

Portfolio allocations in the Middle East and North Africa

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Abstract

We examine the issue of possible portfolio diversification benefits into seven Middle-Eastern and North African (MENA) stock markets. We take the standpoint of the world investor and we construct portfolios in international and local currencies based on five optimization models and two risk measures. We then compare the portfolio out-of-sample performance based on Sharpe and Sortino ratios through the Jobson-Korkie statistic. Our results highlight outstanding diversification benefits in the MENA region, both in dollar and local currencies. Portfolios based on local currencies seem to exhibit a higher degree of diversification, while the measure of risk seems to affect profitability less than the optimization model employed. Overall, we show that these under-estimated, under-investigated markets could attract more portfolio flows in the future.

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1. Introduction

International financial theory highlights the positive impact of market segmentation on international portfolio value. By spreading risks across countries, investors can minimize the negative effects of market volatility and ultimately yield increased long-term returns. However, the growing presence of co-movements across worldwide developed and emerging financial markets is now well documented (Kearney and Lucey, 2003). 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 Africa (MENA) region.

Having undergone macrostabilization during the 1990's, 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%) (BEI, 2005). However, the region is still the world's smallest recipient of portfolio investment : according to the IMF (2004), foreign capital only represents 0.75% of the region's GDP – versus an average of 4.2% for emerging countries. Unsurprisingly, recent empirical studies have underlined the region's segmentation from world's financial markets. (Lagoarde-Segot&Lucey, 2005). This paradoxal situation, where successful financial reforms have not yet resulted in international financial integration, might well be at the origin of significant portfolio diversification opportunities in the MENA region.

The purpose of this paper is therefore to investigate the presence of portfolio diversification benefits into seven MENA markets : Morocco, Tunisia, Egypt, Jordan, Lebanon, Turkey and Israel. To our knowledge, this paper is the first attempt at formally capturing the performance of portfolio investment in the region. Controlling for currency risk, we construct portfolios both in local currencies and in dollars over the 1998-2005 period. We use various optimization models based on modern portfolio theory and several measures of risk. Following Gilmore et.al (2005) and Stevenson (2000), we compute optimal portfolios based on an assymetric risk measure, 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 ratios 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 transaction are denominated in local currencies or in dollars. In most cases, the minimum variance portfolio appears as the most promising optimization technique. In addition,

portfolios based on local currencies seem to exhibit a higher degree of diversification, while the measure of risk seems to affect profitability less than the optimization model employed. 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 puts our contribution in perspective. Section 3 presents the data and the methodology we employed. Section 4 presents our results and section 5 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 are crucial in determining the associated level of risk. Low as opposed to high correlation between securities generally means lower 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 different monetary, fiscal, and industrial policies across countries which add up to different industrial composition of stock markets and result 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 therefore beneficial to both value stability and long run yields.

The power of diversification is magnified in the case of emerging markets. In these 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 (Bartram&Dunfey, 2001). Besides, 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 a portfolio of emerging markets to a diversified developed portfolio would result in a reduction of six percentage points in the total portfolio's volatility while keeping the expected returns unchanged.

However, the performance characteristics of emerging markets may have changed as a consequence of recent crises in emerging markets 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 integration to the world 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 (Bracker and Koch (1999), Harvey (2000), Voronkova (2004)), and often depicted decreasing diversification benefits in markets whose properties are getting closer to developed standards. Besides, 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 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, 2003). 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 & Harvey, 1997).

Investing in an emerging market can hence be seen as a bet on its emergence, since high returns and diversification benefits can go along with either increased volatility through contagion or a smooth move towards development. This being said, very little is known about the recently emerging markets of the Middle East and North African (MENA) region. After a decade of transition towards financial liberalization, these countries are nevertheless dotted with fast growing stock markets opened to international investors. Transaction costs are generally low. As shown in table 1, these countries’ capital markets have had a significant development in size, liquidity and market capitalization.

INSERT TABLE 1 ABOUT HERE

Besides, previous studies involving different methodologies (Neaime, 2004; Lagoarde-Segot & Lucey, 2005) have established that the MENA markets are segmented from major world markets. For illustration, 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 even significant.

INSERT TABLE 2 ABOUT HERE

In line with financial theory, fast growth and segmentation of the MENA capital markets suggests the presence of high diversification benefits and might be a factor of attractivity for portfolio investors. It might therefore be time to investigate the position of these markets in the global allocation of capital.

3. Data and Methodology

3.1 Data

We examine the performance of diversification strategies in a total of seven MENA markets : Morocco, Tunisia, Egypt, Jordan, Lebanon, Israel and Turkey, plus a world benchmark. All eight indices are analyzed using weekly data as provided by the S&P/IFC database over the 1998-2005 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 & 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 hence provide local businesses with a safer access to foreign capital (IFC, 2004). Allowing for comparison, all of the data is analyzed first on the basis of local returns. We then carry the same analysis after having converted these series in US dollars at the appropriate spot exchange rate.

