Project on

Global Portfolio Management

Presented to

First Reader   Second Reader

Dr. Elias Raad   Dr. David Peters

Prepared by

Anwar Abou Mosleh

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Abbreviations

CAC 40 : French Stock Index
COV : Covariance
DM : German Mark
DJIA : Dow Jones Industrial Average Index
EAFA : Europe , Asia , Far East World Index
ESP : Spanish Peseta
FF : French Franc
GDP : Gross Domestic Product
GN IN : Madrid General Index
HK$: Hong Kong Dollar
HG : Hang Seng Index
JPY : Japanese Yen
S&P : Standard and Poors Index
STD : Standard Deviation
STP : Sterling Pound

Global Portfolio Management

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Chapter I

International Portfolio Puzzle

Evidence shows that a large proportion of people's wealth is invested in the stock market. Over the long run, stocks offer the highest returns among primary securities. Several global factors add to the attractiveness of stock markets. Among these factors are: ease of movement of capital and information from one market to another; availability of innovative financial instruments - financial engineering - that aims to reduce risk in the process of managing the portfolio; and the liquidity feature that characterized the stock market and the expansion of the multinational operations of major corporations (whose shares are listed on several exchanges) among others. These factors will be discussed thoroughly throughout this project together with a detailed presentation of the proper way to go through the process of international diversification.

Stock markets differ in size from one country to another. The largest in size, with respect to market capitalization, are the US stock market and the Japanese stock market. However, not only the size of the stock market is what attracts investors but also, among the most important, is the level of efficiency that exists in these markets. Thus, the controversy of market efficiency is widely debated by two parties of researchers; one group

believes that world markets are efficient and the other believes they are not. The former believe that stock markets are expected to be interrelated with respect to price movements of stocks and consequently with respect to the return on investment in these stocks. In an efficient market, prices are expected to reflect all available information and therefore it is impossible to gain superior returns in implementing any timing strategy. On the other hand, the latter group of researchers argues that evidence suggests that markets become inefficient and give the October 1987 crash as an example. This group of researchers developed a hypothesis that directly opposes the Efficiency Market Hypothesis and it called the theory the "Inefficient Market Hypothesis". The Inefficient Market Hypothesis assumes that international markets are inefficient and there is always a chance that an investor can make superior return. Many studies were built around this controversy of market efficiency, yet it remained an incomplete discussion and needs further research. A point supporting the inefficiency hypothesis is the cointegration that exists among these markets. If markets are cointegrated, then we might be able to predict the price movements of one market from the price movements in another. These markets are opened at different times of the day. For example, the Tokyo Stock Exchange closes eight hours and a half before the open of the New York Stock Exchange. Thus, in our study and keeping an eye on market

efficiency that exists in stock markets like Japan, the United States, Germany, England, France, Spain and Hong Kong, we are constructing a portfolio from these stock markets using as a proxy the most popular indices found in each market.

The remainder of the project is organized as follows. The rest of chapter I, briefly introduces the concept of portfolio management; chapter II presents previous studies on international market efficiency and important concepts of international portfolio management; chapter III discusses data and methodology; chapter IV presents the results; and chapter V provides a summary and concluding remarks.

The Portfolio Management Process

Portfolio management is the process of managing money. This process includes several steps from studying the market to the feedback after investment. So, this process includes:

1- Selecting investment objectives;

2- Estimating investment policy;

3- Selecting a portfolio strategy;

4- Selecting assets; and

5- Measuring and evaluating performance.

1-Selecting Investment Objectives: in this step, investors set the objectives they want to reach. Objectives are unique to every investor depending on his or her risk-taking plans, liquidity needs, and the volume of the investment budget. For example, a commercial bank would invest in loans and commercial paper issues that earn higher rates of return and promise certain level of liquidity. Other investors like pension fund institutions, insurance companies, mutual fund institution or even individual investors also have specific objectives that are up to their requirements and limited to their constraints.[1]

2-Establishing an Investment Policy: this step is, usually, an extension of the previous step ; in other words, to achieve the objectives set we should know where to allocate our money .This means we have to choose among all the asset classes found in the market like stocks, bonds, real-estate, foreign securities etc... Moreover, this point is very critical and it encompasses certain measurements to be taken into consideration since each class of assets has special characteristics. In addition, client and regulatory constraints must be taken into consideration when establishing

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(1) Fabbozi, Frank. Investment Management,(New York: Prentice Hall Inc.),1991, Chapter 1.

