary 2-dimensional time series process, and \( m \) is a 2-dimensional vector of drift parameters. If \( m = 0 \) (no drift), let \( z(t) \) be the demeaned vector time series \( y(t) \), otherwise let \( z(t) \) be the detrended vector time series \( y(t) \). The model computes the following partial sums:

\[
Z(t) = z(1) + z(2) + ... + z(t)
\]  

(2)

and the matrices:

\[
A = Z(1)Z(1)' + Z(2)Z(2)' + ... + Z(n)Z(n)'
\]  

(3)
\[ B = z(1)z(1)' + z(2)z(2)' + \ldots + z(n)z(n)' \]  (4)

Let \( c(1) \) and \( c(2) \) be the increasingly ordered generalized eigenvalues of \( A \) with respect to \( B \). If \( y(t) \) is cointegrated with cointegration rank \( r \) then \([n2 \times (c(1) + \ldots + c(2-r))]\) converges in distribution to a function of a standard Wiener process, which is free of nuisance parameters, whereas for \( k > 2 - r \), \([(n^2) \times c(k)]\) converges to infinity.

Therefore, the Breitung test is conducted right-sided, starting with the null hypothesis \( r = 0 \). The cointegration rank \( r \) corresponds to the first accepted null hypothesis. If none is accepted the cointegration rank is \( r = 2 \), which implies that \( y(t) \) is (trend) stationary.

5.2.5 Recursive and moving average integration scores

To measure the time-varying evolution of stock market linkages, our methodology is based on a computation of the individual countries' contribution to global and regional systematic. Following Akdogan (1997) and Barari (2004), we consider the following international risk decomposition model:

\[ R_i = \alpha + bR_g + \varepsilon_i \]  (1)

Where \( R_i \) is the rate of return on the \( i^{th} \) country, \( R_g \) is the global rate of return, \( b \) is the beta of the \( i^{th} \) country with respect to the global index, and \( \varepsilon_i \) is the error term. The variance of the \( i^{th} \) country’s portfolio can then be broken down into:

\[ \text{Var}(R_i) = \beta^2 \text{Var}(R_g) + \text{Var}(\varepsilon_i) \]  (2)

\[ \frac{\text{Var}R_i}{\text{Var}R_g} = \frac{\beta^2 \text{Var}R_g + \text{Var}\varepsilon_i}{\text{Var}R_i} \]  (3)

\[ 1 = p_i + q_i \]  (4)
In equation (4), \( p_i \) measures the country's contribution to worldwide systemic risk and is the proposed measure of market integration. For the purpose of our study, we extend this methodology to the following multivariate framework:

\[
R_i = \alpha + \beta_1 U_1 + \beta_2 U_2 + \beta_g R_g + \epsilon_i \tag{5}
\]

\( U_1 \) and \( U_2 \) are residuals from regressions (6a) and (6b) and represent the proportion of the variance in regional returns factors \( R_{MENA} \) and \( R_{EMU} \) that cannot be explained by global influences \( R_g \). These residuals represent idiosyncratic regional shocks, and are thus assumed to be uncorrelated to \( R_g \) and to each other.

\[
R_{MENA} = \alpha + \beta R_g + U_1 \tag{6a}
\]

\[
R_{EMU} = \alpha + \beta R_g + U_2 \tag{6b}
\]

The variance of \( R_i \) can be then broken down as:

\[
VarR_i = \beta_1^2 VarU_1 + \beta_2^2 Var(U_2) + \beta_g^2 VarR_g \tag{7a}
\]

\[
\frac{VarR_i}{VarR_i} = \beta_1^2 \frac{VarU_1}{VarR_i} + \beta_2^2 \frac{VarU_2}{VarR_i} + \beta_g^2 \frac{VarR_g}{VarR_i} \tag{7b}
\]

\[
1 = a + b + c + d \tag{8}
\]

In (8), \( a, b \) and \( c \) measure integration with the EMU, the MENA and the world, respectively, while \( d \) represents unsystematic risk. In order to observe the dynamic of equity market integration, we compute each of these integration scores over incremental time windows, adding 80 observations per iteration until the end of the sample is reached. We also analyze the impact of financial events, trade liberalization, infrastructure privatisation and political shocks with a simple moving average methodology. Using each considered event as a breaking point, we divide the dataset into two sub-periods and observe the sign indicating the difference between the post
and pre event integration scores. A positive sign suggests integration, a negative sign suggests segmentation. Selected events are described in table 17.

The financial events taken into account are the Turkish crisis and the implementation of the EMU. 1/1/1999 corresponds to the birth of the Euro. 11/21/2000, the selected date for the Turkish financial crisis, corresponds to a dramatic increase of the O/N interest rates, which resulted in a liquidity crisis in the Turkish banking system. Turning to trade liberalization, we adopt a 'de facto' approach, using the dates of implementation of the trade agreement as breaking points.

Table 17 Moving Average Analysis: Selected Events

<table>
<thead>
<tr>
<th>Financial Events</th>
<th>Trade Liberalization</th>
<th>Infrastructure Privatization</th>
<th>Political Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/1/2003</td>
<td>12/16/2001 Egypt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/16/2003 Agadir Agreements</td>
<td>12/24/2002 Tunisia</td>
<td>3/1/2003 Israel</td>
<td></td>
</tr>
</tbody>
</table>

For all countries, we consider the dates where the Euro-Mediterranean Association Agreements entered into force, except for Tunisia, where this happened at the very beginning of the sample (1/3/1998, i.e 60 observations), and Turkey, where the agreement dates back to 1963. Considering that the Agadir Agreements, which created a free trade area between Egypt, Tunisia, Jordan and Morocco, only entered into force in January 2006, we adopt a 'de jure' approach based on a positive reaction from the European Commission one week after these agreements were initialled. This is done in order to better capture market anticipation.

In terms of infrastructure privatization announcements, the selected dates coincide with those published in the World Bank-European Commission 'Private Participation on Mediterranean Infrastructure' review. The selected dates vary from country to country. For Morocco, it corresponds to the renewal of a privatisation program which was launched in 1993 and comprised most infrastructures sectors, excluding electricity. For Lebanon, the chosen date corresponds to the adoption of the May 2000 Privatisation Law, which established a Higher Privatization Council and established the framework for the privatisation of state-owned enterprises. For Turkey, it corresponds to the adoption of a strategic law for the privatisations of the telecom,
airline and electricity sectors. For Jordan, it corresponds to the adoption of the 'economic priority program' which extended previous privatisation to the water and energy sectors. For Egypt, the date corresponds to the adoption of the 'new privatisation strategy', which officially aimed at attracting domestic and foreign funds for investment. For Tunisia, it corresponds to a series of 26 privatisations, mainly in the construction sector. For Israel, it corresponds to the privatisation of the national airline El Al. Finally, political events taken into account include the beginning of the second Intifada in September 2000, the 2001 World Trade Centre Attacks and the invasion of Iraq in March 2003.

5.2.6 Market capitalization-adjusted scores

Weak integration does not necessarily imply the existence of diversification opportunities if the markets are thinly traded. Following Akdogan (1995, 1997), we therefore adjust each score according to the corresponding measure of country contribution to capitalization in the benchmark area. The lower the contribution to systemic risk relative to compared market capitalisation, the higher the diversification benefits. The three adjusted financial integration indicators below are therefore negatively proportional to diversification benefits:

\[
adj_a = \frac{\beta_1 VarU_1}{\text{Var}R_i} \left/ \frac{W_{i,EMU}}{W_{EMU,MC}} \right. = \frac{MC_i}{MC_{EMU}}
\]

\[
adj_b = \frac{\beta_2 VarU_2}{\text{Var}R_i} \left/ \frac{W_{i,MENA}}{W_{MENA,MC}} \right. = \frac{MC_i}{MC_{MENA}}
\]

\[
adj_c = \frac{\beta_3 VarR_3}{\text{Var}R_i} \left/ \frac{W_{i,US}}{W_{US,MC}} \right. = \frac{MC_i}{MC_{US}}
\]

5.3 Results and analysis

After the usual unit root analysis, where all series were characterized as I(1) processes, we proceed to our co-integration tests. The null hypothesis of co-integration with the EMU, the World markets and the local regional benchmark is significantly rejected for all countries. Since it provides no evidence of a stable, long run relationship between the MENA stock markets and the various international
benchmarks, this result clearly indicates that the studied markets display some potential for international diversification.

Table 18 Cointegration analysis results

<table>
<thead>
<tr>
<th>Country</th>
<th>Benchmark</th>
<th>Johansen</th>
<th>Gregory-Hansen</th>
<th>Stochastic HML</th>
<th>Breitung NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>MENA</td>
<td>11.32**</td>
<td>-3.50**</td>
<td>6.37**</td>
<td>78.46**</td>
</tr>
<tr>
<td></td>
<td>EMU</td>
<td>10.16**</td>
<td>-2.84**</td>
<td>5.54**</td>
<td>78.09**</td>
</tr>
<tr>
<td></td>
<td>WORLD</td>
<td>12.89**</td>
<td>-3.48**</td>
<td>5.97**</td>
<td>80.93**</td>
</tr>
<tr>
<td>Israel</td>
<td>MENA</td>
<td>5.51**</td>
<td>-2.84**</td>
<td>4.19**</td>
<td>114.67**</td>
</tr>
<tr>
<td></td>
<td>EMU</td>
<td>7.72**</td>
<td>-3.76**</td>
<td>5.34**</td>
<td>109.83**</td>
</tr>
<tr>
<td></td>
<td>WORLD</td>
<td>5.31**</td>
<td>-2.84**</td>
<td>5.35**</td>
<td>119.55**</td>
</tr>
<tr>
<td>Jordan</td>
<td>MENA</td>
<td>11.97**</td>
<td>-3.25**</td>
<td>5.64**</td>
<td>170.33**</td>
</tr>
<tr>
<td></td>
<td>EMU</td>
<td>11.80**</td>
<td>-3.58**</td>
<td>5.28**</td>
<td>190.92**</td>
</tr>
<tr>
<td></td>
<td>WORLD</td>
<td>8.22**</td>
<td>-3.77**</td>
<td>4.62**</td>
<td>101.83**</td>
</tr>
<tr>
<td>Morocco</td>
<td>MENA</td>
<td>9.26**</td>
<td>-4.01**</td>
<td>5.79**</td>
<td>78.79**</td>
</tr>
<tr>
<td></td>
<td>EMU</td>
<td>12.20**</td>
<td>-4.11**</td>
<td>5.64**</td>
<td>78.53**</td>
</tr>
<tr>
<td></td>
<td>WORLD</td>
<td>11.68**</td>
<td>-4.00**</td>
<td>4.67**</td>
<td>85.69**</td>
</tr>
<tr>
<td>Tunisia</td>
<td>MENA</td>
<td>3.96**</td>
<td>-2.95**</td>
<td>5.27**</td>
<td>67.91**</td>
</tr>
<tr>
<td></td>
<td>EMU</td>
<td>3.75**</td>
<td>-3.05**</td>
<td>5.45**</td>
<td>75.02**</td>
</tr>
<tr>
<td></td>
<td>WORLD</td>
<td>10.21**</td>
<td>-4.81**</td>
<td>5.45**</td>
<td>90.04**</td>
</tr>
<tr>
<td>Lebanon</td>
<td>MENA</td>
<td>4.53**</td>
<td>-3.87**</td>
<td>5.19**</td>
<td>73.33**</td>
</tr>
<tr>
<td></td>
<td>EMU</td>
<td>6.14**</td>
<td>-3.53**</td>
<td>5.23**</td>
<td>73.84**</td>
</tr>
<tr>
<td></td>
<td>WORLD</td>
<td>7.69**</td>
<td>-3.97**</td>
<td>4.13**</td>
<td>87.47**</td>
</tr>
<tr>
<td>Turkey</td>
<td>MENA</td>
<td>5.39**</td>
<td>-4.04*</td>
<td>4.80*</td>
<td>127.43**</td>
</tr>
<tr>
<td></td>
<td>EMU</td>
<td>7.97**</td>
<td>-4.58*</td>
<td>5.59*</td>
<td>122.13**</td>
</tr>
<tr>
<td></td>
<td>WORLD</td>
<td>15.79*</td>
<td>-4.72*</td>
<td>5.13*</td>
<td>199.48**</td>
</tr>
</tbody>
</table>

Note: The above table is a summary of our results from the co-integration analysis. The first column reports trace statistics from the Johansen-Juselius tests. The second column reports the highest values for each of the three Gregory Hansen models. The third column reports the Sn values of the stochastic co-integration test. The last column reports values for the non parametric Breitung tests. In each column, (**) and (*) indicate rejection of the hypothesis of co-integration at the 5% and 1% levels, respectively.

