

Volatility of Returns in Arab Stock Markets*

Riad Dahel**

ملخص

تقلبات العوائد في أسواق الأسهم العربية

تبحث هذه الورقة فيما إذا كانت أسواق الأسهم العربية تتميز بتقلبات زائدة في العوائد. ولهذا الغرض، تضم الدراسة، بالإضافة إلى ثمان أسواق عربية، سوقين ناشئين وثلاث أسواق متقدمة. تتألف البيانات من المؤشرات الأسبوعية لأسعار الأسهم خلال الفترة من أكتوبر ١٩٩٤ إلى ١٩٩٨.

بعد مناقشة أهم خصائص الأسواق محل الدراسة، تقدم الورقة أهم الإحصاءات حول العوائد في هذه الأسواق. ثم تنطرق الورقة إلى قضية تقلبات العوائد من خلال مقياسين مختلفين. الأول، معامل الاختلاف، يقيس درجة تقلبات العوائد النسبية. وبناء على هذا المقياس، لا تبين النتائج الإجمالية أي مستوى واضح من التقلبات في العوائد في الأسواق العربية كمجموعة بالنسبة للتقلبات في المجموعتين الأخرين.

أما المقياس الثاني للتقلبات المستخدم في هذه الدراسة، أي مقياس شورت، فيتم الحصول عليه من خلال تنقية انحدار على خطوتين، وهو تقدير للانحراف المعياري المشروط للعوائد الأسبوعية. ويستخدم مقياس شورت على مستوى المجموعة ليس فقط من أجل كشف الاتجاهات المحتملة في تقلبات العوائد في الأسواق العربية ولكن كذلك من أجل مستوى هذه التقلبات بالنسبة للتقلبات في الأسواق الناشئة والمتقدمة. فتبين الأشكال أن الأسواق العربية تظهر أدنى مستوى في تقلبات العوائد وكذلك عدم تأثرها بالأزمات المالية الدولية. وأخيراً، تنطرق الدراسة إلى قضية انتشار التقلبات إلى أسواق أخرى. فتشير النتائج إلى أن الأسواق العربية تتميز بدرجة منخفضة من الارتباط مع بعضها البعض وكذلك مع الأسواق العالمية.

* This paper was presented at a workshop on "Arab Stock Markets: Recent Trends and Performance" organized by the Arab Planning Institute- Kuwait, March 15-16, 1999.

**Arab Planning Institute – Kuwait.

1- Introduction:

The efficient market hypothesis (EMH) is based on the notion that stock prices quickly and fully reflect all available information. Over the last three decades, the EMH has been tested extensively and continues to be tested as more advanced econometric techniques are being developed. In a recent two-volume set devoted entirely to market efficiency, Lo (1997) puts together the leading articles on the subject. The editor classifies empirical testing of the EMH in four categories. The first category is based on the random walk hypothesis. If stock prices follow a random walk, price changes over time are random. Tests in this category involve the question of whether all information contained in the sequence of past prices is fully reflected in the current price. The second category is concerned with the volatility of prices. The third category tests the EMH by considering investors' reactions to new information, whether they overreact or underreact. Finally, the fourth category tests whether an observed anomaly, i.e., a regular and reliable pattern in stock return which implies predictability, constitutes a violation of the EMH.

Excessive volatility of stock prices is an important phenomenon to investigate because of its negative effect on risk-averse investors, and ultimately on the economy. The volatility tests, also called variance bounds tests, were initially developed by Shiller (1979, 1981) and LeRoy and Porter (1981). These tests, which use the dividend-discount model, are based on a decomposition of the variance of the ex post present value of all future dividends into the variance of the market price and the variance of the forecast error. If the variance of stock prices exceeds that of ex post present values, then the variance bound is violated. Whether a violation of the variance bound implies that the EMH is false, is still being debated in the literature.⁽¹⁾

Regardless of the debate over empirical testing of volatility, the fact remains that volatility is a relative measure. In effect, as stated by El Erian and Kumar (1995), "In theory, while it is difficult to have a clear criterion for defining the degree of

excessiveness, in practice, the standard usually adopted is that of the volatility of the established industrial country flock markets" (op. cit., p.155).

The purpose of this paper is to investigate whether Arab stock markets are characterized by excessive volatility of returns. To this end, the study includes, in addition to 8 Arab stock markets for which data are available over the sample period selected, 2 emerging and 3 developed markets. The data set consists of weekly stock price indexes of those markets over the period extending from October 1994 to November 1998.

