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International portfolio diversification: Is there a role for the Middle East and North Africa?

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Abstract

We examine the issue of possible portfolio diversification benefits into seven Middle East and North African (MENA) stock markets. We construct international portfolios in dollars and local currencies. Ex ante weights are obtained by plugging five optimization models and two risk measures into a rolling block-bootstrap methodology. This allows us to derive 48 monthly rebalanced ex post portfolio returns. We analyze the out-of-sample performance based on Sharpe and Sortino ratios and the Jobson–Korkie statistic. Our results highlight outstanding diversification benefits in the MENA region, both in dollar and local currencies. Overall, we show that these under-estimated, under-investigated markets could attract more portfolio flows in the future.

JEL classification: G11; G12; G15

Keywords: Portfolio allocation; Emerging markets; Middle East and North Africa

1. Introduction

International financial theory highlights the positive impact of market segmentation on international portfolio value. By spreading risks among different countries, investors can minimize the negative effects of market volatility and ultimately yield increased long-term returns. However, the growing presence of co-movements among developed and emerging financial markets is now

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well documented. Considering the recent currency crises and macroeconomic imbalances experienced in many emerging markets of East Asia, Latin America and Eastern Europe, investors might have to consider other emerging markets, such as those of the Middle East and North African (MENA) region.

Having undergone macrostabilization during the 1990s, these countries are indeed in the process of developing their stock markets through waves of privatization and regulatory improvements. These financial development policies have started to yield significant results: taken as a percentage of GDP, market capitalization in the MENA (31%) is now higher than in Latin America (24%) and Eastern Europe (26%). This trend is accompanied by policies aiming at attracting foreign investors. All of these countries have implemented ADR's during the 1990s. However, this region is still the world's smallest recipient of portfolio investment: according to the Mediterranean Economic Research Forum (ERF, 2004), foreign capital only represents 0.75% of the region's GDP—compared with an average of 4.2% for emerging countries. Not surprisingly, recent empirical studies have underlined the region's segmentation from world's financial markets (Lagoarde-Segot and Lucey, 2007). This paradoxical situation, where successful financial reforms have not yet resulted in international financial integration, might give rise to significant portfolio diversification opportunities in the MENA region.

The purpose of this paper is therefore to investigate the presence of portfolio diversification benefits in seven MENA markets: Morocco, Tunisia, Egypt, Jordan, Lebanon, Turkey and Israel. To our knowledge, this paper is the first attempt to formally capture the performance of portfolio investment in the region. Controlling for currency risk, we construct portfolios both in local currencies and in dollars over the 1998–2006 period. We use a rolling block-bootstrap methodology based on five optimization models stemming from modern portfolio theory. Following Gilmore et al. (2005) and Stevenson (2000), we also compute optimal portfolios based on an asymmetric risk measurement, the lower partial moment, which controls for the bias implied by identifying risk with standard deviation when stock returns are characterized by non-normality. We then compare the ex post performance of the constructed portfolios based on Sharpe and Sortino ratios through the Jobson–Korkie pairwise tests for the equality of performance ratios.

Our results highlight the presence of outstanding potential diversification benefits in the MENA region, whether transactions are denominated in local currencies or in dollars. The allocation of portfolio weights is well-balanced among countries. In most cases, the minimum variance portfolio seems to be the most promising optimization technique. Overall, we show that these under-estimated, under-investigated markets should attract more portfolio flows in the future. The remainder of the paper is structured as follows: Section 2 situates our contribution with current contexts. Section 3 is a brief presentation of the MENA markets. Section 4 presents the data and the methodology we employed. Section 5 presents our results and Section 6 draws together our conclusions.

2. Research background

Two main factors explain the attractiveness of international diversification for portfolio managers. First, the correlation between the returns of the securities that make up a portfolio is 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 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 composition

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of stock market and countries and results in significant differentials in country returns dynamics. By allowing the selection of foreign investment projects that exhibit very low correlation with the domestic portfolio, international diversification is beneficial to both value stability and long run yields. The power of diversification is in theory magnified in the case of emerging markets, where 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 (Bartram and Dufey, 2001). Furthermore, specific risks such as political instability and information costs are compensated by higher than average returns due to a faster rate of capital accumulation and faster economic growth than in developed countries. In a seminal study, Harvey (1995) showed that adding an emerging market component to a diversified developed portfolio would result in a reduction of six percentage points in the total portfolio's volatility while the expected returns remain unchanged.