Before proceeding to the recursive analysis, information on the estimation of models 5, 6a and 6b for the whole sample is presented in table 19. Results show that these enriched international capital asset pricing models fail to capture a significant proportion of the MENA’s market variance, as shown by the extremely low r squares.
This is in line with the co-integration analysis, and highlights strong market segmentation in the MENA region. Only idiosyncratic shocks to the regional benchmark seem to affect Egypt (at the 5% level) and Morocco (at the 10% level). This also suggests that results from the recursive Akdogan analysis should be interpreted with caution. These will nonetheless shed light on the time-varying dynamic of these insignificant international linkages, and will help to differentiate between the MENA countries.

Table 19 Models 5, 6a and 6b

<table>
<thead>
<tr>
<th></th>
<th>Constant</th>
<th>U1</th>
<th>U2</th>
<th>World</th>
<th>R square</th>
<th>N.obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>0,000</td>
<td>0,053</td>
<td></td>
<td>0,017</td>
<td>-0,003</td>
<td>0,004</td>
</tr>
<tr>
<td></td>
<td>(-0,443)</td>
<td>(0,047)**</td>
<td>(0,252)</td>
<td>(0,907)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Israel</td>
<td>0,000</td>
<td>0,040</td>
<td></td>
<td>0,019</td>
<td>0,018</td>
<td>0,003</td>
</tr>
<tr>
<td></td>
<td>(0,365)</td>
<td>(0,164)</td>
<td>(0,241)</td>
<td>(0,473)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jordan</td>
<td>0,000</td>
<td>0,001</td>
<td></td>
<td>0,001</td>
<td>-0,020</td>
<td>0,001</td>
</tr>
<tr>
<td></td>
<td>(0,002)**</td>
<td>(0,954)</td>
<td>(0,928)</td>
<td>(0,181)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morocco</td>
<td>0,000</td>
<td>0,026</td>
<td></td>
<td>0,011</td>
<td>0,008</td>
<td>0,002</td>
</tr>
<tr>
<td></td>
<td>(0,914)</td>
<td>(0,079)*</td>
<td>(0,177)</td>
<td>(0,548)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lebanon</td>
<td>0,000</td>
<td>0,038</td>
<td></td>
<td>0,024</td>
<td>0,001</td>
<td>0,002</td>
</tr>
<tr>
<td></td>
<td>(0,155)</td>
<td>(0,159)</td>
<td>(0,123)</td>
<td>(0,975)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tunisia</td>
<td>0,000</td>
<td>0,017</td>
<td></td>
<td>0,001</td>
<td>0,020</td>
<td>0,001</td>
</tr>
<tr>
<td></td>
<td>(0,034)**</td>
<td>(0,459)</td>
<td>(0,954)</td>
<td>(0,320)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>0,000</td>
<td>0,060</td>
<td></td>
<td>0,058</td>
<td>-0,020</td>
<td>0,002</td>
</tr>
<tr>
<td></td>
<td>(0,899)</td>
<td>(0,408)</td>
<td>(0,160)</td>
<td>(0,764)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MENA</td>
<td>0,000</td>
<td></td>
<td></td>
<td></td>
<td>0,418</td>
<td>0,163</td>
</tr>
<tr>
<td></td>
<td>(0,131)</td>
<td></td>
<td></td>
<td>(0,000)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMU</td>
<td>0,000</td>
<td></td>
<td></td>
<td></td>
<td>0,698</td>
<td>0,148</td>
</tr>
<tr>
<td></td>
<td>(0,429)</td>
<td></td>
<td></td>
<td>(0,000)**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: In each case, the first row shows the regression coefficient and the second row shows the associated p-value. * and ** indicate significance at the 10% and 5% level, respectively.

The recursive analysis (figures 19 to 22) reveals that segmentation from the MENA benchmark seems to increase for most countries (Egypt, Jordan, Morocco, Tunisia and Lebanon). However, the process of segmentation vis à vis the EMU has been stabilised in Jordan (since 2000) as well as in Turkey and Tunisia (since 2001). Furthermore, a moderate financial integration process with the EMU seems to have begun for Israel and Lebanon (since 2001), Egypt (since 2002), and Morocco (since 2003). Finally, with the exception of Jordan and Tunisia, our plots display increasing integration into the world for most countries: Morocco, Lebanon and Turkey (since 1999), and Egypt (since 2001).
Figure 19 Akdogan integration score, Egypt and Israel

---

Egypt

- EMU
- MENA
- WORLD

---

Israel

- EMU
- MENA
- WORLD

---

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Figure 20 Akdogan integration score, Jordan and Morocco
Figure 21 Akdogan integration score, Tunisia and Lebanon

Tunisia

Lebanon
In comparison with previous studies investigating equity market integration in Asia, these findings echo the view that financial integration is primarily a global phenomenon (Chuah, 2004). Regional financial integration processes, such as those occurring between Eastern Europe and the EMU (Voronkova, 2004) remain possible, but are conditioned by the insertion of the integration agenda into a wider political project (Eichengreen and Pempel, 2002).

The next step of the analysis is to shed light on the impact of selected financial, economic and political events on these weak international linkages. Results are shown in table 20. The overall difference between post-EMU and pre-EMU integration MENA scores appears to be negative over the study period. This has significant implications.

The implementation of the Euro in January 1999 led to the consolidation of the European securities markets in financial centres EuroNext, Frankfurt and London, resulting in significant intra-European financial integration. In a context of aging demography and savings surpluses in the European Union, this mutation was an opportunity for the structurally debtor MENA countries to attract portfolio flows in need for diversification (CEFI, 1998). Such a process would have helped to reposition these economies favourably in the global savings recycling system. Our results suggest that this mechanism did not occur.
The 2000-2001 Turkish crisis represents another major financial event. Starting with a liquidity crisis in the banking system in November 2000, this crisis not only destabilized the Istanbul Stock Exchange from February 2001 on, but also aggravated the international perception of systemic risk which led to negative anticipation and trends in the global markets (Akyüz and Boratav, 2002). Our results suggest that this crisis reinforced both intra-regional and global linkages within the MENA capital markets. Taken together with the definition of financial contagion as an increase in shock sensibility in the aftermath of a foreign financial crisis (Forbes and Rigobon, 2001), the latter result could constitute preliminary evidence of crisis vulnerability in the MENA region. This would be consistent with recent occurrences in emerging markets of Latin America, East Asia and Eastern Europe (Corsetti et al, 2005).

Turning to the impact of regional economic integration, both the establishment of trade liberalization agreements and the implementation of infrastructure privatization programs seem to have reinforced financial integration into the global market, but not with the EMU nor with the MENA benchmark. This echoes recent work on Asian equity markets suggesting that financial integration can be affected by domestic policies and trade initiatives, but remains global in nature (Chuah, 2004; Vin Voh, 2005). This is also in line with previous research in political economy, suggesting that trade liberalization initiatives do not necessarily result in greater regional financial integration, unless some degree of political and institutional convergence has been reached (Park, 2002).

Finally, the successive increases of political risk in the region seem to have had a contrasting impact, as they appear to have led to integration into the world and the regional markets, but to segmentation from the EMU. These results highlight the co-existence of multiple perceptions of political risk among different categories of investors. Overall, the moving average analysis suggests that the MENA markets display sensitivity to financial, economic and political events. However, this sensitivity seems to take varying forms. Investors should therefore avoid treating these markets homogeneously for global allocation purposes.
Table 20 Moving Average Analysis

<table>
<thead>
<tr>
<th>Event</th>
<th>Egypt</th>
<th>Israel</th>
<th>Jordan</th>
<th>Morocco</th>
<th>Tunisia</th>
<th>Lebanon</th>
<th>Turkey</th>
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<th>Negative</th>
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</table>

Note: The first column reports the events and the regional benchmark under analysis. In columns 2 to 8, for each country we report the difference between post event and pre event integration scores. Then, for each event and benchmark, columns 9 and 10 give the overall number of positive – i.e integration – and negative – i.e segmentation – results.

In order to further assess each country’s diversification potential, we observe the adjusted integration scores from the point of view of EMU, World and MENA investors (table 21 to 23). This permits us to rank the MENA countries with respect to their expected diversification potential. We find that countries are ranked in a very similar way for all three categories of investors. The leading group of countries is formed by Israel and Turkey. A second group is composed of Egypt, Morocco and Jordan. Finally, the third and least advantageous group is includes Tunisia and...
Lebanon. Portfolio choice differences among investors are only minor. Turkey seems preferable to Israel for MENA investors and Tunisia to Lebanon for EMU investors.

Table 21 Integration with the EMU

<table>
<thead>
<tr>
<th>Date</th>
<th>Egypt</th>
<th>Israel</th>
<th>Jordan</th>
<th>Morocco</th>
<th>Tunisia</th>
<th>Lebanon</th>
<th>Turkey</th>
</tr>
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<td>3,713</td>
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Mean    1,542 1,266 2,639 1,683 1,289 1,246 1,827

Wi      0,006 0,013 0,002 0,003 0,001 0,001 0,014

Adjusted 244,354 100,023 1,646,967 564,715 2190,690 2394,558 126,338

(3) (1) (5) (4) (6) (7) (2)

Note: Wi corresponds to each country's market capitalization relative to the benchmark area's. In the last row, numbers in brackets denote country rank.
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<td>0.357</td>
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<td>1.633</td>
<td>0.198</td>
<td>0.261</td>
</tr>
<tr>
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<td>0.772</td>
<td>0.580</td>
<td>1.956</td>
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<td>1.120</td>
<td>2.486</td>
<td>0.465</td>
<td>0.284</td>
</tr>
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</table>

| Mean         | 0.755 | 1.496  | 1.263  | 1.019   | 2.088   | 0.957   | 0.390  |
| W            | 0.167 | 0.397  | 0.051  | 0.095   | 0.019   | 0.016   | 0.438  |
| Adjusted     | 4,514 | 3,763  | 24,801 | 10,716  | 112,447 | 59,810  | 0,891  |

Note: Wi corresponds to each country’s market capitalization relative to the benchmark area’s. In the last row, numbers in brackets denote country rank.
Table 22 Integration with the World

<table>
<thead>
<tr>
<th>Date</th>
<th>Egypt</th>
<th>Israel</th>
<th>Jordan</th>
<th>Morocco</th>
<th>Tunisia</th>
<th>Lebanon</th>
<th>Turkey</th>
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<td>1/1/2005</td>
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<td>2,048</td>
<td>0,900</td>
<td>1,257</td>
<td>3,180</td>
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</table>

Mean: 1,210 1,702 1,294 1,671 2,079 0,706 2,636

W: 0.002 0.004 0.000 0.001 0.000 0.000 0.004

Adjusted: 641,830 450,271 2716,274 1885,465 11909,526 4653,529 613,111

Note: Wi corresponds to each country's market capitalization relative to the benchmark area's. In the last row, numbers in brackets denote country rank.
5.4 Conclusion

The objective of this chapter was to investigate the extent of international equity market integration in the MENA region. Using four co-integration methodologies, we significantly rejected the hypothesis of a stable, long run bivariate relationship between each of these markets and the European Monetary Union, the USA, and a regional benchmark. This result indicated a strong segmentation from global markets, consistently with the low levels of capital flows to the MENA region outlined in the introductory chapter. A time-varying analysis based on Barari (2004) provided further evidence of market segmentation, and suggested that the MENA markets display heterogeneous reactions to external shocks.

Finally, adjusting integration scores by market capitalization suggested that Israel and Turkey are the most attractive markets for diversification and are followed by Egypt, Jordan, Morocco, Tunisia and Lebanon. However, investors should interpret these results with caution: conclusions from Akdogan's market capitalization-adjusted integration measures may indeed be mitigated by the likelihood that the cross-country variations in adjusted market integration measures are highly correlated with differences in market size. Moreover, another area of concern with this international integration measure is the low performance of the underlying asset pricing models. Nevertheless, significant evidence in favour of market segmentation in the MENA region may imply portfolio diversification opportunities for international investors, and may ultimately result in greater capital inflows. Taking this into account, the next chapter will investigate the performance of a MENA inclusive equity portfolio.
6. International portfolio diversification: Is there a role for the MENA region?