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an investment policy. For example, it is recently that the Central Bank of Lebanon lifted the regulation which had forced commercial banks to carry treasury bills in their portfolios equivalent to at least 40% of deposits. [2]

3-Selecting a Portfolio Strategy: It is important for portfolio managers to know how to take advantage of the opportunities found in the market. So, strategic planning in portfolio management is implemented first in choosing a strategy. Either a passive strategy or an active strategy must be chosen. In our discussion, we will start with the passive strategy because it stands as a baseline against which active management techniques must be judged.

A passive strategy of portfolio management assumes, in the first place, that markets are efficient. Thus, the goal of passive management is not to beat the market, but rather to track the performance of a benchmark or an index of assets. In employing indexing methods, a passive investor tries to manage his or her portfolio (called index funds) so that it replicates the benchmark as closely as possible. Today, indexing is a popular choice for many asset fund managers. The reason for this growth is the belief that

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(2)the deregulation was made to be effective on 1\3\97.

index funds can provide returns equal or superior to those of actively managed funds at lower costs. Actually, transaction costs are incurred heavily by active managers with respect to passive managers because active managers typically turnover their portfolios at a rate of nearly 100 percent per year. Popular equity benchmarks are the S&P 500 index in the United States and the EAFE (Europe, Asia, Far East) index for investors in international markets.

On the other hand, managers using an active approach in portfolio management try to monitor markets and currency movements so as to take advantage of low inter market correlation. In this case, active money managers must develop a framework that controls and evaluates the risk of their portfolios as rapidly as possible. Practically, active portfolio managers use either top-down approaches or bottom-up approaches in their investment process. Managers using the former approach, first allocate their assets and then select individual securities to satisfy that allocation. Managers using the later approach, first study the fundamentals of many individual stocks from which they select the best securities to build a portfolio. The bottom-up approach is used in international equity portfolio management.[3]

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(3)Solnik, Bruno, International Investment,,(Addison-Wesley publishing co.),1991,

4-Selecting Assets: After choosing the policy and determining the strategy to follow, investors start building their portfolios in choosing the assets from the market. In this process, investors study the performance of the market, the industry and the individual company. The allocation policy identifies the asset classes appropriate for a specific investment portfolio and the proportions of these assets that would normally comprise the portfolio. And once again the pillars of the optimal portfolio selection risk, return and liquidity are to be considered in choosing the portfolio of assets.

In fact, there are many models which are used to determine the prices of the assets in the market. The most widely known model is the Capital Asset Pricing Model (CAPM). In the (CAPM) world, investors evaluate every risky asset on the basis of its expected return and risk measured by the market risk Beta, but because investors have identical expectations for a given asset, each investor chooses the same risky assets in identical proportions.

5- Measuring and Evaluating Performance: Periodically, investors want to evaluate the results of their investments. In this regard, investors select a benchmark to which they compare their portfolios' performance. Even when an investor follows an active portfolio strategy, it

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is beneficial to compare the selected portfolio's return to that of a selected benchmark, e.g., the "S&P 500". Nevertheless, the process doesn't end here but starts again from the very beginning because the investment process is an ongoing strategy and always needs adjustments whenever any economic or political variables, e.g., prices, interest rates, inflation, employment change. The objective of measuring performance is clarified when answering these following questions:

1- What is the total return on the fund over a specific period of time?

2-How does the overall return compare to that of certain standards? For example, does it perform like the S&P 500 in terms of return, given its level of risk?

3-How has risk diversification objective been achieved?

4-How aggressive is the manager's strategy in achieving the planned objectives?[4]

After analyzing the process of investment management and portfolio selection, we should be able to define what is the optimal portfolio that an investor wants to find? We should know the characteristics of this portfolio, the process of selecting it and upon which criteria this process is developed.

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(4) Solnic, Bruno, International investment chapter 12

The Optimal Portfolio:

A portfolio is a set of securities combined together to produce a certain rate of return subject to a certain level of risk. As we mentioned before, the Capital Asset Pricing Model (CAPM) is the best known model for asset valuation. This model provides us with structures and tools that try to categorize securities with respect to their risk-return ratio.