2- Characteristics of the Markets

The Arab markets included in this study are the following: Bahrain, Egypt, Jordan, Kuwait, Morocco, Oman, Saudi Arabia and Tunisia. By international standards, Arab markets are considered relatively new. Four of them (Bahrain, Jordan, Oman, and Saudi Arabia) started operating over the last two decades, while others (Egypt and Morocco in particular) have been in existence for much longer but until recently, their level of activity was not significant.⁽²⁾ The other markets included in the study belong to two different groups: India and Mexico are emerging markets; Japan, the United Kingdom (UK) and the United States (US) are developed markets.⁽³⁾

In terms of market accessibility to foreign investors, there are significant differences between Arab markets. Egypt, Jordan and Morocco do not impose any restrictions on foreign ownership of stock of listed companies. Bahrain allows full ownership by nationals of the Gulf Cooperation Council ((GCC), but limits ownership by other foreign investors to 49%. Oman and Tunisia also restrict foreign ownership to 49%. Kuwait limits ownership to GCC nationals, but does not put any ceiling on their investment. Saudi Arabia allows only GCC nationals to own a limited number of shares and in a limited number of companies.⁽⁴⁾ With respect to the other markets, only India imposes some restrictions on foreign ownership which is currently limited to 24% of stock of listed companies.⁽⁵⁾

Table (1) presents some indicators on the markets included in the study. With respect to market capitalization, Arab markets are small by international standards. Their total capitalization constitutes less than 2% of that of the US market and only about 85% of that of Mexico, an emerging market. Within the group of Arab markets, the Saudi Arabian market is the largest with a share of about 37% of the total, followed by Egypt and Kuwait.

In terms of monthly turnover, which is the ratio of the monthly trading value to market capitalization at the end of the month, the Kuwaiti market is the most active among Arab markets and is surpassed only by the US market of all the markets covered. Oman and Egypt can also be characterized as active markets.

The number of listed companies by itself, may provide an indication of the choice of firms available to an investor. In this case, Egypt stands out among Arab markets with a total number of listed companies reaching 770 at the end of September 1998. However, if the number of listed companies is used in conjunction with market capitalization, it indicates the average market value of listed companies. In this case, Saudi Arabia has by far, the highest market value per listed company among Arab markets at about \$672 million followed by Morocco at \$330 million. Egypt has the lowest market value per listed company at \$31 million. Between the two emerging markets, the gap is huge with India at about \$22 million and Mexico at \$790 million. The developed markets lead the way in this category with the average value of a listed US company at over \$1.2 billion followed by listed companies in the UK and Japan.

Table (1) Stock Markets: Some Indicators

Market	Market Capitalization (US\$ millions)	Monthly Trading Value (US\$ millions)	Turnover Ratio (%)	Number of Listed Companies
Arab Markets (September 1998)				
Bahrain	7694.84	69.30	0.90	42.00
Egypt	24046.55	513.60	2.13	770.00
Jordan	5800.28	27.82	0.48	150.00
Kuwait	21836.33	1445.98	6.62	76.00
Morocco	16830.75	141.37	0.84	51.00
Oman	5392.53	144.49	2.68	134.00
Saudi Arabia	49102.58	805.53	1.64	73.00
Tunisia	2276.81	10.35	0.45	38.00
Emerging Markets (December 1997)				
India	128466.00	4610.00	3.59	5843.00
Mexico	156595.00	3829.00	2.44	198.00
Developed Markets (December 1997)*				
Japan	2216699.00	104612.50	4.70	2387.00
United Kingdom	1996225.00	69094.25	3.46	2046.00
United States	11308779.00	851339.50	7.53	8851.00

N. B. * The monthly trading value for the developed markets is the monthly average for 1997.

Sources: For Arab Markets; Arab Stock Markets Data Base, Arab Monetary Fund, Third Quarter 1998. For Emerging and Developed Markets: Emerging Stock Markets Factbook 1998, International Finance Corporation.