The coexistence of successful financial reforms and strong financial segmentation might constitute an opportunity for the MENA markets to attract further portfolio equity flows. The purpose of this chapter is thus to investigate the composition and performance of a MENA-inclusive portfolio diversification strategy from an international investor’s point of view. It is structured as follows. The first section presents our data. The second section outlines the methodology employed. The third section discusses our results and the fourth section draws together our conclusions.

6.1 Data

We select stock price indices for the MENA countries and a world benchmark on a weekly basis over the 1998-2006 periods. Data have been provided by the S&P/IFC database. The use of weekly data is generally recommended for portfolio simulations in thinly traded markets as it minimizes the impact of thin trading on the value of securities. We make the assumption that an investor cannot partake in short selling; a reasonable hypothesis given the low level of development of derivative markets in our sample (Li, Sarkar and Wang, 1999). The financial and economic impact of the currency denomination of international portfolios is ambiguous. On the one hand, a portfolio of foreign securities can be exposed to unexpected exchange rate variations as foreign assets are denominated in foreign currency terms (Bartram & Gunfey, 2001). But on the other hand, investing in securities denominated in different currencies with offsetting correlations can also lower currency risk and ultimately contribute to the reduction of overall portfolio risk (Odier & Solnik, 1993). Economically, investment contracts in local currencies are also preferable for recipient countries as they transfer the currency risk to the investor and thus provide local businesses with safer access to foreign capital (IFC, 2004). To allow for comparison, all of the data is analyzed first on the basis of local returns. We then carry out the same analysis after having converted these series to US dollars at the appropriate spot exchange rate as calculated by Datastream International.
6.2 Methodology

Our methodology can be characterized as follows. We use a set of models derived from mean-variance literature. Given the non-normality of our time-series (see previous chapter), we use the lower partial moment as a complementary measure of risk. We deal with issues related to historical data by implementing a block-bootstrap approach to weights optimization. Finally, the ex-post analysis is based on a comparison of portfolio performance based on Sharpe ratios and Sortino ratios through the Jobson-Korkie pair-wise tests for the equality of performance ratios.

6.2.1 Mean-variance optimization

The selected utility functions stem directly from the widely used Markowitz (1959) optimization models. The first model that we use relies on the standard certainty equivalence tangency portfolio (CETP), or *Classical Sharpe* portfolio as presented in Eun and Resnick (1994). The necessary inputs are ex post mean returns, standard deviations and co-variances using ex post data on expected means, variances, and co-variances. The process involves computing the weights of the *ex-post* tangency portfolio and using them as the *ex-ante* portfolio weights, identified by the following maximisation problem:

\[
\text{Max } \theta = \frac{r_p - r_f}{\sigma_p} = \frac{\sum_{i=1}^{N} x_i (R_i - R_f)}{\left( \sum_{i=1}^{N} \sum_{j=1}^{N} x_i x_j \sigma_{ij} \right)^{1/2}}
\]

subject to \( \sum_{i=1}^{N} x_i = 1; x_i \geq 0. \)

Where \( x_i \) is the fraction of wealth invested in asset \( i \); \( R_i \) is the expected return on asset \( i \), \( R_f \) is the risk-free rate, \( \sigma_{ij} \) is the covariance of returns between assets \( i \) and \( j \), and \( \sigma_p \) is the standard deviation of returns on the portfolio. The composition of the
tangency portfolio is therefore independent on the investors' preference structure. The weights in this portfolio offer the highest *ex-post* mean return per unit risk. Note also that $\theta$, in the above formulation is, in fact, the *ex-post* Sharpe Ratio performance measure. Consequently it is the portfolio that is most desirable to *all* investors. Following Stevenson (2000), we assume that the risk-free rate of return is equal to zero in conducting the analysis.

The tangency portfolio has the best risk-to-return trade-off of any portfolio based on the assumption that a portfolio's expected returns are best forecast as the average of its historical returns. However, this does not hold if the empirical distribution of returns is non-normal. Bawa, Brown and Klein (1975) indeed acknowledged that the procedure of substituting ex-post parameters from a prior estimation period for their ex-ante counterparts ignores the uncertainty that arises from using such estimates. In order to diminish the result's sensitivity to estimation error, we also compute the Bayes Stein (BS) estimator as a correction for the non-normality in historical returns (Gilmore, 2005; Stevenson, 2000). The use of Bayes-Stein estimators is designed to reduce the degree of estimation error. It also decreases the tendency for asset allocation studies to arrive at corner solutions (Stevenson, 2000). This methodology was developed by Jorion (1985), who argued that estimation risk due to uncertain mean returns has a considerable impact on optimal portfolio selection, although co-variances are found to be relatively stable. Jorion (1986) showed that the class of shrinkage estimators as proposed by Stein (1955) handles this parameter uncertainty in portfolio analysis appropriately. He used the Bayes-Stein framework to formalise the investor's expected utility maximisation problem. This estimator takes into account the tendency of asset mean returns to revert towards a common value, proxied as the world mean. By shrinking historical asset means towards a global mean, it reduces the difference between extreme observations, and increases the out of sample performance of the tangency portfolio. Jorion (1985,1986) showed that, with parameter uncertainty, the optimal portfolio choice should be based on the predictive density function, which, under a particular informative prior for the vector of expected returns, is multivariate normal with a mean given by:

$$E(r_i) = w r_g + (1 - w) \bar{r}_i$$  \hspace{1cm} (2)
In (2), $E(r_i)$ is the adjusted asset mean, $\bar{r}_i$ is the original asset mean, $r_g$ is the global mean, and $w$ is the shrinkage factor. Jorion (1985, 1986) estimates the shrinkage factor from a suitable prior:

$$w = \frac{\lambda}{T + \lambda} \quad (3)$$

$$\lambda = \frac{(N + 2)(T - 1)}{(r_i - r_g)S^{-1}(r - r_g)1(T - N - 2)} \quad (4)$$

In (3) and (4), $T$ is the sample size, $N$ is the number of markets, $S$ is the sample covariance matrix, $1$ is a vector of ones, and $\bar{r}$ is a vector of the means. In our calculations we use the MSCI global index as a proxy for the global mean.

Another way to diminish estimation risk is to implement the Minimum Variance Portfolio (MVP) approach, which minimizes portfolio variance on the efficient frontier. It has the advantage of depending only on the variance-covariance matrix. It does not include returns and is therefore less sensitive to estimation error. Previous work has underlined that such a portfolio is qualitatively more stable in its risk characteristics than other portfolios and is therefore more likely to perform better in the ex-post analysis (Pagliari et al., 1995; Stevenson, 1999). The performance of the MVP was also underlined in Jorion (1985) and Madura and Abernathy (1985).

Given $N$ risky assets, the minimum-variance portfolio is the portfolio of risky assets that minimizes risk as measured by the variance of the portfolio return. This portfolio can be computed as the solution to the following optimization problem (De Miguel and Nogales, 2006):

$$\arg\min_{\{x_i\}} x_i^T \omega x_i$$

Subject to $\sum_{i=1}^{N} x_i = 1; x_i \geq 0$. \hfill (5)
In (5), $x_i$ is a vector of weights, and the constraint $\sum_{i=1}^{N} x_i = 1; x_i \geq 0$ ensures that the portfolio weights sum to one in the absence of short selling. $x_i^T \omega x_i$ represents the variance of portfolio returns. $\omega$ is the sample covariance matrix of asset returns and can be calculated as $\omega = \frac{1}{T} \sum_{i=1}^{T} (r_i - \bar{r}) (r_i - \bar{r})^T$; where $T$ is the sample size and $\bar{r}$ is the sample mean of asset returns such as $\bar{r} = \frac{1}{T} \sum_{i=1}^{T} r_i$.

Finally, for comparison purposes, we include two intuitive models in the analysis. The first is the naïve portfolio, in which allocations are given equal weights, i.e. $r_i = 1/T; \forall i$. This model assumes that past performance is irrelevant and does not contain any useful information about future performance. It is expected to perform well in an ex-ante framework as it restraints the impact instability on the input parameters (Frost & Savarino 1988). The second model is the home, undiversified portfolio, in which 100% weights are allocated to the home market.

6.2.2. The lower partial moment

Another issue to be considered in portfolio optimization is the definition of the adequate measure of risk. Skewness in returns series undermines the robustness of standard deviation as an appropriate measure of risk. Stevenson (2000) compared results of both variance and downside risk measures to construct optimal international portfolios involving developed countries and emerging markets in Latin America and Asia. In all cases the use of a downside risk measure produced superior out-of-sample results. Not surprisingly, in practice investors prefer to base their optimization decisions on downside risk measures, such as the Lower Partial Moment (hereafter LPM), developed by Bawa (1975) and Fishburn (1977), and the semivariance, which is a special case of the LPM. Both of these measures compute risk using only returns below the mean returns or, alternatively, below a target return. In the presence of negative skewness in a returns series the downside returns will occur in larger magnitudes than the upside returns; the opposite is true in the presence of positive skewness. The popularity of these risk measures is explained by Nawrocki (1999) who points out that investors are interested in minimizing downside risk, since that is what is relevant to them. Further justification is given in Harvey (2000) and Estrada
(2000, 2002) who support the idea that downside risk measures matter for studying emerging market equity indices. We calculate the LPM as:

\[
LPM(a, t) = \frac{1}{K} \sum_{t=1}^{K} \max\{0, t - R_t\}^a
\]

In (6), \(a\) is the investor's risk tolerance value and degree of the lower partial moment, \(t\) is the target return, \(K\) is the number of observations, \(R_t\) is the stock return during period \(t\). In the LPM framework, the market portfolio is considered to have risk only if the return on the market has some chance of falling below the pre-specified target rate. Bawa (1975) has hence argued that Mean-Lower Partial Moment model, based on downside risk measures, is more general than the traditional Mean-Variance model, which requires restriction on utility functions or the return distribution.

Also, the LPM is a versatile risk measure in that it accommodates a range of investor behavior, from risk seeking to risk aversion. A value of \(a = 0\) indicates that the investor is risk loving. At a value of \(a = 1\) the investor is risk neutral. When the value of \(a\) is set at 2, which is appropriate for a risk-averse investor (see Hwang and Pederson, 2004), the LPM is equivalent to the special case of the semi-variance. The objective of this chapter is to investigate whether investing in the MENA emerging markets might be beneficial for diversification. Following Gilmore et.al (2005), we therefore take the standpoint of the risk-averse investor by letting \(a = 2\) and the target return equal zero.

6.2.3 Non parametric block-bootstrap

The extreme sensitivity of portfolio weights to changes in the means is a traditional hurdle to mean-variance analysis: since the true parameters of return time-series are unknowable, the estimation of parameters from historic data introduces severe estimation error in the optimization procedure (Best and Grauer, 1991). By contrast, recent empirical studies have shown that the estimator of the optimal portfolio obtained through the bootstrap procedure tends to outperform other traditional estimators (Kan and Zhou, 2005; Harvey et.al, 2006). The main advantage of bootstrapping portfolio allocations lies in the analysis of estimation risk via the construction of confidence intervals for the asset weights. In this study, optimal
portfolio weights are derived from a non-parametric moving block bootstrap as introduced by Carlstein (1986). The advantage of block-bootstrapping is that serial dependence, as well as cross-sectional correlation, is preserved within the blocks. Recent studies relying on this methodology have underlined that the block length does not appear critical in designing the optimal portfolio weights (Ehling and Ramos, 2005). In our study, each block represents a quarterly period, which is enough to capture the stochastic interactions between markets while also generating a sufficient set of data points.

Our process can be described as follows. The existing sample of asset returns is grouped into \( k \) overlapping blocks of 4 months. The blocks are then re-sampled with replacement \( b \) times until a series \( R^* \) with the same length as \( R \) is obtained, which is equivalent to constructing a trajectory for stocks and bills for each drawing or \( R^* \) (Persson, 2000). From each re-sampled \( R^* \) a variance-covariance matrix, \( \omega^* \), and an expected return vector, \( \mu^* \), are calculated for each investment horizon from non-overlapping holding period returns. \( \omega^* \) and \( \mu^* \) are then used as inputs to the mean-variance optimization in equation (1) to (6), until the optimal portfolio weights, \( w_i^* \) are obtained within each methodology. The above procedure is repeated 1000 times. In the end we have a set of bootstrapped observations for each optimal portfolio and every investment horizon. The empirical distribution of the weights based on the bootstrap samples makes it possible to draw inference about the weights. We construct 95 percent confidence intervals based on the percentiles of the distribution of the assets weights. We order the observations in ascending order and the 5 percent percentile and \( w^{*\alpha} \) is the 50\(^{th}\) ordered value of the replications. Likewise, \( w^{*(1-\alpha)} \) is the 95 percent percentile and the 950\(^{th}\) ordered value of the replications. An indication of the magnitude of the estimation risk is obtained from the intervals since the confidence region displays the degree of uncertainty associated with the efficient frontier.

\[ T = c^* \sqrt{T} \] where \( T \) is the number of observations in the sample and \( c = 1, \ldots, 9 \). Ehling and Ramos (2005) conducted block-bootstrap experiments with \( c = 1, 3, 4, 5, 6 \) and did not find that results depended on the choice of \( c \).

