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Portfolio optimization analysis of federation of Euro-Asian stock exchances (FEAS)

Selim Larlar

PORTFOLIO OPTIMIZATION ANALYSIS OF FEDERATION OF EURO-ASIAN STOCK EXCHANGES (FEAS)

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Business Administration

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by

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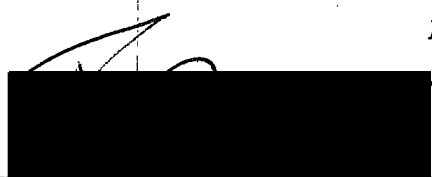

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ABSTRACT

Institutional and individual investors all around the globe are looking for different ways to diversify their stock portfolio. This thesis will give them a chance to understand the difference between Euro-Asian stock market portfolios and the S&P 500. This thesis will also compare performance analyses among ten founding members of the Federation of Euro-Asian Stock Exchanges (FEAS), the S&P 500 Index, the Ten Composite Index and four sample portfolios, consisting of the ten founding member countries of FEAS and S&P 500. The Ten Composite Index is presented in details in the subsection called *measure of overall performance*. The data between 1995 and 2002 for the ten founding countries of FEAS, S&P 500 Index, and Emerging Market Index was used to execute these performance analyses. First, this thesis contains a detailed research about stock exchanges of member countries under the organization called Federation of Euro-Asian Stock Exchanges (FEAS). Second, it will analyze the portfolio performances among the ten founding member countries' stock exchanges. Third, it will compare the FEAS portfolios with the S&P500 and sample portfolios. Risk and return analysis for sample portfolios shows that a portfolio consisting of 100% of the S&P 500 turns out to

have the lowest Annualized Return and also results in the lowest Annualized Standard Deviation between 1995 and 2002, compared to other markets. The Index portfolio weighted by the ten founding stock exchanges' market capitalization offered the highest Annualized Return with a moderate risk level compare to other markets. For the ten founding countries their selves, the Bulgarian, Tehran and Istanbul stock exchanges comparatively out performed other founding stock exchanges. The results of this thesis suggest that investors should invest in portfolios consisting of the S&P500, the Ten Composite Index and the ten founding stock exchanges, rather than only invest in either the ten founding stock exchanges or S&P 500.

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CHAPTER ONE

CHARACTERISTICS OF EMERGING MARKETS

This chapter first presents the literature review for Emerging Markets; second, it reviews the definition and the two basic criteria of Emerging Markets in the ten founding member stock exchanges' countries: whether or not they meet the requirements of being an emerging market, and if they fall within the typical restrictions of that market.

Literature Review for Emerging Market Studies

The literature on emerging stock exchanges is classified into three categories. The first category concentrates on distribution analysis of returns. The second category diagnoses the adequacy of the asset pricing models by using emerging market data, and the third category attempts to explain interdependency of stock markets by using stock market correlations.

Few approaches have determined the return distributions of emerging equity markets comparing with developed equity markets. Those approaches have resulted five distributional characteristics, which are high volatility, high long-term returns, high autocorrelation, time-variation of skewness and kurtosis and low

correlation with both developed markets and other emerging markets (Niu & Cui, 2002).

Research on standard global asset pricing models show that these models fail to explain the cross section of average returns in emerging countries. Based on analyses for predictability of the returns, returns for emerging markets are more likely than developed countries to be affected by local information (Harvey, 1995).

Some researchers also try to establish a relationship between emerging markets and contagion. During the second half of the 1990's, economic turndowns in emerging markets were a major characteristic of the economic landscape (Dungey & Zhumabekova, 2001; Edwards & Susmel, 2001; Forbes & Rigobon, 2002). Those kind of turndowns were by no means a new phenomenon, the special attention to the recent experiences was the perception of a heightened possibility of contagion - the spread outward of pressures from one crisis country to other countries (Meyer, 2001). A typical example of this kind of contagion is the collapse of Thailand's currency that has triggered a chain of crises in other Asian emerging markets. Another example is the Russian financial crisis that puts pressure on world financial markets to industrial economies. The possible solution to prevent that kind of financial crises

for emerging markets in the future is to build robust domestic financial institutions and found domestic economic policies (Meyer, 2001).

Since emerging markets are becoming more and more accessible, research based on emerging market data are significant. Furthermore, two forms of investment instruments would be available to investors in developed countries; closed-end county funds and American Depository Receipts (ADRs). The first instrument, closed-end county funds, are investment companies that invest in portfolio of assets in a foreign country and sell shares of these assets in the domestic market, like in the United States. This instrument not only helps investors gain experience in a foreign country without the need of picking individual stocks in the foreign market, but also provides better liquidity due to transactions executed domestically. The second instrument, American Depositary Receipts (ADRs), gives rights to foreign shares to be traded in dollars over U.S. stock exchanges or over-the-counter. ADRs are unique instruments to solve many of the problems arising from investment restrictions, informational problems associated with investing in foreign securities, and transaction costs (Niu & Cui, 2002).

Characteristics of Actual Emerging Markets

According to the FEAS rules, membership in the federation is open to emerging stock exchanges in Europe and Asia (FEAS Year Book, 2001/2002). The term *Emerging Market* needs to be explained to fully understand this FEAS rule. Emerging Market implies a stock market that is in transition, increasing in size, activity, or level of sophistication. Most often the term is defined by a number of parameters that attempt to assess a stock market's relative level of development and/or an economy's level of development. According to the Standard and Poor's' standards, if a market for the stock exchange meets at least one of the two general criteria, this market would be considered an "Emerging Market." Standard and Poor's clearly determined those two criteria:

a) The market should be located in a low or middle income economy as defined by the World Bank, and

b) The investable market capitalization should be low relative to its most recent Gross Net Income (GNI) figures.

The first criterion is based on the World Bank's classification of low and middle-income economies. In 2000, The World Bank classified economies with a GNI per capita lower than $9,226 as low or medium income countries

(Standard and Poor's Emerging Stock Markets Factbook, 2002).

The second criterion is based on small investable market capitalization relative to gross domestic product in a market. Non-investable holdings include, but are not limited to, large block holdings and parts of companies that are inaccessible due to foreign investment limits.

As illustrated in Table 1, the ten founding members of the FEAS satisfy the World Bank criteria of being low-income economies. For the second criterion, the investable market capitalization-to-GNI ratio must be in the top 25% of emerging markets for three consecutive years to graduate from the Emerging Market Series.

Table 1. Emerging Market Eligibility Test for Ten Member Stock Exchanges

Stock Exchange	Criteria Low/Middle Income Area *GNI Per Capita*
Amman	$3,950.00
Bulgarian	$5,560.00
Cairo & Alexandria	$3,670.00
Dhaka	$1,590.00
Istanbul	$7,030.00
Karachi	$1,860.00
Lahore	$1,860.00
Muscat	$1,250.00
Tehran	$5,910.00
Zagreb	$7,960.00

According to this standard, the ten founding members stock exchange countries were found eligible to stay in the Emerging Market Series (Standard and Poor's Factbook Emerging Stock Markets, 2002).

Typical Restrictions in Emerging Markets

This subsection presents typical restrictions in emerging markets such as capital controls (flexibility in entering/exiting to the market), foreign investment ceilings for listed stocks, and tax regulations.

- Capital controls (flexibility in entering or exiting to the market):

  Flexibility in entering or exiting Emerging Markets varies from country to country, the research proves that investors can easily buy and sell stocks in those ten founding member stock exchanges.

  There are no significant restrictions for foreigners in those stock exchanges, giving investors more flexibility to make their investment decisions among emerging markets (FEAS Year Book, 2001/2002).

- Foreign Investment Ceiling Regulations For Listed Stocks:

Foreign Investment Ceiling Regulations for listed stocks in Emerging Markets are important restrictions that investors should take into consideration when making their investment decisions. In 2002, researchers at Standard and Poor's have reported those regulations in a simple table as shown in Table 2.

Table 2. Foreign Investment Ceiling for Listed Stocks in Ten Founding Member Countries

	Regulation for Ceiling
Amman	100% in general
Bulgarian	100% in general
Cairo & Alexandria	100% in general
Dhaka	100% in general; 10% on banking companies for a single entity
Istanbul	100% in general
Karachi	100% in general
Lahore	100% in general
Muscat	Up to 49% ownership if company approves.
Tehran	100% in general
Zagreb	100% in general

This table also shows that there are no limitations for investors in the ten emerging markets studied, except in the Dhaka and Muscat stock exchanges. In the Dhaka stock exchange, ceiling restriction (10%) applies for stocks in the banking industry. The Muscat stock exchange limits ownership of foreigners to 49%, if the company approves the investment.

- Tax Regulations

Tax withholding is another significant issue for foreigners investing in emerging markets. Investors have a tendency to chose low-tax or zero-tax markets among world markets to avoid higher taxes. Standard and Poor's Emerging Stock Markets Factbook 2002 reports information regarding withholding taxes in Emerging Markets. Table 3 summarizes withholding taxes for ten founding member stock exchanges.

Table 3. Tax Rates in Ten Founding Exchanges' Countries

	Taxes On..		
STOCK EXCHANGE	Interest (%)	Dividens (%)	Long Term Capital Gains (%)
Muscat	0.0%	0.0%	0.0%
Tehran	0.0%	0.0%	0.0%
Cairo & Alexandria	0.0%	0.0%	0.0%
Istanbul *	0.0%	5.5%	0.0%
Amman	0.0%	10.0%	0.0%
Zagreb	0.0%	15.0%	0.0%
Karachi	10.0%	10.0%	0.0%
Lahore	10.0%	10.0%	0.0%
Bulgarian	15.0%	15.0%	15.0%
Dhaka	15.0%	25.0%	0.0%

*Government Securities are exempt from taxation if held to maturity

The Cairo and Alexandria, Tehran and Muscat Stock Exchanges are tax havens for investors with zero tax withholding on interests, dividends and long-term capital

gains. The Istanbul stock exchange is the fourth tax haven requiring only 5.5% tax on dividends. Amman and Zagreb takes the fifth and sixth place requiring 10% and 15% tax on dividends, respectively. Since Karachi and Lahore are in the same country, Pakistan, tax rates are the same, 10% on dividends and interest income. Table 3 also shows Bulgarian and Dhaka are at the bottom of the list by requiring relatively high tax rates on interest income, dividends and capital gains.

CHAPTER TWO

THE FEDERATION OF EURO ASIAN STOCK EXCHANGE MARKETS (FEAS), TREND ANALYSIS AMONG TEN EMERGING MARKETS, S&P 500 AND ALL EMERGING MARKETS

This chapter introduces the Federation of Euro Asian Stock Exchanges. Initially, 12 founding member stock exchanges (Amman, Bulgarian, Dhaka, Cairo and the Alexandria, Istanbul, Karachi, Lahore, Tel-Aviv, Muscat, Tehran, Ukrainian, and Zagreb) were chosen for this project, but because of insufficient information, the Ukrainian and Tel Aviv stock exchanges were eliminated from the sample. The history, goals and objectives of the federation will be explained in the first two subsections. General information about the ten founding member stock exchanges, and the comparative trend analysis among those stock exchanges will be illustrated in the third subsection of this chapter. The following map in Figure 1 also shows the location of each member stock exchange of the FEAS.

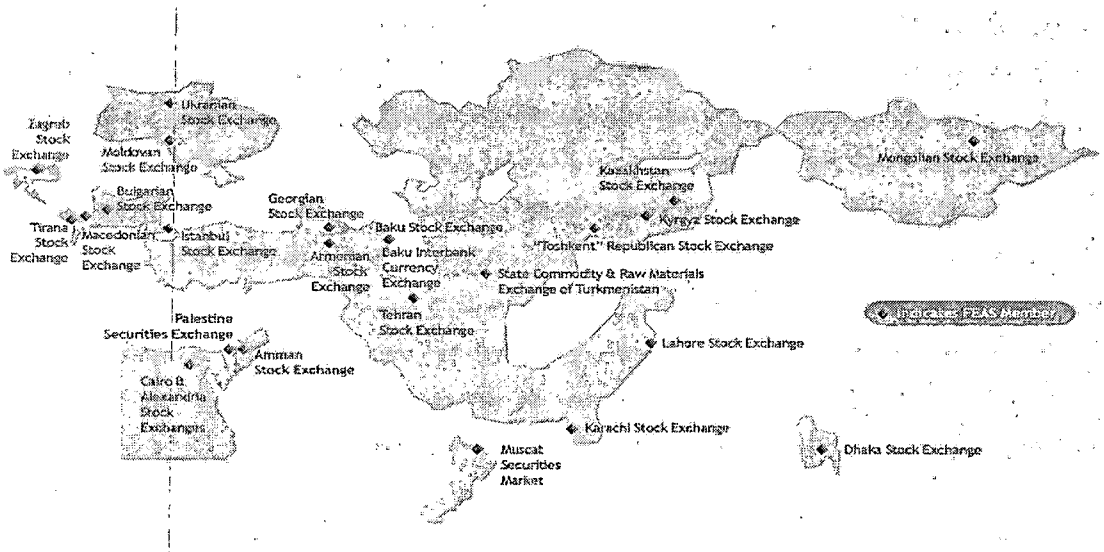


Figure 1. Location of Stock Exchanges

History of Federation of Euro-Asian Stock Exchanges and Founding Stock Exchanges (FEAS)

The federation was established May 16 1995 with 12 founding members. The federation has evolved and now has 23 Member Stock Exchanges as seen in Appendix A. Membership in the federation is open to emerging stock exchanges in Europe and Asia. The major purpose of the FEAS is to create fair, efficient and transparent market environments among the FEAS members and their operating regions. Harmonization of rules, regulations and adoption of new technologies to facilitate the objectives of FEAS are major purposes of the federation (FEAS Year Book, 2001/2002).

The 23 member exchanges represent the federation from 21 countries consisting of over 7,000 traded companies with a market capitalization of $109 billion. Appendix B shows that the market capitalization of the federation hits a peak level and reached $200 million in 1999. In 2002, the federation had its lowest market capitalization, which was $109 million. This table also shows that the ten founding member stock exchanges represent the majority of the 23 member countries in terms of total volume for stock exchanges, bond markets, as well as other markets. The total volume of stocks in ten founding stock exchanges represents 99% of the total volume of stocks in all member stock exchanges. Regional statistics show that 'Other' volume, including currency, T-bills, repo/ reverse repo and derivatives among other instruments, represents 81% of the total market volume for all financial instruments that have been traded in member stock exchanges.

Appendix C shows that the oldest stock exchange is the Alexandria Stock Exchange, which was officially established in 1888 followed by Cairo in 1903. The following stock exchanges are ranked by establishment date:

- The Karachi Stock Exchange (KSE) was founded on September 1947,

- The Dhaka Stock Exchange (DSE) was incorporated on March 1954,
- The Tehran Stock Exchange opened its doors on April 1968,
- The Lahore Stock Exchange (LSE) was established in 1970,
- The Amman Financial Market for stocks was established in 1976,
- The Muscat Securities Market (MSM) was established and share trading began in May 1989,
- The Istanbul Stock Exchange, formally, integrated at the end of 1985,
- The first Bulgarian Stock Exchange (FBSE) was established on 8 November 1991 and started trading in May 1992,
- The Zagreb Stock Exchange (ZSE) was incorporated in 1991 as a joint-stock company by 25 commercial banks and insurance companies.