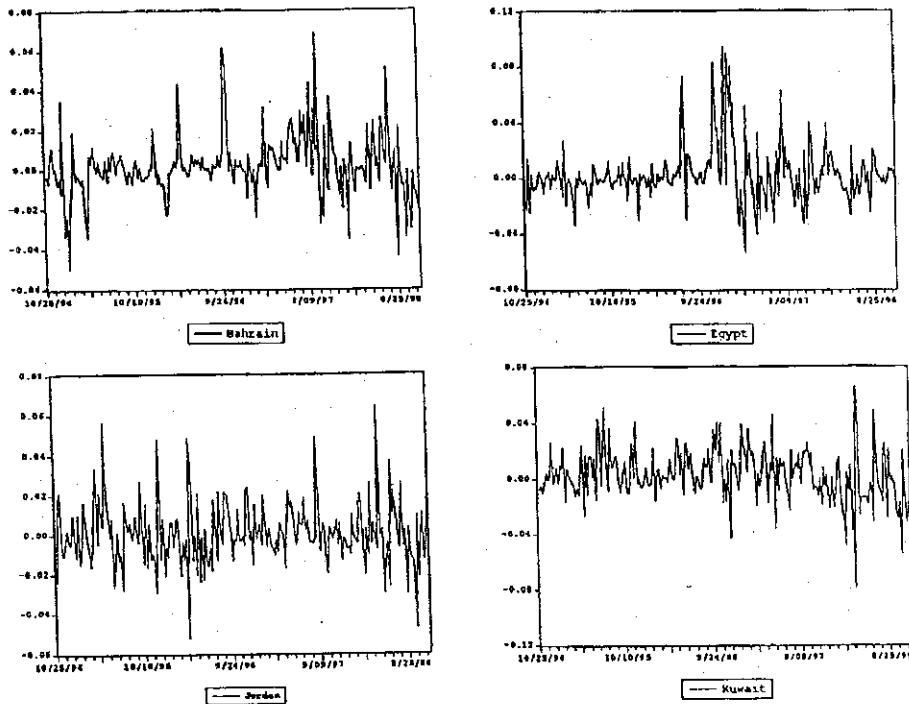
As mentioned earlier, testing of the EMH has resulted in a very large number of studies, but until the early 1990s, most of them focused on developed markets. However, in recent years, researchers have become more interested in emerging markets. Indeed, there has been a growing number of studies on emerging markets, dealing with issues traditionally tackled in mature markets. With the exception of Jordan, most of those studies did not include Arab markets in their group of emerging markets.⁽⁶⁾ The lack of detailed information on Arab markets may have been the main cause behind what appears to be a lack of interest in these markets. Nevertheless, a few empirical studies have been undertaken exclusively on Arab markets. They have examined the issue of market efficiency, using a series of tests.⁽⁷⁾ However,

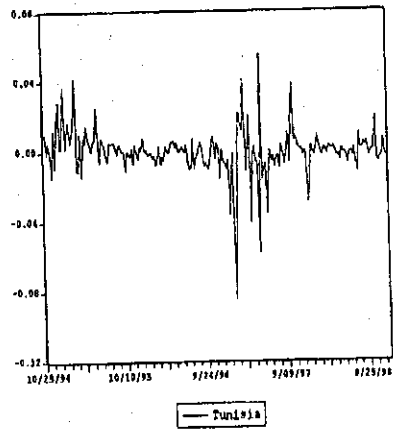
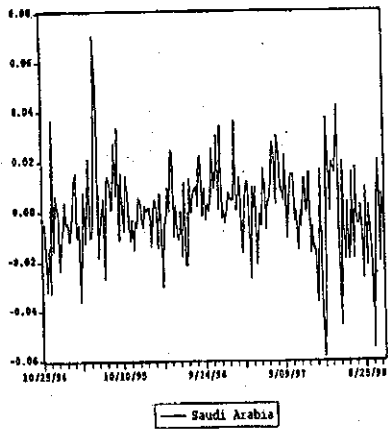
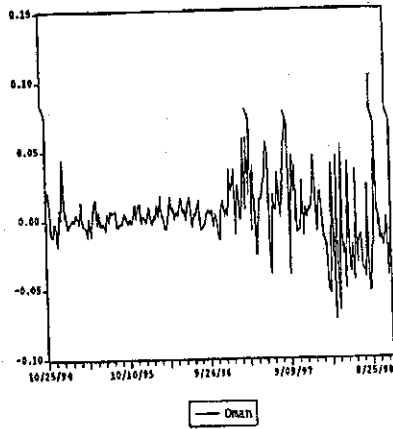
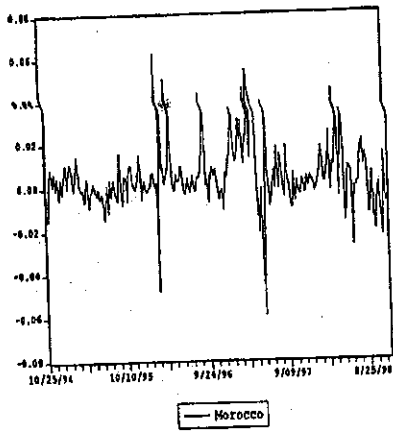
these studies did not make volatility in Arab markets their main focus.⁽⁸⁾

3- Data and Summary Statistics

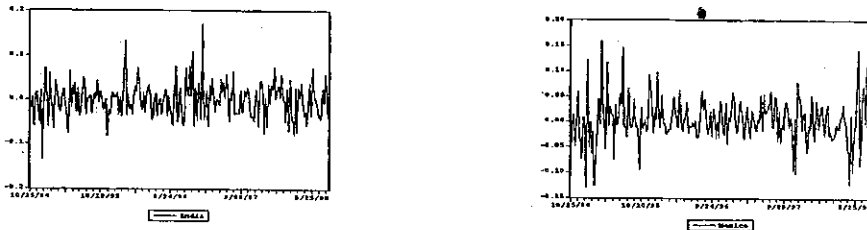
The data used in this study consist of weekly stock price indexes for 13 markets, and the sample period extends from October 25, 1994 to November 17, 1998.⁽⁹⁾ For Arab markets, the data are taken from the Middle East Economic Digest. For emerging and developed markets, they come from The Economist. Graphs of Figure 1 depict the behavior of the weekly returns in all 13 markets, which are calculated as the percentage change in the indexes.