However, the performance characteristics of emerging markets may have changed as a consequence of recent financial crises and the increased economic and financial integration of emerging markets into the global markets. Recent studies measuring the degree of co-movement between stock markets have highlighted increasing international integration as the emerging markets of Eastern Europe, South East Asia and Latin America grow and become more transparent and efficient. These studies generally relied on cointegration analysis and time-varying analysis (Voronkova, 2004). Stronger financial integration can be interpreted as decreasing diversification benefits in markets whose properties are approaching to developed standards. The series 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 also contributed both to an increase in return volatility and negative returns on the S&P/IFCI Composite Index, which led to negative returns for international investors over the 1994–2003 period (AIMR, 2005). However, the impact of such trends on individual emerging market returns was diverse and depended on various factors such as macroeconomic policy, transparency and market efficiency (Bekaert and Harvey, 1997). Overall, investing in an emerging market is considered as 'a bet on its emergence'.

3. The MENA markets

The Middle East and North African region is an under-investigated emerging market area. This study considers diversification strategies within seven MENA markets: Morocco, Tunisia, Egypt, Jordan, Lebanon, Israel and Turkey. As opposed to the rich, oil-exporting GCC countries, these markets constitute small, capital-scarce economies sharing a common economic trajectory through their inclusion in the Euro-Mediterranean partnership (ERF, 2004).

As shown in Table 1, economic reforms have resulted in significant equity market development in the region. On an average, the MENA markets have overcome Latin American markets in terms of capitalization, value traded and listed firms. These markets are nevertheless heterogeneous: the market capitalization to GDP ratio ranges from 110% in Jordan to 10% in Tunisia. Liquidity, as measured by the turnover ratio, ranges from 143% in Turkey to 7–8% in Tunisia and Lebanon. Finally, the number of listed firms ranges from 967 in Egypt to 15 in Lebanon. Such a discrepancy between development levels may seem a downside to selecting these markets as a group for allocation purposes. However, market heterogeneity also suggests high segmentation, and possible diversification benefits. To illustrate this, we report the correlation coefficients of returns between these indices and their significance in Table 2. Most of these coefficients are low, and some of them are not significant. Previous studies involving different methodologies have also established that the MENA markets are segmented from major world markets (Lagoarde-Segot and Lucey, 2007). In line with financial theory, development and segmentation in the MENA capital markets suggests

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Table 1
Correlation coefficients of the weekly stock market returns over the sample period, 1998–2005

	Egypt	Israel	Jordan	Morocco	Tunisia	Lebanon	Turkey	S&P 500
Panel A: in dollars								
Egypt	1.0000							
Israel	0.1115** (0.0250)	1.0000						
Jordan	0.1331** (0.0074)	0.0840 (0.0917)	1.0000					
Morocco	0.0534 (0.2841)	0.0368 (0.4602)	0.0110 (0.8248)	1.0000				
Tunisia	0.0115 (0.8180)	−0.0282 (0.5723)	0.0472 (0.3445)	0.1876** (0.0002)	1.0000			
Lebanon	0.1007** (0.0431)	0.0682 (0.1713)	0.1418** (0.0043)	0.0426 (0.3934)	0.0619 (0.2150)	1.0000		
Turkey	0.1201** (0.0157)	0.2268** (0.0000)	0.0350 (0.4825)	−0.0254 (0.6100)	0.0243 (0.6262)	0.0921 (0.0643)	1.0000	
S&P 500	0.0764 (0.1255)	0.5083** (0.0000)	0.0485 (0.3306)	−0.0275 (0.5817)	−0.0121 (0.8081)	0.1070** (0.0316)	0.3030** (0.0000)	1.0000
Panel B: in local currencies								
Egypt	1.0000							
Israel	0.1436** (0.0038)	1.0000						
Jordan	0.0629 (0.2070)	0.1074** (0.0309)	1.0000					
Morocco	0.1283** (0.0098)	0.0127 (0.7991)	−0.0079 (0.8746)	1.0000				
Tunisia	0.0509** (0.3070)	0.1026** (0.0393)	0.0710 (0.1545)	0.1084** (0.0293)	1.0000			
Lebanon	0.0332 (0.5055)	−0.0072 (0.8855)	0.0929 (0.0620)	0.0784 (0.1154)	0.0704 (0.1579)	1.0000		
Turkey	−0.1303** (0.0087)	0.0654 (0.1895)	−0.0616 (0.2169)	−0.0999** (0.0447)	−0.0324 (0.5166)	−0.0038 (0.9401)	1.0000	
S&P 500	0.1483** (0.0028)	0.0715 (0.1515)	0.1044** (0.0360)	0.0642 (0.1976)	0.0759 (0.1278)	0.0906 (0.0689)	−0.0108 (0.8294)	1.0000

