

Volatility in Emerging Stock Markets: An Examination of the Middle Eastern Region

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ABSTRACT

The objective of this paper is to examine five regional emerging markets in terms of volatility, correlations and effects of day of the week, month of the year and seasonally. The regional markets studied were Egypt, Greece, Israel, Jordan and Turkey. Data were analyzed for the 8/31/93 - 10/14/98 period. One finding was that there was an improvement in the stability of the markets over the period as measured by the variance ratio; this was the case despite the relatively high volatility in the markets. Also, low correlations were evident among the markets using the return factor (percentage change in the index). Conversely, high correlations were found using the index level. Further, the Monday effect, seasonal effect, spring and after summer effect, were clearly evident.

JEL : G15, N25

Keywords: Emerging markets; Middle East Markets, Day of the Week Effect; Month of the Year Effect; Volatility in Emerging Markets; Portfolio Diversification

I. INTRODUCTION

The purpose of this study is to examine the volatility, correlation and effect patterns of five regional emerging markets; that is, Egypt, Greece, Israel, Jordan and Turkey. For diversification purposes, investors require such information so as to be able to make rational decisions.

A review of the literature indicates that no studies of this nature have been undertaken for the five regional emerging markets. Extensive studies have been done, however, for European, Latin American and Southeast Asian countries. Thus, the purpose is to examine the level of integration among the stock markets throughout the above noted region and trends over the last five years. A by-product of this work is to suggest investment strategy timing in the regional markets, i.e., when to enter and exit the markets whether on a daily, weekly, or monthly basis. The next section of this report deals with a review of the literature. Section III describes the data and methodology. Section IV presents the analysis and results. The last section concludes the study.

II. LITERATURE REVIEW

An examination of the literature reveals that most studies concentrated on developed markets, particularly the US, the UK and Japan. But there have been several studies, which focused more on emerging capital markets with regard to market linkages. For example, Errunza, Losg and Padmanablam (1992) investigated the interaction between the emerging markets and the United States. Their conclusion was that markets are not integrated but, at the same time, are not completely segmented. Aggarwal and Rivoli (1989) found some evidence of linkages between the Asian Markets and the US. Lessard (1973) examined the stock markets of Latin America for the 1958 -1968 period. He reported that the markets are independent of each other and country returns are due to country specific factors. Aggarwal and Leal (1997) examined the intraregion and integration linkages of the emerging markets of Asia, Japan and Latin America and found that these markets are, in fact, linked with other regional markets, but are also linked with the rest of the world. A stronger linkage exists for Asia than for Latin America.

As emerging markets develop they became attractive investment outlets for investors seeking larger potential returns. Of particular interest, is the volatility of emerging markets. Some research has been conducted to provide insight regarding the behavior of emerging market stock price volatility. For example, research by Eden and Jovanovic (1994) suggests that volatility in stock prices can result from changes in the level of available public information over time. This notion holds even though aggregate dividends and consumption remain constant.

Ho and Cheung (1994) studied Asian Pacific stock markets for day of the week effects and found a pattern in price volatility as measured by the standard deviation of the returns. The Asian Pacific markets, with the exception of Korea, all exhibited the highest volatility on Mondays. In terms of an investment strategy, investors who are more risk averse may wish to invest only on days with lower volatility; those less risk averse investors should expect higher returns for increased risk of investing on days with high volatility.

Investors are also concerned as to how price volatility behaves over time. Should they expect higher returns, or should they accept investments that were thought to be below their required rate of return due to their volatility characteristics? Jones and Wilson (1989) studied stock price volatility in the US for the 100 + year period of 1885-1989. They found that market volatility peaked during the 1930's, slowly declined until the 1960's, rose again in the 1970's, and declined slightly during the 1980's. Thus, the study suggests that there has been no long-term trend in stock price volatility. It is reasonable to assume, however, that if the markets move towards integration their long trend volatility would be similar to that of the U.S. market.