Table 1 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 overall higher 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 suggests a lesser power of optimization models using standard deviation as a single measure of risk.

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4.2 Methodology

The analysis is undertaken on the basis of a 40 week window, which divides the sample in 10 non overlapping holding periods of equal length. We derive the optimal weights for each of the first ten periods, and apply them to the following period, which is used as an out-of-sample window. In other words, we calculate portfolio returns for each holding period using weights obtained at the previous period. Portfolio performance is therefore evaluated on an ex-post basis. Three optimization models stemming from the mean-variance approach of Markowitz (1959) are used. Our first technique is based on the 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. However, whereas the CETP portfolio allocation critically depends on historical means, the latter are often subject to estimation error. As a result, studies by Jorion (1985, 1986) and Chopra and Ziemba (1993) have suggested that the CETP produces unsatisfactory ex-post results.

In order to increase the robustness of our analysis, we therefore also optimize our portfolio using the Minimum Variance Portfolio (MVP) approach, which depends only on the variance-covariance

matrix, and does not include returns. Following Gilmore (2005) and Stevenson (2001), we thus derive the optimal weights using the Bayes Stein (BS) estimator as a correction for the non normality in historical returns which typically biases the results obtained from the standard CETP methodology. 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.

The general form of the estimators in the BSP model can be defined as follows :

$$E(r_i) = wr_g + (1-w)r_i \quad (1)$$

where $E(r_i)$ is the adjusted asset mean, 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:

$$w = \lambda(T + \lambda) \quad (2)$$

$$\text{Where } \lambda = \frac{(N+2)(T-1)}{(r - r_g \mathbf{1})^T S^{-1} (r - r_g \mathbf{1})(T-N-2)} \quad (3)$$

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

However, skewness in returns undermines the robustness of standard deviation as an appropriate measure of risk. For instance, 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 rather 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:

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

where 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 . 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 semivariance. However, the objective of this paper is to show that the MENA emerging markets might be useful 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. We also examine the performance of an equally weighted portfolio (EQWP), or naïve portfolio strategy, which involves investing equal amounts in each MENA return index and the home-market index. This model assumes that past performance is irrelevant and does not contain any useful information about future performance.

We calculate Sharpe measures of portfolio performance as the ratio of mean excess return to standard deviation for each portfolio as $(Rp - R_f)/Sp$, where R_p is portfolio return, R_f is the risk-free rate (which is assumed to be zero), and Sp 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:

$$t = \frac{s_j r_i - s_i r_j}{\left[\frac{2}{T} (s_i^2 s_j^2 - s_i s_j s_{ij}) \right]^{1/2}} \quad (5)$$

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

5. Results

Table 3 to 6 present the intertemporal stability of weights in international portfolios using our two measures of risk and alternative currencies. Standard deviation ranges from 0.00 for Turkey under the minimum variance portfolio in dollars, using LPM for optimizing to 0.15 for Tunisia, Egypt and Jordan under the tangency portfolio in dollars, using both standard deviation and LPM for optimizing. By comparison, in a study focusing on developed markets, Izan et. Al, 2001, found standard deviation ranging from X to X. Our weights are therefore relatively stable, which suggests a good ex-post performance.

Besides, weights of the minimum variance portfolio seem to be relatively stable over time. For instance, using standard deviation for optimizing, risk within this portfolio ranges from 0.01 for Turkey to 0.14 for Jordan in dollars; and from 0.01 for Turkey to 0.10 for Tunisia in local currencies. By comparison, risk within the tangency portfolio ranges from 0.04 for the S&P 500 to 0.15 for Egypt and Jordan in dollars; and from 0.07 for Lebanon to 0.14 for Tunisia in local currencies. Finally, risk within the Bayes-Stein portfolio ranges from 0.08 for Lebanon to 0.15 for Tunisia in dollars, and from 0.08 for Lebanon to 0.13 for Tunisia in local currencies. A similar pattern can be observed using LPM for optimizing. The finding that MVP weights are more stable is in conformity with Jorion (1985) and Eun & Resnick (1988), who demonstrated that the due to the relative stability of the variance-covariance matrix and the instability of the mean-return vector. This constitutes preliminary evidence of a better performance of the minimum variance portfolio.

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Table 7 and 8 present the summary statistics for the performance of the dollar and local currency portfolios, respectively. In each case, the performance of diversification strategies in the MENA region seems to offer outstanding benefits. Diversification produces positive returns in each of the four diversified models: the tangency, the Bayes-Stein, the minimum variance, and even the naïve portfolio. This observation holds for both measures of risk. The highest Sharpe ratios and Sortino are obtained with the minimum variance portfolio using dollars returns and the tangency portfolio using

local currency returns. We remark that both results are obtained using lower partial moments for the construction of portfolios. This is not surprising considering the non-normality of our series.