Note: Numbers in parenthesis are the correlation coefficient *p*-values.
** Significance at the 5% level.

Table 2
Comparative indicators for emerging markets, 2003

Area	Market capitalization/GDP (%)	Liquidity (%)	Listed companies
Asia			
India	46.80	31.97	5644
China	25.50	71.08	780
Malaysia	156.00	32.45	902
Hong-Kong	456.10	41.44	1037
Korea	48.50	156.20	684
Philippines	29.20	11.52	236
Taiwan	132.53	156.10	674
Average	127.80	71.50	1422
Latin America			
Argentina	27.00	8.80	110
Brazil	45.90	29.35	391
Mexico	19.50	21.11	237
Chile	11.97	7.70	240
Colombia	18.10	5.65	108
Peru	19.90	10.00	227
Average	23.70	13.80	218
MENA			
Egypt	33.79	15.61	967
Morocco	29.32	18.72	52
Tunisia	10.03	7.73	45
Jordan	110.73	23.78	161
Lebanon	7.91	8.72	14
Israel	67.23	27.74	577
Turkey	29.36	143.55	285
Average	41.20	35.12	300

Source: Fédération Internationale des Bourses de Valeur (2003). *Note*: 'Market capitalization/GDP' is the market capitalization at the end of each year divided by GDP for the year. 'Liquidity' corresponds to total value traded for the year divided by market capitalization. 'Listed companies' are the number of listed companies at the end of the year.

the presence of diversification benefits for investors. It might therefore be time to investigate the position of these markets from the perspective of international capital allocation.

4. Data and methodology

4.1. Data

All eight indices are analyzed using weekly data as provided by the S&P/IFC database over the 1998–2006 period. The use of weekly data is generally recommended for portfolio simulations in thinly traded markets as it minimizes the impact of noise trading on the value of securities. Taking the standpoint of institutional investors, we also make the assumption that an investor cannot partake in short selling.

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 and

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Dufey, 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 (Oldier and Solnik, 1993). Economically, investment contracts in local currencies are also preferable for recipient countries as they transfer the currency risk to the investor and hence provide local businesses with a 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.

Table 3 provides some descriptive statistics. As expected in emerging markets, both the standard deviation and the lower partial moment – an appropriate measure of risk accommodating with non-normality – seem higher overall in the MENA countries than in the S&P 500 benchmark, which suggests a higher level of risk. These risks are accompanied by higher mean returns, especially in local currency. The returns also display positive skewness and kurtosis, while the Jarque–Bera test rejects the null hypothesis of normality at the 5% level. This finding provides a justification for the use of the lower partial moment as a complementary measure of risk.

4.2. Methodology

The main advantage of bootstrapping portfolio allocations lies in the analysis of estimation risk via the construction of confidence intervals for the asset weights. The extreme sensitivity of portfolio weights to changes in the means is indeed a traditional hurdle to mean-variance analysis: the true parameters of return time-series being 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).