Goals and Objectives of FEAS

Objectives of the FEAS are listed below (FEAS Year Book, 2001/2002):

- Encouraging collaboration between member countries to develop the each securities market.

- Acting as the representative of member stock exchanges around the world.
- Promoting the development of more integrated international stock exchanges in the region.
- Offering listing and trading opportunities for securities issued in the region.

The federation aims to utilize a common trade platform model as well as implement a data center to promote cross-market statistics. Other special projects under FEAS are:

- To promote the growth of stock exchange operators through extensive training programs,
- To promote development of small to medium economic enterprises on a national level within member markets, and
- To arrange regional training in the area of IT for both IT professionals and non-IT professionals (FEAS Year Book, 2001/2002).

General Information about Ten Founding Member Stock Exchanges

This subsection introduces general information about the ten founding stock exchanges based on their market

capitalization, listed companies and turnover ratio. Explanation for each category is shown as follows:

Listed Companies

As shown in Table 4, the Cairo Stock Exchange leads with 1151 listed companies. The Karachi and Lahore stock exchanges are second and third with 711 and 592 listed companies. Other stock exchanges follow those two stock exchanges; Bulgarian, 354, Tehran, 327, Istanbul, 288, Dhaka, 229, Muscat, 220, Amman, 212, and Zagreb, 71. For comparison purposes, about 2,800 companies are listed on the New York Stock Exchange (NYSE).

Table 4. Listed Companies

	1995	1996	1997	1998	1999	2000	2001	2002
Amman	97	98	139	150	152	163	161	212
Bulgarian	26	15	15	998	828	503	399	354
Cairo & Alexandria	746	649	654	861	1033	1076	1110	1151
Dhaka	183	186	202	208	211	221	230	229
Istanbul	205	229	257	277	285	315	310	288
Karachi	764	782	781	773	765	762	747	711
Lahore	640	647	636	627	619	614	613	569
Muscat	-	-	-	-	140	131	191	220
Tehran	220	220	263	277	295	304	316	327
Zagreb	61	66	77	50	59	64	62	71
EM	17,572	19,574	18,864	25,582	25,975	25,687	24,880	27,560
S&P-500	500	500	500	500	500	500	500	500
Min	-	-	-	-	59	64	62	71
Max	17,572	19,574	18,864	25,582	25,975	25,687	24,880	27,560
Average	1,751	1,914	1,866	2,525	2,572	2,528	2,460	2,683

Market Capitalization

Market capitalization is basically defined as the total dollar value of all outstanding shares, it is calculated by multiplying the number of shares times the current market price. This term is referred to as market cap.

Table 5 shows that the Istanbul Stock Exchange reached the highest market capitalization ($34.4 million) in 2002 while the Bulgarian Stock Exchange had the lowest market capitalization, $712,000. Other founding stock exchanges achieved the following market capitalizations: Cairo ($26.4 million), Tehran Stock Exchange ($14.3 million), Karachi Stock Exchanges ($10.2 million), Lahore Stock Exchange ($10.1 million), Amman Stock Exchange ($7million), Muscat Stock exchange ($5.1 million), Zagreb ($3.8 million), and Dhaka ($1.2 million). Table 5 also shows that the average market capitalization of the ten founding stock exchanges, $921 billion, was lower than the S&P 500's market capitalization, $8,254 billion.

Table 5. Analyses on Market Capitalization ($mio)

	1995	1996	1997	1998	1999	2000	2001	2002
Amman	4,670	4,551	5,446	5,838	5,827	4,943	6,316	7,093
Bulgarian	N/A	11	N/A	146	707	572	506	712
Cairo & Alexandria	8,088	14,173	20,830	24,381	32,838	28,741	24,335	26,415
Dhaka	1,338	4,551	1,537	1,034	865	1,186	1,145	1,228
Istanbul	20,772	30,020	61,090	33,646	112,716	69,659	47,150	34,401
Karachi	9,286	10,639	11,899	5,836	7,064	6,602	4,944	10,204
Lahore	-	-	9,234	5,463	5,989	6,947	4,724	10,179
Muscat	1,978	2,662	7,108	4,392	4,302	3,463	2,606	5,152
Tehran	6,552	17,024	15,159	15,167	21,858	7,538	9,698	14,344
Zagreb	581	2,975	4,246	3,190	2,584	2,742	3,319	3,805
EM	1,893,625	2,223,895	2,133,165	1,775,267	2,948,429	2,608,486	2,572,064	2,684,562
S&P-500	4,588,269	5,747,638	7,290,191	9,908,953	12,223,581	11,586,787	10,433,301	8,254,166
Min	-	-	1,537	146	707	572	506	712
Max	4,588,269	5,747,638	7,290,191	9,908,953	12,223,581	11,586,787	10,433,301	8,254,166
Average	594,105	671,512	869,082	981,943	1,280,563	1,193,972	1,092,509	921,022

Turnover Ratio

This ratio is the percentage of outstanding shares traded during a period of time and was calculated monthly for the ten founding stock exchanges. The formula for the ratio is shown as follows:

Turnover Ratio (%) = Total Volume of Stocks (# of shares)/Total Market Capitalization

Turnover ratio indicates trading activity: for instance, high turnover ratios indicate a highly liquid market and the low turnover ratio indicates a low liquid market. Table 6 shows that the Karachi Stock Exchange has the highest turnover ratio of 200, which means that the market

is more liquid compared to the other stock exchanges: Dhaka (40), Amman (20), Istanbul (20), Bulgarian (10), Cairo (10) Lahore (10), Muscat (10), Tehran (10) and Zagreb (3). Zagreb stock exchange had the lowest the liquidity compared to other founding stock exchanges.

Table 6. Turnover Ratio (%)

	1995	1996	1997	1998	1999	2000	2001	2002
Amman	11	6	10	11	9	7	16	20
Bulgarian	0	0	0	2	6	9	13	10
Cairo & Alexandria	10.9	22.2	33.5	22.3	31.6	34	14	10
Dhaka	13.3	24.2	12.8	63	83	74	64	40
Istanbul	226	133	113	154	102	206	161	20
Karachi	29	58	103	114	345	475	226	200
Lahore	0	0	0	0	10	10	6	10
Muscat	0	0	0	0	10	14	16	10
Tehran	N/A	N/A	N/A	N/A	10	10	10	10
Zagreb	8.2	12.6	9.7	2.8	2.7	7.4	4	3
EM	55	70	110	133	99	152	93	99
S&P-500	5	4.58	4.92	9.46	6.16	8.91	4.43	3.82
Min	0	0	0	0	3	7	4	3
Max	226	133	113	154	345	475	226	200
Average	33	30	36	47	60	84	52	36

To understand the trend of the above-mentioned basics among the ten emerging markets, Table 8, 9, and 10 were prepared to show this trend analysis between 1995 and 2002. Results from this trend analysis are shown as follows:

Trend Analyses of Listed Companies

Table 7 illustrates an upward trend in number of listed companies for the ten founding stock exchanges between 1995 and 2001. After 2001, except in Amman, Cairo, Muscat, and Zagreb, the number of listed companies in other stock exchanges had a downward trend. The Bulgarian stock exchange lost 300 listed companies between 1999 and 2000. This decrease in the number of companies listed is due to new regulations from the newly established Securities and Stock Exchange Commission. The new regulation introduced a new requirement that all listed stocks must have their prospectuses approved by the Commission in order to trade in the stock exchange. There were no companies that were able to comply with this requirement; therefore, trading was suspended for a while. Between 1995 and 2002, listed companies had a positive trend in all emerging markets and an average growth rate occurred at 7% while the number of listed companies in the Bulgarian stock exchange grew by 45% on average, the highest growth rate among other stock exchanges.

Table 7. Trend Analyses of Listed Companies

	1995	1996	1997	1998	1999	2000	2001	2002
Amman	97	98	139	150	152	163	161	212
Bulgarian	26	15	15	998	828	503	399	354
Cairo & Alexandria	746	649	654	861	1033	1076	1110	1151
Dhaka	183	186	202	208	211	221	230	229
Istanbul	205	229	257	277	285	315	310	288
Karachi	764	782	781	773	765	762	747	711
Lahore	640	647	636	627	619	614	613	569
Muscat	-	-	-	-	140	131	191	220
Tehran	220	220	263	277	295	304	316	327
Zagreb	61	66	77	50	59	64	62	71
EM	17,572	19,574	18,864	25,582	25,975	25,687	24,880	27,560
S&P-500	500	500	500	500	500	500	500	500
Min	-	-	-	-	59	64	62	71
Max	17,572	19,574	18,864	25,582	25,975	25,687	24,880	27,560
Average	1,751	1,914	1,866	2,525	2,572	2,528	2,460	2,683
Std								

Trend Analyses of Market Capitalization

Table 8 shows that the Istanbul stock exchange and the Zagreb stock exchange have a unique position compared to other founding stock exchanges. The same table also illustrates that the market capitalization of the Istanbul Stock Exchange dramatically increased from $20 million to $112 million with an average growth rate of 54% between 1995 and 1999. The closest growth rate to Istanbul stock exchange's market capitalization occurred in the Zagreb stock exchange with a growth rate of 45% for the same period. Trend analysis for market capitalization of each

Table 8. Trend Analyses of Market Capitalization ($mio)

	1995	1996	1997	1998	1999	2000	2001	2002	Growth (%)
Amman	4,670	4,551	5,446	5,838	5,827	4,943	6,316	7,093	6.15%
Bulgarian	-	11	-	146	707	572	506	712	37.29%
Cairo & Alexandria	8,088	14,173	20,830	24,381	32,838	28,741	24,335	26,415	18.42%
Dhaka	1,338	4,551	1,537	1,034	865	1,186	1,145	1,228	-1.22%
Istanbul	20,772	30,020	61,090	33,646	112,716	69,659	47,150	34,401	7.47%
Karachi	9,286	10,639	11,899	5,836	7,064	6,602	4,944	10,204	1.36%
Lahore	-	-	9,234	5,463	5,989	6,947	4,724	10,179	1.97%
Muscat	1,978	2,662	7,108	4,392	4,302	3,463	2,606	5,152	14.65%
Tehran	6,552	17,024	15,159	15,167	21,858	7,538	9,698	14,344	11.84%
Zagreb	581	2,975	4,246	3,190	2,584	2,742	3,319	3,805	30.80%
EM	1,893,625	2,223,895	2,133,165	1,775,267	2,948,429	2,608,486	2,572,064	2,684,562	5.11%
S&P-500	4,588,269	5,747,638	7,290,191	9,908,953	12,223,581	11,586,787	10,433,301	8,254,166	8.75%
Min	-	-	-	146	707	572	506	712	
Max	4,588,269	5,747,638	7,290,191	9,908,953	12,223,581	11,586,787	10,433,301	8,254,166	
Average	544,597	671,512	796,659	981,943	1,280,563	1,193,972	1,092,509	921,022	

stock exchange shows that the Bulgarian Stock Exchange is an infant stock exchange compared to other stock exchanges. Total Market capitalization in all emerging markets grew only 5%, on average, between 1995 and 2002. Other founding stock exchanges with high market capitalization compared to the emerging markets are Tehran, Muscat and Cairo Stock exchanges, with growth rates of 12%, 15%, and 18% respectively. Compared to the ten founding stock exchanges' market capitalization, S&P 500's market capitalization grew only 9% during the same period.

Trend Analyses of Turnover Ratios

Turnover ratios are unique indicators to analyze the liquidity of stock markets. Table 9 shows that turnover ratio in the S&P 500 ranged between 3.82% and 9.46%, between 1995 and 2002. Overall turnover ratios for the emerging markets reached 84%, its peak point in 2000 as illustrated in the Table 9. Due to the new regulation, a new requirement was introduced that all listed stocks must have their prospectuses approved by the Commission in order to trade in the stock exchange. The Bulgarian stock exchange has the weakest turnover ratio, at 13%. Turnover ratio for the Istanbul Stock Exchange ranged from 20% to 226% between 1995 and 2002. Due to the devaluation of the local currency against the U.S. dollar in Turkey, and the chain reaction in the lack of trade volume in the market, turnover ratio dramatically decreased to 20, from 161 between 2001 and 2002.

Table 9. Trend Analyses of Turnover Ratio (%)

	1995	1996	1997	1998	1999	2000	2001	2002
Amman	11	6	10	11	9	7	16	20
Bulgarian	0	0	0	2	6	9	13	10
Cairo & Alexandria	10.9	22.2	33.5	22.3	31.6	34	14	10
Dhaka	13.3	24.2	12.8	63	83	74	64	40
Istanbul	226	133	113	154	102	206	161	20
Karachi	29	58	103	114	345	475	226	200
Lahore	0	0	0	0	10	10	6	10
Muscat	0	0	0	0	10	14	16	10
Tehran	N/A	N/A	N/A	N/A	10	10	10	10
Zagreb	8.2	12.6	9.7	2.8	2.7	7.4	4	3
EM	55	70	110	133	99	152	93	99
S&P-500	5	4.58	4.92	9.46	6.16	8.91	4.43	3.82
Min	0	0	0	0	3	7	4	3
Max	226	133	113	154	345	475	226	200
Average	33	30	36	47	60	84	52	36
Std								

Trend Analyses of Price Indices

The Bulgarian, Karachi and Tehran Stock exchanges have performed better compared to the S&P 500 between 1995 and 2002. The average performance for those stock markets are 8.26%, 8.8%, and 21.53% respectively, which are above the S&P 500's average return of 5%. Due to new reforms and re-entry programs to IMF, the Lahore stock exchange had the worst growth rate of -12% among other markets. The emerging markets' index also retained a negative figure during the same period (see Table 10 for detail).