Research by Stiglitz (1989) and Summers and Summers (1989) concluded that the short-term traders caused excessive volatility and speculation and that such activity was viewed as undesirable. But more recent work by Berkman and Eleswarapu (1998), who studied the effect of short-term traders on share prices and liquidity at the Bombay Stock exchange, came to the opposite conclusion. Their results suggest that the market perceives short-term traders as beneficial and that they play a significant positive role, providing the necessary market liquidity especially important for less liquid stocks.

With regard to the integration of emerging stock markets, Bekaert and Harvey (1995) examined this aspect not only among the emerging markets themselves, but also among the emerging markets of Japan, the UK and the US. Their findings suggested that most emerging markets are poorly integrated with more developed markets, with the exception of Malaysia.

Claire, Ibrahim and Thomas (1998) examined the behavior of returns of the Kuala Lumpur Stock Exchange Composite Index from 1983 to 1993. They focused on the effects of the day of the week, month of the year, public holidays, seasonal patterns, weekends, settlement periods and time zones. They found, for example, a strong day of the week effect with the lowest return occurring on Monday and the highest on Thursday. Explanations offered included the impact of holidays, time zone differences, market age and price, January effect and mismeasured risk.

Bhargava, Bose and Dubofsky (1998) note that there is mounting evidence that international stock markets are becoming increasingly correlated.

The direction of flow is from the U.S. to foreign markets and the correlation level increases when worldwide volatility increases.

Research by Chan, Gup and Pan (1992) studied the relationships among stock markets in Hong Kong, South Korea, Singapore, Taiwan, Japan and the U.S. It was found that neither the stock price of a single country nor that of a group of countries can be used to predict the future stock prices of another country. For example, stock price movements in Japan cannot be predicted by using various combinations of stock prices in the U.S., Hong Kong, South Korea, Singapore and Taiwan. Stock prices in each of these markets are independent of one another. Thus, international diversification of investment portfolios is justified and desirable because unsystematic risk across countries can be reduced.

Building on their previous 1992 study, Chan, Gup and Pan (1997) not only extended the time period from 1962–1992, but also increased the number of markets to eighteen. Their findings show that the international diversification among stock markets may be effective because stock markets do not have long run co-movements.

Thus, the research described in this paper adds to the body of knowledge related to emerging stock market activity. A better understanding of volatility, correlation and market pattern effect is necessary for attracting investors to important markets that include Egypt, Greece, Israel, Jordan and Turkey. Selected data for each of these markets can be found in Appendix A.

III. DATA AND METHODOLOGY

In order to conduct this study and reach valid conclusions, daily stock index data for the countries of Egypt, Greece, Israel, Jordan and Turkey, as well as the Emerging Market Index (consisting of twenty six emerging market countries) were obtained from MSCI covering the period of 1993–1998. It should be noted that the Emerging Market Index referred to above is not an investable instrument, and should be regarded as a limitation to this study. In determining the volatility and developing correlations of the five regional markets, three approaches were used. For each country, the index mean and standard deviation were computed. Then, the standardized risk (standard deviation/ mean) was developed. Also, returns were computed (based on percentage of daily index changes), as were standard deviations. These figures were annualized in order to obtain an annualized standardized risk. Correlations were developed for index levels as well as returns. The data were also analyzed for determining day for the week, month of the year and seasonality effects. Finally, variance ratios, calculated as: $((\text{annualized standard deviation for the period} / \text{number of years in the period}) / \text{annualized standard deviation for each year})$, were computed for each year to test market

stability over the period.

IV. DATA ANALYSIS AND RESULTS

This section presents the results of an examination and comparison of statistics for the twenty-six emerging markets index as well as for the five regional countries. While most of the data are complete for the time period studied, some data for Egypt were not available. It is recognized that some countries have holidays whereby the market may be closed for a part of the day or completely closed and may have an effect on some of the findings.