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

Table 3
Summary statistics of the weekly stock market returns over the sample period, 1998–2005

	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
Panel A: in dollars								
Mean	0.001	0.001	0.004	0.000	0.001	0.002	0.001	0.001
S.D.	0.038	0.033	0.025	0.032	0.022	0.027	0.084	0.024
LPM	0.015	0.011	0.007	0.011	0.005	0.007	0.073	0.006
Skewness	0.258	−0.603	0.692	0.081	0.455	−0.758	−0.158	−0.431
Kurtosis	4.007	4.143	6.614	7.249	5.363	12.107	4.999	3.742
Jarque–Bera	21.487	46.339	251.494	303.647	107.674	1431.063	68.774	21.733
Panel B: in local currency								
Mean	0.003	0.003	0.002	0.002	0.004	−0.001	−0.014	0.001
S.D.	0.037	0.020	0.029	0.024	0.029	0.029	0.231	0.024
LPM	0.014	0.004	0.009	0.006	0.009	0.009	0.552	0.006
Skewness	0.532	0.406	−0.248	0.451	−0.364	0.510	2.617	−0.435
Kurtosis	5.165	3.994	2.682	5.403	11.709	6.190	70.956	3.747
Jarque–Bera	97.960	27.758	5.842	110.895	1285.754	188.780	78,198.320	22.139

Note: A target rate of zero is used for the lower partial moment (LPM) measure.

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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 (Persson and Riksbank, 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 datapoints.

For a family of utility functions $(\mu_1, \ldots, \mu_k)$, we therefore generate 1000 draws from a posterior density $\theta_{i,k} \approx p(\theta/x^{o})$. For each $\vartheta_{i,k}$ we then find weight $\omega_{i,k}$ that maximizes $\mu_k(\omega, \theta_{i,k})$, and we finally use the empirical distribution to draw a 95% confidence interval corresponding to the selected optimal portfolio weights. The selected utility functions stem directly from the widely used Markowitz (1959) optimization models. The first model relies on the standard certainty equivalence tangency portfolio (CETP), which derives the optimal weights from the assumption that historical returns constitute an appropriate forecast of a portfolio's expected returns. 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 et al., 2005; Stevenson, 2000). The BS 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, this approach reduces the difference between extreme observations, and increases the out of sample performance of the tangency portfolio (Jorion, 1985, 1986). The general form of the estimators in the BSP model can be defined as follows:

$$E(r_i) = wr_g + (1 - w)\bar{r}_i \tag{1}$$

where $E(r_i)$ is the adjusted asset mean, $\bar{r}_i$ the original asset mean and r_g is the global mean,and w is the shrinkage factor. Jorion (1985, 1986) estimates the shrinkage factor from a suitable prior:

$$w = \frac{\lambda}{T + \lambda} \tag{2}$$

where

$$\lambda = \frac{(N + 2)(T - 1)}{(r_i - r_o 1)' S^{-1} (\bar{r} - r_g 1)(T - N - 2)} \tag{3}$$

where T is the sample size, N the number of markets, S the sample covariance matrix, '1' the 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. Finally, another way to diminish estimation risk is to implement the minimum variance portfolio (MVP) approach which depends only on the variance–covariance matrix, and does not include returns. This approach is generally presented as more robust as it is not very sensitive to estimation error. Previous work has also 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, 1995; Stevenson, 2000). We also consider the naïve portfolio strategy, in which allocations are given equal weights. 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 constraints the impact instability on the input parameters (Frost and Savarino, 1988). For comparison purposes, we finally compute the home, undiversified portfolio.

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

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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 their optimization decisions on downside risk measures, such as the lower partial moment (hereafter LPM), developed by Bawa (1975), 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), who supports the idea that downside risk measures matter for studying emerging market equity indices. We calculate the LPM as:

$$\mathrm{LPM}(a,t) = \frac{1}{K}\sum_{T-1}^{K}\mathrm{Max}[0, t - R_t]^a \tag{4}$$

where a is the investor's risk tolerance value and degree of the lower partial moment, t the target return, K the number of observations and R_t is the stock return during period t. 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 (Hwang and Pederson, 2004), the LPM is equivalent to the special case of the semivariance. The objective of this paper 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 a target return equal to zero.