Arab Markets





Emerging Markets



Developed Markets

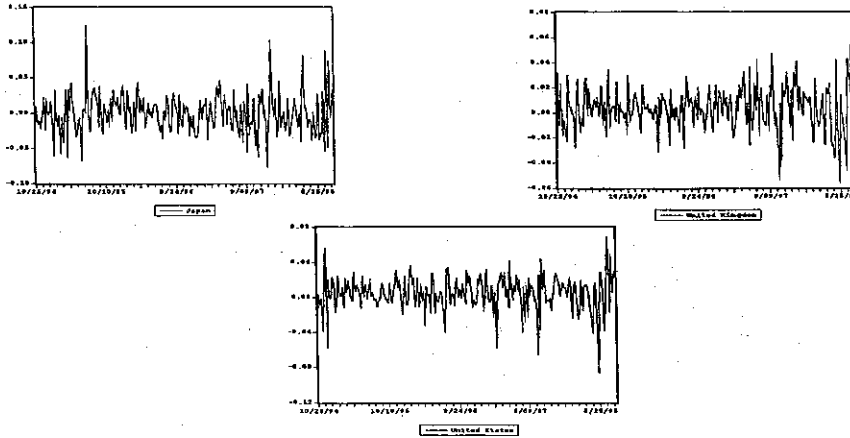


Figure 1. Weekly market returns.

For the group of Arab markets, the graphs show that the returns in the GCC markets behaved rather similarly in the last quarter of the sample period which coincided with the downturn in world oil prices beginning the last quarter of 1997. In addition

to the downward trend in returns, which reflected the impact of oil prices on these economies, volatility of the returns also increased over this period particularly in the case of Oman. For the other four Arab markets, the returns do not show any particular trend except for a few cases of sudden jump or drop caused by specific market developments or the increased volatility in the case of Egypt over a period extending from the last quarter of 1996 to the beginning of 1998 which corresponded to the significant increase in the pace of privatization.

For the groups of emerging and developed markets, the graphs seem to indicate some volatility of returns throughout the sample period. However, the band of this volatility appears to have been narrower in the developed markets than in the emerging markets. For India and Mexico, the biggest drop in the market indexes coincided with the Mexican crisis of late 1994. For Japan and the UK, the markets experienced their biggest drop in the fall of 1997 at the height of the Asian crisis with the UK market index decreasing as much during the Russian crisis in August 1998. But this latest crisis impacted the most on the US market (after the Mexican market) which had in early September 1998, the biggest decrease in its index for the whole sample period.

Table (2) presents summary statistics of the weekly returns in all 3 groups of markets for the full sample period. The mean returns in Arab markets range from 0.4% in Morocco to about -0% in Tunisia. For the other markets, India has the lowest mean return at -0.1% while the US has the highest at 0.4%. With respect to total risk, the standard deviation of returns in Arab markets ranges from a high of 2.4% in Oman to a low of almost 1.4% in Tunisia. Except for Japan, the standard deviation of returns in developed markets is within the range of that in Arab markets. However, with a standard deviation of returns above 4%, the group of emerging markets exhibits the highest level of risk of all markets included in this study.

Table (2) Summary Statistics: Weekly Returns
(October 25, 1994- November 17, 1998)

Market	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Bera-Jarque
Arab Market								
Bahrain	0.001686	0.000453	0.068736	-0.050197	0.015709	0.675022	6.452247	121.3756
Egypt	0.002029	-0.000212	0.094951	-0.054749	0.020941	1.552187	7.870112	294.6369
Jordan	0.000626	-0.001507	0.064604	-0.052667	0.016188	0.597825	5.105245	51.77780
Kuwait	0.003108	0.001600	0.065745	-0.079565	0.019540	-0.156997	4.690469	26.11380
Morocco	0.004390	0.002608	0.062714	-0.059899	0.014618	0.509528	7.393545	179.6851
Oman	0.002932	0.001540	0.102636	-0.073970	0.024455	0.356613	5.325460	52.26202
Saudi Arabia	0.000481	0.000362	0.070678	-0.058907	0.017521	0.082360	4.926048	33.00833
Tunisia	-0.000088	0.000356	0.055717	-0.085189	0.013943	-1.185629	13.27067	981.4682
Emerging Markets								
India	-0.001132	0.002190	0.171174	-0.135441	0.040625	0.415888	4.479227	25.55968
Mexico	0.002783	-0.001710	0.159056	-0.128955	0.044289	0.259814	4.755617	29.75082
Developed Markets								
Japan	-0.000920	-0.001623	0.124153	-0.077528	0.028633	0.596773	5.122876	52.63902
United Kingdom	0.0030103	0.003382	0.062147	-0.055830	0.018568	-0.092421	3.675269	4.350126
United States	0.004278	0.005878	0.069069	-0.086937	0.020127	-0.801158	5.743239	89.57340

Sources: Middle East Economic Digest for Arab markets and The Economist for emerging and developed markets, various issues.