Table 10. Trend Analyses of Price Indices (End of Period Levels)

	1995	1996	1997	1998	1999	2000	2001	2002	Growth (%)
Amman (ASE)	225	216	238	239	236	187	243	239	0.87%
Bulgarian (SOFIX-50)	105	78	N/A	N/A	N/A	N/A	118	183	8.26%
Cairo & Alexandria (CASE-30)	3269	4615	5365	4003	5759	3591	2228	2704	-2.67%
Dhaka (DSE)	834	2300	756	540	487	642	817	822	-0.21%
Istanbul (ISE-100)	382	534	982	484	1654	817	557	368	-0.53%
Karachi (KSE-100)	1497	1339	1753	945	1408	1507	1273	2701	8.80%
Lahore (LSE-101)	14.9	10.3	11.1	6	6.7	5.7	3.8	6	- 12.40%
Muscat (MUSCAT-ALL)	158	199	481	228	250	201	150	191	2.75%
Tehran (TEPIX)	1288	1967	1631	1531	1989	2880	3554	5044	21.53%
Zagreb (CROBEX)	0	1000	1002	715	713	890	1034	1172	2.29%
EM Composite Index	370	391	328	252	403	282	274	230	-6.57%
S&P-500	615	756	936	1226	1458	1305	1144	895	5.51%
Min	-	10	11	6	7	6	4	6	
Max	3,269	4,615	5,365	4,003	5,759	3,591	3,554	5,044	
Average	730	1,117	1,226	924	1,306	1,119	950	1,213	
Std									

CHAPTER THREE

MACRO ECONOMIC AND MARKET INFORMATION ABOUT TEN EMERGING MARKETS

To understand the dynamics of each of the original 12 founding member stock exchanges, macroeconomic data of each stock exchange's country summarized in a matrix format are illustrated in Appendix D. This chapter compares the ten emerging markets with each other in terms of stock exchange indices, GNP, inflation rate, budget deficit, unemployment rate, market segmentation and instruments. The matrix analysis in Appendix D helped to compare those categories. Interpretations for each category are shown as follows:

Gross National Product

Gross National Product helps investors to understand the magnitude of the stock exchange in a country. A number of previous studies show that financial deepening promoted the growth of GNP in emerging countries (Standard and Poor's Emerging Stock Markets Factbook, 2002). The research suggests a strong connection between stock market development and economic growth. According to another study, "it is also clear that an active equity market is an important engine of economic growth in developing

countries or emerging markets" (Harvey, 1995). Comparative analysis in Appendix D shows the difference between emerging markets in terms GNP. The Istanbul Stock Exchange leads with a GNP of $199,437 million and Cairo Stock Exchange follows it with a GNP of $98,725.

Average Inflation

Purchasing power affects investment decisions in the domestic market and the comparative inflation rates in the matrix show differences between the markets. The Bulgarian, Zagreb and Istanbul Stock Exchanges have inflation rates over 50%: 102%, 86%, and 76% respectively.

Budget Deficit

In terms of capital outflow and inflow, the budget deficit of each market has an important impact. Budget deficits illustrate whether a country has excess funds or lack of funds. Because the magnitude of budget deficit has a strong affect on borrowing and/or lending rates in the market, investors should focus on this figure to make an efficient investment decision in a market. The Istanbul and Dhaka Stock Exchanges are in countries with comparatively high budget deficits, $9,772 million and $2,732 million respectively, however, those budget deficits are relatively small compared to the deficit in

America, which is $40 billion by the end of 2002. The Tehran and Amman stock exchanges are in countries with high budget surpluses, $5,518 million and $5,838 million respectively. Other countries have reported budget deficits; Pakistan (Karachi & Lahore) has a deficit of $221.8 million; Egypt (Cairo & Alexandria) reported a deficit of $118.4million; Oman (Muscat) has a budget deficit of $299 million; Croatia (Zagreb) has a deficit of $39 million.

Unemployment Rate

Unemployment rate provides investors with sufficient information about the general picture in the economy and the matrix in Appendix D compares unemployment rates among the ten founding emerging markets. According to the matrix, Zagreb and Dhaka Stock Exchanges are countries in which the unemployment rate is extremely high compared to other countries, at 21% and 35%. For instance, Pakistan (Karachi & Lahore stock exchanges) has the lowest unemployment rate, at 6.3% compared to other founding stock exchanges' countries. The Amman (14%) Bulgarian (15.3%), Cairo (12%), Istanbul (10%), and Tehran (14%) stock exchanges are in countries with moderate unemployment rates.

Market Segmentation and Instruments

To efficiently make an investment decision in emerging markets, investors should understand market segmentation. Market segmentation not only indicates the depth of the market but also introduces investment alternatives to investors in the market to diversify portfolios. To understand market segmentation, some terms from the matrix analysis in Appendix D need to be defined: First Market or IPO market is the market for new companies while the secondary market is for existing companies. Off-floor transactions represent the transactions between dealers and brokers placed out of the market. Derivative market is the market in which secondary products of stocks, currencies and bonds are traded among investors. Equity and fixed income markets are markets for certificate of deposits and annuities such as insurance and mortgages. Bond markets are the place for fixed borrowing instruments for governments and corporations. The Amman, Bulgarian and Istanbul Stock Exchanges have different markets where investors can access different instruments rather than typical stocks and bonds. Those instruments are foreign securities, depository receipts, municipality bonds and mortgage bonds (only in The Bulgarian Stock Exchange).

Stock Exchange Indices

Each of the ten founding stock exchanges uses a different base for their index calculation. Some stock exchanges use only certain companies in their calculations while other use all companies. For instance, the Amman Stock Exchange uses all companies in the index computation (ASE-All), while Bulgarian Stock Exchange has 50 companies for SOFIX-50 index. The column for indices of the ten founding member countries can help to determine the differences between stock exchanges in terms of index structure. For instance, SOFIX-50 determines that index calculation is based on 50 stocks in the Bulgarian Stock Exchange. The calculation method for most of those indices is based on market capitalization.

CHAPTER FOUR

METHODOLOGY

This chapter introduces the methodology that is used in this thesis. First, processes for the methodology will be listed in five steps, and second, each step in this list will be explained in detail. These steps include:

- risk and return calculations, including diversification concept, and measure of price movements,
- the comparison of risk adjusted performance for the ten founding stock exchanges,
- overall performance of those stock exchanges
- a creation of sample portfolios to analyze risk diversification in the ten founding stock exchanges.

Measure of Performances

The following procedures were used to compare the performance of the selected ten founding member stock exchanges and to measure the risk investors face when investing in these exchanges:

- Risk and Return Analyses to measure the monthly performances of each index from 1995 thru 2002,

- Correlation Coefficient Analyses to measure the relationship between prices movements between each country and S&P 500.
- Sharpe, Treynor and Jensen performance measures to analyze the risk adjusted return performances of the chosen stock exchanges.
- A weighted average Ten Composite Index consisting of ten founding stock exchanges was created to measure the performance of those ten stock exchanges in a portfolio structure.
- Four sample portfolio to compare performances among domestic, foreign and a combination of domestic and foreign investment

Measure of Return and Risk Return

The concept of return provides a convenient way to express the financial performance of an investment. Two methods are typically used to calculate performance - return in dollar terms and return in percentage terms. In dollar terms, the return is the total dollars received from the investment. In percentage terms, the return is calculated on a percentage basis to avoid the scale problems of dollar returns. This thesis used monthly percentage terms to get accurate solutions in performance

analyses by avoiding scale problems. First, the monthly returns were calculated for the years 1995 and 2002. Second, the Average Monthly Return of each stock exchange was calculated over the seven years under investigation: Algebrically:

$$Rit = (Pit - Pit_{-1}) / Pit_{-1}$$

Rit = Return of market i for month t

Pit = Price Index of market i for month t

Pi_{t-1} = Price Index of market i for month (t-1)

$$Rmit = \sum_{t=1}^{n} (Rit) / 96$$

t = 1 to 96 (number of months for 8 years)

Rmit = Average Monthly Return of market i

The Average Monthly Return was then converted into an Annualized Return (AR) by multiplying by 12. Therefore, investors can efficiently compare returns of chosen stock markets on an annual basis. The following equation was used to calculate ARi:

$$ARi = Rmi * 12$$

ARi = Annualized Return of market i

Risk and Diversification

The basic premise underlying the relationship between risk and return is investors who like returns but do not like risk. This means that investors will invest in

riskier than- average assets if, and only they expect to receive above average returns on those risky assets. The risk can be measured in different ways, and different conclusions about an asset's riskiness can be reached depending on the measure used. There are two methods in which the risk can be considered: on a stand-alone basis, where the asset's cash flows are analyzed by themselves, or in a portfolio context, where cash flow from number of assets are combined and then consolidated cash flows are analyzed (Reilly, & Brown, 2000).

In one stock context, a stock's stand alone risk can be analyzed from two standpoints; on a stand-alone basis, where the stock is considered isolated, and on a portfolio basis, where the stock is held as one of the number of stocks in the portfolio. Therefore, an asset's stand-alone risk is the risk an investor would face if he or she held only this one asset. No investment will be undertaken unless the expected rate of return is high enough to compensate the investor for the perceived risk of the investment (Reilly, & Brown, 2000).

In portfolio context, a stock's risk can be divided into two components: A diversifiable risk component, which can be diversified away, or a market risk component, which reflects the risk of a general stock market decline. This

market risk cannot be eliminated by diversification. Only market risk is relevant. Diversifiable risk is irrelevant to most investors because it can be eliminated (Reilly, & Brown, 2000).

Figure 2 helps investors learn how adding more stocks to a portfolio affects the portfolio risk. According to this table, the portfolio is affected by forming larger and larger portfolios of randomly selected stocks from stock exchanges (Brigham, Gapenski, & Daves, 2000).

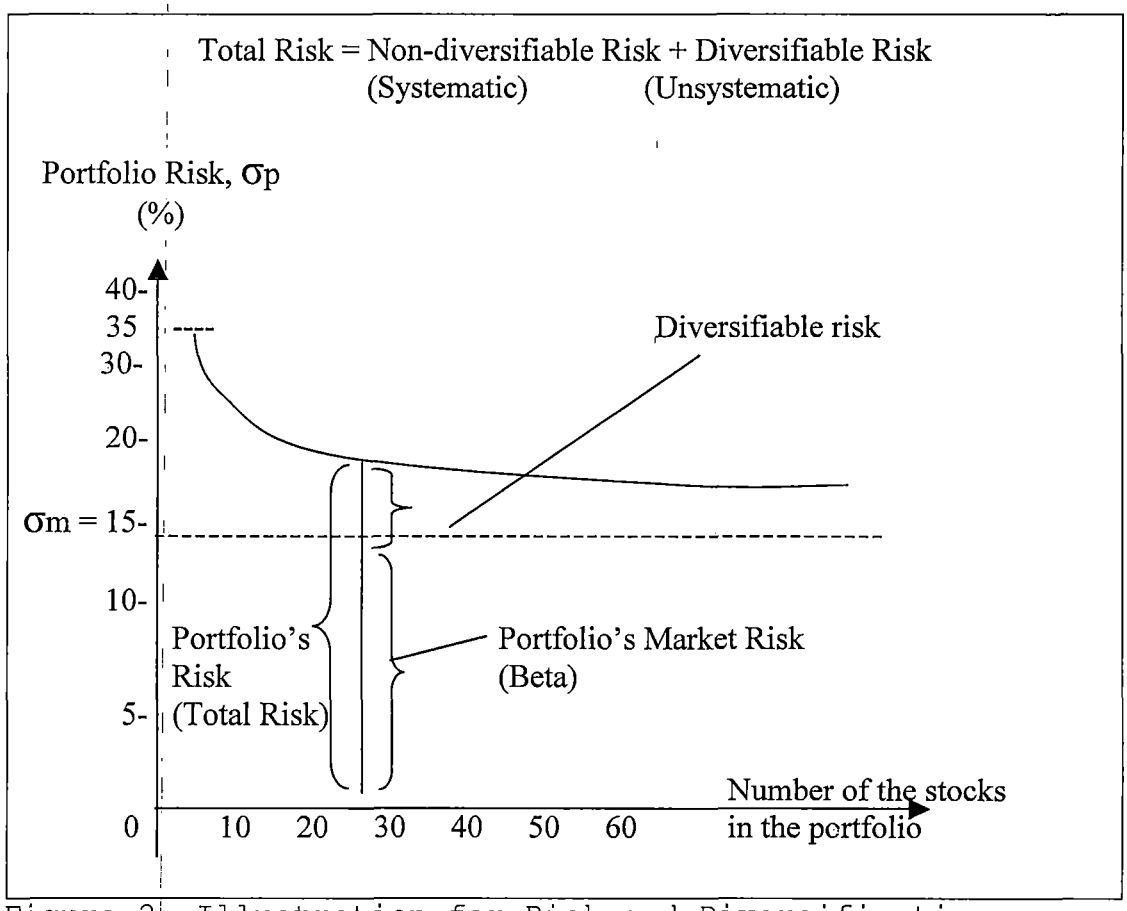


Figure 2. Illustration for Risk and Diversification

In this thesis, the Emerging Market index represents market index, while each of the ten founding stock exchanges represents individual assets. The sample graph in the table illustrates that the riskness of a portfolio consisting of large company stocks tends to decline and approach some limit as the size of the portfolio increases. According to the sample graph in Figure 2, the standard deviation of a one-stock portfolio or an average stock is approximately 35%, while a portfolio consisting of all stocks, which is called the market portfolio, would have a standard deviation of about 20.4%, which is shown as the horizontal dashed line. Almost half of the riskiness inherent in an average individual stock can be eliminated if the stock is held in a reasonable, well-diversified portfolio.

Based on information in Table 11, the same relationship exists among the Muscat, 52.2%, Lahore 33.1% Dhaka 26.7%, Zagreb 27.5 and Emerging Market Index, 18.8%. The four individual stock exchanges have higher standard deviations than the Emerging Market Index's standard deviation, 18.8%., which also includes those four individual stock exchanges' index. In this thesis, each stock exchange was considered an individual asset, while

Table 11. Risk and Return of The Ten Stock Markets, The Ten Composite Index and S&P 500

Market	Number of Observations	Average Monthly Return	Standard Deviation	Correlation Coefficient with S&P 500
10 COMPOSITE	96	2.20%	75.30%	0.32
ISTANBUL	96	1.70%	60.70%	0.45
MUSCAT	88	-0.40%	52.20%	0.13
KARACHI	96	1.30%	34.90%	0.05
LAHORE	96	-1.70%	33.10%	0.13
ZAGREB	64	0.50%	27.50%	0.42
DHAKA	96	0.40%	26.70%	0.06
BULGARIAN	51	1.90%	23.90%	0.07
CAIRO	96	-0.03%	17.10%	0.08
S&P 500	96	0.80%	16.70%	1
TEHRAN	96	1.60%	16.30%	0.03
AMMAN	96	0.40%	12.30%	0.03

the Ten Composite Index, Emerging Market Index and four sample portfolios were considered portfolios.

It is difficult, if not impossible, to find stocks whose expected returns are not positively correlated. Most stocks tend to go well when the national economy is strong. Even very large portfolios end up with a substantial amount of risk, but not as much risk than if all the money was invested in only one stock. One of the purposes of this thesis is to evaluate different portfolio structures consisting of the ten founding stock exchanges, S&P 500, and the Ten Composite Index. The chapter titled *Analysis of Findings* concludes the results of analyses

based on those portfolio structures. Some risk always remains. It is virtually impossible to completely diversify portfolio risk. The part of the risk of a stock that can be eliminated is called diversifiable risk or unsystematic risk, while the part that cannot be eliminated is called market risk or systematic risk. The total of those risks is known as total risk of the portfolio. Diversifiable or unsystematic risk is caused by such random events as lawsuits, strikes, successful and unsuccessful marketing programs, winning or losing a major contract, and other events that are unique to a particular asset or stock. Since these events are random, their effects on portfolio can be eliminated by diversification. Bad events in one asset will tend to be offset by good event in another. Market risk stems from factors, which systematically affect all assets in the portfolio. Typical events are war, inflation, recessions, and high interest rates. Since most assets in the portfolio tend to be negatively affected by these factors, market risk cannot be eliminated by diversification (Brigham, Gapenski, & Daves, 2000).