---

\[ \text{Hall, Jing and Lahiri (1998) argued that the procedure should be implemented with block length} \]

\[ \bar{T} = c^* \sqrt{T} \] where \( T \) is the number of observations in the sample and \( c = 1, \ldots, 9 \). Ehling and Ramos (2005) conducted block-bootstrap experiments with \( c = 1, 3, 4, 5, 6 \) and did not find that results depended on the choice of \( c \).
6.2.4 Ex-post analysis

The period ranging from January 1st, 2002 to January 1st, 2006 is used as an out of sample window, where ex-post returns are calculated based on a rolling monthly rebalancing of portfolios using four years of weekly ex-ante data. For instance, weights for the January 2002 portfolio are optimized using data ranging from January 1st, 1998 to December 31st, 2001, and so on with the sample ending in January 1st, 2006. This allows us to yield a series of 48 ex-post portfolio returns. We then calculate Sharpe measures of portfolio performance as the ratio of mean excess return to standard deviation for each portfolio as $(R_p - R_f)/S_p$, where $R_p$ is portfolio return, $R_f$ is the risk-free rate (which is assumed to be zero), and $S_p$ is the standard deviation. However the exclusive use of Sharpe ratios has been criticized on the premise that risk is adjusted using a non directionally-biased measure. We therefore also calculate Sortino ratios. This ratio is computationally very similar to the Sharpe Ratio, but uses downside standard deviation as the proxy for risk for investors, instead of using standard deviation of all the fund's returns. This in effect removes the negative penalty that the Sharpe Ratio imposes on positive returns. Finally, we compare the different above strategies using the Jobson-Korkie (1981) statistic defined as

$$ t = \frac{s_j r_j - s_j r_{j'}}{\sqrt{\frac{2}{T} \left( s_i^2 s_j^2 - s_i s_j s_{j'} \right)^{1/2}}} \text{, where } s_j \text{ is the appropriate measure of risk of stock return} $$

$j, r_j$ is the mean return of $j$, and $s_{j'}$ is the covariance between $I$ and $j$.

6.3 Results

Table 24 presents the average and standard deviation for our bootstrapped portfolio weights. The average optimal amount of investment in the home market is only 11.10% (in dollars) or 9.11% (in local currencies). This suggests the presence of diversification opportunities in the MENA region. The smallest home portfolio weight is obtained using the MVP-LPM optimization in local currencies (1.64%), which constitutes preliminary intuition of a good performance of MVP portfolios.
### Table 23 Average rolling bootstrapped portfolio weights, 1997-2006

#### Panel A: in dollars

<table>
<thead>
<tr>
<th></th>
<th>Egypt</th>
<th>Israel</th>
<th>Jordan</th>
<th>Morocco</th>
<th>Turkey</th>
<th>Lebanon</th>
<th>Tunisia</th>
<th>S&amp;P 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>CETP-SD</td>
<td>3.20%</td>
<td>24.40%</td>
<td>29.29%</td>
<td>8.79%</td>
<td>4.52%</td>
<td>7.60%</td>
<td>8.61%</td>
<td>13.59%</td>
</tr>
<tr>
<td>MVP-SD</td>
<td>4.34%</td>
<td>5.30%</td>
<td>21.92%</td>
<td>21.78%</td>
<td>1.91%</td>
<td>11.53%</td>
<td>21.30%</td>
<td>11.92%</td>
</tr>
<tr>
<td>BSP-SD</td>
<td>8.82%</td>
<td>3.32%</td>
<td>13.37%</td>
<td>9.22%</td>
<td>32.82%</td>
<td>16.03%</td>
<td>9.51%</td>
<td>6.91%</td>
</tr>
<tr>
<td>NAIVE-SD</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
</tr>
<tr>
<td>HOME-SD</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>CETP-LPM</td>
<td>7.68%</td>
<td>18.70%</td>
<td>24.21%</td>
<td>14.74%</td>
<td>7.98%</td>
<td>4.17%</td>
<td>9.38%</td>
<td>13.15%</td>
</tr>
<tr>
<td>MVP-LPM</td>
<td>21.64%</td>
<td>2.46%</td>
<td>3.95%</td>
<td>37.29%</td>
<td>0.84%</td>
<td>4.11%</td>
<td>26.45%</td>
<td>2.97%</td>
</tr>
<tr>
<td>BSP-LPM</td>
<td>13.01%</td>
<td>12.93%</td>
<td>7.87%</td>
<td>11.81%</td>
<td>20.77%</td>
<td>11.03%</td>
<td>7.28%</td>
<td>15.29%</td>
</tr>
<tr>
<td>NAIVE-LPM</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
</tr>
<tr>
<td>HOME-LPM</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>10.46%</td>
<td>11.51%</td>
<td>15.70%</td>
<td>16.08%</td>
<td>11.73%</td>
<td>9.97%</td>
<td>13.44%</td>
<td>11.10%</td>
</tr>
<tr>
<td><strong>St. dev</strong></td>
<td>0.06</td>
<td>0.08</td>
<td>0.09</td>
<td>0.09</td>
<td>0.11</td>
<td>0.04</td>
<td>0.07</td>
<td>0.04</td>
</tr>
</tbody>
</table>

#### Panel B: in local currencies

<table>
<thead>
<tr>
<th></th>
<th>Egypt</th>
<th>Israel</th>
<th>Jordan</th>
<th>Morocco</th>
<th>Turkey</th>
<th>Lebanon</th>
<th>Tunisia</th>
<th>S&amp;P 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>CETP-SD</td>
<td>8.32%</td>
<td>17.55%</td>
<td>27.02%</td>
<td>5.40%</td>
<td>20.95%</td>
<td>7.23%</td>
<td>6.36%</td>
<td>7.16%</td>
</tr>
<tr>
<td>MVP-SD</td>
<td>4.28%</td>
<td>5.68%</td>
<td>20.83%</td>
<td>19.37%</td>
<td>2.55%</td>
<td>12.00%</td>
<td>24.05%</td>
<td>11.25%</td>
</tr>
<tr>
<td>BSP-SD</td>
<td>8.11%</td>
<td>3.00%</td>
<td>16.94%</td>
<td>13.37%</td>
<td>22.04%</td>
<td>15.11%</td>
<td>14.53%</td>
<td>6.91%</td>
</tr>
<tr>
<td>NAIVE-SD</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
</tr>
<tr>
<td>HOME-SD</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td>CETP-LPM</td>
<td>5.94%</td>
<td>3.95%</td>
<td>27.14%</td>
<td>20.01%</td>
<td>16.98%</td>
<td>3.67%</td>
<td>16.11%</td>
<td>6.21%</td>
</tr>
<tr>
<td>MVP-LPM</td>
<td>22.47%</td>
<td>2.53%</td>
<td>4.05%</td>
<td>37.84%</td>
<td>0.81%</td>
<td>4.07%</td>
<td>26.58%</td>
<td>1.64%</td>
</tr>
<tr>
<td>BSP-LPM</td>
<td>11.37%</td>
<td>10.06%</td>
<td>13.01%</td>
<td>7.41%</td>
<td>29.91%</td>
<td>10.03%</td>
<td>3.47%</td>
<td>14.74%</td>
</tr>
<tr>
<td>NAIVE-LPM</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
<td>12.50%</td>
</tr>
<tr>
<td>HOME-LPM</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>100.00%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>10.69%</td>
<td>8.47%</td>
<td>16.75%</td>
<td>16.05%</td>
<td>14.78%</td>
<td>9.64%</td>
<td>14.51%</td>
<td>9.11%</td>
</tr>
<tr>
<td><strong>St. dev</strong></td>
<td>0.06</td>
<td>0.05</td>
<td>0.08</td>
<td>0.10</td>
<td>0.10</td>
<td>0.04</td>
<td>0.08</td>
<td>0.04</td>
</tr>
</tbody>
</table>

**Note:** For each optimization model, this table reports the average optimal portfolio weights in dollars and local currencies. Total average and standard deviation are calculated omitting allocations from the home portfolio, i.e., taking into account the diversified portfolios only.

Overall, the optimal MENA portfolio appears well-balanced among the sample countries. This suggests a good performance of the naïve diversification strategy. For instance, the ordered ranking of dollar portfolio weights is Morocco (16.08%), Jordan (15.70%), Tunisia (13.44%), Turkey (11.73%), Israel (11.51%), Egypt (10.46%), and Lebanon (9.97%). Turning to local currencies, it is Jordan (16.75%), Morocco (16.05%), Turkey (14.78%), Tunisia (14.51%), Egypt (10.69%), Lebanon (9.64%) and Israel (8.47%). The differences in country order following the currency denomination of portfolios also suggest that exchange rate factors may affect the optimal allocation of MENA portfolio investment. Analyzing the patterns of portfolio weights across optimization methodologies permits us to make certain deductions concerning the country level risk-to-return tradeoff. For instance, market attractiveness in Morocco and Tunisia seems to be primarily driven by low risks rather than high...
returns. Morocco indeed obtains the highest weights when returns are not taken into account, and when risk is assimilated to downside deviation. For instance, allocations in the MVP-LPM portfolio are 37.29% and 37.84% in dollars and local currencies, respectively. By comparison, the CETP portfolio weights are 8.79% and 5.40% using standard deviation as a measure of risk. Similarly, the Tunisian market also gets the highest weights through the MVP approach: 21.30% and 26.45% using SD, and 24.05% and 25.08% using LPM, in dollars and local currencies, respectively.

The opposite situation is found in Jordan and Israel. Portfolio allocations in these two countries are very small when the optimization technique relies on downside risk minimization: Jordan gets 3.95% and Israel 2.46% in the dollar MVP-LPM portfolio. By contrast, the inclusion of returns in the algorithm significantly increases portfolio weights: the dollar CETP-SD portfolio allocates 29.29% of resources to Jordan and 24.40% to Israel. Overall, these two markets seem to display both high returns and risks, in line with the standard view for emerging markets (Bekaert and Harvey, 2004). Interestingly, portfolio allocations in Egypt seem to be very sensitive to the selected measure of risk. For instance, in dollars, CETP-SD, MVP-SD and BS-SD allocations are 3.20%, 4.34% and 8.82%, versus 7.68%, 21.64%, 13.01% for their LPM counterparts. This clearly suggests the predominance of upwards volatility in the Egyptian market, not a surprising feature considering last decade’s massive capitalization increases in the Egyptian market (see chapter 5).

Portfolio allocations are the most unstable in Turkey, where the cross-methodology standard deviation is of 0.11. More specifically, this country obtains the greatest share of allocations when time series are smoothed towards a common factor (32.82% in the dollar BS-SD portfolio), while weights collapse when the focus shifts towards the minimization of downside risk volatility (0.81% in the local MVP-LPM portfolio). This suggests that in spite of high average returns, the magnitude of downside volatility makes portfolio allocation converge to zero when risk minimization is the main optimization criterion. This dynamic might reflect the multiplier impact of the 2001 crisis on downside volatility in the Turkish market. It might nonetheless be interesting to follow the evolution of MVP weights in this market in the future. Finally, Lebanon seems to display the least attractive risk to return trade-off, being ranked last in dollars and second last in local currencies, with average portfolio weights of 9.97% and 9.64%, respectively. This is not surprising considering that the
Lebanese market was almost nonexistent at the beginning of the sample period and remains to this day by far the region’s smallest.

Table 25 investigates the presence of significant shifts in portfolio allocation over the 48-month period by reporting coefficients of variations for each country according to the different methodologies used. Average coefficients are inferior to unity for most countries, suggesting that the allocation of weights is stable over time.