In the market, we find thousands of securities that vary in their rate of return and level of risk. However, in combining securities that are not perfectly positively correlated in a portfolio we end up with a portfolio return that is a weighted average return of all securities that constitute the portfolio. Assuming a portfolio consists of only two securities "i" and "j", then, the rate of return of the portfolio **Rp** is,

$$Rp = W_iR_i + W_jR_j$$

where W_i and W_j are the weights of securities "i" and "j" in the portfolio, and Ri and Rj are the rates of return of securities "i" and "j", respectively.

On the other hand, the level of risk of the portfolio is measured by the standard deviation of the portfolio σ_p.

$$\sigma_p = (W^2_i\sigma^2_i + W^2_j\sigma^2_j + 2W_iW_j \text{ cov } (R_i,R_j))^{.5}$$

where σ^2_i and σ^2_j are the return variances of securities "i" and "j", respectively, and cov (R_i, R_j) is the covariance between the returns of securities "i" and "j", respectively.

In choosing an optimal portfolio, an investor picks a portfolio that maximizes the investor's expected utility. This portfolio is chosen from a set of efficient portfolios called the efficient frontier.

An optimal portfolio is a well diversified portfolio that provides the investor with the highest rate of return for a specified level of risk or the lowest amount of risk possible for a specified expected return. The Markowitz Efficiency Theorem can be used to show how investors should diversify their portfolio. A Markowitz Efficient Strategy is concerned with combining assets that are less than perfectly correlated. Thus, the total risk of the portfolio is lowered without affecting the required rate of return.

In constructing the Markowitz efficient frontier, investors make certain assumptions about the market. First, there are only two parameters that affect the investor's decision in choosing a portfolio; these parameters are risk and return. Second, the model assumes that investors are risk averse; i.e., when they are faced with two assets of the same level of risk they choose the one that provides higher rate of return. Third, the model assumes that markets are efficient, i.e., that prices of securities are the

reflection of the real value of these securities. Finally, the model assumes that all investors have the same expectations regarding returns and variances of the risky assets found in the market due to the availability of information assumption.

After the development of Markowitz portfolio theory ,William Sharpe built a model called (CAPM) that calculates the equilibrium price of an asset. Sharpe's (CAPM) concludes that an investor should invest in the market portfolio in order to have the best risk-return ratio.

However, purchasing the market portfolio is not a practical procedure. Thus, investors have to choose a combination of assets that can best represent the market portfolio. Inspired by the (CAPM), investors introduced index funds in the early 70's in order to have a portfolio that can act as a proxy to the market portfolio.

Indices:

An index is benchmark which investors follow as representative of market performance. Typically, to have a portfolio that performs like the market in a passive portfolio management strategy, investors try to create a portfolio by buying the securities that make up the index. In every market, there are several indices found to serve different clienteles with different requirements. In general, a quality index should:

1- reflect what a hypothetical investor, facing transaction costs or taxes, could achieve in the market that the index purports to measure;

2- be reflective of a broad class of securities, either by containing all the securities in the class or by careful selection of subset;

3- have a reasonably long back history; and

4- be updated in a timely fashion.

The most important function of an index is to provide a benchmark for portfolio performance. Indices are also typically used to form index funds and those indices by which index funds cannot be constructed are generally regarded as poor indices.

Indices may also be broad or narrow; a narrow index like the Dow Jones, has an advantage of being related to the market. However, broad indices provide a better indication of changes in most investors wealth in the long run than do a narrowly defined indices.

Indices are constructed in several ways. The two most important are the price weighted index and the value weighted index. A price weighted index is calculated by taking the prices of a certain number of securities and divide the sum by a certain divisor. This divisor is only adjusted when there are stock splits, stock dividends or when a stock is added or dropped from the index. The other kind of index is the value weighted which is

constructed by choosing a number of stocks and multiplying their prices by their market capitalization.

Frequently-used weighting methods for international equity portfolios are market capitalization and GNP or GDP weights. Nevertheless, each index has its strengths and weaknesses in being a fair representative of the market. When combining index funds from the world market, investors are creating a Markowitz market portfolio using the world as their market. However, the assumption of efficient markets that should exist in order for this theory to hold is debated by many researchers suggesting that there is no efficient frontier in the world market and investors can take advantage of overpriced and underpriced securities by arbitraging between markets.[5]

Arbitrage:

Arbitrage, in its present form, is the practice of buying a security in one market and simultaneously selling it in another market in order to take advantage of price differences existing at the moment of purchase and sale without risk of loss of capital. The usual subjects of arbitrage are currencies, currency futures, securities and precious metals. A single

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(5) Fitzpatrick D. Brian ,"Is Efficient Market Hypothesis a Myth or Reality? A Financial Management Case for Inefficient Market Hypothesis", Journal of Financial Management and Analysis, December 1995, pp14.

arbitrageur with unlimited ability to sell short could conceivably correct a price of a certain security by financing purchases in the underpriced market with proceeds of short sale in the overpriced market. One of the explanations of lack of arbitrage profit opportunities is the law of one price. This law states that a given security must have the same price regardless of the means by which one goes about creating that security.