Investment risk is basically related to the probability of earning less than the return. In this thesis, risk concept was analyzed for the ten founding

stock exchanges, Emerging Market Index, the Ten Composite Index, S&P 500 and sample portfolios consisting of the Ten Composite Index and the S&P 500. Standard deviation is one of the ways to measure the risk of each index. The smaller standard deviation represents the lower the risk of the index. Standard deviation provides an insight of how far above or below the actual value is likely to be. Unlike returns, the riskiness of a portfolio generally is not the weighted average of the standard deviation of the individual assets in the portfolio (Brigham, Gapenski, & Daves, 2000).

The following formula was used to calculate Standard Deviation of Monthly Return for ten stock exchanges' indices.

$$\sigma i = \sqrt{\left(\sum_{t=1}^{n} (Rit - Rmit)^2 / n-1\right)}$$

σi = Standard Deviation of Monthly Return of market i

n = amount of months considered (96)

Rit = Return of market i for month t

Rmit = Average Monthly Return of market i for month t

The Annualized Standard Deviation for each Index was calculated in order to compare the risk of the different

countries on annual cross-section bases. The following equation was used for this calculation:

$$A\sigma i = \sqrt{(\sigma i^2 * 12)}$$

Aσi = Annualized Standard Deviation of market i

Measure of Price Movement Relationship

Measure of Price Movement Relationship

Covariance and the correlation coefficient are two key concepts to measure the price movement relationship. Covariance is a measure, which combines the variance or volatility of a stock's returns with the tendency of those returns to move up or down at the same time other stocks move up or down. The covariance between two stocks tell us whether the returns of two stocks tend to rise and fall together as well as how large those movements tend to be. Correlation is a statistical measure of the relationship between a series of data, and the correlation coefficient is a measure of the degree of correlation between the series of data. Correlation coefficient varies between (-1) and (+1). A positive sign means that variables move together while the negative sign indicates two assets tend to move in opposite directions. Explaining the idea of diversification will help to understand the correlation coefficient analysis. Portfolio theory assumes that

investors are basically risk averse, meaning they will select the asset with the lower risk, but this does not imply that everybody is risk averse or that investors are completely risk averse regarding all financial commitments. The majority of investors attempt to diversify their risk. The purpose of the diversification is to reduce the standard deviation of the total portfolio return. A well-diversified portfolio includes securities that have a low coefficient of correlation. In diversification, only the unsystematic risk, which is the risk that is specific to the firm, can be diversified away in portfolio construction. Market risk or systematic risk is the risk of the entire market, and cannot be diversified away. Macroeconomic variables such as money supply, interest rate volatility, industrial production, and corporate earnings, would cause this systematic risk, which remains in the market portfolio and cannot be diversified away (Reilly & Brown, 2000).

In this thesis, correlation coefficients among the S&P 500, the Ten Composite Index and the ten founding member stock exchanges' indices were calculated to measure the price movement relationship between the U.S. and the selected ten-member country's indices. The formula for correlation coefficient is shown as follows:

$$rij = \sum_{t=1}^{n} (Rit - Rmit)(Rjt - Rmjt) / (\sigma i \, \sigma j)$$

rij = Correlation Coefficient between i and j markets

t = amount of months considered (96 in this thesis)

Rit = Return of market i for month-t

Rmit = Average Monthly Return of market i for month t

Rjt = Return of market j for month t

Rmjt = Average Monthly Return of market j for month t

σi = Standard Deviation of Monthly Return of market i

σj = Standard Deviation of Monthly Return of market j

An optimum portfolio is a combination of investments, each having desirable individual risk-return characteristics that also fit together based on their correlations. This deeper understanding of portfolio theory should lead investors to reflect back on how to use foreign stocks and bonds to reduce the overall risk of the portfolio.

Need for Beta

The correct measure of an individual stock's contribution to the risk of the market portfolio is its beta coefficient, or simply beta, which is calculated as follows:

$$\text{Beta Stock of I} = ßi = \frac{rim\ \sigma i\ \sigma m}{(\sigma m)^2}$$

OR

$$= \frac{rim\ \sigma i}{\sigma m}$$

The market portfolio has a beta of 1.0. Adding a stock with a beta of 1.0 to the market portfolio will not change the portfolio's overall risk. Adding a stock with a beta of less than 1.0 will reduce the portfolio's risk; hence reduce its expected rate of return. Adding a stock with a beta greater than 1.00 will increase the portfolio's risk and expected return, therefore, stock's beta is as a measure of how closely it moves with the market. A stock with a beta greater than 1.0, will tend to move up and down with the market, but with wider swings. A stock with a beta close to zero will tend to move independently of the market. When a stock has a beta coefficient of 1.0, if the market goes up 15% the stock will also increase by 15%; if the market goes down by 15% the stock returns would decrease by 15%. A portfolio with that kind of beta coefficient would be as risky as the market average. If a stock has a beta of 0.5, the stock is only half as volatile as the market. It will rise and fall only half as much as the market and a portfolio of such stocks will be half as risky as a portfolio of beta = 1.00 stocks. On the

other hand, if beta= 2.00, the stock is twice as volatile as an average stock. Therefore, a portfolio of such stocks will be twice as risky as an average portfolio (Brigham, Gapenski, & Daves, 2000).

The beta for each market was calculated in order to measure each individual portfolio's contribution to the risk of the market portfolio. These calculations also help investors to understand the volatility of each market, which is essential to diversify their portfolios based on their risk preferences. Table 12 summarizes beta calculations for the ten stock exchanges, the S&P 500, and sample portfolios. The Amman, Bulgarian, Cairo, Dhaka, Karachi, Lahore, Tehran, Zagreb stock exchanges, and S&P 500 have all beta less than 1.00 while the four sample

Table 12. Beta Values

Market	Beta	Sample Portfolios	Beta
AMMAN	0.002	AVERAGE	3.170
BULGARIAN	0.907	AGGRESSIVE	3.700
CAIRO	0.180	MODERATE	2.640
DHAKA	0.377	10 COMPOSITE	2.150
ISTANBUL	2.390	INDEX PORTFOLIO	2.134
KARACHI	0.932		
LAHORE	0.870		
MUSCAT	0.195		
TEHRAN	0.243		
ZAGER	0.104		

portfolios and the Ten Composite Index have a beta higher than 1.00.

Measure of Overall Performance

Definition of Index

The index is set at a numerical level on the base period or starting point against which a percentage change can be compared to any particular point of time. The index measures the up and down movement of stocks or bonds or funds reflecting market price and market direction (Reilly & Brown, 2000).

A stock index will reveal the overall trend in the equity market. It is a comprehensive measure of market trends indicating the general stock market price movements. The index will be the investor's yardstick for the level of the whole stock market, or a certain group of stocks, against which the performance of individual stocks can be measured or judged. Indices are worldwide instruments used by investors in developed as well as developing markets.

Benefits of Creating Indices

Benefits of Indices can be summarized in four ways:

- Summarizes the whole market: An index is composed of companies from all sectors of the

economy, so it provides an easy way to quantify the performance of the economy as well as the market as a whole. Indices act as indicators of business conditions since stock markets are believed to be sensitive to them. An index can also be constructed for a given sector to measure the performance of that sector.

- Leading indicator: Prices of companies, represented in the index, are equivalent to the present value of future cash flows. If future cash flows are expected to change (increase or decrease), the index will reflect these expectations.
- Allows for a self-regulating market: Arbitrageurs can easily identify discrepancies in the market and correct the market to ensure that prices are accurate.
- International investors can compare the performance of the country's index to other indices around the world. A strong return will increase public awareness and foreign investment in this market (Reilly & Brown, 2000).

Indices are the major indicator for the performance of the bond and/or stock market in each country. Investors

consider market performance first and the portfolio performance second. To provide investors with sufficient information, most of the investment firms and public organizations created indexes. In this thesis, the Ten Composite Index consisting of ten stock markets was created to provide investors sufficient information about those ten stock exchanges.

Establishing an Index

Choosing a sample, weighting the sample, and using the computing index procedures are three major challenges to establish an index. By recalling statistics, a sample should represent the population, all stock performance series. Sampling is the only way to determine something about those stock series. To weight each member in the sample, fund managers and securities analysts usually use three methods; price-weighted series, value weighted series and un-weighted or equally weighted series. Computing indices by using the sample and weighting methods consists of simple arithmetic average and geometric averages (Reilly & Brown, 2000).

Price-weighted Series

The typical example for this index is the Dow Jones Index and is calculated by using the arithmetic average of

current prices. The changes in the price of each stock influence the value of the index. One limitation for this index is that the stock values are price weighted, a high priced stock influences more weight than a low priced stock.

Value-weighted Series

The initial base for those types of indices is calculated by using the total market value of all stocks in the sample. The market value is calculated as follows:

Market Value = Shares Outstanding * Current Market Price

Percentage change in the index is calculated by comparing the market value of the index at time (t+1) to the initial value of the index at time t. The limitation for this method is companies having a large market value have a significant affect on index changes, compared to a comparable percentage change for a small company.

Geometric Mean of Percentage Changes

In addition to arithmetic average calculation in the above - mentioned methods, geometric mean of the holding periods method is rarely used by some indices such as Value Line Industrial Average and Financial Times Ordinary Share Index.

Conclusion Remark for Choosing Computation Method

Because the ten founding stock exchanges, Emerging Market Index and the S&P 500 all use the market value weighted method with the arithmetic average computation procedure, this thesis will use the same method to create a composite index consisting of ten founding stock exchange indices.

Composite Index

To measure overall performance of the ten founding member stock exchanges, a composite index was created by using the ten stock exchanges' market capitalization and monthly indices provided by the headquarters of FEAS. Market capitalization for each market was used to determine each market's weight in the composite index. To determine the ten Composite Index following formula was used:

$$10\ COMPINDX_t = \sum_{t=1}^{n} (wi * Pit)$$

t = time index

wi = weight

Pit = Price Index for market i in time t.

The composite index will be used to compare the overall performance of the ten founding stock exchanges with the performance of the S&P 500 between 1995 and 2002.

Performance Evaluation Measures: Jensen Index, Sharpe Ratio and Treynor Index

This section presents the classical indices used in this study; Sharpe Ratio (SI), Treynor Index (TI) and Jensen Index (JI). It also includes a comparison of the indices used in this thesis.

Jensen Index

Jensen's alpha is the most widely used index of performance among scholars and practitioners. It is defined as the difference between the actual portfolio return and the estimated benchmark return. The benchmark could be based on either the Capital Asset Pricing Model (CAPM) or the Arbitrage Pricing Theory (APT) model. CAPM specifies the relationship between risk and required rates of return on assets when they are held in well-diversified portfolios. If many factors were required to specify the equilibrium risk/return relationship rather than just one or two, APT can include any number of risk factors, so the required rate of return could be a function of two, three, four or more factors (Brigham, Gapenski, & Daves, 2000). The Jensen Index has been used for individual securities as well as portfolios. This Index is sensitive only to depth and not to breadth; while depth analysis indicates magnitude of excess returns, breadth analysis takes

magnitude of residual variance into consideration (Reilly, & Brown, 2000).

$$E(Ri) = RF + ßi\ (E(Rm) - RFi)$$

E(Ri) = Expected return on portfolio i

RF = Risk free rate of the market (short term government bond rate)

E(Rm) = The expected return on the market portfolio of risky assets.

ßi = The systematic risk (beta) for security or portfolio

The Sharpe Ratio

The Sharpe Ratio is defined as the ratio of the excess return of the portfolio, over the risk free return, to the standard deviation. For other applications, the relationship must be proportional, that is, it is assumed that the future measure will equal the same constant, typically less than 1.0, times the historic measure. The Sharpe Ratio indicates the expected differential return per unit of risk associated with this same expected differential return. This Sharpe ratio is sensitive to both depth and breadth analysis. While depth analysis means magnitude of excess returns, breadth analysis concentrates on diversification. Since the standard deviation of return is the measure of risk, the Sharpe

Index is only appropriate for portfolios and not for individual securities (William, 1994).

$$SIi = \frac{(ARi - RFi)}{A\sigma i}$$

SIi = Sharp Index of market i

RFi = Risk free rate of market i (short term government bond rate)

Aσi = Annualized Standard Deviation of Monthly Return of market i

ARi = Annualized Return of market i

Treynor Index

A measure of a portfolio's excess return per unit of risk, equal to the portfolio's rate of return minus the risk-free rate of return, divided by the portfolio's beta. The Treynor Index may also be defined as the risk premium earned per unit of risk taken, where beta is the risk measure. This is a similar ratio to the Sharpe ratio, except that the portfolio's beta is considered the measure of risk as opposed to the variance of portfolio returns. This is useful for assessing the excess return from each unit of systematic risk, enabling investors to evaluate how structuring the portfolio to different levels of systematic risk will affect returns. The Treynor Index is a measure with which one may measure the performance of a

portfolio over a given period of time. In order to use the Treynor Index, the portfolio return, the risk-free rate of return, and the beta of the portfolio should be calculated. The average return of a government bond or note over a given period of time can be used for risk free rate of return. The formula for the index is shown as follows (Reilly & Brown, 2000).

Treynor = (Portfolio Return - Risk-Free Return)/Beta

or,

$$TIi = \frac{(ARi - RFi)}{ßi}$$

TIi = Treynor Index of market i

RFi = Risk free rate of market i (short term government bond rate)

Limitations of The Jensen Index, Treynor Index and Sharpe Ratio

Most researchers found that both the Jensen and Sharpe indices are potentially useful, however, these indices suffer significant limitations. The most critical issues are the appropriate benchmark to be used for comparison, the role of market timing and the affect of transaction costs.

For Jensen, researchers argued that the Jensen's alpha is sensitive to the choice of the benchmark model

that is employed for comparison. Another argument is that the estimation of Jensen's alpha may be biased due to market timing, which is the ability of fund managers to systematically change the target risk of the fund. When portfolio managers change the target beta for the fund by moving money among different investments, estimation bias can be introduced into the benchmark model because it assumes a constant beta coefficient over the period under study. The Jensen performance measure also does not take care of transaction costs or expenses associated with the purchase and sale of securities.

For Sharpe, as compared to Jensen, this index prevents the problem arising from the specification of the benchmark model. This index also does not take into consideration the transaction costs or expenses associated with the purchase and sale of securities.

The Treynor Index has similarities with the Jensen Index, since the beta coefficient is the risk measure. The Treynor Index, like the Jensen Index, is insensitive to breadth (i.e., it ignores residual variance). With beta as the risk measure, the Treynor Index is applicable for individual securities as well as for portfolios. The Treynor Index has an advantage over the Jensen Index. The Treynor Index takes the opportunity to lever excess

returns into account when ranking alternatives (Muthi, Choi, & Desai, 1998).