Regarding the distribution of returns, the figures show that among Arab markets, those for Egypt are highly skewed to the right. Those for Tunisia are highly skewed to the left. For the other markets, returns in the US are highly skewed to the left as well. As to the coefficient of kurtosis of the returns, it is high for all Arab markets but particularly in the case of Tunisia. For the other markets, it ranges from a high of 5.7 for the US to a low of 3.6 for the UK. Finally, the Bera-Jarque statistic, which tests whether the returns are normally distributed, confirms the results on distribution. The null hypothesis of normality is rejected in all cases but that of the UK.

In its weak form, the EMH is based on the notion that stock prices quickly and fully reflect all historical data. One major type of testing this form of efficiency is based on the random walk hypothesis. If stock prices follow a random walk, price changes over time are random. Thus, stock returns are independent over time. One test of the random walk hypothesis is that of the autocorrelations of the returns. Table (3) presents the results of the Ljung-Box Q-statistic which tests the hypothesis that all of the autocorrelations of returns up to the order specified, are zero. The figures in the Table are the Q-statistics and statistical significance indicates rejection of the null hypothesis.

**Table (3) Autocorrelations of the Returns:
Ljung- Box Q- Statistic Tests**

Market	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6	Lag 12
Arab Markets							
Bahrain							
Egypt	11.60*	19.03*	23.65*	29.96*	30.51*	32.04*	42.57*
Jordan	13.34*	27.67*	37.23*	40.60*	40.60*	41.92*	51.72*
Kuwait	0.04	0.07	0.16	1.20	1.98	4.03	9.81
Morocco	1.13	1.84	4.50	9.34	14.13*	15.38*	23.09*
Oman	14.36*	22.85*	30.31*	41.26*	43.78*	44.32*	47.44*
Saudi Arabia	6.13*	11.74*	17.92*	20.89*	25.85*	28.99*	42.57*
Tunisia	11.33*	11.92*	12.95*	15.47*	15.93*	15.94*	23.06*
	5.65*	7.10*	18.89*	18.90*	19.40*	20.47*	33.22*
Emerging							
India	1.49	1.83	3.99	3.99	5.02	6.74	19.02
Mexico	0.28	0.29	0.32	0.34	2.18	2.18	6.54
Developed Markets							
Japan	1.48	3.19	3.39	5.29	5.77	7.09	11.30
United Kingdom	0.47	0.68	0.68	3.78	5.65	6.69	15.33
United States	0.17	0.18	2.45	5.16	5.16	6.92	13.96

N. B. * Statistical significance at the 5 percent level.

The results show evidence of autocorrelation of the returns up to lag 12 in 7 out of the 8 Arab markets. In the case of Kuwait, evidence of serial correlation starts appearing only at lag 5. As for Jordan, it is the only market for which the null hypothesis is not rejected at all lags. With respect to the emerging and developed markets, the results do not indicate that returns contain a predictable component.

4- Volatility of Returns

In this section, two measures of volatility are presented and discussed: the coefficient of variation and the Schwert measure of volatility.

(4-1) Coefficient of Variation

The coefficient of variation figures presented in Table (4) measure the degree of volatility of weekly market return relatives.

Table (4) Volatility of Market Return Relatives

Market	Coefficient of Variation
Arab Markets	
Bahrain	9.31
Egypt	10.32
Jordan	25.86
Kuwait	6.29
Morocco	3.33
Oman	8.34
Saudi Arabia	36.42
Tunisia	-158.44
Emerging	
India	-35.88
Mexico	15.91
Developed Markets	
Japan	-31.12
United Kingdom	5.98
United States	4.70

For the group of Arab markets, Tunisia appears to be, by far, the most volatile followed by Saudi Arabia and Jordan, with Morocco the least volatile. However, for Tunisia, it should be noted that the figure is out of proportion because the mean return is almost zero. To a lesser extent, the same can be said about Saudi Arabia and Jordan. For the emerging markets, the coefficients of variation are higher on the average than those for most of the Arab markets. As for the developed markets, only Japan exhibits a high level of volatility of return relatives because it has both the highest standard deviation and the lowest mean return of the group. Overall, based on the coefficient of variation, the figures do not seem to indicate any distinct level of volatility of the returns in Arab markets as a group vis-a-vis that of the other 2 groups.