<table>
<thead>
<tr>
<th>Panel A: in dollars</th>
<th>Egypt</th>
<th>Israel</th>
<th>Jordan</th>
<th>Morocco</th>
<th>Turkey</th>
<th>Lebanon</th>
<th>Tunisia</th>
</tr>
</thead>
<tbody>
<tr>
<td>CETP-SD</td>
<td>1.47</td>
<td>0.64</td>
<td>0.33</td>
<td>0.60</td>
<td>1.17</td>
<td>0.71</td>
<td>0.70</td>
</tr>
<tr>
<td>MVP-SD</td>
<td>1.00</td>
<td>0.68</td>
<td>0.31</td>
<td>0.22</td>
<td>1.84</td>
<td>0.28</td>
<td>0.28</td>
</tr>
<tr>
<td>BSP-SD</td>
<td>0.32</td>
<td>1.62</td>
<td>0.39</td>
<td>0.99</td>
<td>0.71</td>
<td>0.45</td>
<td>1.15</td>
</tr>
<tr>
<td>CETP-LPM</td>
<td>1.07</td>
<td>0.76</td>
<td>0.45</td>
<td>0.89</td>
<td>1.26</td>
<td>0.97</td>
<td>0.93</td>
</tr>
<tr>
<td>MVP-LPM</td>
<td>0.31</td>
<td>2.44</td>
<td>1.53</td>
<td>0.32</td>
<td>5.43</td>
<td>1.43</td>
<td>0.17</td>
</tr>
<tr>
<td>BSP-LPM</td>
<td>0.60</td>
<td>0.41</td>
<td>0.63</td>
<td>0.58</td>
<td>0.48</td>
<td>0.74</td>
<td>0.98</td>
</tr>
<tr>
<td>Average</td>
<td>0.80</td>
<td>1.09</td>
<td>0.60</td>
<td>0.60</td>
<td>1.82</td>
<td>0.76</td>
<td>0.70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: in local currencies</th>
<th>Egypt</th>
<th>Israel</th>
<th>Jordan</th>
<th>Morocco</th>
<th>Turkey</th>
<th>Lebanon</th>
<th>Tunisia</th>
</tr>
</thead>
<tbody>
<tr>
<td>CETP-SD</td>
<td>1.04</td>
<td>0.63</td>
<td>0.37</td>
<td>0.97</td>
<td>0.67</td>
<td>1.22</td>
<td>0.98</td>
</tr>
<tr>
<td>MVP-SD</td>
<td>1.13</td>
<td>0.83</td>
<td>0.28</td>
<td>0.37</td>
<td>1.61</td>
<td>0.39</td>
<td>0.15</td>
</tr>
<tr>
<td>BSP-SD</td>
<td>0.84</td>
<td>0.93</td>
<td>0.32</td>
<td>0.73</td>
<td>1.11</td>
<td>0.39</td>
<td>0.79</td>
</tr>
<tr>
<td>CETP-LPM</td>
<td>1.38</td>
<td>0.92</td>
<td>0.30</td>
<td>0.53</td>
<td>0.73</td>
<td>1.21</td>
<td>0.61</td>
</tr>
<tr>
<td>MVP-LPM</td>
<td>0.26</td>
<td>2.39</td>
<td>1.45</td>
<td>0.32</td>
<td>5.61</td>
<td>1.71</td>
<td>0.19</td>
</tr>
<tr>
<td>BSP-LPM</td>
<td>1.01</td>
<td>0.55</td>
<td>0.76</td>
<td>0.95</td>
<td>0.34</td>
<td>0.32</td>
<td>1.50</td>
</tr>
<tr>
<td>Average</td>
<td>0.94</td>
<td>1.04</td>
<td>0.58</td>
<td>0.64</td>
<td>1.68</td>
<td>0.87</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Note: For each optimization model, this table reports the coefficient of variation in dollars and local currencies. The coefficient of variation is computed as the standard deviation to mean ratio using the 48 months ex-ante weight allocations.

However, the S&P 500, Israel and Turkey constitute exceptions. The high S&P average coefficient of variation should not surprise us considering that the major booms and busts that occurred in global markets during last decade have resulted in increased volatility (AIMR, 2005). The latter seems to have impacted portfolio weights both when returns are taken into account (the coefficient for the dollar BSP-SD model is 1.63) and when the emphasis is placed on risk minimization (the coefficient for the MVP-LPM model in local currencies is 4.64). In the case of Israel, the high average coefficient (1.09 in dollars and 1.04 in local currencies) seems to be due to strong variations in the MVP-LPM allocation (2.44 and 2.39 in dollars and local currencies, respectively). These variations suggest the presence of volatility breaks in the Tel-Aviv Stock Exchange throughout the study period. It could also
reflect the market's shock-sensitivity. The Tel-Aviv Stock Exchange indeed allows for dual listing of any company accepted for trading on the NASDAQ, NYSE, AMEX, and LSE. Finally, in the case of Turkey, we observe the highest variation observed through the MVP-LPM and MVP-SD methodologies. This may reflect the impact of the 2001 crisis on the index variance and lower partial moment.

The patterns of ex-post returns using the rolling ex ante bootstrapped weight are displayed in figure 23 and 24. Inspection of the figures reveals similarities in the dynamic of rolling returns. Not surprisingly, the MVP returns appear to be the least volatile both in dollars and local currencies, which suggests a good performance. In dollars, the biggest gap between extreme values seems to be reached through the BS methodology using standard deviation; and through the CETP methodology using LPM. In both cases, the home portfolio appears relatively volatile, which suggests that diversification in the MENA region may be an efficient strategy. Turning to local currencies, the figures are more ambiguous, however the home portfolio displays the most obvious volatility. Each figure displays an upward trend, indicating increasing time-varying returns in the MENA region. This suggests that undergoing reform program in the MENA markets exerts a positive effect on their attractiveness for international portfolio investment.
Figure 23 Holding period returns, $US

Dollar Portfolios Returns (SD)

Dollar Portfolios Returns (LPM)
Table 26 presents the computed Sharpe and Sortino ratios for each methodology and currency denomination. In each case, the lowest ratios are obtained for the non-diversified portfolios, which range from 0.01 to 0.03. In line with previous
observations, the highest Sharpe and Sortino ratios are obtained using the MVP methodology (0.56 and 1.52, respectively). By comparison, Gilmore et.al (2005) found the maximum ratios to be 0.37 and 0.61 in the emerging markets of Central Europe. Our study therefore clearly suggests a favourable risk-to-return tradeoff in the MENA markets.

Table 25 Performance ratios

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Sharpe ($)</th>
<th>Sortino ($)</th>
<th>Sharpe</th>
<th>Sortino</th>
</tr>
</thead>
<tbody>
<tr>
<td>CETP-SD</td>
<td>0.36</td>
<td>0.68</td>
<td>0.42</td>
<td>0.97</td>
</tr>
<tr>
<td>MVP-SD</td>
<td>0.58</td>
<td>1.29</td>
<td>0.54</td>
<td>1.52</td>
</tr>
<tr>
<td>BSP-SD</td>
<td>0.18</td>
<td>0.31</td>
<td>0.29</td>
<td>0.50</td>
</tr>
<tr>
<td>NAIVE-SD</td>
<td>0.49</td>
<td>1.16</td>
<td>0.54</td>
<td>1.28</td>
</tr>
<tr>
<td>HOME-SD</td>
<td>0.02</td>
<td>0.03</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Average</td>
<td>0.33</td>
<td>0.69</td>
<td>0.36</td>
<td>0.86</td>
</tr>
<tr>
<td>CETP-LPM</td>
<td>0.35</td>
<td>0.64</td>
<td>0.37</td>
<td>0.78</td>
</tr>
<tr>
<td>MVP-LPM</td>
<td>0.55</td>
<td>1.41</td>
<td>0.56</td>
<td>1.37</td>
</tr>
<tr>
<td>BSP-LPM</td>
<td>0.39</td>
<td>0.85</td>
<td>0.38</td>
<td>0.81</td>
</tr>
<tr>
<td>NAIVE-LPM</td>
<td>0.49</td>
<td>1.16</td>
<td>0.54</td>
<td>1.28</td>
</tr>
<tr>
<td>HOME-LPM</td>
<td>0.02</td>
<td>0.03</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Average</td>
<td>0.36</td>
<td>0.82</td>
<td>0.37</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Note: For each optimization model, this table reports theSharpe and Sortino ratios as calculated from a series of 48 ex-post rolling portfolio returns in dollars and local currencies.

Finally, our t-statistics allow us to draw some comparisons among investment strategies. In table 27 and 28, we observe that most investment strategies significantly outperform the home portfolio, which confirms previous observations on the presence of significant diversification opportunities in the MENA region. There also seems to be more difference in cross-methodology outcomes when the analysis is undertaken through a single currency. The MVP portfolio appears to be the most promising strategy, as it significantly outperforms the BSP, CETP and home portfolio. Our results therefore suggest that investors considering portfolio diversification in the MENA markets should primarily seek to minimize risk.
### Table 26 Statistical comparisons of the out of sample performance: in dollars

#### Panel A: Sharpe Ratios

<table>
<thead>
<tr>
<th></th>
<th>S&amp;P (SD)</th>
<th>EQWP (SD)</th>
<th>MVP (SD)</th>
<th>BSP (SD)</th>
<th>S&amp;P (LPM)</th>
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Note: These tables presents the Jobson and Korkie (1981) test for the equality of the Sharpe ratios. For 48 degrees of freedom, the one-tail test at a 5% level is 1.686.

### Table 27 Statistical comparisons of the out of sample performance: in local currencies

#### Panel A: Sharpe Ratios

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#### Panel B: Sortino Ratios

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6.4 Conclusion

The objective of this chapter was to investigate the prospects of portfolio diversification investment within the MENA stock markets. We assumed the standpoint of a global investor and assessed the diversification benefits of investing in the MENA equity markets. We constructed portfolios in dollars and local currencies to control for currency risk based on five optimization models and two risk measures. We then compared the portfolio out-of-sample performance based on Sharpe ratios and the Jobson-Korkie statistic. Our results highlighted the presence of outstanding potential diversification benefits in the MENA region, whether transactions were denominated in local currencies or in dollars. The allocation of portfolio weights appeared well-balanced throughout these countries, and in most cases, the minimum variance portfolio seemed to be the most promising optimization technique. Overall, we suggested that these under-estimated, under-investigated markets may attract more portfolio flows in the future. However, there are several limits to this analysis. Portfolio managers should interpret our results with caution. According to the S&P classification, some of the listed markets (Tunisia, Morocco and Lebanon) are still frontier markets. Experience has shown that strong and transparent economic and financial institutions are essential for maintaining long-run portfolio returns in emerging markets. It can also be argued that our results do not fully reflect liquidity-related costs. As shown in chapter 4, the MENA markets display reasonable liquidity levels in comparison with other emerging markets (as measured by our bootstrapped index). From a policy perspective, empirical evidence has highlighted that portfolio flows may overshoot and be subject to sudden reversal in the middle-run. More fundamentally, theory suggests that increased market integration goes along with financial vulnerability costs. Taking this into account, the purpose of the next chapter is to measure and analyze shift-contagion vulnerability among the MENA countries.
7. Shift-contagion to the MENA equity markets

Previous studies have highlighted that financial contagion is a major consequence of market integration and has important economic and financial consequences. The objective of this chapter is therefore to investigate the impact of market development and market integration on contagion vulnerability in the MENA region. It is structured as follows. The first section presents our dataset and crisis timeline. The second section specifies our methodological framework. The third section discusses our findings, and the fourth section presents our conclusions.

7.1 Dataset and crisis definition

We investigate shift-contagion to the MENA markets during each of the major financial crises of the 1990's. The analysis begins with the 1997-1998 Asian crises, the 1998 Russian financial turmoil and its extension to Brazil the same year. We then turn to the 2001 Turkish crisis and the Argentinean insolvency crisis in 2002. We also include the September 2001 terrorist attacks and the Enron and WorldCom accounting scandals in the crisis timeline. Serwa and Bohl (2005) indeed highlighted that these two events coincided with significant market turmoil in the MSCI standardized US country index.

For each crisis, we divide the dataset into a stable and a turmoil period. Our starting dates are based on existing literature, and the length of the turmoil is chosen to be one or two months, depending on crisis development. Following the literature on equity market contagion, we identify the breakout of the East Asian crisis with the remarkable collapse of the stock market and the dramatic increase of short-term interest rates in Hong Kong on October 23, 1997 (Serwa and Bohl, 2005). The dates for the Russian crisis and its Brazilian sequel are based on the results of Baig and Goldfajn (1999). According to their timeline, the initial shock to the Russian bond market took place on August 6, 1998. The stock market reacted one week later and the turmoil persisted until the end of September. The Brazilian crisis, which was often associated with contagion from the Russian crisis, lasted from October 1998 until March 1999, but the capital market suffered mostly during the period from the end of November 1998 to January 1999. The start dates of the two American market crashes are taken from daily newspapers (Mishkin and White, 2003). The terrorist acts in New
York and Washington took place on September 11, 2001, and WorldCom revealed its accounting fraud on June 25, 2002. Dates for the Turkish crisis were selected following Alper (2001) and Yeldan (2002), and the duration of the Argentinean crisis is identified following Serwa and Bohl (2005). The chosen crisis timelines coincide with Serwa and Bohl (2005) and are shown in Table 29.