The period ranging from January 1, 2002, to January 1, 2006, is used as an out of sample window, where ex post returns are calculated based on a rolling monthly rebalancing of portfolios using 4 years of weekly ex ante data. For instance, weights for the January 2002 portfolio are optimized using data ranging from January 1, 1998, to December 31, 2001, and so on with the sample ending in January 1, 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 $(R_\mathrm{p} - R_\mathrm{f})/S_\mathrm{p}$, where R_p is portfolio return, R_f 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 premises 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 above different strategies using the Jobson–Korkie (1981) statistic defined as follows:

$$t = \frac{s_j r_i - s_i r_j}{(2/T)(s_i^2 s_j^2 - s_i s_j s_{ij})^{1/2}} \tag{5}$$

where s_j is the appropriate measure of risk of stock return j, r_j the mean return of j and s_{ij} is the covariance between i and j.

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5. Results

Table 4 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.

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 currency, 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.

Table 4
Average rolling bootstrapped portfolio weights, 1997–2006

	Egypt	Israel	Jordan	Morocco	Turkey	Lebanon	Tunisia	S&P 500
Panel A: in dollars								
CETP-SD (%)	3.20	24.40	29.29	8.79	4.52	7.60	8.61	13.59
MVP-SD (%)	4.34	5.30	21.92	21.78	1.91	11.53	21.30	11.92
BSP-SD (%)	8.82	3.32	13.37	9.22	32.82	16.03	9.51	6.91
NAÏVE-SD (%)	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
HOME-SD (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
CETP-LPM (%)	7.68	18.70	24.21	14.74	7.98	4.17	9.38	13.15
MVP-LPM (%)	21.64	2.46	3.95	37.29	0.84	4.41	26.45	2.97
BSP-LPM (%)	13.01	12.93	7.87	11.81	20.77	11.03	7.28	15.29
NAÏVE-LPM (%)	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
HOME-LPM (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Average (%)	10.46	11.51	15.70	16.08	11.73	9.97	13.44	11.10
S.D.	0.06	0.08	0.09	0.09	0.11	0.04	0.07	0.04
Panel B: in local currencies								
CETP-SD (%)	8.32	17.55	27.02	5.40	20.95	7.23	6.36	7.16
MVP-SD (%)	4.28	5.68	20.83	19.37	2.55	12.00	24.05	11.25
BSP-SD (%)	8.11	3.00	16.94	13.37	22.04	15.11	14.53	6.91
NAÏVE-SD (%)	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
HOME-SD (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
CETP-LPM (%)	5.94	3.95	27.14	20.01	16.98	3.67	16.11	6.21
MVP-LPM (%)	22.47	2.53	4.05	37.84	0.81	4.07	26.58	1.64
BSP-LPM (%)	11.37	10.06	13.01	7.41	29.91	10.03	3.47	14.74
NAÏVE-LPM (%)	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
HOME-LPM (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
Average (%)	10.69	8.47	16.75	16.05	14.78	9.64	14.51	9.11
S.D.	0.06	0.05	0.08	0.10	0.10	0.04	0.08	0.04

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.

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Analyzing the patterns of portfolio weights across optimization methodologies permits us to make certain deduction concerning the country level risk-to-return tradeoff. For instance, market attractivity in Morocco and Tunisia seems to be primarily driven by low risks rather than high returns. Morocco obtains indeed 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.

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, a not surprising feature considering last decade's massive capitalization increases in the Egyptian market (see Lagoarde-Segot and Lucey, 2007).