(4-2) Schwert Measure

Following Schwert (1989), a two-step regression technique is applied to estimate weekly volatilities from weekly returns.⁽¹⁰⁾

In the first step, the weekly returns are regressed on 13 lagged values. The absolute value of the residual from this equation is an estimate of the standard deviation of the return for week t . In the second step, the absolute value of the residual from the previous equation is regressed on 13 lagged absolute values of the residuals. The fitted values from this second equation, multiplied by $(2/\pi)^{-1/2}$ are estimates of the conditional weekly return standard deviations given information available before week t .

After the volatility measures are estimated for each market separately, an average measure of volatility is then constructed for each group of markets. This measure is calculated by taking the weighted average of the different market volatilities, with the weights representing the share of each market in the total market capitalization of the group.⁽¹¹⁾

In the case of the coefficient of variation, volatility in Arab markets (and in emerging and developed markets) has been measured at the market level. The figures in Table 4 do not provide a clear assessment of the degree of volatility of returns in Arab markets as a group compared to that in the other 2 groups of markets. The Schwert measure of volatility used at the group level should reveal not only the potential trends in volatility of returns in Arab markets but also their level of volatility relative to that of emerging and developed markets. Figure 2 shows the Schwert measure of volatility for the 3 groups.

The first observation that could be made from Figure 2 is that Arab markets as a group, exhibit the lowest level of volatility and emerging markets the highest. Both emerging and developed markets show an increase in volatility, particularly over the periods corresponding to the last 2 major financial crises that the world has experienced over the last 4 years.⁽¹²⁾ For these 2 groups, Figure 2 also shows an upward trend in volatility starting around the time of the Russian crisis and sustained most probably because of the fear about a potential Brazilian crisis.

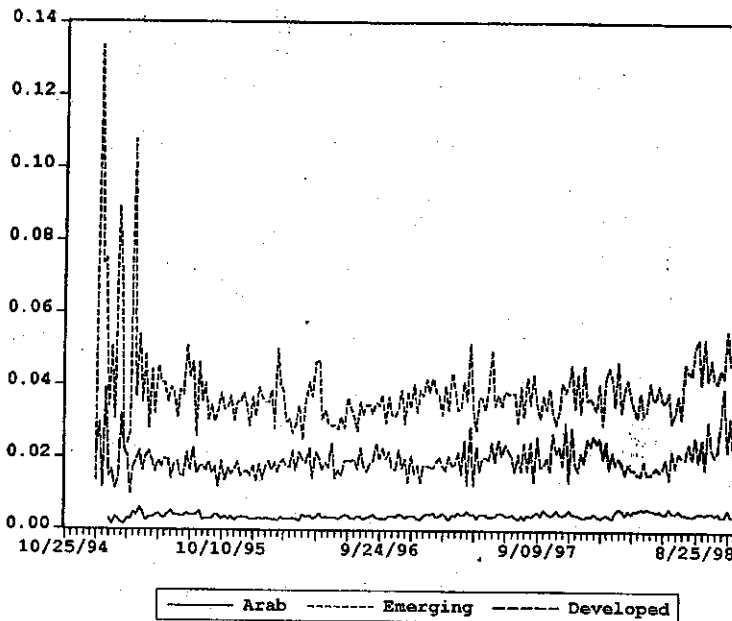


Figure 2. Average volatility of weekly market returns.

As to the Arab markets as a group, they do not seem to have been affected by any of the international crises. However, Figure 2 also shows a slight increase in their level of volatility beginning the last quarter of 1997, the period which corresponds to the downturn in world oil prices. As mentioned earlier in the discussion of market returns, volatility of returns in the GCC markets increased over this period. Since the weight of the GCC markets constitutes about 2/3 of the total weight of the group, it is evident that any increase in their level of volatility will impact noticeably upon the volatility of the group. However, the same fact about the weight distribution could be used to argue that Arab markets show the lowest level of volatility because they are the most insulated from international shocks, being as a group, the least open to foreign investment of all markets included in

the study.⁽¹³⁾ Therefore, the main sources of volatility in these markets are only of two types, i.e. world oil prices and domestic factors.

While the 2 figures seem to indicate that Arab markets are not affected by international financial crises, it is worth completing the analysis by considering the issue of volatility spillovers. In the framework of stock market integration, it is believed that the more integrated in international markets a particular market is, the more affected by volatility in those markets it will be.⁽¹⁴⁾ Therefore, by providing a measure of the degree of integration of Arab markets in international markets, it would be possible to estimate the likelihood of occurrence of volatility spillovers into Arab markets.

One traditional measure of the degree of integration of stock markets in international markets is the correlation of the returns. Based on the previous results and discussion, the correlation between Arab markets and the other markets is expected to be quite low. Table (5) presents the correlation coefficients for the 3 groups of markets.