Table 28 Crisis Timeline

<table>
<thead>
<tr>
<th>Crisis name</th>
<th>Crisis country</th>
<th>Stable periods</th>
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<td>Asian “Flu”</td>
<td>Hong Kong</td>
<td>1997 :10 :1-</td>
<td>1997 :10 :23-</td>
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<tr>
<td>Brazilian crisis</td>
<td>Brazil</td>
<td>1998 :11 :1-</td>
<td>1999 :1 :1-</td>
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<tr>
<td></td>
<td></td>
<td>1998 :12 :31</td>
<td>1999 :3 :1</td>
</tr>
<tr>
<td>Turkish collapse</td>
<td>Turkey</td>
<td>2000 :12 :5-</td>
<td>2001 :2 :15-</td>
</tr>
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<td>Argentinean crisis</td>
<td>Argentina</td>
<td>2001 :10 :13-</td>
<td>2001 :12 :27-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2001 :12 :12</td>
<td>2002 :2 :26</td>
</tr>
</tbody>
</table>


Our dataset includes dollar-denominated stock market returns for Morocco, Egypt, Tunisia, Lebanon, Jordan, Turkey, Israel, Hong-Kong, Russia, Brazil, Argentina and the US, as well as an emerging markets and world benchmark for the September 1997 to September 2002 period. Returns are taken from the S&P/IFCG emerging markets database. For the US market we used the MSCI broad market index. In line with current literature, we use daily returns smoothed using a two-day moving average filter in order to neutralize the possible impact of different trading days while maintaining a high data frequency (Serwa and Bohl, 2004). It should be noted, however, that this approach does not permit to overcome the usual drawbacks associated to using daily data in emerging markets (time-varying heteroskedasticity and stale pricing).
7.2 Methodology

We follow a three-step procedure. We first implement a series of recently developed contagion tests to check for financial contagion in the MENA markets. These encompass joint regional contagion and country-level contagion over the specified sample period. The joint regional contagion test was developed by Baur and Fry (2005). Our country contagion tests encompass Forbes and Rigobon (2001), Corsetti et al. (2005), and Favero and Giavazzi (2002). We then aggregate the results into a new vulnerability index using a nonparametric bootstrap methodology. This allows us to discuss the dynamics of financial vulnerability in the MENA region.

7.2.1 Joint contagion

Before investigating the country-level crisis transmission mechanism, we assess whether the MENA countries are subject to joint, regional contagion. Baur & Fry (2005) developed a multivariate test of contagion based on a panel data model which controls for common vulnerabilities through the inclusion of a world and emerging equity market index. The framework is a basic regression model of the form:

\[ r_{it} = \alpha_i + \gamma_t + \beta_{1t} \tau_{global,t} + \beta_{2t} \tau_{emerging,t} + \epsilon_{it} \] (1)

Where \( r_{it} \) is the return of country \( i \) at time \( t \), \( \tau_{global,t} \) and \( \tau_{emerging,t} \) are global and emerging markets factors, respectively. The model contains a constant, \( \alpha_i \), for each country return vector \( \gamma_t \) and a fixed time effect \( \gamma_t \) which is defined for a period of \( K \) days through time across all countries. The fixed time effect is interpreted in comparison with a base period and is deemed to capture contagion in this model.

The model differentiates between common vulnerabilities and contagion through the relative importance of the regional and global regressors compared to the fixed time effects. It is assumed that vulnerabilities exist in both the benchmark and crisis period and capture the systematic relationship between the equity markets of each country, emerging markets and the world. The fixed time effect captures time-varying joint positive and negative movements across markets that are unexplained by the loading factors over the period of study. Contagion occurs wherever these fixed time effects
reach a certain threshold, highlighting the fact that asset prices are determined by a large unexplained common factor. The threshold is reached if the t-statistic of an estimate of the fixed effect is significant at the 5% level. The advantage of this approach is that the model can endogenously determine contagion and hence avoid the sample selection bias discussed in Pesaran and Pick (2004). The panel model is multivariate, and therefore provides evidence for joint contagion through an estimation of global interdependencies.

7.2.2 Country contagion

There is now a reasonably large body of empirical work testing for the existence of contagion during financial crisis. The seminal methodology used to analyze simultaneously falling stock markets over breakdown periods was developed by Longin and Solnik (1995) and involves a comparison of correlation coefficient with a benchmark. However, the typical presence of heteroscedasticity during crisis periods was found significantly to bias raw coefficient analysis (Forbes & Rigobon, 2002). We thus use instead a standard conditional correlation coefficients approach as developed by Forbes and Rigobon (2002). Taking into account the need to control for structural breaks in the international transmission mechanism, we complement this analysis by including a common factor variance effect as developed by Corsetti (2002). However, a residual line of criticism against coefficient based analysis suggests that they might be misleading since they rely on an exogenous definition of the crisis period (Dungey & Zhumabekova, 2001). We deal with these difficulties by implementing an outlier based structural model following Favero and Giavazzi (2002). We aggregate results from these approaches into a vulnerability index.

7.2.2.1 Conditional correlation analysis: Forbes and Rigobon (2002)

We first implement the heteroscedasticity-adjusted correlation coefficient as developed by Forbes and Rigobon (2002). These authors have argued that the presence of heteroscedasticity in market returns can have a significant impact on estimates of cross-market correlations. Therefore, when market volatility increases, which tends to happen during crises, any test will overstate the magnitude of cross-market relationships. As a result, estimates may suggest that contagion occurred, even
when the underlying propagation mechanism is constant, which leads to misleading conclusions about the presence of shift-contagion. These authors proposed a methodology to compensate for this bias. This methodology has been used by Collins and Biekpe (2002) in the context of African markets and can be outlined as follows. Consider the basic conditional correlation coefficient between country 1 and 2:

\[ p = \frac{\sigma_{1,2}}{\sigma_1 \sigma_2} \] (2)

An adjustment can be made using the following transformation:

\[ p^* = \frac{p}{\sqrt{1 + \delta [1 - (p)^2]}} \] (3)

Where \( \delta = \frac{\sigma_{1}^h}{\sigma_{1}} - 1 \) measures the change in high period volatility against the low period volatility in the crisis country, the null hypothesis of no contagion is then tested as:

\[ H_0 : p_h^* - p_l^* = 0, \] where \( p_h^* \) and \( p_l^* \) are the adjusted correlation coefficients for the high and low volatility periods, respectively.

7.2.2.2. Common factor model: Corsetti et.al (2005)

However, it has been argued that this approach sometimes fails to detect contagion. A change in variance might actually be driven by an increase in the variance of a common factor rather than a rise in correlation between two markets. Taking this into account, Corsetti et.al (2005) presented a new methodology to test for structural breaks in the international transmission mechanism. In their approach, contagion is defined as the presence of co-movements in significant excess to what could be expected from an unchanged transmission mechanism. In their paper investigating financial contagion to African markets, Collins and Biekpe (2002) have described the model as follows. The model first creates a data-generating process in country 1 and country 2, where country 2 is the country where the crisis occurs:
\begin{align*}
\begin{cases}
r_1 = \alpha_1 + \gamma_1 f + \varepsilon_1 \\
r_2 = \alpha_2 + \gamma_2 f + \varepsilon_2 
\end{cases}
\end{align*}
\tag{4}

Where \( \alpha \)'s are constants, \( \gamma_1 \) and \( \gamma_2 \) are country-specific factor loading, \( f \) is a common factor, \( \varepsilon_i \) and \( \varepsilon_j \) are country-specific factors. Correlation coefficients are defined as:

\begin{align*}
p_c &= \frac{1}{\left[ 1 + \frac{\text{Var}(\varepsilon_1)}{\gamma_1^2 \text{Var}(f \mid C)} \right]^{\frac{1}{2}}} \times \left[ 1 + \frac{\text{Var}(\varepsilon_2)}{\gamma_2^2 \text{Var}(f)} \right]^{\frac{1}{2}} \\
p_t &= \frac{1}{\left[ 1 + \frac{\text{Var}(\varepsilon_1)}{\gamma_1^2 \text{Var}(f)} \right]^{\frac{1}{2}}} \times \left[ 1 + \frac{\text{Var}(\varepsilon_2)}{\gamma_2^2 \text{Var}(f)} \right]^{\frac{1}{2}}
\end{align*}
\tag{5}

\( p_c \) and \( p_t \) are coefficients for the crisis and tranquil periods, respectively. If the transmission mechanism is left unchanged between the tranquil and crisis periods, \( \gamma_1 \), \( \gamma_2 \), \( \text{Var}(\varepsilon_1) \) and \( \text{Cov}(\varepsilon_i, \varepsilon_2) \) will be constant and the correlation coefficient between asset returns becomes:

\begin{align*}
\phi(\lambda_1, \lambda_2^C, \delta, p) &= p \left( \frac{1 + \lambda_2^C}{1 + \lambda_2} \right)^2 \frac{1 + \delta}{1 + p^2 \left( 1 + \delta \left( \frac{1 + \lambda_2^C}{1 + \lambda_2} \right) - 1 \right) \left( 1 + \lambda_2 \right)}^{\frac{1}{2}}
\end{align*}
\tag{6}

\( \lambda_2 = \frac{\text{Var}(\varepsilon_1)}{\gamma_2^2 \text{Var}(f)} \) and \( \lambda_2^C = \frac{\text{Var}(\varepsilon_2 \mid C)}{\gamma_2^C \text{Var}(f \mid C)} \).

Testing the null hypothesis of interdependence versus contagion amounts to measuring whether \( p^C \) is significantly higher than \( \phi \), which represents the theoretical measure of interdependence:

\[ H_0 : p^C \leq \phi \]
In implementing the correlation-based methodology, we need an appropriate test-statistic to measure the significance of the difference between coefficients. Forbes & Rigobon (2002) used the Fisher transformation, but this approach makes the assumption of normality, and might therefore lack in robustness if returns are skewed. We therefore instead use an exact t-test based on actual sample correlation coefficients (as suggested in Collins & Biekpe, 2002).

\[
t = \left( p_x - p_y \right) \sqrt{\frac{n_1 + n_2 - 4}{1 - \left( p_x - p_y \right)^2}}
\]

In (7), \( t(0.05, n_1 + n_2 - 4) \). P-values \( P(t) \) are then estimated through the linear interpolation formula \( P(t) = p_1 + \left[ \frac{t - t_1}{t_2 - t_1} \right] (p_2 - p_1) \), in which \( (t_1, t_2) \) are the values surrounding our t value estimates \( t \) in the student distribution table and \( (p_1, p_2) \) their corresponding p values.

7.2.2.3 Structural model and outliers: Favero and Giavazzi (2002)

A frequent line of criticism against the above correlation-based analysis is that conclusions might be misleading as they rely on an exogenous definition of the crisis period. Favero & Giavazzi (2002) have proposed a methodology which allows to endogenously define contagion by identifying many short-lived crisis periods associated with extreme returns. As highlighted in Dungey et.al (2004), the Favero and Giavazzi approach amounts to implementing VAR model to control for the interdependence between asset returns, and to use the heteroscedasticity and non-normalities of the residuals to identify unexpected shocks transmitted across countries, which are considered to be contagion. Crisis observations are then defined through a set of dummies associated with extreme residuals for each country. In their review of contagion methodologies, Dungey et.al (2004) have also suggested the following representation. Consider the following VAR model:

---

8 Corsetti et al. (2002) also suggest calculating the test based on threshold values derived from the variance ratios. However, this framework requires that studied markets display high correlation levels (>0.32) during the crisis period, otherwise threshold values tend towards infinity and the null hypothesis cannot be rejected.
Where \( Z_t \) are pooled asset returns across the sample period, \( \Phi \) contains the \( N \times N \) VAR parameters, and \( \nu_t \) are the reduced-form disturbance with zero means and variances given by \( E[\nu_t^2] = \sigma_i^2 \). The dummy variables are then defined as:

\[
d_{i,t,j} = \begin{cases} 
1 &: |\nu_{i,t}| > 3\sigma_i^2 \\
0 &: \text{otherwise} 
\end{cases}
\]  

One single dummy variable is defined per observation. These dummy variables are then included in the following structural model:

\[
z_{1,t} = \alpha_{1,1} z_{1,t-1} + \theta_1 d_{1,1,t} + \gamma_1 z_{2,t-1} + \gamma_{1,2} d_{2,1,t} + \eta_{1,t} \\
z_{2,t} = \alpha_{2,1} z_{1,t-1} + \theta_2 d_{2,1,t} + \gamma_{2,1} d_{1,1,t} + \gamma_{1,2} d_{2,2,t} + \eta_{2,t}
\]  

In (10), \( \theta_1 \) and \( \theta_2 \) are the parameters on own lags and \( \eta_{i,t} \) are the structural disturbances. In order to correct for the simultaneity bias, this model is implemented using an 2SLS estimator where instruments are the dummy variables and each country’s own lagged returns. Contagion from country 1 to country 2 is tested by checking the significance of the shock in asset returns in the second country on asset returns in the first country. The null hypothesis of this test is \( H_0 : \gamma_{1,2} = 0 \).