Table 1
Comparative risk and return statistics of the twenty-six emerging markets and the five regional countries, (8/31/93 - 10/14/98)

	Emerging Markets	Greece	Egypt	Israel	Jordan	Turkey
Daily Return (Mean), μ	-.0001	.0008	.0005	.0010	.0005	.0012
Annualized Return ¹	-3.6%	33.9%	20%	44%	20%	55%
Standard Deviation (Daily), σ	0.0090	0.0160	0.0100	0.0310	0.0290	0.0420
Annualized Standard Deviation ²	3.2850	5.8400	3.6500	11.315	10.585	15.330
Annualized Standardized Risk	-.88000	.17000	.18000	.25000	.52000	.27000
Total Days of Trading in Sample	1296	1296	950 ³	1255	1255	1255

¹Annualized = [(Daily Average Return+1)³⁶⁵ -1]

²Annualized Standard Deviation = Daily Standard Deviation x 365

³Parts of 1993 and 1994 Data are Unavailable

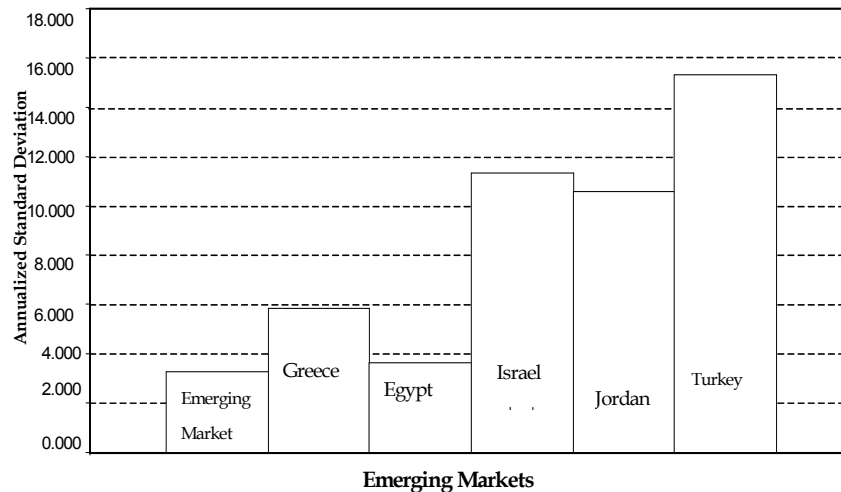
Based on the daily percentage change in the index, the annualized standardized risk in Table 1 shows that Jordan presents the highest risk (.52). Apparently, the Jordanian market does not reward its investors for the risk they are assuming. Although further study is needed, there could be a direct relationship between real GDP growth rate and volatility of the market.

Greece and Egypt, on the other hand, provide the lowest annualized standardized risk (.17 and .18), which implies that the reward to investors is higher for the risk assumed. Israel and Turkey are considered to exhibit more moderate risk levels (.25 and .27). The Emerging Markets as a whole, which shows a poor return for the period, is thought to be due to the 1997 - 1998 Asian currency crisis.

Figure 1, which provides measurements of volatility based on index changes (return) again shows graphically that Turkey is the riskier among these five markets. As an aside, the Emerging Markets taken as a whole, even though its annualized standard deviation is low (3.285%), do not represent a well-diversified portfolio over the last five years. A well-diversified portfolio should have a standard deviation of zero, or very close to it. Further, this chart shows that each country's market is more volatile than the Emerging Markets as a whole. Egypt, however, is the market closest to the average.

Figure 1

Volatility of returns (as measured by annualized standard deviation) for the twenty-six emerging markets and five regional countries, (8/31/93 - 10/14/98)



Based on the daily percentage change in the index, Table 2 shows that the highest correlation is found between Jordan and Israel (.87). This may be due, in part, to the positive relationship between the countries that has developed over the years. The next highest correlations are found between