Table (5) presents the correlations of returns within each group and between the groups. Within the group of Arab markets, the correlations are quite low and the highest is that between Kuwait and Oman at 22.5% followed by that between Bahrain and Saudi Arabia at 18%. In fact, 4 of the highest 5 correlation coefficients involve GCC markets. The lowest correlation within the group is between Egypt and Oman at 0.2%. The correlation between Arab and emerging markets is very low except for that between Oman and Mexico at 12.6%. As to the correlation between Arab and developed markets, it is higher than 10% (but does not exceed 14%) only in 5 cases, 3 of which involve the UK and none for the US.

The correlation between the two emerging markets is quite low, and their correlation with the developed markets is of a different magnitude. Whereas the correlation of India with those markets does not exceed 10% (with the US), that of Mexico is

significant particularly with the US at 43.5%. As to the correlation between the developed markets, it is quite high, reaching 62.1% between the UK and the US.

Thus, the coefficients in Table (5) clearly show that some Arab markets, the GCC markets, are relatively correlated. But this result could simply reflect a common reaction of these markets to changes in world oil prices and not necessarily the impact of developments of one market on the others. But overall, the correlation of returns between Arab markets is quite low, as is their correlation with the other markets.

5- Conclusion

Since the implication of a violation of the variance bound on the EMH remains subject to debate in the literature, this study has investigated the issue of volatility in Arab stock markets from the standpoint that volatility is a relative measure. Therefore, a benchmark was needed to examine whether these markets were characterized by excessive volatility. To this end, the study included a group of emerging markets and one of developed markets. The data set consisted of weekly stock price indexes over the period extending from October 1994 to November 1998.

After a discussion of the main characteristics of the markets covered such as market accessibility to foreign investors, market size and level of activity, the paper presented the main summary statistics of the weekly returns in these markets. Then, the issue of volatility of returns was tackled through two different measures. The first, the coefficient of variation, measures the degree of volatility of weekly market return relatives. The overall results did not seem to indicate any distinct level of volatility of the returns in Arab markets as a group relative to that of the other two groups, also given that the coefficient of variation measures volatility at the market level. The second measure of volatility used in this study, the Schwert measure, was obtained from a two-step regression technique and was an estimate of the conditional standard deviation of weekly returns.

The Schwert measure was used at the group level so that it could reveal not only the potential trends in volatility of returns in Arab markets but also their level of volatility relative to that of emerging and developed markets. The graphs show that Arab markets exhibited the lowest level of volatility of returns and that they were not affected by international financial crises. Finally, the study addressed the issue of volatility spillovers. The results indicate that Arab markets were characterized by low correlations with each other and with international markets.

One interpretation of the results on volatility of returns in Arab markets may require a differentiation between these markets. For the main GCC markets, which are basically closed to foreign investment, it may be difficult at this juncture to predict how their volatility would be affected if they became accessible to international portfolio flows. As to the other markets, some of which compare to the main developed markets in terms of openness, it could be that their low level of volatility reflects the small size of international portfolio flows. It could also be that their macroeconomic fundamentals are sound and their risk-return tradeoff is favorable, so that there is no ground for international portfolio flows to have a destabilizing effect. A study at the market level should shed some light on these issues.

References

- Al-Loughani, N. E. 1995. Random walk in thinly traded stock markets: The case of Kuwait." Arab Journal of Administrative Sciences Vol. 3: 189-209.
-and Moosa, I. A. 1997. "Testing the efficiency of an emerging stock market using trading rules: The case of Kuwait." Working Papers Series Number 1. Kuwait University, College of Administrative Science, Kuwait.
- Arab Monetary Fund. 1997. Arab Stock Markets Data Base: Arab Stock Markets Participating in the Data Base: Their Creation and Development. Special Issue. Abu Dhabi.
- Arab Monetary Fund. 1998. Arab Stock Markets Data Base, Third Quarter. Abu Dhabi.
- Bekaert, G. 1995. Market integration and investment barriers in emerging equity markets. The World Bank Economic Review Vol. 9: 75-107.
- Bera, A. K. and C. M. Jarque. 1980. Model specification tests: a simultaneous approach. Journal of Econometrics Vol.20; 59-82.
- Bollerslev, T. and R. J. Hodrick. 1995. Financial market efficiency tests. In Handbook of Applied Econometrics: Macroeconomics. Edited by M. Hashem Pesaran and Mike Wickens. Oxford: Blackwell Publisher Ltd.
- Buckberg, E. 1995. Emerging stock markets and international asset pricing. The World Bank Economic Review Vol. 9; 51-74
- Butler, K. C. and S. J. Malaikah. 1992. Efficiency and inefficiency in thinly traded stock markets; Kuwait and Saudi Arabia. Journal of Banking and Finance Vol. 16:197-210.
- Dahel, R. and B. Laabas. 1999. The behavior of stock prices in the GCC markets. Journal of Development and Economic Policies Vol. 2: 37-105.
- Darrat, A. F. and S. R. Hakim. 1997. Price linkages, efficiency, and integration of emerging stock markets in the Middle East." Paper presented at the ERF Fourth Annual Conference on Regional Trade, Finance and Labor Markets in Transition, October 7-9, Beirut, and Lebanon.
- The Economist. Various issues.
- El Erian, M. and M. Kumar. 1995. Emerging equity markets in Middle Eastern countries. In Development of Financial Markets in the Arab Countries, Iran and Turkey. Economic Research Forum for the Arab Countries, Iran and Turkey. Cairo.