INSERT TABLE 7 ABOUT HERE

INSERT TABLE 8 ABOUT HERE

The minimum variance portfolio seems to produce the best and most reliable performances in both local currencies and dollar denominated portfolios. Whatever risk measure and performance ratio was utilized, the minimum variance portfolio indeed appears as the first choice in all cases; except for local returns with LPM, when it is second best. This dominance is consistent with the findings of Izan et.al (1991) and Stevenson (2000). Theoretically, this stems from the fact that this approach totally excludes the problem of estimation error resulting from a bias in the means. As stated above, though, the highest Sharpe and Sortino ratios are obtained with the tangency portfolio in local currency, using LPM for optimizing. This surprising finding is similar to Gilmore et al. (2005). We also note that the Bayes Stein portfolio does not seem to increase portfolio performance, which is in contrast to the results of Jorion (1985) and Chopra and Zembia (1993), but in accordance with Stevenson (2000).

Quite surprisingly, the naïve portfolio appears to be second best in dollars, while it turns in the worst performance in local currency. This is probably due to the smoothing effect of the dollar conversion on stock prices. Market prices are generally more volatile in local currencies as they incorporate inflation trends. These trends have been important over the period of study, which corresponds to a macrostabilization efforts from the governments, with various outcomes. For instance, whereas inflation was brought back from about 50% to 2% in Lebanon over the nineties, it is still rampant in the case of Turkey, with rates of 25% in 2003 (IMF). The naïve diversification model, which makes no attempt at optimization based on this information, logically produces an inferior performance in local currency.

Comparing portfolio results based on lower partial moments versus standard deviation as a risk measure suggests that the ranking of portfolios remains stable in most cases. The only difference is that the tangency portfolio seems to outperform the minimum variance portfolio when we use local currencies. Turning to the degree of diversification, in each case, optimal portfolios are relatively well diversified, as no country weight exceeds 20% the portfolio allocation. However, it seems that models based on LPM lead to slightly less diversified portfolio allocations than the standard deviation based models. This is consistent with the assumption the LPM better captures investment risk in the case of return non-normality and subsequently induces a greater degree of caution in diversification strategies. Regardless of the optimization measure and the currency, the majority of diversification seems to occur in Israel. For instance, in Panel A of table 4, using the LPM for optimizing, investors allocate on average 23.05% of their portfolio in this country under the minimum variance portfolio. The corresponding value is 16.55% in local currency under the tangency portfolio.

Turning to a comparison of local currency and dollar portfolios, we notice that the structure of the optimal portfolio differ slightly whether returns are denominated in dollars or local currencies. The local currency portfolio seems to be more diversified across countries: apart from Israel, portfolio allocations are greater than 10% for Egypt (11.56%), Jordan (12.57%), Morocco (15.05%), and Lebanon (16.44%). No country receives more than 20% or less than 5% of portfolio allocation. This contrasts with results in dollars, where allocations are greater than 20% for Israel (23.05%) and Morocco (20.53%), and lower than 5% for Tunisia (1.08%). This divergence can be explained by the fact that correlation coefficients between the studied markets are generally higher in local currencies than in dollars. Then, looking at measures of performance, both local currency and dollar denominated portfolios are comparable. However the highest Sharpe and Sortino ratios are achieved in local currency under the LPM-based tangency strategy (0.492 and 0.462). According to the IFC (2004), local currency denominated portfolio investments are important for local economic development, as they provide a low-cost and safer access to capital for local businesses and infrastructure projects. Our result suggest that transferring the currency risk to lenders who invest in the MENA region is not a hindrance to portfolio investment profitability either.

Finally, table 5 compares the performance of the portfolios as measured by Sharpe and Sortino ratios with the Jobson-Korkie t-statistic. For the dollar-denominated portfolios, the minimum variance strategy seems to be significantly superior to other strategies, whatever the measure of risk. For instance, not only does the MVP based on LPM beats the home, the BS and the CETP portfolios using LPM, but it also does when we use standard deviation as a measure of risk, and reciprocally. This suggest that the portfolio construction strategy matters more than the risk measure when it comes to profitability. This finding seems to corroborate Gilmore et.al (2005). Turning to local currency portfolios, the analysis reveals the same pattern. We also notice that the tangency portfolio, is not significantly better than the minimum variance portfolio. The latter appears as the most promising strategy for portfolio investment in the MENA region.