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),

Table 5
Coefficients of variations for the ex ante weights

	Egypt	Israel	Jordan	Morocco	Turkey	Lebanon	Tunisia	S&P 500
Panel A: in dollars								
CETP-SD	1.47	0.64	0.33	0.60	1.17	0.71	0.70	0.67
MVP-SD	1.00	0.68	0.31	0.22	1.84	0.28	0.28	0.40
BSP-SD	0.32	1.62	0.39	0.99	0.71	0.45	1.15	1.63
CETP-LPM	1.07	0.76	0.45	0.89	1.26	0.97	0.93	0.98
MVP-LPM	0.31	2.44	1.53	0.32	5.43	1.43	0.17	2.79
BSP-LPM	0.60	0.41	0.63	0.58	0.48	0.74	0.98	0.59
Average	0.80	1.09	0.60	0.60	1.82	0.76	0.70	1.17
Panel B: in local currencies								
CETP-SD	1.04	0.63	0.37	0.97	0.67	1.22	0.98	0.94
MVP-SD	1.13	0.83	0.28	0.37	1.61	0.39	0.15	0.48
BSP-SD	0.84	0.93	0.32	0.73	1.11	0.39	0.79	0.90
CETP-LPM	1.38	0.92	0.30	0.53	0.73	1.21	0.61	1.30
MVP-LPM	0.26	2.39	1.45	0.32	5.61	1.71	0.19	4.04
BSP-LPM	1.01	0.55	0.76	0.95	0.34	0.32	1.50	0.51
Average	0.94	1.04	0.58	0.64	1.68	0.87	0.70	1.36

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 standards deviation to mean ratio using the 48 months ex ante weight allocations.

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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 towards 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 not existent at the beginning of the sample period and remains to this day by far the region's smallest.

Table 5 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 method-

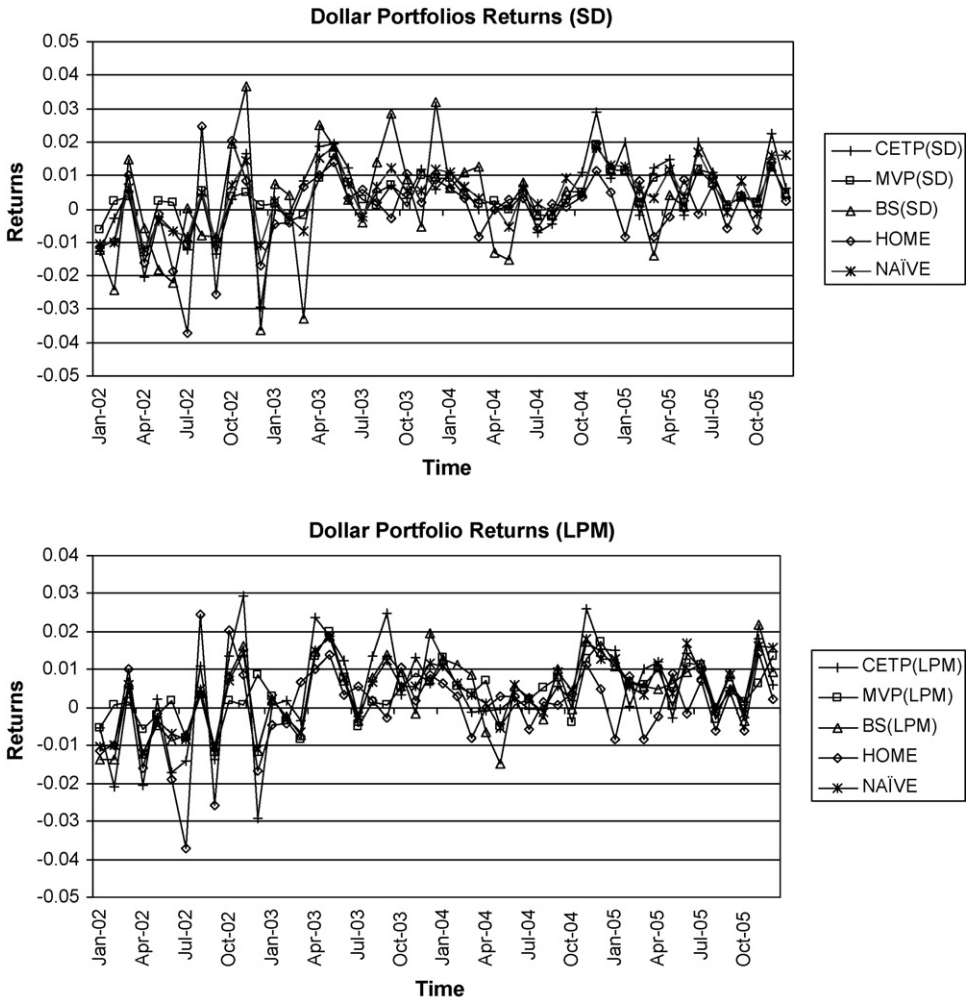

Fig. 1. Holding period returns, in dollars.