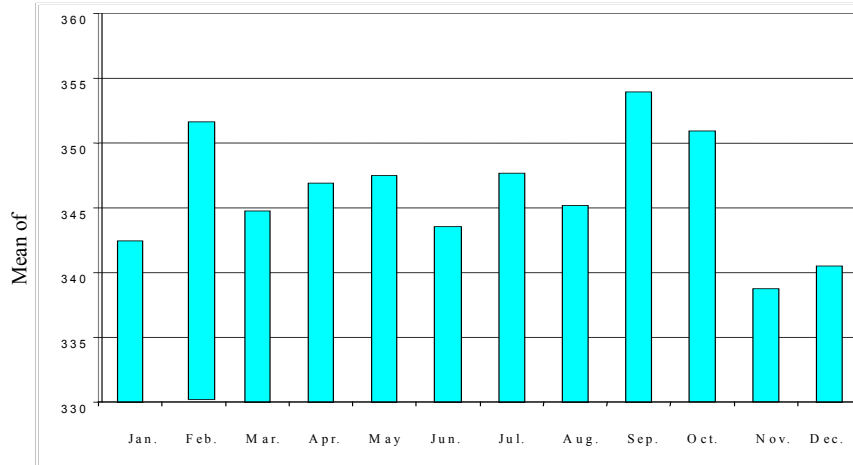
Turkey and Jordan (.67) and between Turkey and Israel (.63). These three countries appear to have closer political and economic relationships than do the other countries. For diversification purposes, the low correlation between Greece and the other countries as well as Egypt and the other countries should render the best diversification. Perhaps Greece and Egypt are less economically integrated in the region – Greece being more aligned with Europe, and Egypt more integrated with Africa and Asia.

Figure 2 shows that the index average reaches the highest level in September, perhaps when more investors enter the market after the summer recess (summer effect). The months with the next highest means of the index are February and October. The lowest means of the index are found in November, December and January (in that order).

Table 2
Emerging markets correlation of returns, (8/31/93 – 10/14/98)

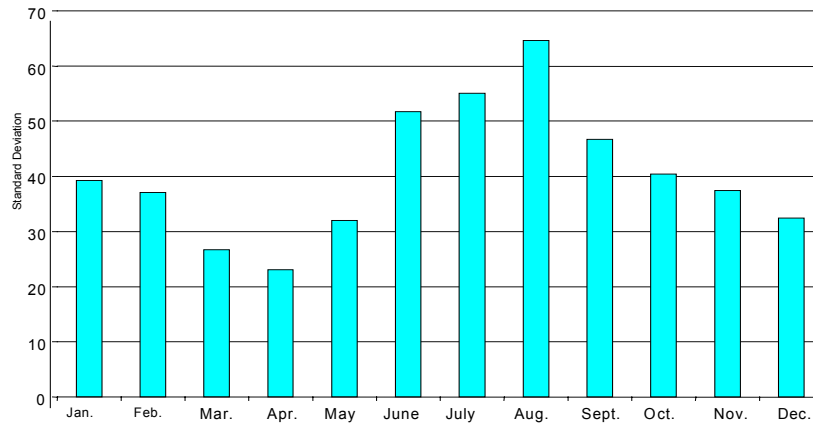
	Emerging Markets	Greece	Egypt	Israel	Jordan	Turkey
Emerging Markets	1.00					
Greece	0.21	1.00				
Egypt	0.05	0.01	1.00			
Israel	0.15	0.03	0.07	1.00		
Jordan	0.06	0.01	0.03	0.87	1.00	
Turkey	0.16	0.11	0.08	0.63	0.67	1.00

Figure 2
Emerging market index level – seasonal effect, (8/31/93 – 10/14/98)



As compared to Figure 2, Figure 3 shows that the risk level (standard deviation), is highest in August, the month preceding the highest level of return. Therefore, it appears that the best time to reenter the market is November, then exit in February (end of year effect), reenter in March and exit again in September (possibly a summer effect). The pattern of the bar chart provides some direction for investor timing. Although the highest volatility (based on daily percentage changes) occurs in August, the spring months (March, April, May) exhibit the lowest volatility. This could be attributed to active investor trading, which lowers the volatility and produces a stabilizing effect in the market. Here again, the seasonal effect is evident with high volatility in the summer season that could be explained by the low trading level. Also, the effect is evident in the spring whereby the volatility is low but the level of trading is higher. Volume trading data is necessary to substantiate this seasonal effect.