Chapter 2

How to Get Global

Global investment has become so important in portfolio management. Investors began to realize its importance, especially its effectiveness in diversifying risk. The improved portfolio risk/return profile afforded by international investments has resulted in a substantial increase in U.S. foreign equity investments as well as investments in other countries. Mutual funds specializing in foreign equity securities have become a prominent means of attaining international investments for many investors. The explosive growth of international equity mutual funds indicates its popularity. On a broader perspective, for example, European investors have followed this strategy long ago; however, in the United States it is a recent trend to internationally diversify especially among institutional investors such as corporate and public pension plans. As a result, European investors have 50% of their portfolio of assets abroad. [6]

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(6) Ibbotson G., Roger and Brinson P.,Gary, Global Investing. (McGraw-Hill, Inc., New York),1993, pp 11-12

The size of foreign markets, as mentioned from the very beginning of the paper, justifies international diversification even for US investors. The stock market capitalization of these international financial markets is expected to be in trillions of USD. Yet, despite the rapid growth of international equity funds, their investment performance is a puzzle.

In a fully efficient, integrated, international capital market, buying the world market portfolio would be the natural strategy. However, the lack of a fully integrated international capital market means it is very difficult to find a way to combine efficiently the international market portfolio. The subject of international market efficiency will be addressed later in the paper.

Studies on international stock market efficiency provide some interesting insights. Several studies have found empirical evidence in support of inter-temporal stability in international stock market comovements. Archanapalli and Doukas in 1993, using daily data of stock indices from five countries for the period beginning January 1980 and ending May 1990, explained that the US stock market has a considerable impact on France, German, and UK stock markets but has no impact on the Japanese stock market. Furthermore, they found that the response of France,

German, and UK markets to the US stock market innovations to be consistent with the view of cross-border information efficient stock market. In their research, Archanapally and Doukas used the Dickey-Fuller test to examine the cointegration of the US stock market with the other five stock markets. To prove the cointegration feature, they tested the stationarity of the residual error-correction factor in predicting DJIA from the indices of the other European markets using t-test and F-test. [7]

Satyanarayan, 1996, studied the relation of the Japanese stock market with other developing Asian markets of Hong Kong, Taiwan, Korea and Thailand. Using stock index prices from December 1984 till June 1992, he tried to find if there existed any form of cointegration among these markets. He found that trends in stock indices in Tokyo cannot be used to predict movement in stock indices in other emerging Asian markets. Furthermore, he found that there is no long-run link between the Japanese stock market and the other stock markets. He concluded, based on these tests, that these markets were weak-form efficient.

Several other studies, however, have found no empirical evidence in support

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(7) Arshanapali, Bala and Doukas, John," International Stock Market Linkages: Evidence from the pre- and post-October 1987 period", Journal of Banking and Finance, 1993 ,pp 197

of inter-temporal stability in international stock market relationships. Kardyi and Stulz [1996] analyzed the US-Japan stock returns comovements from 1988 to 1992 by looking at the effects of shocks on the covariance of the US and Japanese stock markets. They differentiated between two kinds of shocks: the global shock and the competitive shock. They found that the covariance changed over time from one country to another. They concluded that only large shocks on countries with broad market indices (like the Nikkei and the S&P500) have positive impacts on the magnitude and persistence of the return correlation. Using creative mathematical models, the researchers measured global shocks to have an unexpected increase in return on investment and thus resulting in high covariance while competitive shocks to result in low covariance. They proved that correlation are changeable over time due to factors like macroeconomics announcements, foreign exchange rate shocks and industry effects.