INSERT TABLE 9 ABOUT HERE

6. Conclusion

The objective of this paper was to investigate the issue of possible portfolio diversification benefits into seven Middle-East and North African (MENA) 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,

portfolios based on local currencies seemed to exhibit a higher degree of diversification, and the measure of risk appeared to be less important than the optimization model when it comes to determining performance. Overall, we showed that the under-estimated, under-investigated MENA markets should display some attractivity.

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Table 1 Summary statistics of the weekly stock market returns over the sample period, 1998-2005

Panel A: in dollars	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
Mean	0,001	0,001	0,004	0,000	0,001	0,002	0,001	0,001
Std. Dev.	0,038	0,033	0,025	0,032	0,022	0,027	0,084	0,024
Lower Partial Moment	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	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
Mean	0,003	0,003	0,002	0,002	0,004	-0,001	-0,014	0,001
Std. Dev.	0,037	0,020	0,029	0,024	0,029	0,029	0,231	0,024
Lower Partial Moment	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	78198,320	22,139

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

Table 2 Correlation coefficients of the weekly stock market returns over the sample period, 1998-2005

Panel A: in dollars	Egypt	Israel	Jordan	Morocco	Tunisia	Lebanon	Turkey	USA
Egypt	1.0000							
Israel	0.1115*	1.0000 (0.0250)						
Jordan	0.1331*	0.0840 (0.0074)	1.0000 (0.0917)					
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	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	USA
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 () are the correlation coefficient p-values. (*) indicates significance at the 5% level.

Table 3 Intertemporal stability of weights in MENA portfolios -using standard deviation for optimizing

Panel A : in dollars

Certainty Equivalent Portfolio

Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
1	0,03	0,20	0,00	0,30	0,25	0,17	0,01	0,04
2	0,03	0,04	0,35	0,06	0,28	0,02	0,23	0,01
3	0,01	0,08	0,02	0,27	0,39	0,05	0,12	0,07
4	0,25	0,02	0,10	0,06	0,33	0,01	0,17	0,06
5	0,01	0,43	0,10	0,19	0,01	0,14	0,01	0,11
6	0,17	0,37	0,03	0,02	0,02	0,14	0,10	0,15
7	0,01	0,06	0,40	0,39	0,02	0,02	0,04	0,05
8	0,26	0,17	0,09	0,24	0,14	0,04	0,06	0,01
9	0,44	0,05	0,04	0,07	0,09	0,23	0,05	0,03
10	0,14	0,22	0,15	0,19	0,04	0,12	0,10	0,03
Mean	0,14	0,16	0,13	0,18	0,16	0,09	0,09	0,05
SD	0,15	0,15	0,14	0,12	0,14	0,08	0,07	0,04

Minimum Variance Portfolio

Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
1	0,09	0,14	0,09	0,16	0,33	0,12	0,01	0,07
2	0,03	0,33	0,07	0,20	0,23	0,06	0,01	0,07
3	0,01	0,43	0,10	0,19	0,01	0,14	0,01	0,11
4	0,01	0,43	0,10	0,19	0,01	0,14	0,01	0,11
5	0,09	0,22	0,15	0,21	0,08	0,04	0,01	0,20
6	0,18	0,12	0,06	0,20	0,12	0,13	0,00	0,18
7	0,12	0,21	0,01	0,27	0,09	0,12	0,01	0,18
8	0,06	0,11	0,01	0,22	0,21	0,13	0,01	0,25
9	0,10	0,14	0,06	0,19	0,28	0,01	0,03	0,19
10	0,06	0,05	0,15	0,16	0,21	0,06	0,02	0,30
Mean	0,07	0,22	0,08	0,20	0,16	0,10	0,01	0,16
SD	0,05	0,14	0,05	0,03	0,11	0,05	0,01	0,08

Bayes Stein Portfolio

Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
1	0,03	0,20	0,00	0,30	0,25	0,17	0,01	0,04
2	0,06	0,04	0,15	0,10	0,33	0,14	0,05	0,13
3	0,25	0,02	0,10	0,06	0,33	0,01	0,17	0,06
4	0,05	0,12	0,02	0,10	0,37	0,04	0,01	0,29
5	0,01	0,43	0,10	0,19	0,01	0,14	0,01	0,11
6	0,17	0,37	0,03	0,02	0,02	0,14	0,10	0,15
7	0,01	0,06	0,40	0,39	0,02	0,02	0,04	0,05
8	0,26	0,17	0,09	0,24	0,14	0,04	0,06	0,01
9	0,44	0,05	0,04	0,07	0,09	0,23	0,05	0,03
10	0,08	0,26	0,04	0,28	0,02	0,03	0,28	0,02
Mean	0,14	0,17	0,10	0,17	0,16	0,10	0,08	0,09
SD	0,14	0,14	0,12	0,12	0,15	0,08	0,09	0,09