Creation of Sample Portfolios

A portfolio represents a set of two or more assets. The return of a portfolio is equal to the weighted average of the return of the individual indices in the portfolio. This subtitle illustrates how several sample portfolios were created to analyze possible risk diversification for investors. The following sample portfolios were created to compare performance among domestic, foreign and a combination of domestic and foreign investment. Those sample portfolios also help to analyze how different combinations of individual stock indices affect portfolio risk and return performances. By executing these analyses, investors can choose any of the portfolio combinations according to their risk and return preferences.

S&P 500 Portfolio: This portfolio consists 100% of the S&P 500 Index

The Ten Composite Index: The Ten Composite portfolio consists of 100% of the Ten Composite Index

Index Portfolio: A portfolio comprised of the Ten Composite Index and the S&P 500,

weighted according to their market capitalization

Aggressive Portfolio: Consists 25% of the S&P 500 and 75 % of the Ten Composite Index

Average Portfolio: Consists 50% of the S&P 500 and 50 % of the Ten Composite Index

Moderate Portfolio: Consists 75% of the S&P 500 and 25 % of the Ten Composite Index

Risk and return of those sample portfolios were analyzed on the basis of Annualized Return (AR), Treynor Index, Sharpe Ratio and Jensen Index.

Formulas used for these analyses are shown as follows:

Annualized Return:

$$AR(P) = \sum_{t=1}^{n} (wi \times ARi)$$

wi = weight of the market capitalization

$$\sum_{t=1}^{n} (wi) = 1.00$$

Portfolio Standard Deviation:

$$\sigma i = \sqrt{\left(\sum_{t=1}^{n} (Rit - Rimt)^2\right) / n-1}$$

σi = Standard Deviation of Monthly Return of market i

n = amount of months considered (96)

Rit = Return of market i in t

Rmit = Average Monthly Return of market i in t

(market is emerging markets)

CHAPTER FIVE

DATA

This chapter introduces basic statistics for the data used to do performance analyses among the ten founding members of the Federation of Euro-Asian Stock Exchanges (FEAS), S&P 500 Index, Ten Composite Index and four sample portfolios consisting of the ten founding member countries of FEAS and the S&P 500. All data gathered for these performance analyses is based on the monthly observations between 1995 and 2002.

Market Capitalization

As mentioned previously, data about the market capitalization of the ten countries was collected to determine the weight of each country. This determination helped to create sample portfolios and a composite index for the ten founding stock exchanges and the S&P 500. Data for market capitalization of the ten founding stock exchanges was gathered by using FEAS Yearbooks. Market capitalization for the S&P 500 and Emerging Market Index (EMI) were gathered from the Standard and Poor's Emerging Stock Markets Factbook 2002.

Short Term Government Bond Rates

Short-term government bond rates were summarized by using the database at FEAS, and they determine the risk free rate of the ten emerging stock markets. The risk-free rate is needed to calculate the Sharpe Index, Treynor Index and Jensen's Alpha. Results in Table 13 indicate that these rates vary between 3% and 69%.

Table 13. Short Term Government Bond Rates

	1995	1996	1997	1998	1999	2000	2001	2002
Amman	3.0%	4.0%	7.0%	4.0%	4.0%	5.0%	6.0%	5.0%
Bulgarian	10.0%	15.0%	12.0%	14.0%	15.0%	12.0%	13.0%	14.0%
Cairo & Alexandria	9.0%	6.0%	8.0%	8.0%	11.0%	12.0%	9.0%	8.0%
Dhaka	5.0%	6.0%	8.0%	9.0%	7.0%	5.0%	8.0%	7.0%
Istanbul	60.0%	75.0%	49.0%	69.0%	57.0%	65.0%	64.0%	56.0%
Karachi	11.0%	12.0%	13.0%	15.0%	12.0%	13.0%	15.0%	13.0%
Lahore	14.0%	12.0%	15.0%	16.0%	17.0%	16.0%	14.0%	13.0%
Muscat	18.0%	22.0%	20.0%	19.0%	15.0%	18.0%	21.0%	20.0%
Tehran	9.0%	8.0%	11.0%	12.0%	13.0%	14.0%	16.0%	12.0%
Zagreb	8.0%	9.0%	6.0%	11.0%	12.0%	8.0%	7.0%	9.0%

Price Indices

All price indices were collected on a monthly basis from the FEAS database. The database includes price indices between January 1, 1995 and December 31, 2002. The Ten Composite Index and Performance Analyses were performed based on this database and Appendix E illustrates those indices in detail. All indices for the

ten stock exchanges provided by the headquarters of FEAS use the market capitalization weighted method. Indices for the Amman, Bulgarian, Dhaka Cairo, Muscat, Tehran and Zagreb stock exchanges use performance of all listed companies in the market, while indices for the Istanbul, Karachi, and Lahore stock exchanges use the performance of a predetermined group of 100 stocks listed in each stock exchange.

Composite Index

Research on the ten founding stock exchanges' indices showed that due to lack of consistency among those stock exchanges in weighting, sample selection, and computational procedure, it is difficult to compare the results implied by indices across countries. In order to prevent this problem, a composite index that consists of the ten founding stock exchanges' indices was created, weighted by their market capitalization.

CHAPTER SIX

ANALYSIS OF FINDINGS

Correlation Coefficient Analyses

This chapter compares the correlation coefficients between the ten stock exchanges, the S&P 500 index and the Ten Composite Index. The results of the calculations are shown in Table 14. All selected markets or portfolios have a positive correlation coefficient with the S&P 500, ranging from + 0.03 to +0.45. This analysis concludes that the ten stock exchanges and the Ten Composite Index tend to move in the same directions with the S&P 500; when the S&P 500 increases 1 unit, the Ten Composite Index is expected to increase 0.32 units or the index of the Istanbul Stock Exchange is expected to increase 0.45 units based on analysis shown in Table 14. Since those coefficients are too small, investing in FEAS stock exchanges might reduce risk substantially.

In terms of risk and return relationship, the Ten Composite Index has the highest average monthly return of 2.2% with a standard deviation of 75.3%, which represents the highest risk among other portfolios. While the S&P 500 had a poor monthly average performance (0.80%) between 1995 and 2002, the Bulgarian Stock Exchange had the

Table 14. Correlation Coefficient Analyses

Market	Number of Observations	Average Monthly Return	Standard Deviation	Correlation Coefficient with S&P 500
10 COMPOSITE	96	2.20%	75.30%	0.32
ISTANBUL	96	1.70%	60.70%	0.45
MUSCAT	88	-0.40%	52.20%	0.13
KARACHI	96	1.30%	34.90%	0.05
LAHORE	96	-1.70%	33.10%	0.13
ZAGREB	64	0.50%	27.50%	0.42
DHAKA	96	0.40%	26.70%	0.06
BULGARIAN	51	1.90%	23.90%	0.07
CAIRO	96	-0.03%	17.10%	0.08
S&P 500	96	0.80%	16.70%	1
TEHRAN	96	1.60%	16.30%	0.03
AMMAN	96	0.40%	12.30%	0.03

highest average monthly return of 1.9% compared to other stock exchanges for the same period.

In addition to the correlation coefficient analysis between the ten stock exchanges and the S&P 500, Table 15 illustrates the cross section analysis in a matrix format for the ten stock exchanges, S&P 500, and Ten Composite Index. This matrix would help investors to analyze how two of those portfolios tend to move together. Since the correlation coefficient between the Bulgarian Stock Exchange and the Karachi Stock Exchange is less than 0 (-0.05), these two portfolios are negatively correlated; they tend to move in opposite directions. This helps investors to diversify their portfolio by adding those two

stock exchanges. Because the correlation coefficient between Istanbul and Lahore is greater than 0, +0.30, those two portfolios are positively correlated. Consequently, those two stock exchanges tend to move up and down together. The Istanbul and Cairo stock exchanges also show a positive correlation of 0.176 between 1995 and 2002. The correlation coefficient between Zagreb and Karachi shows a positive ratio of +0.20. In terms of negatively correlated stock exchanges, Dhaka has negative

Table 15. Correlation Coefficient Matrix for Ten Stock Markets, The Ten Composite Index and S&P 500

Market	AMMAN	BULGARIA	CAIRO	DHAKA	ISTANBUL	KARACHI	LAHORE	MUSCAT	TEHRAN	ZAGREB	10 COMPOSITE	S&P 500
AMMAN	1.00											
BULGARIAN	(0.02)	1.00										
CAIRO	0.03	0.09	1.000									
DHAKA	0.13	(0.04)	(0.010)	1.00								
ISTANBUL	0.12	0.20	0.176	0.01	1.00							
KARACHI	0.04	(0.05)	0.108	(0.14)	0.27	1.00						
LAHORE	0.11	0.02	0.116	(0.17)	0.30	0.88	1.00					
MUSCAT	(0.02)	0.03	(0.014)	0.06	(0.20)	(0.06)	(0.06)	1.00				
TEHRAN	(0.09)	0.04	0.460	0.13	0.04	(0.04)	(0.06)	0.07	1.00			
ZAGREB	0.03	0.05	(0.045)	0.10	0.16	0.20	0.15	0.27	0.15	1.00		
10 COMPOSITE	0.13	0.15	0.306	(0.01)	0.03	0.34	0.38	(0.28)	0.10	0.17	1.00	0.32
S&P 500	0.03	0.07	0.083	0.06	0.45	0.06	0.13	0.13	0.02	0.43	(0.11)	1.00

correlation coefficients with Karachi and Lahore, -0.14 and -0.17 respectively.

The matrix analysis in Table 15 could help investors to forecast the movement of their composite portfolios consisting of these individual portfolios. By recalling the portfolio theory, a completely diversified portfolio would have a correlation with the market portfolio of +1.00. Therefore, if stock exchanges' correlation coefficients are close to +1.00, those stock exchanges should be chosen to establish a successfully diversified portfolio.

Because the Lahore and Karachi have a correlation coefficient of 0.88, investors would benefit greatly by selecting those stock exchanges for their portfolio. A similar combination would be the S&P 500 and the Istanbul Stock Exchange, whose correlation coefficient is 0.45.

Cross Section Analyses

Risk and Return Comparison

The purpose of these analyses are to compare each individual stock exchange the Ten Composite Index portfolio and the S&P 500 portfolio, in terms of annualized return and annualized risk, as well as the performance evaluation methods (Sharpe Index, Treynor

Index and Jensen Index). Table 16 summarized the result of these cross-section analyses.

Coefficient of variation or risk per unit of return calculations in Table 16 helps to compare risk and return relationships among ten founding stock exchanges, the S&P 500 and Ten Composite Index. According to these calculations, the Tehran Stock Exchange, The Bulgarian Stock Exchange and the S&P 500 have the lowest coefficient variations compared to Karachi, Amman, Istanbul, Zagreb, and Dhaka. Table 16 also shows that the Dhaka stock exchange has the highest coefficient variation of 5.56 compared to other stock exchanges. This means Dhaka has the highest risk per unit of return.

Comparison of Sharpe Measures

Findings in Table 16 indicate that the Ten Composite Index, Bulgarian and Tehran stock exchanges outperformed the S&P 500 with the highest risk premium returns of 23.6%, 40.8% and 47.1% respectively. Karachi exhibits a positive ratio slightly lower than the S&P 500, 9.1%, Muscat, -44.6%, Istanbul, -68.3%, Lahore, -63.7%, Cairo, -53.4%, Zagreb, -12.3% and Dhaka, -7.1%, all have negative risk premium returns. Since the bond rates in each stock

Table 16. Cross Section Analyses of The Ten Stock Markets, The Ten Composite Index and S&P 500

Market	Number of Observation	Annualized Return	Annualized Risk	Risk Per Unit of Return (Coefficient of Variation)
DHAKA	96	4.80%	26.70%	5.56
ZAGREB	64	5.50%	27.50%	5.00
ISTANBUL	96	20.50%	60.70%	2.96
10 COMPOSITE	96	26.50%	75.30%	2.84
AMMAN	96	4.80%	12.30%	2.56
KARACHI	96	15.70%	34.90%	2.22
S&P 500	96	9.30%	16.70%	1.80
BULGARIAN	51	22.90%	23.90%	1.04
TEHRAN	96	19.60%	16.30%	0.83
LAHORE	96	-8.40%	33.10%	(3.94)
MUSCAT	88	-4.00%	52.20%	(13.05)
CAIRO	96	-0.36%	17.10%	(47.50)

Market	Sharpe Index (SI)	Treynor Index (TI)	Jensen Measure
DHAKA	-0.071	-0.17	7%
ZAGREB	-0.123	-1.22	9%
ISTANBUL	-0.683	-0.60	24%
10 COMPOSITE	0.236	0.29	8%
AMMAN	0.006	1.25	5%
KARACHI	0.087	0.11	11%
S&P 500	0.091	0.075	8%
BULGARIAN	0.408	0.37	12%
TEHRAN	0.471	1.1	12%
LAHORE	-0.637	-0.84	11%
MUSCAT	-0.446	-4.13	19%
CAIRO	-0.534	-1.76	9%

exchange's countries out performed stock exchange's performance, negative premium returns were retained in those markets.

Comparison of Treynor Measures

Treynor was interpreted as a measure of performance that would apply to all investors regardless of their risk preferences. This index shows the portfolio's risk premium return and considers risk premium return earned per unit of risk. This method assumes a completely diversified portfolio. Table 16 also presents Treynor Index (TIE) between the ten stock exchanges, Ten Composite Index and S&P 500.

Comparison of Jensen Measures

The Jensen performance measure basically calculates the realized return on a security or portfolio during a given time period and is a linear function of the risk free-rate of return during the period. Jensen values in Table 16 shows that the Istanbul stock exchange has the highest return of 24% while Amman has the lowest rate of 5%. Muscat, 19%, Tehran, 12%, Bulgarian, 12%, Karachi, 11% Lahore, 11% Zagreb, 9% and Cairo, 9%, have all out performed the S&P 500.

Treynor Versus Sharpe Measure

For a completely diversified portfolio, those two measures give identical rankings while a poorly diversified portfolio could have a high ranking on the basis of the Treynor performance measure, however a much

lower ranking on the basis of the Sharpe performance measure. Any difference in rank would come directly from a difference in diversification. Therefore, these two performance measures provide complementary yet different information. Table 17 illustrates these ranking analyses for the ten founding stock exchanges, Ten Composite Index and S&P 500. Since the Dhaka and Karachi stock exchanges have an identical ranking under two performance measures, those portfolios are considered well diversified portfolios compared with other portfolios with the ranking (Reilly & Brown, 2000).

Table 17: Rankings Based on Two Performance Measures

	TREYNOR		SHARPE	
LOW	MUSCAT	-4.13	ISTANBUL	-0.683
	CAIRO	-1.76	LAHORE	-0.637
	ZAGREB	-1.22	CAIRO	-0.534
	LAHORE	-0.84	MUSCAT	-0.446
	ISTANBUL	-0.60	ZAGREB	-0.123
	DHAKA	-0.17	DHAKA	-0.071
	S&P 500	0.08	AMMAN	0.006
	KARACHI	0.11	KARACHI	0.087
	10 COMPOSITE	0.29	S&P 500	0.091
	BULGARIAN	0.37	10 COMPOSITE	0.236
	TEHRAN	1.11	BULGARIAN	0.408
HIGH	AMMAN	1.25	TEHRAN	0.471

Portfolio Analysis

Risk and Return Comparison

Among six different portfolio structures, the Moderate Portfolio, consisting of 50 % of the S&P 500 and 50% of the Ten Composite Index, turns out to have the highest risk per unit of return or coefficient variation of 2.85. Index Portfolio that consists of the Ten Composite Index and the S&P 500, weighted according to their market capitalization has achieved the lowest coefficient variation of 0.82. The S&P 500 has moderately performed and achieved coefficient variation of 1.80. The Average Portfolio and Aggressive portfolio has the same coefficient variation of 2.84 after Moderate Portfolio (see Table 18 for detail).