Finnerty, Becker, and Gupta [1990] also studied the inter-temporal relation between the US and the Japanese stock markets. They found that there exist a high correlation existed among open to close returns in these two stock markets taking as a sample daily data from October 1984 to December 1988. They also found that the performance of the US market has a great impact on the Japanese stock market. This means that there is a high correlation between these two markets which boldly

violates the Efficient Market Hypothesis. The researchers found that the S&P500 returns in the previous day explain from 7 to 25% the fluctuations in the Nikkei index returns in the following day. In addition, the US performance on a certain day explains between 11 to 18% of the fluctuations in the Japanese overnight return. From trading simulations performed in the Japanese market based on the US market performance, they deduced that a strategy can be developed to beat the market; however, the arbitrage profits disappear when transaction costs and transfer taxes are considered.

Fitzpatrik [1995] , also presented research that opposes the Efficient Market Hypothesis. In supporting his argument, Fitzpatrik stressed the psychological aspect of human nature. He stated that investors are irrational by nature causing wide swings to overvaluation and undervaluation of assets in the market. That is why proficient investors continue to consistently make greater returns with less of risk. He also stated that investors by their nature tend to follow the crowd and that they are not all risk averse, but rather they are risk averse when expecting a gain and risk seeking when faced with a loss. On this point, an investor advisor from Cambridge, Massachussets states "we tend to overvalue losses in relation to gains by two-and-a-half to one" and that "Volatility in the market is a reflection of our

irrationality". [8]Fitzpatrik also poses the following questions: Why the existence of circuit breakers? Aren't they to protect us from our irrationality. Why the great investors of the world consistently beat the market? Don't they serve as a contradiction to a perfectly efficient market.

To introduce the global investing strategy one needs to consider the characteristics of a good international investment portfolio. Two features characterize international diversification. First, empirical evidence suggests that it may represent one of the most powerful dimension for risk reduction. Second, it is subject to a number of obstacles, that we may call disadvantages, like currency and political risks, additional taxes and transaction costs, less efficient markets and, in some cases, outright barriers. Thus, international portfolio selection combines complex tradeoffs between the potential of risk diversification through diversification and the costs and risks unique to international investment [9]. As a result, there is no ideal internationally diversified portfolio that exists; nevertheless, portfolios are to differ from one investor to another depending on their preferrences

(8) Mcgoth, Robert, "Diversification and Cash May Soothe Investors" The Wall Street Journal Europe, Monday, March 17, 1997

(9)Lessard, Donald, International Financial Management: Theory and Application, (John Wiley & Sons, New York),1985,pp 16.

or needs. So, the ideal portfolio of an investor depends on the investor's preferences, tax situation, beliefs about market movements, and risk attitude. Now, let us start our discussion about the advantages of international investment.

Risk Diversification

International investment offers lower risk without sacrificing expected return. Practically, risk is divided into two main parts: systematic or market risk and unsystematic or diversifiable risk. Unsystematic risk is the part which can be eliminated through diversification. In general, it is expected that higher risk assets earn more than risk-free assets; and because systematic risk is the only risk that remains in a well-diversified portfolio, risk averse investors will hold diversified portfolios of assets.

To reduce the total risk of a portfolio, we tend to combine various securities together. Moreover, one should recognize that the proportion of total risk that is systematic depends on the degree of correlation among the outcomes of the various securities. For example, in the United States the degree of correlation between returns on shares of individual securities and the completely diversified portfolio, the market portfolio, is around 50%. This means that on average, the systematic risk of a security is 50% of its total risk . [10]

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(10) Solnik, Bruno, International Investment, (Addison-Wesley Publishing co.), 1991, pp 105-106

Nevertheless, the proportions of risk of securities that is systematic differ from one country to another depending on many factors. Mainly, markets differ in their well diverse industrial base and their volatile political environment. The proportion of risk of securities that is systematic in other countries, especially less developed countries, is typically higher than in the United States.

When diversification is extended across boundaries, a substantial proportion of the systematic risk within each country is averaged out. To elaborate on the example of the United States presented before, comparing the risk reduction through international diversification to that diversification within the United States, international portfolio risk drops 33%; i.e., one third less than the domestic portfolio.