Table 4 Intertemporal stability of weights in MENA portfolios -using standard deviation for optimizing

Panel B : in local currencies

Certainty Equivalent Portfolio

Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
1	0,06	0,10	0,01	0,29	0,26	0,01	0,02	0,26
2	0,04	0,23	0,32	0,02	0,25	0,04	0,10	0,00
3	0,01	0,08	0,02	0,27	0,39	0,05	0,12	0,07
4	0,08	0,01	0,32	0,02	0,34	0,02	0,01	0,20
5	0,00	0,27	0,14	0,10	0,01	0,00	0,22	0,25
6	0,12	0,37	0,03	0,01	0,04	0,18	0,21	0,03
7	0,18	0,11	0,12	0,35	0,03	0,19	0,01	0,00
8	0,20	0,21	0,05	0,22	0,04	0,15	0,03	0,09
9	0,31	0,29	0,00	0,01	0,07	0,08	0,08	0,16
10	0,16	0,04	0,20	0,23	0,21	0,11	0,00	0,04
Mean	0,12	0,17	0,12	0,15	0,17	0,08	0,08	0,11
SD	0,10	0,12	0,12	0,13	0,14	0,07	0,08	0,10

Minimum Variance Portfolio

Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
1	0,09	0,14	0,09	0,16	0,33	0,12	0,01	0,07
2	0,13	0,24	0,12	0,16	0,12	0,11	0,01	0,10
3	0,01	0,43	0,10	0,19	0,01	0,14	0,01	0,11
4	0,05	0,27	0,14	0,12	0,13	0,11	0,04	0,14
5	0,04	0,21	0,16	0,22	0,06	0,09	0,01	0,22
6	0,13	0,15	0,07	0,24	0,16	0,07	0,02	0,16
7	0,12	0,22	0,10	0,15	0,13	0,19	0,04	0,05
8	0,10	0,13	0,02	0,14	0,23	0,14	0,03	0,21
9	0,02	0,16	0,18	0,19	0,29	0,00	0,03	0,13
10	0,04	0,11	0,15	0,16	0,07	0,26	0,00	0,21
Mean	0,07	0,20	0,11	0,17	0,15	0,12	0,02	0,14
SD	0,05	0,10	0,05	0,04	0,10	0,07	0,01	0,06

Bayes Stein Portfolio

Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500
1	0,03	0,20	0,00	0,30	0,25	0,17	0,01	0,04
2	0,04	0,23	0,32	0,02	0,25	0,04	0,10	0,00
3	0,02	0,24	0,11	0,12	0,34	0,05	0,09	0,01
4	0,05	0,12	0,02	0,10	0,37	0,04	0,01	0,29
5	0,00	0,27	0,14	0,10	0,01	0,00	0,22	0,25
6	0,00	0,19	0,09	0,03	0,01	0,17	0,27	0,24
7	0,26	0,06	0,23	0,25	0,08	0,08	0,02	0,01
8	0,26	0,17	0,09	0,24	0,14	0,04	0,06	0,01
9	0,29	0,19	0,02	0,00	0,16	0,24	0,10	0,00
10	0,16	0,04	0,20	0,23	0,21	0,11	0,00	0,04
Mean	0,11	0,17	0,12	0,14	0,18	0,09	0,09	0,09
SD	0,12	0,08	0,10	0,11	0,13	0,08	0,09	0,12

Table 5 Intertemporal stability of weights in MENA portfolios -using LPM for optimizing