Engle, R. F and R. Susmel. 1993. Common volatility in international equity markets. *Journal of Business & Economic Statistics* Vol. 11:167-76.

Harvey, C. R. 1995. Predictable risk and returns in emerging markets. *The Review of Financial Studies* Vol. 8: 773-816.

International Finance Corporation. 1998. *Emerging Stock Markets Factbook* Washington, D.C.

Kim, E. H. and V. Singal. 1993. Opening up of stock markets by emerging economies: effect on portfolio flows and volatility of stock prices. In *Portfolio Investment in Developing Countries* Edited by Stijn Claessens and Sudarshan Gooptu. World Bank Discussion Paper 228. Washington, D.C.

LeRoy, S. F. and R. D. Porter. 1981. The present-value relation: tests based on implied variance bounds. *Econometrica* Vol. 49: 555-574.

Ljung, I. and G. Box. 1978. On a measure of lack of fit in time series models. *Biometrika* Vol. 65: 297-303.

Lo, A. W., ed. 1997. *Market Efficiency: Stock Market Behaviour in Theory and Practice*. Cheltenham: Edward Elgar Publishing Limited.

Middle East Economic Digest. Various issues.

Richards, A. J. 1996. Volatility and predictability in national stock markets: How do emerging and mature markets differ? *IMF Staff Papers*, Vol. 43: 461-501.

Schwert, O. W. 1989. Why does stock market volatility change over time? *The Journal of Finance* Vol. 44:1115-1153.

Shiller, R. J. 1979. The volatility of long-term interest rates and expectations models of the term structure. *Journal of Political Economy* Vol. 57:1190-1219.

Schiller 1981. Do stock prices move too much to be justified by subsequent changes in dividends? *American Economic Review* Vol. 71: 421- 436.

Notes:

- 1- For a discussion of this issue and the modeling of volatility clustering in the returns with autoregressive conditional heteroskedasticity (ARCH) and generalized ARCH (GARCH) models, see Bollerslev and Hodrick (1995).
- 2- For a discussion of the development of Arab markets, see Arab Monetary Fund (1997).
- 3- Although all Arab markets are emerging markets and 3 of them (Egypt, Jordan and Morocco) are included in the International Finance

Corporation indexes for emerging markets. The distinction in this study between Arab and emerging markets is made only for the purpose of the analysis.

- 4- For more details on the status of openings by Arab markets, see Arab Monetary Fund (1997).
- 5- For a list of specific ceilings on foreign investment in emerging markets, see International Finance Corporation (1998).
- 6- See for instance, Bekart (1995), Buckberg (1995), and Harvey (1995).
- 7- These studies include Butler and Malaikah (1992), Al-Loughani (1995), Al-Loughani and Moosa (1997), Darrat and Hakim (1997 - they also examined the issue of integration), and Dahel and Laabas (1999).
- 8- El Erian and Kumar (1995), for instance, provided some figures on volatility using the standard deviation of the percentage change in prices as a measure of volatility. However, they included only Jordan from the Arab group in their sample.
- 9- The indexes used for the 13 markets are: Bahrain Bahrain Stock Exchange (BSE), Egypt: Egyptian Stock Exchange (ESE) General: Jordan: Amman Financial Market (AFM); Kuwait: Kuwait Stock Exchange(KSE); Morocco: Casablanca Finance Group (CFG); Oman: Muscat Securities Market (MSM); Saudi Arabia: National Center for Financial and Economic Information (NCFEI); Tunisia: Bourse des Valeurs Mobilieres de Tunis (BVMT); India: F. E Bombay; Mexico: BMV General; Japan: Nikkei; United Kingdom: Financial Times (FT) 100; United States: Dow Jones Industrial Average (DJIA).
- 10-Studies which have used the Schwert measure of volatility include Kim and Singal (1993) and Richards (1996). Kim and Singal applied it only to emerging markets, and Richards to both emerging and developed markets.
- 11-To calculate the weights, the following base periods are used: for Arab markets the third quarters of 1996, 1997 and 1998; for emerging and developed markets, the end of the years 1996 and 1997.
- 12-The high level of volatility in emerging markets at the beginning of the sample period should be considered with caution since Mexico, the country where the first crisis originated, represents slightly more than half the total weight of the group.
- 13-The combined weight of Saudi Arabia and Kuwait closed to non- GCC investors, constitutes almost 60% of the total.
- 14-For a brief discussion of this issue, see Engle and Susmel (1993).