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ologies used. Average coefficients are inferior to unity for most countries, suggesting that the allocation of weights is stable over time. Nevertheless, 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 an 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

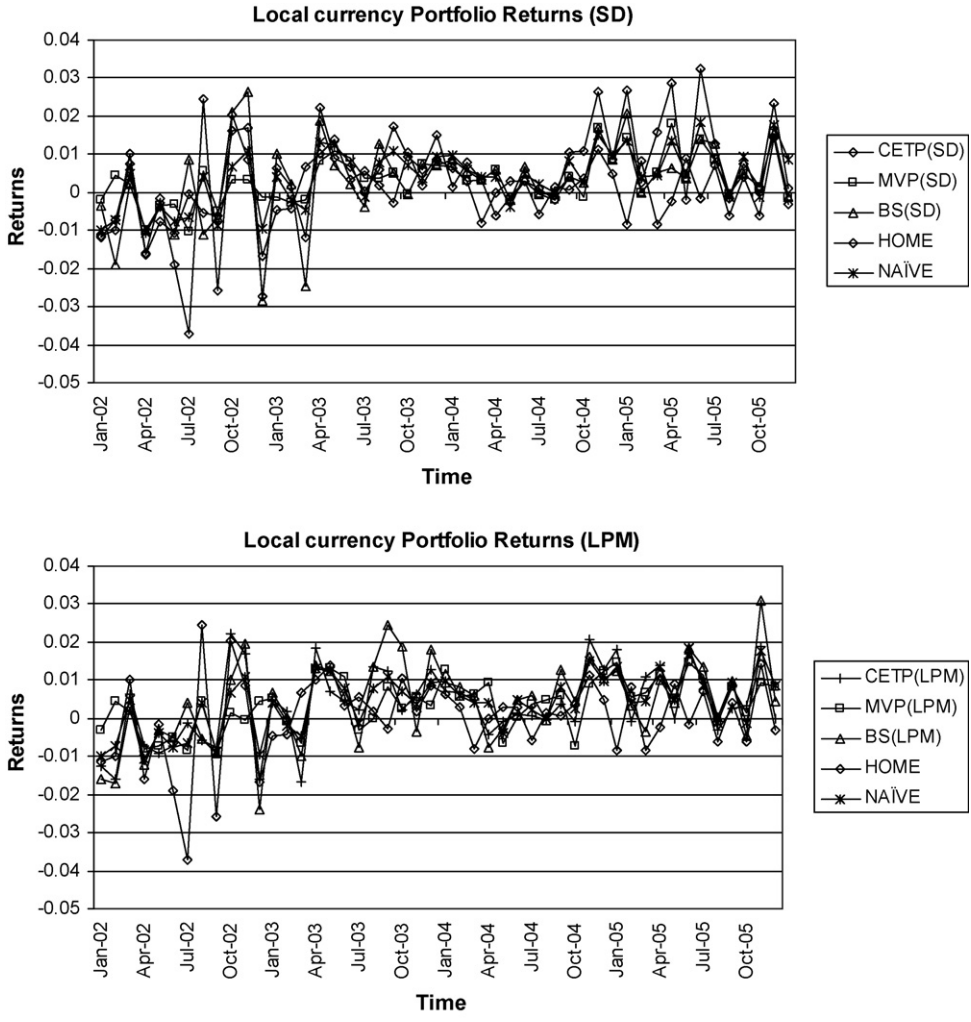

Fig. 2. Holding period returns, in local currencies.

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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 Figs. 1 and 2. Inspection of the figures reveals similarities in the dynamic of rolling returns. Not surprisingly, the MVP returns appear to be the less 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 the undergoing reform program in the MENA markets exerts a positive effect on their attractivity for international portfolio investment.

Table 6 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 ranges form 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.