Panel A : in dollars									
Certainty Equivalent Portfolio									
Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500	
1	0,03		0,20	0,00	0,30	0,25	0,17	0,01	0,04
2	0,03		0,04	0,35	0,06	0,28	0,02	0,23	0,01
3	0,01		0,08	0,02	0,27	0,39	0,05	0,12	0,07
4	0,05		0,12	0,02	0,10	0,37	0,04	0,01	0,29
5	0,01		0,43	0,10	0,19	0,01	0,14	0,01	0,11
6	0,17		0,37	0,03	0,02	0,02	0,14	0,10	0,15
7	0,01		0,06	0,40	0,39	0,02	0,02	0,04	0,05
8	0,26		0,17	0,09	0,24	0,14	0,04	0,06	0,01
9	0,29		0,19	0,02	0,00	0,16	0,24	0,10	0,00
10	0,14		0,22	0,15	0,19	0,04	0,12	0,10	0,03
Mean	0,10		0,19	0,12	0,18	0,17	0,10	0,08	0,07
SD	0,11		0,13	0,14	0,13	0,15	0,08	0,07	0,09
Minimum Variance Portfolio									
Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500	
1	0,09		0,14	0,09	0,16	0,33	0,12	0,01	0,07
2	0,03		0,33	0,07	0,20	0,23	0,06	0,01	0,07
3	0,01		0,43	0,10	0,19	0,01	0,14	0,01	0,11
4	0,01		0,43	0,10	0,19	0,01	0,14	0,01	0,11
5	0,09		0,22	0,15	0,21	0,08	0,04	0,01	0,20
6	0,09		0,22	0,15	0,21	0,08	0,04	0,01	0,20
7	0,12		0,21	0,01	0,27	0,09	0,12	0,01	0,18
8	0,06		0,11	0,01	0,22	0,21	0,13	0,01	0,25
9	0,03		0,17	0,09	0,24	0,22	0,02	0,01	0,21
10	0,06		0,05	0,15	0,16	0,21	0,06	0,02	0,30
Mean	0,06		0,23	0,09	0,21	0,15	0,09	0,01	0,17
SD	0,04		0,13	0,05	0,04	0,11	0,05	0,00	0,08
Bayes Stein Portfolio									
Holding periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500	
1	0,03		0,20	0,00	0,30	0,25	0,17	0,01	0,04
2	0,03		0,04	0,35	0,06	0,28	0,02	0,23	0,01
3	0,25		0,02	0,10	0,06	0,33	0,01	0,17	0,06
4	0,05		0,12	0,02	0,10	0,37	0,04	0,01	0,29
5	0,01		0,43	0,10	0,19	0,01	0,14	0,01	0,11
6	0,17		0,37	0,03	0,02	0,02	0,14	0,10	0,15
7	0,01		0,06	0,40	0,39	0,02	0,02	0,04	0,05
8	0,26		0,17	0,09	0,24	0,14	0,04	0,06	0,01
9	0,29		0,19	0,02	0,00	0,16	0,24	0,10	0,00
10	0,14		0,22	0,15	0,19	0,04	0,12	0,10	0,03
Mean	0,12		0,18	0,13	0,15	0,16	0,09	0,08	0,07
SD	0,11		0,14	0,14	0,13	0,14	0,08	0,07	0,09

Table 6 Intertemporal stability of weights in MENA portfolios -using LPM for optimizing

Panel B : in local currencies									
Certainty Equivalent Portfolio									
Holding Periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500	
1	0,06	0,10	0,01	0,29	0,26	0,01	0,02	0,26	
2	0,04	0,23	0,32	0,02	0,25	0,04	0,10	0,00	
3	0,01	0,08	0,02	0,27	0,39	0,05	0,12	0,07	
4	0,08	0,01	0,32	0,02	0,34	0,02	0,01	0,20	
5	0,00	0,27	0,14	0,10	0,01	0,00	0,22	0,25	
6	0,12	0,37	0,03	0,01	0,04	0,18	0,21	0,03	
7	0,18	0,11	0,12	0,35	0,03	0,19	0,01	0,00	
8	0,20	0,21	0,05	0,22	0,04	0,15	0,03	0,09	
9	0,30	0,24	0,05	0,01	0,06	0,16	0,14	0,04	
10	0,16	0,04	0,20	0,23	0,21	0,11	0,00	0,04	
Mean	0,12	0,17	0,13	0,15	0,16	0,09	0,09	0,10	
SD	0,09	0,11	0,12	0,13	0,14	0,07	0,08	0,10	
Minimum Variance Portfolio									
Holding Periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500	
1	0,09	0,14	0,09	0,16	0,33	0,12	0,01	0,07	
2	0,13	0,24	0,12	0,16	0,12	0,11	0,01	0,10	
3	0,01	0,43	0,10	0,19	0,01	0,14	0,01	0,11	
4	0,05	0,27	0,14	0,12	0,13	0,11	0,04	0,14	
5	0,04	0,21	0,16	0,22	0,06	0,09	0,01	0,22	
6	0,13	0,15	0,07	0,24	0,16	0,07	0,02	0,16	
7	0,12	0,22	0,10	0,15	0,13	0,19	0,04	0,05	
8	0,06	0,03	0,08	0,10	0,28	0,20	0,01	0,23	
9	0,02	0,16	0,18	0,19	0,29	0,00	0,03	0,13	
10	0,04	0,11	0,15	0,16	0,07	0,26	0,00	0,21	
Mean	0,07	0,20	0,12	0,17	0,16	0,13	0,02	0,14	
SD	0,05	0,11	0,04	0,04	0,11	0,07	0,01	0,06	
Bayes Stein Portfolio									
Holding Periods	Egypt	Jordan	Israel	Morocco	Tunisia	Lebanon	Turkey	S&P 500	
1	0,03	0,20	0,00	0,30	0,25	0,17	0,01	0,04	
2	0,04	0,23	0,32	0,02	0,25	0,04	0,10	0,00	
3	0,02	0,24	0,11	0,12	0,34	0,05	0,09	0,01	
4	0,05	0,12	0,02	0,10	0,37	0,04	0,01	0,29	
5	0,00	0,27	0,14	0,10	0,01	0,00	0,22	0,25	
6	0,00	0,19	0,09	0,03	0,01	0,17	0,27	0,24	
7	0,18	0,11	0,12	0,35	0,03	0,19	0,01	0,00	
8	0,19	0,16	0,08	0,20	0,13	0,17	0,05	0,02	
9	0,29	0,19	0,02	0,00	0,16	0,24	0,10	0,00	
10	0,14	0,06	0,20	0,18	0,23	0,17	0,00	0,03	
Mean	0,09	0,18	0,11	0,14	0,18	0,12	0,09	0,09	
SD	0,10	0,07	0,09	0,12	0,13	0,08	0,09	0,12	