Comparison of Sharpe and Treynor Measures

Based on illustrations in Table 18, the Aggressive Portfolio shows the highest return premium of 28.6% while the S&P 500 showed the lowest return premium of 9.1%. The Average Portfolio has the second highest return premium of 27.5% per risk retained. Moderate Portfolio, 25.9%, Index Portfolio, 23.9%, and the Ten Composite Portfolio, 23.6 % have all performed moderately compared to other sample portfolios. Treynor Index (TIE) comparisons for the four sample portfolio structures show that Aggressive Portfolio

Table 18. Result Analysis on Six Portfolios

Market	Annualized Return	Annualized Risk	Risk Per Unit of Return (Coefficient of Variation)
MODERATE	33.00%	94.20%	2.85
AGGRESSIVE	46.40%	131.80%	2.84
AVERAGE	39.80%	113.00%	2.84
S&P 500	9.30%	16.70%	1.80
10 COMPOSITE	26.50%	21.70%	0.82
INDEX PORTFOLIO	27.00%	22.10%	0.82

Market	Sharpe Index (SI)	Treynor Index (TI)	Jensen Measure
MODERATE	0.259	0.32	7.90%
AGGRESSIVE	0.286	0.35	7.60%
AVERAGE	0.275	0.34	7.80%
S&P 500	0.091	0.075	7.70%
10 COMPOSITE	0.236	0.29	8.08%
INDEX PORTFOLIO	0.239	0.3	8.07%

has the highest return premium of 0.35 per total risk retained in the portfolio. The S&P 500's performance is low and the return premium is 0.075. According to the coefficient of variation analyses in Table 18, the Moderate Portfolio has the highest risk premium per unit of return, 2.85, while the Index Portfolio has the lowest premium of 0.82. Therefore, the Moderate portfolio has the highest risk level to earn one unit of return. The Aggressive Portfolio and the Average Portfolio show the second closest coefficients, 2.84, after the Moderate Portfolio.

Comparison of Jensen Measures

Based on this performance measure, the Ten Composite had the highest return of 8.08% and Aggressive Portfolio had the lowest return of 7.6% between 1995 and 2002. The main reason why the Aggressive Portfolio had the lowest return in Jensen while it had the highest returns under other performance measures, is because of this portfolios' higher beta, which represents the total market risk. The higher total risk in the portfolio brings down the return performance in Jensen. The Index, Moderate, and Average portfolios also out performed the S&P 500 (7.7%) in the Jensen performance measure, 8.07%, 7.90, and 7.8% respectively.

Treynor Versus Sharpe Measure

Table 19 illustrates rankings for the ten founding stock exchanges, Ten Composite Index and S&P 500. Since all sample portfolios have identical rankings in Table 19 those portfolios are considered well-diversified portfolios, compared with individual stock exchanges.

Table 19. Rankings Based on Two Performance Measures

	TREYNOR		SHARPE	
LOW	S&P 500	0.075	S&P 500	0.091
	10 COMPOSITE	0.290	10 COMPOSITE	0.236
	INDEX PORTFOLIO	0.300	INDEX PORTFOLIO	0.239
	MODERATE	0.320	MODERATE	0.259
	AVERAGE	0.340	AVERAGE	0.275
HIGH	AGGRESSIVE	0.350	AGGRESSIVE	0.286

CHAPTER SEVEN

CONCLUSION

Based on the information in the chapter titled *Analysis of Findings*, the correlation coefficient comparison between stock portfolios would help investors to analyze how individual portfolios affect the movement of the composite portfolio. Therefore, they can efficiently diversify their portfolio. All ten stock exchanges and the Ten Composite Index are positively correlated with the S&P 500. The Ten Composite Index had the highest annualized return of 26.5%, with the highest annualized standard deviation of 75.3%. The Ten Composite index and S&P 500 tend to move same direction. Since the correlation coefficient is 0.32 between S&P 500 and Ten Composite Index, for instance, if S&P 500 increases by 10%, the Ten Composite portfolio increases by 3.2%.

The correlation coefficient matrix analyses for the ten founding stock exchanges, S&P 500 and Ten Composite Index suggest that the Lahore and Karachi stock exchanges had the highest positive correlation coefficient ratio of +0.88. Therefore, investors would benefit greatly by selecting those stock exchanges for their portfolio.

The Annualized return analyses summarize that the Bulgarian Stock Exchange and Ten Composite Index show the highest returns with the highest standard deviations. Since the Treynor and Sharpe measures give identical rankings for Dhaka and Karachi, those stock exchanges are considered well-diversified portfolios. Therefore, adding Dhaka and Karachi in a portfolio would help to diversify portfolio risk under the Treynor and Sharpe measures.

The Jensen performance measure suggests that the Istanbul stock exchange had the highest return of 24% while Amman had the lowest rate of 5%. The same performance measure also shows that Muscat, Tehran, Bulgarian, Karachi, Lahore, Zagreb, and Cairo had higher returns than the S&P 500's return, while the Dhaka Stock Exchange under performed the S&P 500.

The Jensen performance measure for sample portfolios suggests that the Ten Composite performed the highest return of 8.08% compared to other sample portfolios. The Jensen also shows that Aggressive Portfolio had the lowest return of 7.6% while Index Portfolio, 8.07%, Moderate Portfolio, 7.9%, and Average Portfolio, 7.8%, out performed the S&P 500, 7.7%.

According to *Portfolio Analyses,* Aggressive Portfolio performed the highest annualized return of 46.4% while the

S&P 500 had the lowest return of 9.3% compared to other sample portfolios. These analyses also show that five sample portfolios (Aggressive, Index, Ten Composite, Average and Moderate) and the Ten Composite out performed the S&P 500 not only based on return performances, but also based on three other performance measures. Investing on those 5 portfolios (Aggressive, Index, Ten Composite, Average and Moderate) are superior to investing in either the ten founding stock exchanges or the S&P 500. Figure 3 also illustrates those comparative analyses in a graph format.

By recalling the Literature Review for Emerging Markets Studies, due to the accessibility of the ten founding stock exchanges by investors, two forms of investment instruments would be available to investors in the United States -- closed-end county funds and American Depository Receipts (ADRs.) The first instrument, closed-end county funds, is for investment companies to help investors to invest in portfolio assets in the ten founding stock exchanges and sell shares of these assets in the domestic market, i.e. the United States.

Figure 3. Conclusion Graph

This instrument not only helps investors gain experience in these ten emerging markets without picking individual stocks in those foreign markets, but also provides better liquidity due to transactions executed domestically. The second instrument, American Depositary Receipts (ADRs), gives foreign shares the right to be traded in dollars over U.S. exchanges or over-the-counter. They are unique instruments to solve many of the problems arising from investment restrictions, informational problems associated with investing in those ten founding stock exchanges' securities, as well as transaction costs (Niu & Cui, 2002).

APPENDIX A

FEDERATION OF EURO-ASIAN STOCK EXCHANGES

MEMBER EXCHANGES

FEDERATION OF EURO-ASIAN STOCK EXCHANGES

MEMBER EXCHANGES

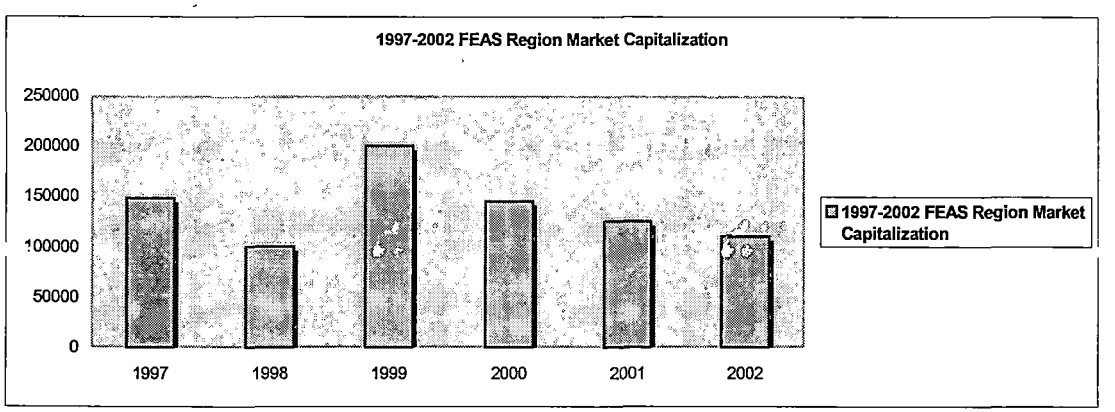
- Amman Stock Exchange
- Armenian Stock Exchange
- Baku Interbank Currency Exchange
- Baku Stock Exchange
- Bulgarian Stock Exchange
- Dhaka Stock Exchange
- Egyptian Stock Exchange
- Georgian Stock Exchange
- Istanbul Stock Exchange
- Karachi Stock Exchange
- Kazakhstan Stock Exchange
- Kyrgyz Stock Exchange
- Lahore Stock Exchange
- Macedonian Stock Exchange
- Moldavian Stock Exchange
- Mongolian Stock Exchange
- Muscat Securities Market
- Palestine Securities Exchange
- Tehran Stock Exchange
- Tirana Stock Exchange
- Toshkent Republican Stock Exchange
- Ukrainian Stock Exchange
- Zagreb Stock Exchange

APPENDIX B

CONSOLIDATED FEAS MEMBERS 2002 STATISTICS

Consolidated FEAS Members 2002 Statistics

	STOCKS				BONDS				OTHER					
2002	Total Volume ($ Millions)	Total Volume for 10 Stock Exchanges	%	Average Daily Volume ($ Millions)	Total Volume ($ Millions)	Total Volume for 10 Stock Exchanges	%	Average Daily Volume ($ Millions)	Total Volume ($ Millions)	Total Volume for 10 Stock Exchanges	%	Average Daily Volume ($ Millions)	Market Cap.	Total Market Cap. for 10 Stock Exchanges
Jan-02	14,828	14,810	100%	669	10,901	10,302	95%	530	100,210	100,042	100%	4,555	145,262	141585
Feb-02	11,609	11,593	100%	588	5,834	5,464	94%	292	86,794	86,654	100%	4,339	113,757	110439
Mar-02	5,685	5,654	99%	335	1,677	1,209	72%	95	62,546	62,389	100%	3,474	103,849	100639
Apr-02	9,254	9,224	100%	468	1,873	1,367	73%	96	47,011	46,868	100%	2,350	117,981	114841
May-02	13,088	13,052	100%	572	3,469	3,002	87%	156	56,608	52,662	93%	2,462	109,474	107055
Jun-02	7,566	7,532	100%	366	3,516	3,129	89%	174	52,840	51,289	97%	2,517	107,632	105166
Jul-02	6,986	6,949	99%	319	2,476	2,017	81%	115	56,487	42,357	75%	2,567	100,107	97136
Aug-02	5,472	5,430	99%	248	2,838	2,327	82%	132	42,501	35,136	83%	1,932	98,131	96182
Sep-02	3,963	3,924	99%	209	2,526	1,933	77%	135	35,306	31,780	90%	1,765	85,453	79445
Oct-02	7,351	7,304	99%	329	3,271	2,446	75%	149	32,021	31,163	97%	1,455	94,843	92713
Nov-02	10,147	10,034	99%	467	4,398	3,206	73%	204	31,379	25,582	82%	1,426	103,008	100434
Dec-02	7,916	7,822	99%	442	4,361	3,135	72%	239	26,612	3,135	12%	1,400	109,410	106939
Total	103,865	103,325		422	47,140	39,537		192	630,315	569,057	90%	2,511		



APPENDIX C

HISTORICAL OVERVIEW OF TEN FOUNDING STOCK EXCHANGES

HISTORICAL OVERVIEW OF TEN FOUNDING STOCK EXCHANGES

Amman Stock Exchange

The Amman Financial Market was established in 1976, and started its first day of business on January 1978, as a public financial institution with legal, administrative and financial independence, operating under the auspices of the Minister Of Finance.

Bulgarian Stock Exchange

The first Bulgarian Stock Exchange (FBSE) was established on 8 November 1991 and started trading in May 1992. In 1996, the newly established securities and Stock Exchange Commission (SSEC) introduced the requirement that all lusted stocks must have their prospectuses approved by the Commission in order to trade on the FBSE.

Dhaka Stock Exchange

The Dhaka Stock Exchange (DSE) was incorporated in March 1954 as the East Pakistan Stock Exchange Association Ltd. On June 1962, it was renamed the Dhaka Stock Exchange. Formal trading began in 1954 but was suspended when Bangladesh gained independence in 1971. With the change in the economic policy of the government in 1976, trading activities were ultimately resumed with nine listed companies.

Cairo and the Alexandria Stock Exchange

The Alexandria Stock Exchange was officially established in 1888 followed by Cairo in 1903. The Egyptian Stock Exchange is comprised of two exchanges: The Cairo and the Alexandria Stock Exchanges (CASE), and is governed by the same board of directors that share the same trading, clearing, and settlement systems.

Istanbul Stock Exchange

In 1981, The Capital Market Law was enacted and one year later the main regulatory body The Capital Market Board was established. In October 1983, the Parliament approved the regulations for the establishment and functions of Securities Exchange, which paved the way for the establishment of the Istanbul Stock Exchange, formally integrated at the end of 1985.

Karachi Stock Exchange

The Karachi Stock Exchange (KSE) came into existence on September 1947. It was later converted and registered as a company limited by guarantee on March 1949. Although as many as 90 members were licensed at that time, only half dozen were active brokers.

Lahore Stock Exchange

The present Lahore Stock Exchange (LSE) was established in 1970 in Lahore, the provincial capital of Punjab, Pakistan under the 1969 Securities and Exchange Ordinance

Muscat Securities Market

The Muscat Securities Market (MSM) was established and share trading began in May 1989. Until 15 January 1999 the MSM fulfilled many roles: regulating the market, organizing the exchange and acting as the central depository. The MSM has now separated these functions into three organizations, each with its own board of directors.

Tehran Stock Exchange

The idea of having a well-organized stock market to speed up the process of industrialization of the country dates back to the 1930s when Bank Melli Iran studied the market. The outbreak of WWII and subsequent economic and political events delayed the establishment of the TSE until 1967. The TSE opened in April 1968. Initially, only government bonds and certain state-backed certificates were traded. During the 1970s, the demand for capital boosted the demand for stock. At the same time, institutional changes led to the expansion of stock market activity. The restructuring of the economy following the Islamic Revolution expanded public sector control over the economy and reduced the need for private capital. At the same time, the abolishment of interest-bearing bonds terminated their presence in the stock market. As a result, the TSE entered a period of stagnation. This period ended in 1989 and since then the TSE has expanded continuously.