Figure 3
Emerging markets index - month of the year volatility
(8/31/93 - 10/14/98)



For an investment strategy, Figure 4 shows that one should enter the market on Monday (when price shares are low) and sell on Wednesday (when stock prices have risen). Of course, as a short-term trader, one must be wary of high trading commissions that may apply.

Figure 4
Emerging markets index level, day of the week effect
(8/31/93 - 10/14/98)

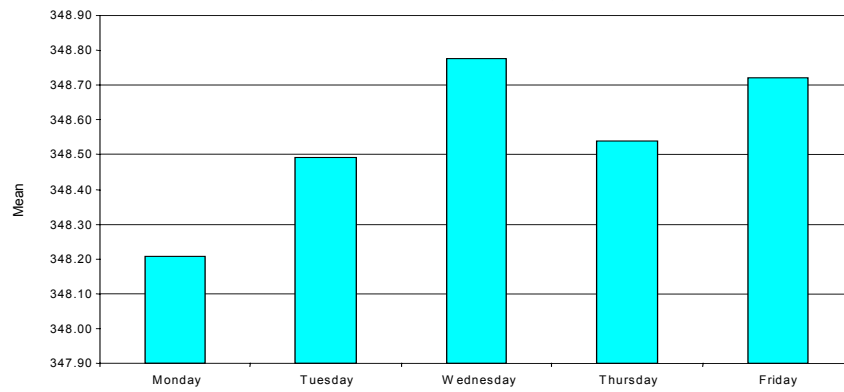


Figure 5
Emerging market index level volatility, day of the week effect
(8/31/93 - 10/14/98)

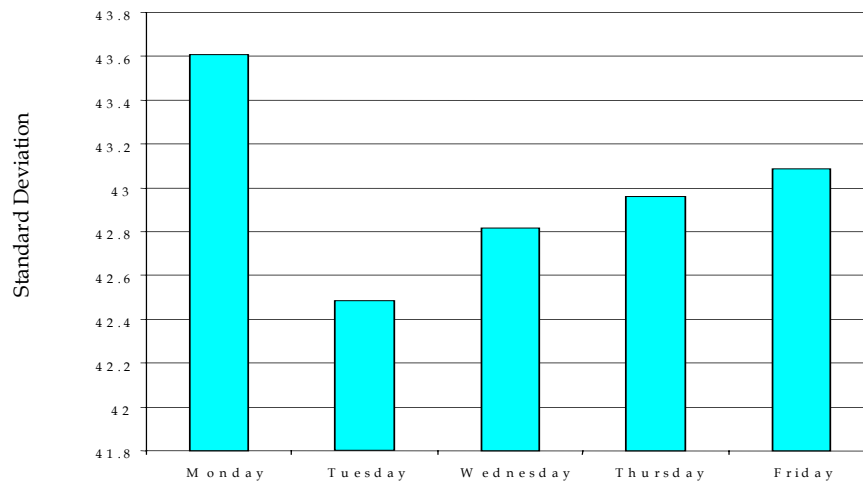


Figure 5, which shows the highest volatility (as measured by the standard deviation) on Monday, should direct the investor to enter the market on Monday, hopefully at the lowest stock price level of the market. Clearly, the day of the week effect is obvious from the above graph, showing Monday having the greatest volatility, with a significant drop on Tuesday, then increasing as the week progresses.

The Variance Ratio (VR) measures market stability as noted by Aitken (1995) and Buckberg (1997). If the ratio increases over time, it implies an increasing instability, i.e., decreasing stability. If the ratio decreases over time, it implies a decreasing instability, i.e., increasing stability. Further, if VR is greater than (1) and increasing, then it implies that the market is not governed by fundamentals. Rather, it is influenced by other behavioral or sentimental factors or noise trading.