Table 6 Performance of the portfolio construction strategies, 1998-2005, US dollars

Performance of the portfolio construction strategies - in dollars					
	Home market portfolio	Naive portfolio (EQWP)	Minimum variance portfolio (MVP)	Bayes Stein portfolio (BSP)	CE tangency portfolio (CETP)
Panel A: using standard deviations for optimizing					
Portfolio allocations (%)					
Egypt	0,0	12,5	7,43	13,65	13,55
Israel	0,0	12,5	21,78	17,15	16,30
Jordan	0,0	12,5	7,74	9,69	12,81
Morocco	0,0	12,5	19,93	17,34	17,82
Turkey	0,0	12,5	15,92	15,89	15,86
Lebanon	0,0	12,5	9,56	9,61	9,39
Tunisia	0,0	12,5	1,22	7,76	8,83
World	100,0	12,5	16,43	8,90	5,43
Mean return	0,001	0,002	0,002	0,002	0,002
Standard deviation	0,0047	0,0057	0,0046	0,0086	0,0085
Downside standard deviation	0,0044	0,0056	0,0049	0,0082	0,0082
Sharpe ratio	0,123	0,293	0,478	0,187	0,212
Sortino ratio	0,129	0,297	0,452	0,190	0,219
Panel B: using lower partial moments for optimizing					
Portfolio allocations (%)					
Egypt	0,00	12,5	5,78	14,33	10,03
Israel	0,00	12,5	23,05	21,89	18,72
Jordan	0,00	12,5	9,06	15,47	11,79
Morocco	0,00	12,5	20,53	19,31	17,52
Turkey	0,00	12,5	14,84	4,48	17,06
Lebanon	0,00	12,5	8,82	11,89	9,70
Tunisia	0,00	12,5	1,08	10,13	7,71
World	100,00	12,5	16,84	2,50	7,47
Mean return	0,001	0,002	0,002	0,001	0,002
Standard deviation	0,0047	0,0057	0,0045	0,0083	0,0081
Downside standard deviation	0,0044	0,0056	0,0048	0,0079	0,0078
Sharpe ratio	0,123	0,293	0,482	0,172	0,193
Sortino ratio	0,129	0,297	0,455	0,179	0,200

Table 7 Performance of the portfolio construction strategies, 1998-2005, local currencies

Performance of the portfolio construction strategies - in local currencies					
	Home market portfolio	Naive portfolio (EQWP)	Minimum variance portfolio (MVP)	Bayes Stein portfolio (BSP)	CE tangency portfolio (CETP)
Panel A: using standard deviations for optimizing					
Portfolio allocations (%)					
Egypt	0,00	12,5	7,40	11,19	11,68
Israel	0,00	12,5	20,44	17,13	16,97
Jordan	0,00	12,5	11,13	12,22	12,11
Morocco	0,00	12,5	17,22	13,89	15,10
Lebanon	0,00	12,5	15,33	18,34	16,55
Tunisia	0,00	12,5	12,44	9,37	8,40
Turkey	0,00	12,5	2,05	8,86	8,07
World	100,00	12,5	13,98	9,02	11,12
Mean return	0,001	0,000	0,002	0,001	0,002
Standard deviation	0,0047	0,0062	0,0037	0,0052	0,0054
Downside standard deviation	0,0044	0,0059	0,0039	0,0050	0,0057
Sharpe ratio	0,123	0,058	0,470	0,200	0,436
Sortino ratio	0,129	0,061	0,447	0,207	0,420
Panel B: using lower partial moments for optimizing					
Portfolio allocations (%)					
Egypt	0,00	12,5	6,94	9,42	11,56
Israel	0,00	12,5	19,53	17,71	16,55
Jordan	0,00	12,5	11,75	10,93	12,57
Morocco	0,00	12,5	16,85	14,03	15,05
Lebanon	0,00	12,5	15,80	18,04	16,44
Tunisia	0,00	12,5	13,07	12,34	9,17
Turkey	0,00	12,5	1,92	8,65	8,73
World	100,00	12,5	14,15	8,88	9,95
Mean return	0,001	0,000	0,002	0,001	0,003
Standard deviation	0,0047	0,0062	0,0037	0,0051	0,0053
Downside standard deviation	0,0044	0,0059	0,0038	0,0049	0,0057
Sharpe ratio	0,123	0,058	0,453	0,192	0,492
Sortino ratio	0,129	0,061	0,433	0,200	0,462