Zagreb Stock Exchange

The Zagreb Stock Exchange (ZSE) was incorporated in 1991 as a joint-stock company by 25 commercial banks and insurance companies. Today, the ZSE has 43 shareholders who in turn elect a nine-member supervisory board for a two-year term. The supervisory board appoints the Manager of the Exchange who is in charge of the strategic planning and day-to-day operations.

The ZSE currently has 39 members. Prerequisites for ZSE membership include: compliance with the Securities Law, CROSEC requirements and ZSE rules. A seat on the ZSE currently costs approximately US$ 13,000. Members are required to comply with the rules and regulations of the ZSE and must register at least one licensed broker (FEAS Year Book, 2001/2000).

APPENDIX D

MACRO ECONOMIC AND MARKET INFORMATION ABOUT TEN EMERGING MARKETS

MACRO ECONOMIC AND MARKET INFORMATION ABOUT TEN EMERGING MARKETS

CONCEPT	Amman	Bulgaria	Dhaka	Cairo & Alexandria	Istanbul	Karachi	Lahore	Muscat	Tehran	Zagreb
Index	ASE All	SOFIX-50	DSE-All	CASE 30	ISE-100	KSE-100	LSE-100	MSM-All	TEPIX All	CROBEX All
GNP ($ Million)	8,340	11,995	47,106	98,725	199,437	61,638	61,638	14,962	456	19,031
Average Inflation (%)	3	102	4	8	76	10	10	N/A	26	86
Budget Deficit (% of GDP)	0.7	N/A	-5.8	-1.2	-4.9	-3.6	-3.6	-20	12.1	-2.1
	5,838		(273,215)	(118,470)	(977,241)	(221,897)	(221,897)	(299,240)	5,518	(39,965)
Unemployment Rate (%)	14.00	15.30	35.00	12.00	10.00	6.30	6.30	N/A	14.00	21.00
First -IPO Market	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Secondary Market	Y	Y	N	Y	Y	Y	Y	Y	N	N
Off-Floor Transactions	Y	N	N	N	Y	N	N	N	N	N
Derivatives Market	N	N	N	N	Y	N	N	N	N	N
Equity and Fixed Income	N	N	N	N	Y	N	N	N	N	N
Bond Market	Y	Y	N	Y	Y	Y	Y	Y	N	Y
Stocks	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mutual Funds	Y	N	Y	Y-Close Ended	Y	N	N	Y	N	N
T-Bonds	Y	N	N	Y	Y	Y	Y	Y	N	Y
Foreign Securities	Y	N	N	N	Y	Y	Y	N	N	N
Municipality Bonds	N	Y	N	N	Y	Y	Y	Y	N	N
Corporate Bonds	N	Y	N	N	Y	Y	Y	Y	N	N
Mortgage Bonds	N	Y	N	N	N	N	N	N	N	N
Depository Receipts	N	Y	N	N	Y	N	N	N	N	N
Foreign Participation	No restrictions	No restrictions	No restrictions	No restrictions	No restrictions	No restrictions	No restrictions	No restrictions	Restricted	No restrictions

APPENDIX E

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

AMMAN		BULGARIAN		CAIRO-ALEXANDRIA		ISTANBUL		KARACHI	
Date	Index	Date	Index	Date	Index	Date	Index	Date	Index
Jan-95	173.0	Jan-95	60.0	Jan-95	3,100.0	Jan-95	290.0	Jan-95	1,256.0
Feb-95	170.0	Feb-95	65.0	Feb-95	3,150.0	Feb-95	298.0	Feb-95	1,270.0
Mar-95	178.0	Mar-95	70.0	Mar-95	3,170.0	Mar-95	300.0	Mar-95	1,298.0
Apr-95	175.0	Apr-95	76.0	Apr-95	3,200.0	Apr-95	305.0	Apr-95	1,350.0
May-95	170.0	May-95	82.0	May-95	3,260.0	May-95	308.0	May-95	1,300.0
Jun-95	174.0	Jun-95	83.0	Jun-95	3,270.0	Jun-95	334.0	Jun-95	1,345.0
Jul-95	178.0	Jul-95	84.0	Jul-95	3,300.0	Jul-95	340.0	Jul-95	1,360.0
Aug-95	183.0	Aug-95	86.0	Aug-95	3,290.0	Aug-95	345.0	Aug-95	1,398.0
Sep-95	186.0	Sep-95	90.0	Sep-95	3,260.0	Sep-95	350.0	Sep-95	1,400.0
Oct-95	191.0	Oct-95	97.0	Oct-95	3,255.0	Oct-95	353.0	Oct-95	1,450.0
Nov-95	195.0	Nov-95	102.0	Nov-95	3,250.0	Nov-95	358.0	Nov-95	1,470.0
Dec-95	225.0	Dec-95	105.0	Dec-95	3,269.0	Dec-95	382.0	Dec-95	1,497.8
1995	225.0	1995	105	1995	3269.0	1995	382.6	1995	1,497.8
Jan-96	229.0	Jan-96	109	Jan-96	4300	Jan-96	387.0	Jan-96	1,503.0
Feb-96	234.0	Feb-96	112	Feb-96	4,320.0	Feb-96	400.0	Feb-96	1,500.0
Mar-96	245.0	Mar-96	90	Mar-96	4,390.0	Mar-96	423.0	Mar-96	1,490.0
Apr-96	250.0	Apr-96	85	Apr-96	4,400.0	Apr-96	430.0	Apr-96	1,469.0
May-96	243.0	May-96	82	May-96	4,430.0	May-96	434.0	May-96	1,450.0
Jun-96	256.0	Jun-96	86	Jun-96	4,500.0	Jun-96	440.0	Jun-96	1,440.0
Jul-96	250.0	Jul-96	90	Jul-96	4,590.0	Jul-96	445.0	Jul-96	1,430.0
Aug-96	230.0	Aug-96	93	Aug-96	4,632.0	Aug-96	450.0	Aug-96	1,390.0
Sep-96	225.0	Sep-96	87	Sep-96	4,685.0	Sep-96	460.0	Sep-96	1,370.0
Oct-96	210.0	Oct-96	81	Oct-96	4,670.0	Oct-96	470.0	Oct-96	1,360.0
Nov-96	212.0	Nov-96	79	Nov-96	4,650.0	Nov-96	490.0	Nov-96	1,356.0
Dec-96	216.0	Dec-96	78	Dec-96	4,615.0	Dec-96	534.0	Dec-96	1,339.0
1996	216.0	1996	78.00	1996	4,615.0	1996	534.0	1996	1,339.9

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

DHAKA		LAHORE		MUSCAT		TEHRAN		ZAGREB	
Date	Index	Date	Index	Date	Index	Date	Index	Date	Index
Jan-95	750	Jan-95	10.0	Jan-95	126.00	Jan-95	1,170.0	Jan-95	#N/A
Feb-95	770	Feb-95	11.0	Feb-95	126.00	Feb-95	1,190.0	Feb-95	#N/A
Mar-95	790	Mar-95	11.6	Mar-95	124.00	Mar-95	1,210.0	Mar-95	#N/A
Apr-95	800	Apr-95	12.1	Apr-95	128.00	Apr-95	1,225.0	Apr-95	#N/A
May-95	760	May-95	12.5	May-95	130.00	May-95	1,239.0	May-95	#N/A
Jun-95	745	Jun-95	12.7	Jun-95	133.00	Jun-95	1,249.0	Jun-95	#N/A
Jul-95	735	Jul-95	13.0	Jul-95	135.00	Jul-95	1,245.0	Jul-95	#N/A
Aug-95	780	Aug-95	13.3	Aug-95	138.00	Aug-95	1,250.0	Aug-95	#N/A
Sep-95	800	Sep-95	13.6	Sep-95	140.00	Sep-95	1,260.0	Sep-95	#N/A
Oct-95	845	Oct-95	14.0	Oct-95	150.00	Oct-95	1,269.0	Oct-95	#N/A
Nov-95	840	Nov-95	14.3	Nov-95	154.00	Nov-95	1,280.0	Nov-95	#N/A
Dec-95	834	Dec-95	14.9	Dec-95	158.00	Dec-95	1,288.1	Dec-95	#N/A
1995	834	1995	14.9	1995	158	1995	1,288.1	1995	#N/A
Jan-96	900	Jan-96	15.0	Jan-96	164	Jan-96	1,828.0	Jan-96	#N/A
Feb-96	1,000	Feb-96	14.7	Feb-96	166	Feb-96	1,840.0	Feb-96	#N/A
Mar-96	1,100	Mar-96	14.0	Mar-96	168	Mar-96	1,860.0	Mar-96	#N/A
Apr-96	1,300	Apr-96	13.0	Apr-96	165	Apr-96	1,850.0	Apr-96	#N/A
May-96	1,450	May-96	13.1	May-96	170	May-96	1,838.0	May-96	#N/A
Jun-96	1,500	Jun-96	12.7	Jun-96	175	Jun-96	1,845.0	Jun-96	#N/A
Jul-96	1,590	Jul-96	12.3	Jul-96	180	Jul-96	1,850.0	Jul-96	#N/A
Aug-96	1,700	Aug-96	12.0	Aug-96	184	Aug-96	1,890.0	Aug-96	#N/A
Sep-96	1,750	Sep-96	11.5	Sep-96	180	Sep-96	1,970.0	Sep-96	#N/A
Oct-96	1,900	Oct-96	11.0	Oct-96	187	Oct-96	1,934.0	Oct-96	#N/A
Nov-96	2,100	Nov-96	10.5	Nov-96	190	Nov-96	1,945.0	Nov-96	#N/A
Dec-96	2,300	Dec-96	10.3	Dec-96	198	Dec-96	1,967.3	Dec-96	#N/A
1996	2,300	1996	10.3	1996	199	1996	1,967.3	1996	#N/A

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

AMMAN		BULGARIAN		CAIRO-ALEXANDRIA		ISTANBUL		KARACHI	
Jan-97	216.0	Jan-97	#N/A	Jan-97	5300.0	Jan-97	812.0	Jan-97	1,534.2
Feb-97	221.0	Feb-97	#N/A	Feb-97	5320.0	Feb-97	773.0	Feb-97	1,667.1
Mar-97	214.0	Mar-97	#N/A	Mar-97	5340.0	Mar-97	744.0	Mar-97	1,574.7
Apr-97	212.0	Apr-97	#N/A	Apr-97	5345.0	Apr-97	618.0	Apr-97	1,538.8
May-97	230.0	May-97	#N/A	May-97	5379.0	May-97	666.0	May-97	1,508.0
Jun-97	224.0	Jun-97	#N/A	Jun-97	5400.0	Jun-97	738.0	Jun-97	1,565.7
Jul-97	235.0	Jul-97	#N/A	Jul-97	5500.0	Jul-97	717.0	Jul-97	1,989.5
Aug-97	234.0	Aug-97	#N/A	Aug-97	5450.0	Aug-97	696.0	Aug-97	1,744.6
Sep-97	249.0	Sep-97	#N/A	Sep-97	5510.0	Sep-97	874.0	Sep-97	1,849.7
Oct-97	241.0	Oct-97	#N/A	Oct-97	5470.0	Oct-97	920.0	Oct-97	1,875.0
Nov-97	242.0	Nov-97	#N/A	Nov-97	5370.0	Nov-97	867.0	Nov-97	1,772.2
Dec-97	238.7	Dec-97	#N/A	Dec-97	5365.0	Dec-97	982.0	Dec-97	1,753.8
1997	238.7	1997	#N/A	1997	5,365.0	1997	982.0	1997	1,753.8
Jan-98	235.3	Jan-98	#N/A	Jan-98	5370.0	Jan-98	965.0	Jan-98	1,609.2
Feb-98	239.3	Feb-98	#N/A	Feb-98	5345.0	Feb-98	834.0	Feb-98	1,650.3
Mar-98	233.8	Mar-98	#N/A	Mar-98	5365.0	Mar-98	789.0	Mar-98	1,553.1
Apr-98	240.2	Apr-98	#N/A	Apr-98	5200.0	Apr-98	984.0	Apr-98	1,562.2
May-98	253.6	May-98	#N/A	May-98	5100.0	May-98	849.0	May-98	1,040.2
Jun-98	246.3	Jun-98	#N/A	Jun-98	5000.0	Jun-98	901.0	Jun-98	879.6
Jul-98	254.1	Jul-98	#N/A	Jul-98	4834.0	Jul-98	939.0	Jul-98	920.5
Aug-98	253.2	Aug-98	#N/A	Aug-98	4780.0	Aug-98	555.0	Aug-98	970.8
Sep-98	241.5	Sep-98	#N/A	Sep-98	4700.0	Sep-98	479.0	Sep-98	1,111.5
Oct-98	228.2	Oct-98	#N/A	Oct-98	4536.0	Oct-98	449.8	Oct-98	841.7
Nov-98	233.0	Nov-98	#N/A	Nov-98	4275.0	Nov-98	499.0	Nov-98	1,051.0
Dec-98	240.0	Dec-98	#N/A	Dec-98	4003.0	Dec-98	484.0	Dec-98	945.2
1998	239.9	1998	#N/A	1998	4,003.0	1998	484.0	1998	945.2