7.2.3 The vulnerability index

Comparing financial vulnerability levels across MENA countries requires us to aggregate the results from the country-level tests into a synthetic measure for the individual countries. To this end, we propose a new ‘vulnerability index’. Our process is the following. For each country, we create a result matrix in which columns represent the various methodologies and rows represent the crisis intervals. The elements of the matrix are dummy variables taking the value of 1 if the market is subject to contagion and 0 if not. The arithmetic average of all elements of the matrix increases with financial vulnerability. This constitutes the first component of the
vulnerability index. We also need to capture the severity of contagion and the overall sensitivity to external financial crises in order to refine cross-country comparisons. To this end, we create a series of similar matrices whose elements are the inverted p-values for the respective crises and methodologies. The arithmetic average of all elements of this matrix can be interpreted as an indicator of overall sensitivity to financial contagion, and constitutes the second component of the index.

The last issue is to determine the appropriate weights of each component. As in chapter 3 and 4, we use a simple nonparametric bootstrap to derive a significance level for the index without relying on strong ex-ante assumptions. We generate 10,000 random combinations of uniformly distributed random weights adding up to unity in the interval (0,1). We impose the constraint \( \alpha > \beta \) to ensure that significant evidence of contagion is given more weight than overall shock sensitivity. We calculate the index for each of these combinations of weights, and select the value corresponding to a 50% cumulative distribution function of the obtained series. Our final index can therefore be described as follows:

\[
\text{INDEX}_i = \alpha \frac{\sum_{c=1}^{C} \sum_{m=1}^{M} \text{CONTAGION}_{i,c,m}}{M \cdot C} + \beta \frac{\sum_{c=1}^{C} \sum_{m=1}^{M} (1 - p_i)}{M \cdot C}
\]

Where \( C \) is the number of crises, and \( M \) the number of methodologies, \( \text{CONTAGION}_{i,c,m} \) is the contagion dummies for country \( i \), and \( p_i \) the test p-value. \( \alpha \) and \( \beta \) are bootstrapped weights for each component of the index.

7.3 Results

As shown in table 30, results from the fixed-effect panel regression suggest that the world index is significant in explaining co-movements between the MENA markets. By contrast, the emerging market index is insignificant. This might reflect the fact that most of the MENA countries' real economic linkages occur with developed countries (FEMISE, 2004).
Table 29 Regional and global vulnerabilities

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Coefficients</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.00</td>
<td>-0.40</td>
<td>0.690</td>
</tr>
<tr>
<td>S&amp;P 500</td>
<td>0.09</td>
<td>2.8*</td>
<td>0.005</td>
</tr>
<tr>
<td>S&amp;P EM</td>
<td>0.00</td>
<td>0.11</td>
<td>0.911</td>
</tr>
<tr>
<td>R²</td>
<td>0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F(3,9783)</td>
<td>37.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob&gt;F</td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table shows an estimate of \( y_{i,t} = \alpha_i + \gamma_t + \beta_{1i} \tau_{global,t} + \beta_{12} \tau_{emerging,t} + \epsilon_{i,t} \) over all countries estimated as a panel.

The time series of the fixed time effect over the whole sample period, including the seven investigated crisis is presented in figure 25. The first panel of the figure presents coefficients estimates and the second panel presents the t-values associated with critical values at the 5% significance level. Inspection of this figure shows the absence of joint contagion over the period of study. This finding is not surprising considering the small co-movements among the MENA markets (Girard and Ferrera, 2004).
Graphs in panel a show estimates of the fixed effects parameter from the regression \( y_{i,t} = \alpha_i + \gamma_i + \beta_{i1} \tau_{\text{global},t} + \beta_{i2} \tau_{\text{emerging},t} + \epsilon_{i,t} \). Associated t-statistics are shown in panel b, where the dashed line represents the 95% critical value.
We now break down the impact of each crisis at the country level in order to gain further insight into these countries’ financial vulnerability.

Table 30 Shift contagion analysis

<table>
<thead>
<tr>
<th></th>
<th>Asian flu</th>
<th>Russian crisis</th>
<th>Brazilian crisis</th>
<th>Turkish crisis</th>
<th>WTC attacks</th>
<th>Argentinesan crisis</th>
<th>Enron scandal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Egypt</strong></td>
<td>0.18</td>
<td>0.027*</td>
<td>0.99</td>
<td>0.49</td>
<td>0.60</td>
<td>0.99</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>0.78</td>
<td>0.21</td>
<td>0.29</td>
<td>0.72</td>
<td>0.57</td>
<td>0.63</td>
<td>0.57</td>
</tr>
<tr>
<td><strong>Israel</strong></td>
<td>0.72</td>
<td>0.79</td>
<td>0.24</td>
<td>0.54</td>
<td>0.99</td>
<td>0.99</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>0.22</td>
<td>0.92</td>
<td>0.90</td>
<td>0.045*</td>
<td>0.50</td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>0.51</td>
<td>0.49</td>
<td>0.68</td>
<td>0.74</td>
<td>0.2</td>
<td>0.07</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>0.049*</td>
<td>0.38</td>
<td>0.16</td>
<td>0.031**</td>
<td>0.35</td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td><strong>Morocco</strong></td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
<td>0.048*</td>
<td>0.36</td>
<td>0.79</td>
<td>0.046*</td>
</tr>
<tr>
<td></td>
<td>0.21</td>
<td>0.26</td>
<td>0.12</td>
<td>0.25</td>
<td>0.96</td>
<td>0.77</td>
<td>0.96</td>
</tr>
<tr>
<td></td>
<td>0.28</td>
<td>0.23</td>
<td>0.33</td>
<td>0.12</td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td><strong>Jordan</strong></td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
<td>0.039*</td>
<td>0.99</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>0.15</td>
<td>0.43</td>
<td>0.76</td>
<td>0.99</td>
<td>0.35</td>
<td>0.57</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>0.99</td>
<td>0.99</td>
<td>0.33</td>
<td>0.35</td>
<td>0.042*</td>
<td>0.61</td>
<td>0.018*</td>
</tr>
<tr>
<td><strong>Tunisia</strong></td>
<td>0.99</td>
<td>0.99</td>
<td>0.025*</td>
<td>0.99</td>
<td>0.036*</td>
<td>0.46</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>0.85</td>
<td>0.07</td>
<td>0.001**</td>
<td>0.85</td>
<td>0.9</td>
<td>0.19</td>
<td>0.9</td>
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<tr>
<td></td>
<td>0.80</td>
<td>0.95</td>
<td>0.95</td>
<td>0.32</td>
<td>0.66</td>
<td>0.99</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>Lebanon</strong></td>
<td>0.13</td>
<td>0.90</td>
<td>0.99</td>
<td>0.34</td>
<td>0.40</td>
<td>0.13</td>
<td>0.003**</td>
</tr>
<tr>
<td></td>
<td>0.34</td>
<td>0.11</td>
<td>0.48</td>
<td>0.00**</td>
<td>0.15</td>
<td>0.38</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>0.97</td>
<td>0.99</td>
<td>0.99</td>
<td>0.56</td>
<td>0.3431</td>
<td>0.99</td>
<td>0.32</td>
</tr>
<tr>
<td><strong>Turkey</strong></td>
<td>0.99</td>
<td>0.99</td>
<td>0.96</td>
<td>-</td>
<td>0.10</td>
<td>0.99</td>
<td>0.026*</td>
</tr>
<tr>
<td></td>
<td>0.89</td>
<td>0.17</td>
<td>0.23</td>
<td>-</td>
<td>0.15</td>
<td>0.56</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>0.006**</td>
<td>0.99</td>
<td>0.99</td>
<td>-</td>
<td>0.011*</td>
<td>0.99</td>
<td>0.011*</td>
</tr>
</tbody>
</table>

Note: for each country and crisis, the first row gives the p-value for the Forbes-Rigobon analysis, the second that of the p-value Favero-Giavazzi analysis, and the third row the p-value for the Corsetti analysis. *, **, and *** represent significance at 10%, 5% and 1% respectively.

The small number of significant coefficients in table 31 (5 at the 5% level) suggests that no contagion at all existed in the sample. Nevertheless, evidence for contagion may be held to be stronger in cases where similar results were found using different approaches. For instance, we may suspect contagion in Israel during the Turkish crisis, Jordan during the World Trade Center breakdown, Tunisia during the Brazilian crisis, and Turkey during the Enron crisis. Only Israel and Turkey seem to have undergone contagion during the Asian crisis. This suggests a link between contagion vulnerability and market development, since these two markets are the oldest and largest of our sample. Contagion to the MENA markets also seems to increase over time. Looking at the number of contagion relationships per crisis, we yield two relationships during the 1997 Asian crisis, four during the 2001 Turkish crisis, and our results culminate with five relationships during the 2002 Enron crisis.
To consider these results altogether, Turkey appears as the sample’s most vulnerable market. It seems to have endured contagion three times, during the Asian crisis, the World Trade Center breakdown and the Enron crisis. It is followed by Israel (during the Asian and Turkish crises), Jordan (during the two American crises), Tunisia (during the Brazilian and 9/11 crises), and Morocco and Lebanon (during the Turkish and Enron crises). Egypt seems to be the region’s least vulnerable market, as it seems to have been affected only during the Russian crisis.

Table 31 The vulnerability index

<table>
<thead>
<tr>
<th>Country</th>
<th>Average (1-p value)</th>
<th>Average contagion dummy</th>
<th>Vulnerability Index (CDF=0.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey</td>
<td>0.53</td>
<td>0.22</td>
<td>0.42</td>
</tr>
<tr>
<td>Israel</td>
<td>0.49</td>
<td>0.17</td>
<td>0.38</td>
</tr>
<tr>
<td>Jordan</td>
<td>0.40</td>
<td>0.17</td>
<td>0.32</td>
</tr>
<tr>
<td>Tunisia</td>
<td>0.34</td>
<td>0.17</td>
<td>0.28</td>
</tr>
<tr>
<td>Lebanon</td>
<td>0.56</td>
<td>0.11</td>
<td>0.26</td>
</tr>
<tr>
<td>Morocco</td>
<td>0.45</td>
<td>0.11</td>
<td>0.22</td>
</tr>
<tr>
<td>Egypt</td>
<td>0.42</td>
<td>0.06</td>
<td>0.18</td>
</tr>
</tbody>
</table>

Note: The first column shows the first component of the index. The second column shows the second component of the index. The third column shows the selected value of the index with bootstrapped weights corresponding to the 50% cumulative distributive function.

As shown in table 32, our vulnerability index highlights that Turkey, Israel and Jordan may be the most vulnerable markets of the MENA region. These results are intuitive as these three markets are the samples’ largest. They are followed by Tunisia, Morocco, Lebanon and Egypt, which were, on average, smaller over the study period. However, considering that Egypt is now one of the regions’ deepest markets, we may expect to find a different situation for this country in the event of a future financial crisis.

Overall, the increase in contagion relationships and the possible emergence of new ‘host’ markets through time suggests that financial vulnerability might be positively correlated to market development and international integration, as suggested in Bekaert, Harvey and Ng (2005) and Collins and Biekpe (2002). The rationale is that thinner stock markets are less hospitable host to international capital, and as a result tend to exhibit lower co-movement with the rest of the world. By contrast, the deepening of capital markets may fosters the ability of market participants to
accommodate order flows, and ultimately impact on the adjustment of prices to new information, with a multiplier effect on volatility transmission in times of turmoil.