Table 8 Statistical comparisons of Sharpe ratios, 40 weeks

Panel A: in dollars									
	S&P (SD)	EQWP (SD)	MVP (SD)	BSP (SD)	CETP(SD)	S&P(LPM)	EQWP(LPM)	MVP(LPM)	BSP(LPM)
EQWP (SD)	0,97								
MVP (SD)	2,25*	1,50							
BSP (SD)	0,26	0,93	-2,31*						
CETP (SD)	0,49	0,71	2,12*	-0,22					
EQWP (LPM)	-0,97	0,00	0,60	-0,36	-1,14	0,97			
MVP (LPM)	-2,34*	-0,42	-0,01	-2,03*	-1,87	2,36*	1,65		
BSP(LPM)	-0,28	1,18	2,25*	0,11	0,33	0,20	1,24	-3,07*	
CETP(LPM)	-0,40	0,72	2,11*	-0,05	0,13	0,41	1,07	3,03*	-0,33

Panel B: in local currencies									
	S&P (SD)	EQWP (SD)	MVP (SD)	BSP (SD)	CETP(SD)	S&P(LPM)	EQWP(LPM)	MVP(LPM)	BSP(LPM)
EQWP (SD)	-0,33								
MVP (SD)	5,83*	8,34*							
BSP (SD)	0,50	-0,75	-0,93						
CETP (SD)	3,11*	-2,31*	0,13	-0,63					
EQWP (LPM)	0,33	0,00	3,36*	0,68	1,87*	-0,33			
MVP (LPM)	-5,77*	-1,56	0,14	-1,00	-0,08	6,38*	9,96*		
BSP(LPM)	-0,48	-0,79	0,95	0,02	0,66	0,47	-0,68	-0,87	
CETP(LPM)	-3,57*	-2,40*	-0,08	-0,80	-0,17	3,30*	-2,53*	-0,14	-0,77

Note: This table presents the Jobson and Korkie (1981) test for the equality of the Sharpe ratios . For 9 degrees of freedom, the one-tail test at a 5% level is 1.686.

Table 9 Statistical comparisons of Sortino ratios, 40 weeks

Statistical comparisons of Sortino ratios									
Panel A: in dollars									
	S&P (SD)	EQWP (SD)	MVP (SD)	BSP (SD)	CETP(SD)	S&P(LPM)	EQWP(LPM)	MVP(LPM)	BSP(LPM)
EQWP (SD)	1,04								
MVP (SD)	2,03*	1,12							
BSP (SD)	0,28	1,16	-1,96*						
CETP (SD)	0,55	0,84	1,76*	-0,35					
EQWP (LPM)	-3,42*	0,00	2,40*	-0,34	-0,26	0,93			
MVP (LPM)	-2,64*	-0,74	-0,02	-0,63	-0,58	1,73*	1,20		
BSP(LPM)	-0,41	0,89	2,16*	0,16	0,42	0,30	1,93*	-2,55*	
CETP(LPM)	-0,60	0,75	2,03*	-0,05	0,18	0,49	1,67*	2,43*	-0,30

Panel B: in local currencies									
	S&P (SD)	EQWP (SD)	MVP (SD)	BSP (SD)	CETP(SD)	S&P(LPM)	EQWP(LPM)	MVP(LPM)	BSP(LPM)
EQWP (SD)	-0,19								
MVP (SD)	2,14*	9,12*							
BSP (SD)	0,55	-0,65	-0,84						
CETP (SD)	2,71*	-2,09*	0,11	-0,57					
EQWP (LPM)	0,21	0,00	2,50*	0,61	1,99*	-0,39			
MVP (LPM)	-0,99	-1,20	0,09	-0,93	-0,21	6,42*	21,17*		
BSP(LPM)	-0,79	-0,79	0,86	0,02	0,59	0,61	-0,59	-0,78	
CETP(LPM)	-3,11*	-2,89*	-0,06	-0,73	-0,14	3,17*	-2,36*	-0,12	-0,69

Note: This table presents the Jobson and Korkie (1981) test for the equality of the Sortino ratios . For 9 degrees of freedom, the one-tail test at a 5% level is 1.686.