In conclusion, returns from common stocks in various countries do not move in lockstep and thus the risk-return combinations available with an internationally diversified portfolio are likely to be superior to those of the individual stock markets. The question that remains is what propotion of the investors' portfolios should be invested in the international market, since most of the outright barriers to international investment have diminished in recent years. There remain several reasons why investors may be justified in maintaining some degree of "Home Country Bias" in their portfolio holdings. Home bias means that investors in one

country invest a larger proportion, or prefer to invest in their home country, thus sacrificing some of the expected returns. Nevertheless, home bias can only be explained by the incremental costs or risks from international investment. So, we set to explain some of the costs and risks that are perceived by investors as obstacles to international diversification. [11]

Obstacles to International Investment:

The world capital market unfortunately doesn't match the ideal. There are barriers to cross-border investment and there is no proof that various national markets are always priced properly in relation to each other. These barriers are currency risk, political risk, limited size and depth of foreign markets, efficiency of foreign markets, taxes and cost restrictions, and other institutional obstacles.

Currency Risk:

The most important motivation for diversifying investment portfolios internationally is to improve the reward-to-risk tradeoff by taking advantage of the low correlation that exist among returns on assets traded on different capital market. However, when investing internationally, one is investing in assets that provide return in various currencies whose relative values can fluctuate; thus, involving foreign exchange risk. It is obvious, though, that the volatility of currency movement

(11)Lessard, Donald, International Financial Management, 1985.

has increased in recent years and it is significant relative to the movement of equity markets. So, the dollar returns are more volatile than the local currency returns, although by a very small margin relative to the volatility of the exchange rate. The reason for this is that the volatility of dollar returns depends not only on the volatility of local currency and exchange rate changes, but also on the correlation between the two. Formally:

$$\sigma^2 = \sigma^2_D + \sigma^2_F + 2R\,\sigma_D \cdot \sigma_F.$$

Where σ is the total risk in U.S. dollars; σ_D is the market risk in the domestic currency , and σ_F is the exchange rate volatility. And (R) is the correlation coefficient between the two risks. [12]

There are two other aspects of currency risk that must be considered. The first is that the risk mentioned before is valid only if one considers risk and return in nominal terms. Therefore, investors should judge returns after adjusting for inflation, because given the volatility of inflation in most economies. If this adjustment is made, exchange risk will certainly be reduced and domestic securities will be viewed as having significant risk and that will certainly be reflected in its return. The other consideration is that currency risk can be hedged. This hedge can follow two processes, either borrowing in the local currency or selling it forward. In fact, the main assumption remains that we are hedging our portfolio to the risk of

(12)Solnik, Bruno, International Investment, 1991.

fluctuation in the exchange rate. So, to rather explain hedging we are to put in front of us the strategies of hedging available to the international portfolio managers.

A-Never Hedge

This is a passive strategy which simply ignores currency risk. The advantages of this strategy are the absence of transaction costs as well as the savings on costs associated with generating exchange rate forecasts either in-house or from commercial sources. This approach assumes that markets are efficient. In this case, it means that exchange rates are fully reflected in securities' prices and fully reflect all available information. According to this strategy it is impossible "to beat the forward exchange rate", since an investment depends on forward expected returns and one the forward exchange rate.

B- Always Hedge

This strategy is an active hedging strategy according to which the entire foreign portfolio should be covered against exchange risk all the time. Practically, it might not be possible to hedge all foreign currency exposures all the time, when the value of the portfolio in local currency fluctuates with changing stock prices, this will necessitate changes in the amount of the hedge volume. Moreover, not all currency hedging is available because either legal aspects or physical availability of

the hedge instrument prevent that. This strategy has always proved its superiority to the "never hedge" strategy.

C- Hedge Selectively

This strategy means hedging some of the exposure some of the time. Here the international portfolio manager seems to have the best of the two strategies presented before. This strategy is based on the assumption that currency forecasters can indeed "beat the forward exchange market". The strategy combines the aims of risk-level and the cost of hedging; i.e., by selectively hedging some of the currencies that an investor assumes more risky will cost less than hedging the currency exposure of all securities in the portfolio.

In conclusion, currency risk is not a significant obstacle to international investment for two main reasons. First, currency risk should be considered in its effect on real return after adjusting for inflation. Second, currency risk can be isolated through hedging; that is, when hedging our portfolio we can still get the risk-reducing benefit without significant currency exposure. However, not all but most of this currency volatility can be hedged. [13]

Political or Sovereign Risk

Political or sovereign risk is viewed by many investors to be the major kind of

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(13) Beidleman, Carl, The Handbook of International Investing,(Probus Publishing Company, Chicago, Illinois) 1987,pp.215

risk to foreign investment. Obviously, the political risks found in certain countries will dampen the enthusiasm of investors to internationally diversify their portfolios. Moreover, not only foreign investors fear political instability but also domestic investors are not attracted to invest in countries of political disorder. So, countries that seems to have internal political upheaval or have a pronounced trend towards the elimination of the private sector will be unattractive to investors. And thus, this political risk will be reflected in the prices of securities found in that country and little new private real investment will take place.