7.4 Conclusion

The objective of this chapter was to examine the relationship between market development and shift-contagion vulnerability in the MENA emerging markets. We first tested for shift-contagion during recent episodes of financial crisis and aggregated the results into a new bootstrapped index in order to compare vulnerability levels across countries. Overall, our results suggested weak but heterogeneous levels of financial contagion vulnerability amongst the MENA equity markets. We found that Turkey, Israel and Jordan were the most vulnerable markets over the 1997-2002 period, followed by Tunisia, Morocco, Lebanon and Egypt. Two conclusions can be drawn from this analysis. First, the benefits of diversification to the MENA markets may be relatively reduced in times of global turmoil, and may further diminish as these markets develop and reach higher levels of financial integration. Second, our results remind us that equity market development strategies are accompanied by contagion costs. These costs should be acknowledged, and addressed by all stakeholders if the region is to ensure a smooth transition towards financial integration.
8. General conclusion

Contending with the threats and opportunities of economic globalization, the MENA countries have engaged in a profound reform program. Ten years after the launching of the Euro-Mediterranean initiative, these countries have indeed made significant progress in many areas of the transition agenda: the macroeconomic situation has been stabilized, gradual trade integration has begun and legal and institutional indicators are improving. However, the MENA countries need to reposition themselves more favourably within the global system of international capital allocation if the objective of achieving higher economic growth through economic integration is to be reached. Taken together, their equity markets indeed attract a smaller share of global foreign capital than Sub-Saharan Africa.

A growing awareness of this problem has led policy-makers to modernize the MENA equity markets in an effort to promote domestic investment and to attract further capital flows. Nevertheless, the overarching transmission mechanisms uniting equity markets and economic development are unclear. Moreover, little research has been conducted on the MENA equity markets. Taking this into account, the objectives of this thesis were (i) to clarify the financial and economic consequences of equity market development and (ii) to analyze the properties of the MENA markets.

8.1 Results

The second chapter of this thesis presented an overview of the financial and economic outcomes of equity market development. Conclusions from this literature review suggested that the domestic development and international integration of equity markets have dissociated effects. At the domestic level, equity markets foster the mobilization and allocation of financial resources, and can improve corporate governance. This mechanism, however, is conditioned by the extent of informational efficiency, which remains widely debated by empiricists. Turning to international linkages, equity market integration lowers the cost of capital, but increases financial vulnerability and has a mixed impact on capital flows.

Overall, two conclusions arose. First, policies seeking to maximize the growth-enhancing impact of equity markets should focus on reaching and maintaining adequate levels of institutional transparency. Second, the optimal degree of
international integration depends on a trade-off between cheaper capital and financial stability.

The remainder of this thesis then focused on analyzing various dimensions of the equity market development process in the MENA region. In the third chapter, we compared market emergence levels from an intra and inter regional point of view. Our strategy was to generate indexes of market size, market depth, market activity and market transparency. We then conducted a qualitative analysis. Strikingly, the average level of market emergence appeared more pronounced in the MENA region than in other emerging areas, such as Latin America and Eastern Europe. Nonetheless, our results also showed that the MENA capital markets are very heterogeneous. While Turkey, Israel, Jordan and Egypt appear to be converging towards developed standards, Lebanon, Tunisia and Morocco can still be considered as 'frontier markets'. We also investigated the factors driving market emergence using a probit regression. Our estimates highlighted that market size and market activity are the main variables leading to market emergence.

The fourth chapter focused on an important area of concern for international investors and policy-makers: the need for transparent and well-disseminated information. We measured informational efficiency in the MENA region by aggregating the results of random-walk tests and technical trade analysis into a single index. Turkey, Israel and Jordan showed the strongest evidence of market efficiency, and were followed by Tunisia, Egypt, Lebanon and Morocco. These results reflected emergence levels and highlighted that market size, market activity and market transparency should be prioritized if the MENA markets are to reach a satisfactory level of market efficiency.

In the fifth chapter, we aimed to determine the extent of the MENA markets' integration into global finance. Based on four co-integration techniques, we rejected the hypothesis of a stable, long run bi-variate relationship between each of these markets and the European Monetary Union, the USA and a regional benchmark. A time-varying approach also suggested that the MENA capital markets tend to react heterogeneously to political, economic and financial shocks. Overall, this chapter highlighted strong international segmentation in the MENA region, in spite of the reform agenda.

Based on this observation, the sixth chapter investigated the optimal composition and performance of a MENA inclusive portfolio. We plugged five optimization models and two risk measures into a rolling block-bootstrap methodology to derive portfolio
weights, and assessed the performance of ex-post results by comparing Sharpe and Sortino ratios. The analysis of the out-of-sample performance highlighted outstanding diversification benefits in the MENA region. Moreover, our results suggested that an efficient MENA portfolio should be based on a risk minimization strategy. The optimal portfolio appeared to be well-balanced among the region’s capital markets, ranging from 16.75% in Jordan to 8.47% in Israel. Portfolio simulation analysis therefore suggested that the MENA economies may attract further portfolio flows in the near future. However, these results should be interpreted with caution, given the recent transmission of financial crises to emerging markets. These episodes have highlighted the potential negative impact of financial crises and contagion on economic stability and portfolio value.

Taking this into account, the seventh chapter considered ‘shift-contagion’ as a potential downside to equity market integration in the MENA area. We modelled the international shock transmission mechanism for the MENA markets during seven recent episodes of financial crises and aggregated the results of tests into a ‘vulnerability index’. Our results highlighted that Turkey, Israel and Jordan are the most vulnerable MENA markets. They are followed by Tunisia, Lebanon, Morocco and Egypt. This suggests that international shock sensitivity is a positive function of market development and global integration and highlights the growing impact of world volatility in the developing MENA equity markets, while also constituting a warning against diversifying in the MENA region in times of global turmoil.

8.2 Implications

Considering the intersection of these results allow us to locate the MENA countries within the ‘equity market development triangle’ and to deliver a policy message.

8.2.1 Financial implications

This thesis has found that the MENA countries have reached different market emergence levels. As illustrated in figure 26, Turkey and Israel have the most transparent, financially integrated and vulnerable equity markets, and may thus constitute a first concentric triangle within the equity market development triangle.
Egypt and Jordan may constitute an intermediate group of fast growing equity markets. However, it should be noted that results from chapter 7 suggested that Egypt is the sample’s least vulnerable market. This could be due to the fact that the studied crises episodes ranged from 1997 to 2002, a period preceding the massive development that later occurred in the Cairo Stock Exchange. We might thus assume that the Egyptian market is now more vulnerable to financial contagion. Finally, Tunisia, Morocco and Lebanon seem to constitute a third triangle of relatively segmented, inefficient and least vulnerable markets.
8.2.2 Policy implications

Financially integrated emerging countries (such as East Asian countries) attract a higher share of global capital inflows. These investments offer high returns, thereby stimulating economic activity. Concurrently, our results have suggested that the market emergence process in the MENA region has resulted in an increasing, but not yet significant, level of global market integration corresponding to potential diversification opportunities for international investors. This might constitute an opportunity for economic development in the region.

There are, however, two main drawbacks to this process. First, allocating additional funds to the most productive investment opportunities is a necessary condition for accelerating economic growth. This requires institutional development and high levels of market transparency, levels of which are heterogeneous in the MENA region. Second, potential nonlinearities in capital flows and the introduction of an external systemic risk component in domestic markets could induce significant destabilization costs. The external equity market development process should therefore be monitored very carefully.

In the worst possible configuration, premature financial integration would result in increased economic volatility, in a context where additional financial resources would be misallocated due to informational inefficiencies, thereby further increasing economic fragility. In other words, the MENA countries may endure the costs of the market integration process without reaping its economic benefits. Taking this into account, we suggest that policy makers in the MENA region should view institutional and corporate governance reforms as prerequisites for further market integration.

This conclusion appears in line with conventional wisdom. For instance, Aizenman and Powell (2003) suggested that legal and information-related problems explain why volatility has profound effects on emerging market economies. Similarly, Mishkin (1999) claimed that policy makers must put in place the proper institutional structures before liberalizing their financial systems. More generally, the importance of quality institutions for economic development has emerged as a central theme in economic thought. For instance, Rodrik et.al. (2002) have shown that institutional development tends to outperform geography and openness as explanations of real income per capita.
Our results have also shown that equity market development levels are not converging within the MENA region. This divergence might be due to a gap in the Barcelona Declaration, which focused mostly on structural adjustment and trade liberalisation programs. This situation may however constitute an additional obstacle to income convergence in the MENA region considering that equity markets have an important role to play in economic development. Taking this into account, two alternative strategies appear available for equity market development in the MENA region.

Within the first, non-cooperative policies would be implemented at the national level, resulting in a different pace of international equity market integration across countries. In this approach, countries endowed with thin equity markets (Tunisia, Morocco, Lebanon) should, in the short run, seek institutional development and market efficiency rather than higher rates of foreign equity participation. By contrast, the most developed MENA markets (Turkey, Israel and, to a lesser extent, Jordan and Egypt) could begin a gradual movement towards international financial integration. The advantages of this strategy are its operational simplicity and its low cost. Its disadvantage, however, is that the performance of the MENA equity markets in mobilizing and allocating resources would diverge (at least in the short run), at the risk of further aggravating economic inequality in the region.

An alternative cooperative strategy would be the progressive merging of the national MENA equity markets into a single ‘pan-oriental’ regional equity market. Within this approach, policy-makers would first implement joint regulations in the diffusion of information and the execution of orders, while simultaneously allowing firms to be cross-listed in several MENA equity markets, before proceeding with a physical unification of the region’s equity markets. The main advantages of this process would be the emergence of a unified and transparent MENA financial market, in which a maximum allocational efficiency would be ensured for all participating countries through joint institutional improvements and the realisation of economies of scale within the equity market. Such a unified market would also demultiply the region’s visibility in international finance, and serve as a useful mechanism for attracting further foreign capital flows into the region. Finally, this project would constitute an original South-South economic integration initiative and may serve as a conçuit for further political cooperation, in the spirit of the Barcelona Process. The main inconvenience of this process, however, would be an increased exposure to global systemic risk. In addition, practical obstacles include (i) the existence of sociological
and cultural differences among countries, (ii) a significant cost, and, (iii) the requirement of significant political will.

Regardless of the path chosen for equity market development in the MENA region, only experience will determine whether fears of political risk will deter investors from entering this emerging area in a significant way, and the extent to which financial integration will increase financial and economic volatility. To conclude, we might underline that it is the responsibility of all stakeholders involved – governments, academics, multilateral organizations, and private investors – to find the means to ensure a smooth and successful transition towards equity market development in this region.

8.3 Directions for future research

While this thesis has provided a rough picture of the processes at stake in equity market development, further research is much needed to fully understand the complexity of this phenomenon, both in the MENA region and in emerging markets in general. We might suggest three potential directions for future research.

First, the exact factors driving market efficiency are yet to be identified. Such an investigation would help policy makers to design an optimal sequencing of market development reforms. A possible research strategy could be to develop *de facto* and *de jure* institutional indicators reflecting market organizations, by-laws and market size, as well as composite indexes of market efficiency encompassing the various definitions of the concept. It could then be possible to assess the nature of the time-varying relationship between institutions and efficiency within a large panel of frontier, emerging and developed markets.

Second, theoretical models and empirical evidence suggest that equity market integration lowers the cost of capital, but increases financial volatility. Clarifying the relationship uniting market integration, financial vulnerability and the cost of capital, and identifying the main characteristics of firms affected by financial contagion would help policy makers to design appropriate responses. One possibility would be to identify the time-varying dynamic of the firm-level cost of capital within periods of externally induced financial stress.

Third, the impact of financial integration and shareholder dominance on corporate governance and social, economic and environmental externalities in emerging
countries could also be investigated. One possible approach might be to develop proxies for social, environmental and corporate governance, before assessing the impact of equity market development and international integration on these. Ethical funds and Islamic funds also constitute a burgeoning industry providing a new dataset for the traditional finance research agenda (efficiency studies, asset pricing, etc...).

To conclude, one might note that the complexity of the equity market development process may call for an interdisciplinary approach. Financial liberalization has implications for various social sciences including development economics, political science and law. Increasing data availability and advances in econometric theory also permit researchers to obtain a very high degree of precision in empirical investigations. Taken together, these possible research angles seem to create the conditions for a vast research agenda.
References


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