Finally, our *t*-statistics allow us to draw some comparisons among investment strategies (Tables 7 and 8). 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 portfo-

Table 6
Performance ratios

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

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

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Table 7
Statistical comparisons of the out of sample performance: in dollars

	S&P (SD)	EQWP (SD)	MVP (SD)	BSP (SD)	S&P (LPM)	EQWP (LPM)	MVP (LPM)	BSP (LPM)
Panel A: Sharpe ratios								
EQWP (SD)	−3.78**							
MVP (SD)	−4.76**	−1.05						
BSP (SD)	−1.01	3.21**	2.66**					
CETP (SD)	−2.55**	1.70**	2.81**	−1.35				
EQWP (LPM)	−3.78**	0.00	1.05	−3.21**	−3.78**			
MVP (LPM)	−3.35**	−0.50	0.38	−2.29**	−3.55**	−0.50		
BSP (LPM)	−2.85**	1.73**	1.80**	−2.47**	−2.85**	1.73**	1.31	
CETP (LPM)	−2.66**	2.04**	2.26**	−1.65	−2.66**	2.04**	1.44	0.48
Panel B: Sortino ratios								
EQWP (SD)	−5.11**							
MVP (SD)	−5.72**	−0.35						
BSP (SD)	−5.02**	2.89**	5.94**					
CETP (SD)	−3.94**	1.43	1.89**	−1.92**				
EQWP (LPM)	−5.11**	0.00	0.35	−2.89**	−5.11**			
MVP (LPM)	−9.21**	−0.69	−0.33	−6.85**	−7.65**	−0.69		
BSP (LPM)	−4.17**	0.80	1.38	−1.84**	−4.17**	0.80	1.72	
CETP (LPM)	−3.44**	1.51	2.24**	−1.41	−3.44**	1.51	3.07**	0.67

Note: This table 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.
** Significance at the 5% level.

Table 8
Statistical comparisons of the out of sample performance: in local currencies

	S&P (SD)	EQWP (SD)	MVP (SD)	BSP (SD)	S&P (LPM)	EQWP (LPM)	MVP (LPM)	BSP (LPM)
Panel A: Sharpe ratios								
EQWP (SD)	−4.12**							
MVP (SD)	−4.60**	0.05						
BSP (SD)	−1.67	2.45**	1.76**					
CETP (SD)	−2.58**	1.65	1.17	−1.45				
EQWP (LPM)	−4.12**	0.00	0.05	−2.45**	−4.12**			
MVP (LPM)	−3.43**	−0.20	−0.18	−1.76**	−3.44**	−0.20		
BSP (LPM)	−2.44**	2.15**	1.20	−0.93	−2.44**	2.15**	1.23	
CETP (LPM)	−2.31**	2.22**	1.52	−1.13	−2.31**	2.22**	1.43	0.16
Panel B: Sortino ratios								
EQWP (SD)	−5.86**							
MVP (SD)	−5.49**	0.55						
BSP (SD)	−5.40**	2.69**	4.23**					
CETP (SD)	−8.27**	0.80	−1.40	−1.57				
EQWP (LPM)	−5.86**	0.00	0.55	−2.69**	−5.86**			
MVP (LPM)	−10.52**	−0.22	0.35	−4.64**	−10.37**	−0.22		
BSP (LPM)	−6.12**	1.28	2.32**	−1.12	−6.12**	1.28	2.22**	
CETP (LPM)	−6.38**	1.35	2.08**	−0.93	−6.38**	1.35	2.05**	−0.07

Note: This table 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.
** Significance at the 5% level.

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lio. Our results therefore suggest that investors considering portfolio diversification in the MENA markets should primarily seek to minimize risk (Tables 7 and 8).

6. Conclusion

The objective of this paper was to investigate the issue of possible portfolio diversification benefits within seven Middle East and North African stock markets. Taking the standpoint of the world investor, our portfolios were constructed in dollars and local currencies to control for currency risk and were 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. Overall, our results highlighted the presence of outstanding diversification benefits in the MENA region. In addition, the minimum variance portfolio seemed to display the best performance. However, 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 indeed shown that strong and transparent economic and financial institutions are essential for maintaining long-run portfolio returns in emerging markets. Taking this into account, future research could attempt to capture the extent and dynamic of institutional transparency in the MENA countries. It might also be necessary to investigate the importance of transaction costs.

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