Table 3, indicates that over the last six years VR for all Emerging Markets are less than one and declining. The implication is that these markets are influenced by fundamentals rather than behavioral factors. This is contrary to the common conception that Emerging Markets are highly influenced by behavioral rather than fundamental factors. The declining VR for all markets, except Jordan, implies that these markets are becoming more stable despite their relatively high volatility. This could be attributed to the increasing share of institutional investors in the trading activities of these markets. As for Jordan, where VR has been increasing between 1993 and 1997, this may be a case where institutional investors could have been a destabilizing rather than a stabilizing factor in that market. The VR for Jordan, however, declined drastically in 1998 apparently becoming more consistent with the other markets in the region and the overall trend in the Emerging Markets.

This analysis could lead to a recommendation that the markets in the region should continue to encourage more institutional investors to participate in the markets and continue to press companies for more transparency. Investors then can utilize the fundamental analysis and control the impact of behavioral factors and noise traders.

V. CONCLUSION

This research was undertaken to examine the volatility, integration and stability, as well as the existence of day of the week and seasonal effects of five regional markets. The markets include Egypt, Greece, Israel, Jordan and Turkey. Daily market index data were obtained from Morgan Stanley Emerging Markets (MSCI) for 1993–1998 period. While stability has improved in the region there is much more to be done. Low integration was found, which makes the markets more attractive for portfolio diversification.

Table 3
Variance ratios for the emerging markets and the five regional countries, by year, (8/31/93 - 10/14/98)

	Emerg. Markets	Greece	Turkey	Israel	Jordan	Egypt
1993						
Annualized Mean	2.9097	0.7891	2.8002	0.4931	0.0188	N/A
Standard Deviation	0.0068	0.0182	0.0241	0.0109	0.0093	N/A
Annualized Stand. Dev.	2.4972	6.6385	8.8098	3.9941	3.4076	N/A
Variance Ratio	0.2850	0.1460	0.2900	0.4720	0.5180	N/A
1994						
Annualized Mean	-0.0217	-0.0252	-0.5312	-0.4276	-0.1308	N/A
Standard Deviation	0.0080	0.0147	0.0467	0.0178	0.0093	N/A
Annualized Stand. Dev.	2.9190	5.3592	17.0351	6.5133	3.3821	N/A
Variance Ratio	0.1870	0.1820	0.1850	0.2890	0.5220	N/A
1995						
Annualized Mean	-0.1420	0.1709	0.0244	0.3636	0.0896	0.1725
Standard Deviation	0.0070	0.0119	0.0248	0.0116	0.0073	0.0061
Annualized Stand. Dev.	2.5469	4.3538	9.0342	4.2344	2.6629	2.2305
Variance Ratio	0.2150	0.2230	0.3110	0.4450	0.6620	0.2700
1996						
Annualized Mean	0.0637	0.0357	0.5880	-0.0323	-0.1533	0.7237
Standard Deviation	0.0052	0.0093	0.0190	0.0114	0.0063	0.0073
Annualized Stand. Dev.	1.8829	3.3801	6.9361	4.1664	2.3107	2.6717
Variance Ratio	291.0000	0.1670	0.3680	0.4530	0.7630	0.2220
1997						
Annualized Mean	-0.1895	0.5266	2.3393	0.3715	-0.0189	0.3124
Standard Deviation	0.0103	0.0195	0.0305	0.0143	0.0062	0.0132
Annualized Stand. Dev.	3.7633	7.1151	11.1502	5.2070	2.2650	4.8315
Variance Ratio	0.1450	0.1280	0.2290	0.3620	0.7790	0.1260
1998						
Mean	-0.0071	-0.0026	-0.0068	-0.0053	-0.0060	-0.0056
Annualized Mean	-12.1036	-1.5631	-10.7697	-5.8065	-7.9678	-6.5806
Standard Deviation	0.0592	0.0661	0.0586	0.0673	0.0676	0.0495
Annualized Stand. Dev.	21.5990	24.1407	21.3994	24.5756	24.6772	18.0785
Variance Ratio	0.025	0.04	0.12	0.077	0.0715	0.034

Variance Ratio (VR) = $(\sigma_T/T)/\sigma_v$; σ_T : Annualized Standard deviation for the six years; T: Number of years; σ_v : Annualized Standard deviation for one year.