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

DHAKA		LAHORE		MUSCAT		TEHRAN		ZAGREB	
Jan-97	1,962.0	Jan-97	11.5	Jan-97	#N/A	Jan-97	1,942.7	Jan-97	#N/A
Feb-97	1,702.0	Feb-97	13.0	Feb-97	#N/A	Feb-97	1,823.4	Feb-97	#N/A
Mar-97	1,199.0	Mar-97	12.2	Mar-97	#N/A	Mar-97	1,938.8	Mar-97	#N/A
Apr-97	957.0	Apr-97	11.7	Apr-97	#N/A	Apr-97	1,916.2	Apr-97	#N/A
May-97	1,217.0	May-97	11.5	May-97	#N/A	May-97	1,872.8	May-97	#N/A
Jun-97	1,112.0	Jun-97	11.4	Jun-97	#N/A	Jun-97	1,859.4	Jun-97	#N/A
Jul-97	973.1	Jul-97	14.3	Jul-97	#N/A	Jul-97	1,792.9	Jul-97	#N/A
Aug-97	824.0	Aug-97	12.3	Aug-97	#N/A	Aug-97	1,681.4	Aug-97	#N/A
Sep-97	939.9	Sep-97	12.5	Sep-97	1,225.8	Sep-97	1,643.8	Sep-97	1,225.8
Oct-97	840.0	Oct-97	12.1	Oct-97	980.9	Oct-97	1,634.6	Oct-97	980.9
Nov-97	750.0	Nov-97	11.5	Nov-97	929.4	Nov-97	1,629.5	Nov-97	929.4
Dec-97	756.0	Dec-97	11.1	Dec-97	481.0	Dec-97	1,631.4	Dec-97	1,002.1
1997	756	1997	11.1	1997	481	1997	1,631.4	1997	1,002.1
Jan-98	741.8	Jan-98	10.0	Jan-98	913.9	Jan-98	1,646.5	Jan-98	913.9
Feb-98	687.5	Feb-98	10.5	Feb-98	1,025.6	Feb-98	1,652.2	Feb-98	1,025.6
Mar-98	644.7	Mar-98	9.7	Mar-98	1,028.4	Mar-98	1,609.5	Mar-98	1,028.4
Apr-98	574.4	Apr-98	9.8	Apr-98	933.6	Apr-98	1,610.4	Apr-98	933.6
May-98	628.2	May-98	7.1	May-98	824.8	May-98	1,601.8	May-98	824.8
Jun-98	676.5	Jun-98	5.9	Jun-98	824.8	Jun-98	1,604.1	Jun-98	824.8
Jul-98	652.4	Jul-98	6.1	Jul-98	794.0	Jul-98	1,557.9	Jul-98	794.0
Aug-98	583.1	Aug-98	6.5	Aug-98	462.8	Aug-98	1,517.8	Aug-98	462.8
Sep-98	600.6	Sep-98	7.3	Sep-98	561.1	Sep-98	1,533.7	Sep-98	561.1
Oct-98	594.4	Oct-98	5.7	Oct-98	600.9	Oct-98	1,566.5	Oct-98	600.9
Nov-98	570.6	Nov-98	6.9	Nov-98	705.9	Nov-98	1,560.0	Nov-98	705.9
Dec-98	540.2	Dec-98	6.0	Dec-98	711.6	Dec-98	1,531.1	Dec-98	711.6
1998	540	1998	6.0	1998	711.6	1998	1,531.1	1998	711.600

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

AMMAN		BULGARIAN		CAIRO-ALEXANDRIA		ISTANBUL		KARACHI	
Jan-99	251.9	Jan-99	#N/A	Jan-99	4,012.0	Jan-99	453.0	Jan-99	900.6
Feb-99	257.5	Feb-99	#N/A	Feb-99	4,123.0	Feb-99	647.0	Feb-99	926.2
Mar-99	254.5	Mar-99	#N/A	Mar-99	4,236.0	Mar-99	725.0	Mar-99	1,056.8
Apr-99	245.0	Apr-99	#N/A	Apr-99	4,356.0	Apr-99	804.0	Apr-99	1,107.0
May-99	240.9	May-99	#N/A	May-99	4,590.0	May-99	733.0	May-99	1,222.0
Jun-99	237.4	Jun-99	#N/A	Jun-99	4,693.0	Jun-99	689.0	Jun-99	1,054.7
Jul-99	235.3	Jul-99	#N/A	Jul-99	4,845.0	Jul-99	794.0	Jul-99	1,251.8
Aug-99	229.7	Aug-99	#N/A	Aug-99	4,900.0	Aug-99	659.0	Aug-99	1,206.5
Sep-99	222.8	Sep-99	#N/A	Sep-99	4,907.0	Sep-99	769.0	Sep-99	1,199.3
Oct-99	222.7	Oct-99	#N/A	Oct-99	5,274.0	Oct-99	800.0	Oct-99	1,189.3
Nov-99	228.5	Nov-99	#N/A	Nov-99	5,390.0	Nov-99	961.0	Nov-99	1,247.4
Dec-99	236.0	Dec-99	#N/A	Dec-99	5,759.0	Dec-99	1,654.0	Dec-99	1,408.9
1999	236.1	1999	#N/A	1999	5,759.0	1999	1,654.0	1999	1,408.9
Jan-00	229.4	Jan-00	#N/A	Jan-00	5,688.00	Jan-00	1,751.4	Jan-00	1,772.8
Feb-00	224.6	Feb-00	#N/A	Feb-00	5,543.00	Feb-00	1,620.4	Feb-00	1,930.6
Mar-00	216.6	Mar-00	#N/A	Mar-00	5,234.00	Mar-00	1,575.8	Mar-00	1,999.7
Apr-00	206.7	Apr-00	#N/A	Apr-00	4,932.00	Apr-00	1,844.6	Apr-00	1,901.1
May-00	208.3	May-00	#N/A	May-00	4,803.00	May-00	1,537.9	May-00	1,536.7
Jun-00	201.9	Jun-00	#N/A	Jun-00	4,707.00	Jun-00	1,360.9	Jun-00	1,520.7
Jul-00	196.0	Jul-00	#N/A	Jul-00	4,590.00	Jul-00	1,273.5	Jul-00	1,554.9
Aug-00	189.7	Aug-00	#N/A	Aug-00	4,100.00	Aug-00	1,174.1	Aug-00	1,518.3
Sep-00	187.1	Sep-00	#N/A	Sep-00	3,860 00	Sep-00	996.3	Sep-00	1,564.8
Oct-00	191.9	Oct-00	110.6	Oct-00	3,657.00	Oct-00	1,155.9	Oct-00	1,488.3
Nov-00	189.3	Nov-00	109.7	Nov-00	3,542.00	Nov-00	745.9	Nov-00	1,276.1
Dec-00	187.7	Dec-00	104.7	Dec-00	3,591.00	Dec-00	817.5	Dec-00	1,507.6
2000	187.7	2000	104.7	2000	3,591.00	2000	817.5	2000	1,507.6

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

DHAKA		LAHORE		MUSCAT		TEHRAN		ZAGREB	
Jan-99	535.8	Jan-99	5.7	Jan-99	772.4	Jan-99	1527.19	Jan-99	772.4
Feb-99	537.0	Feb-99	5.7	Feb-99	731.5	Feb-99	1523.96	Feb-99	731.5
Mar-99	516.0	Mar-99	6.4	Mar-99	709.1	Mar-99	1,542.4	Mar-99	709.1
Apr-99	481.0	Apr-99	6.6	Apr-99	708.3	Apr-99	1,600.4	Apr-99	708.3
May-99	508.0	May-99	6.5	May-99	746.2	May-99	1,697.3	May-99	746.2
Jun-99	547.0	Jun-99	5.6	Jun-99	724.6	Jun-99	1,732.2	Jun-99	724.6
Jul-99	534.0	Jul-99	6.4	Jul-99	681.2	Jul-99	1,701.4	Jul-99	681.2
Aug-99	513.0	Aug-99	6.2	Aug-99	658.6	Aug-99	1,731.0	Aug-99	658.6
Sep-99	502.0	Sep-99	6.0	Sep-99	508.7	Sep-99	1,765.0	Sep-99	508.7
Oct-99	533.8	Oct-99	5.9	Oct-99	536.4	Oct-99	1,834.9	Oct-99	536.4
Nov-99	492.0	Nov-99	6.1	Nov-99	645.9	Nov-99	1,938.0	Nov-99	645.9
Dec-99	487.8	Dec-99	6.7	Dec-99	250.3	Dec-99	1,989.7	Dec-99	715.3
1999	487.8	1999	6.7	1999	250.3	1999	1,989.7	1999	715.3
Jan-00	490	Jan-00	8.3	Jan-00	236	Jan-00	2,049.9	Jan-00	779.3
Feb-00	500	Feb-00	8.9	Feb-00	226	Feb-00	2,149.4	Feb-00	849.2
Mar-00	522	Mar-00	9.2	Mar-00	244	Mar-00	2,223.8	Mar-00	952.3
Apr-00	543	Apr-00	8.9	Apr-00	237	Apr-00	2,309.9	Apr-00	834.5
May-00	538	May-00	7.3	May-00	215	May-00	2,408.5	May-00	876.8
Jun-00	578	Jun-00	7.2	Jun-00	211	Jun-00	2,428.4	Jun-00	834.7
Jul-00	597	Jul-00	7.2	Jul-00	204	Jul-00	2,414.7	Jul-00	792.5
Aug-00	603	Aug-00	6.7	Aug-00	193	Aug-00	2,514.6	Aug-00	829.1
Sep-00	619	Sep-00	6.4	Sep-00	194	Sep-00	2,561.8	Sep-00	823.7
Oct-00	628	Oct-00	6.1	Oct-00	181	Oct-00	2,709.3	Oct-00	849.8
Nov-00	637	Nov-00	5.2	Nov-00	209	Nov-00	2,849.8	Nov-00	904.8
Dec-00	642	Dec-00	5.7	Dec-00	201	Dec-00	2,880.7	Dec-00	890.0
2000	642.0	2000	5.7	2000	201	2000	2,880.7	2000	890.0

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

AMMAN		BULGARIAN		CAIRO-ALEXANDRIA		ISTANBUL		KARACHI	
Jan-01	192.86	Jan-01	108.2	Jan-01	3,402.00	Jan-01	916.1	Jan-01	1,461.61
Feb-01	194.46	Feb-01	96.36	Feb-01	3,256.00	Feb-01	556.1	Feb-01	1,423.2
Mar-01	195.34	Mar-01	82.45	Mar-01	3,109.00	Mar-01	457.77	Mar-01	1,324.40
Apr-01	192.00	Apr-01	82.12	Apr-01	2,956.00	Apr-01	633.01	Apr-01	1,367.05
May-01	198.98	May-01	71.86	May-01	2,900.00	May-01	525.27	May-01	1,377.62
Jun-01	198.68	Jun-01	102.00	Jun-01	2,769.00	Jun-01	520.80	Jun-01	1,366.44
Jul-01	204.02	Jul-01	99.03	Jul-01	2,659.00	Jul-01	436.36	Jul-01	1,228.89
Aug-01	211.42	Aug-01	92.69	Aug-01	2,300.00	Aug-01	423.54	Aug-01	1,258.4
Sep-01	218.21	Sep-01	92.39	Sep-01	2,459.00	Sep-01	292.41	Sep-01	1,133.4
Oct-01	234.39	Oct-01	88.20	Oct-01	2,256.00	Oct-01	361.3	Oct-01	1,406.1
Nov-01	243.87	Nov-01	97.61	Nov-01	2,306.00	Nov-01	459.6	Nov-01	1,358.2
Dec-01	243.61	Dec-01	118.6	Dec-01	2,228.00	Dec-01	557.5	Dec-01	1,273.1
2001	243.6	2001	118.6	2001	2,228.0	2001	557.5	2001	1,273.1
Jan-02	248.29	Jan-02	117.4	Jan-02	2,230.00	Jan-02	591.2	Jan-02	1,620
Feb-02	244.84	Feb-02	117.9	Feb-02	2,240.00	Feb-02	464.5	Feb-02	1,766
Mar-02	242.90	Mar-02	120.6	Mar-02	2,250.00	Mar-02	508.38	Mar-02	1,868
Apr-02	232.75	Apr-02	122.7	Apr-02	2,300.00	Apr-02	500.24	Apr-02	1,899
May-02	245.11	May-02	129.9	May-02	2,400.00	May-02	421.70	May-02	1,663
Jun-02	261.55	Jun-02	132.2	Jun-02	2,445.00	Jun-02	348.09	Jun-02	1,770
Jul-02	257.77	Jul-02	152.4	Jul-02	2,567.00	Jul-02	353.09	Jul-02	1,788
Aug-02	251.55	Aug-02	147.9	Aug-02	2,590.00	Aug-02	342.90	Aug-02	1,975
Sep-02	245.61	Sep-02	149.8	Sep-02	2,640.00	Sep-02	311.97	Sep-02	2,019
Oct-02	238.05	Oct-02	156.1	Oct-02	2,690.00	Oct-02	359.1	Oct-02	2,279
Nov-02	241.60	Nov-02	187.0	Nov-02	2,704.00	Nov-02	504.5	Nov-02	2,286
Dec-02	239.80	Dec-02	183.1	Dec-02	2,708.00	Dec-02	368.3	Dec-02	2,701.4
2002	239.80	2002	183.1	2002	2,708.00	2002	368.3	2002	2,701.4

MONTHLY PRICE INDICES FOR TEN FOUNDING STOCK EXCHANGES

DHAKA		LAHORE		MUSCAT		TEHRAN		ZAGREB	
Jan-01	645	Jan-01	5.4	Jan-01	194.93	Jan-01	2,835	Jan-01	887.1
Feb-01	649	Feb-01	5.0	Feb-01	194.86	Feb-01	2,948	Feb-01	961.8
Mar-01	659	Mar-01	4.48	Mar-01	186.23	Mar-01	2,973	Mar-01	934.6
Apr-01	690	Apr-01	4.59	Apr-01	171.71	Apr-01	3,183	Apr-01	981.0
May-01	687	May-01	4.44	May-01	165.92	May-01	3,379	May-01	938.6
Jun-01	713	Jun-01	4.29	Jun-01	165.85	Jun-01	3,359	Jun-01	983.0
Jul-01	723	Jul-01	3.86	Jul-01	171.70	Jul-01	3,392	Jul-01	1,007.9
Aug-01	790	Aug-01	3.97	Aug-01	174.51	Aug-01	3,458	Aug-01	1,009
Sep-01	830	Sep-01	3.49	Sep-01	167.14	Sep-01	3,297	Sep-01	937.1
Oct-01	820	Oct-01	4.4	Oct-01	162.06	Oct-01	3,383	Oct-01	946.8
Nov-01	815.5	Nov-01	4.3	Nov-01	157.08	Nov-01	3,441.9	Nov-01	1,017
Dec-01	817.8	Dec-01	3.8	Dec-01	152.08	Dec-01	3,554.4	Dec-01	1,035
2001	817.8	2001	3.8	2001	152.1	2001	3,554.4	2001	1,034.7
Jan-02	818	Jan-02	#N/A	Jan-02	160.96	Jan-02	3,681	Jan-02	1,167.1
Feb-02	818	Feb-02	#N/A	Feb-02	157.57	Feb-02	3,679	Feb-02	1,197.1
Mar-02	819	Mar-02	#N/A	Mar-02	165.73	Mar-02	3,766	Mar-02	1,279.9
Apr-02	819	Apr-02	#N/A	Apr-02	167.50	Apr-02	4,091	Apr-02	1,231.3
May-02	819	May-02	#N/A	May-02	181.98	May-02	4,184	May-02	1226.3
Jun-02	820	Jun-02	#N/A	Jun-02	185.31	Jun-02	4,355	Jun-02	1,157.9
Jul-02	820	Jul-02	#N/A	Jul-02	187.88	Jul-02	4,571	Jul-02	1,084.5
Aug-02	821	Aug-02	#N/A	Aug-02	183.09	Aug-02	4,816	Aug-02	1,110
Sep-02	822	Sep-02	#N/A	Sep-02	180.16	Sep-02	4,673	Sep-02	1,110.1
Oct-02	822	Oct-02	#N/A	Oct-02	179.80	Oct-02	4,620	Oct-02	1,096.2
Nov-02	822	Nov-02	#N/A	Nov-02	186.97	Nov-02	4,918	Nov-02	1,167
Dec-02	822	Dec-02	1,763.5	Dec-02	191.86	Dec-02	5,044.1	Dec-02	1,173
2002	822	2002	1,763.5	2002	191.86	2002	5,044.1	2002	1,173

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