The lower the risk associated with each market, the greater the likelihood that more capital can be attracted to those markets. On the other hand, policymakers would like to see more integration, which should translate into larger markets for products and services, for movement and flow of capital, and therefore, more activity in the stock markets. It is clear that these securities markets are bringing increased attention to the region studied, and that they will play a significant role in capital formation process.

This work should provide guidelines for further research and for investors in their efforts to become more knowledgeable regarding the regional markets examined. It adds to the literature in that, to date, this region holds little attraction for researchers.

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APPENDIX A

Emerging market/country characteristics

The following information was obtained from several sources including the IMF, International Finance Corporation Emerging Market Handbook (1997 and 1998), and The Handbook of World Stock, Derivative & Commodity Exchanges (1998). Table A below summarizes selected data. In all markets, listed stocks are freely available to foreign investors. Also, there is no repatriation of income or capital. According to the IMF classification, Israel and Greece are considered to be "other advanced economies." Egypt, Jordan and Turkey, on the other hand, are categorized as developing countries. All fall into the Middle East and European region.

A. Egypt Stock Exchange

Egypt's Stock Exchange is comprised of the Cairo and Alexandria exchanges, which are governed by the same board of directors and share the same trading, clearing, and settlement systems. The Alexandria Stock Exchange was officially established in 1888, with Cairo following in 1903. Both exchanges were very active in the 1940s, and the combined Egyptian Stock Exchange ranked fifth in the world. Central planning policies adopted in the mid-1950s led to the Exchanges dormancy between 1961 and 1992. In the 1990s, the Egyptian government's restructuring and economic reform program resulted in the revival of the Egyptian stock market. As noted in Table A, in 1997 the market capitalization was more than \$20 billion US for the 650 listed companies. In the case of individuals, mutual funds and international funds, no taxes are levied on dividends, capital gains and interest on bonds.

Egypt's GNP in 1996 was \$64 billion US, but GNP per capita was only \$1,080, the lowest of the five regions studied. On a positive note, annual inflation is down from 26% in January of 1992 to 4% in 1998 (Demirsar, 1998).

Table A

Selected data related to the five-country emerging stock markets & region (end of year 1997 unless otherwise specified)

	Egypt	Greece	Israel	Jordan	Turkey
Number of Listed Companies	650	230	640	139	257
Market Capitalization (MC) (US dollars, millions)	20830	34164	45268	5446	61090
Trading Value (TV) (US dollars, millions)	5859	21146	10727	501	59105
Turnover Ratio*	33.5	73.8	26.7	9.7	113.5
Market Performance (rank out of 79 markets)	33	18	28	39	4
GNP - 1996 (US dollars, millions)	64275	120021	90310	7088	177530
GNP per capita - 1996 (US dollars)	1080	11460	15870	1650	2830
Average Annual Inflation, % 1990 - 1996	11.3	12.2	12.2	4.0	78.2

*Ratios for each market are determined by dividing the Total Value Traded by the Average Market Capitalization.

B. Athens Stock Exchange

Athens Stock Exchange (A.S.E.), established in 1876, is a joint stock company, supervised by the Ministry of National Economy. The majority ownership of the exchange belongs to the Greek State (60.3%) and banks (22.7%). Listed companies, pension funds, mutual funds and insurance companies comprise most of the balance of ownership. The 230 listed companies, valued at \$34 billion US in 1997, are allowed to purchase up to 10% of their outstanding shares in order to support their price. Shares acquired through the buyback procedure must be sold back to the market or be distributed to the existing shareholders within three years from the purchase date or else are cancelled. There are no restrictions for non-residents from other countries wishing to invest in listed shares.

Greece's GNP in 1996 amounted to \$120 billion US and GNP per capita was relatively high at \$11,460. The inflation rate of the country is now around 10%. The low valuation of the market in comparison with other international markets and the free convertibility of the Drachma to other currencies attract foreign investors, who are mainly Europeans.

C. Israel Stock Exchange

Trading of securities began in 1935, when the Anglo-Palestine Bank, together with the country's leading banks and brokerage firms founded the Exchange Bureau for securities, an unofficial stock exchange operating according to criteria stipulated by the banks. The Tel Aviv Stock Exchange (TASE) trades equity shares, warrants, convertible bonds, government and corporate bonds, and treasury bills. Commercial banks and brokerage firms which meet admission criteria relating to reputation, financial standing, integrity, and experience hold membership in the TASE. TACT (Tel Aviv Continuous Trading) combines the advantage of a call market with those of continuous trading. Foreign investors may buy and sell any listed security or mutual fund. If the original purchase of such securities was made in foreign currency, interest, dividend payments and principal may be repatriated in foreign currency. In 1997, 640 companies were listed with a market capitalization of \$45 billion US. Both interest and dividends are taxed.

Israel, with a GNP in 1996 of \$90 billion US and \$15,870 US GNP per capita is the strongest country, economically, for its size in the region. Total trade exchange between Israel and the U.S. is expected to be over \$14 billion. Among large companies operating in Israel are Microsoft, Intel, America Online, Coca-Cola and McDonald's. In 1997, direct foreign investment reached

a high of \$3.7 billion. Principal growth sectors are telecommunications, software development and computers. GDP has been growing at a steady 6% in the first half of the 1990's and has a potential to remain growing at 4%-5% a year.

D. Jordan Stock Exchange

The Amman Financial Market (AFM), established in 1976, was a major step in developing the financial sector in Jordan. The AFM is comprised of companies, individual investors, institutional investors, securities firms and dealers. Foreign investors are free to invest and trade in Jordanian Securities. Both equities and securities are traded in the AFM.

Of the five emerging markets studied, the AFM is the smallest, having in 1997, 139 listed companies with a market capitalization of \$5.4 billion US. Overall, Jordan is a relatively poor country where the GNP was \$7 billion US and GNP per capita amounted to \$1,650 US in 1996. In 1997, inflation was only 3% and is expected to remain at the same level.

Also, the World Bank is expecting an 8% growth rate in its financial market with interest rates rising to 16% by the year 2003. Jordan has been criticized by international institutions for inaccurate and inflated data regarding growth rate and their economy, many of which were lower than actual.

E. Istanbul Stock Exchange

The history of this securities market dates back to 1866, but the Istanbul Stock Exchange (ISE) was inaugurated in 1986. It is an autonomous, semi-public organization. 257 companies are listed on this exchange with a market capitalization of \$61 billion US in 1997. Since 1997, the ISE has calculated sectorial and sub-sectorial indices on the basis of prices and total return. The ISE National-100 Index is used as a main indicator of the National Market. At year-end 1997, the trading value of shares amounted to \$59 billion US, the highest of the five regional emerging markets. In terms of worldwide stock market performances in 1997 the ISE ranked fourth out of seventy-nine markets.

The high turnover ratio (113%) for Turkey indicates that it is the most active market in the region as of 1997. After the devaluation of the Turkish Lira in 1994, the aforementioned financial market collapsed. The devaluation was triggered by attempts to reduce the government's deficit. This action resulted in the devaluation of the currency by 44%, a fall of the GDP by 5.4%, a rise in

the inflation rates equal to 106%, and finally a market drop of 70%. In contrast to the above, an improvement in the country's leading indicators encouraged international investors and the market recovered by 40%.

Turkey's GNP was the highest in the region in 1997 at \$177 billion US. But, its GNP per capita is relatively low, at \$2,830. Its average annual inflation rate for the 1990-1996 period was overwhelmingly high at 78.2%.