Here, once again the concept of efficient markets comes to the scene; when investors see disorder in a certain country they will increase their investment in other countries and decrease investment in this country; thus, causing prices of domestic securities to decrease. As mentioned before, this kind of risk is an obstacle for investment to domestic and foreign investors equally, but only few kind of political risks are borne by foreign investors, only one of which is the risk of currency controls.

Limited Size and Depth and Relative Efficiency of Foreign Markets

The recurrent feature that international investors observe about existing markets is the limitation of the practical scope of investment. Many markets are perceived to be small, less liquid and less efficient than fully developed markets like

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that of the United States, for example. Most investors question if markets are large enough and active enough so that they can take positions in such markets and realize some benefit from their investment. Today, most equity markets in the world have become billion dollar markets, yet the US market is still the largest. Moreover, in newly developed markets, the market capitalization is often misleading indicators of the marketability of a certain security because a large proportion of the shares might be owned by banks, holding companies, or other concerns. Also, the degree of concentration within various markets play an important role in attracting foreign investors. When only a small number of shares accounts for the major portion of the value of all shares found in the market; this implies that domestic investors of moderate and small size fund countries will want to hold foreign investment in substantial proportions relative to their holdings in domestic investments.

A closely related concern is that of market efficiency. Efficiency differs in levels from one country to another. Some markets are very efficient and some are not efficient at all. Although less efficient markets should be desirable by foreign investors who follow active portfolio strategies, because it implies that superior performance is possible, it also puts the international investor at a disadvantage relative to the domestic investor because domestic investors have greater information about their domestic market.

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Numerous studies on the efficiency of major stock markets of the world have been performed. The general conclusion from these studies is that markets are very efficient. The reason for the effenciency is the competition among professional security analysts and managers in each national market. Another reason is also the intrusion of foreign investors with their own techniques helped to make the markets more efficient.

It has been deduced that each domestic market is quiet efficient making it difficult to consistently outperform the local index. However, do international markets perform efficiently? Could assets, allocated in international markets consistently outperform the international index? It seems there is less competition among countries than within a single market. Though there is little evidence that international markets are efficient, these markets seem to perform efficiently due to the level of integration among them. In integrated financial markets arbitrageurs will take advantage of any new information that sparks anywhere in the world. Others argue that international markets are rather segmented. Due to certain barriers as political risks, transaction costs, and various kinds of risks mentioned throughout this paper.

Taxes and Other Institutional Obstacle

There are many obstacles that make international investment unattractive, and in some cases impossible. These obstacles include formal barriers to international transactions, such as exchange controls that do not allow investors to purchase foreign currency investments. In other countries the ownership of securities are conditioned by the nationality of the investor. Also under formal obstacles stands the point of high transaction costs. Though assuming efficient markets, transaction costs are due to correspondents' services and costs form collecting information about foreign markets.

On the other hand, informal obstacle also exists as barriers to international investment. Such barriers are difficulty of obtaining information about a market, differences of reporting practices that make international comparisons difficult and subtle impediments to foreign investment based on traditional practice.

In conclusion, after presenting and analyzing the advantages and obstacles of foreign investment one can realize that the advantages outweigh the obstacles. Moreover, one can see that the obstacles presented can be overcome. Currency risks do not seem to reduce significantly the gains from well diversifying the portfolio; nevertheless, there is the possibility to hedge the portfolio against such kind of risk. There is also little reason to believe that political risks are not

accounted for by even domestic investors. Finally, the improvements of the information technology tools in providing availability and easy movement of information make the intentional market efficient.

Chapter 3

Model Presentation and Means

of Measurements

In this chapter, the daily comovements of stock returns among several countries are investigated in order to determine the nature of the relationship that exists among world markets. In doing so, the reasons why these returns change from one country to another are discussed. Practically, the effectiveness of internationally diversifying a portfolio among the chosen countries is examined. This portfolio of assets outperforms the portfolio that is domestically diversified. From the world markets, those of the United States, England, Spain, France, Germany, Japan, and Hong Kong have been chosen. The indices selected have been those most representative of the markets in which they are traded : the Dow Jones Industrial Average (DJIA), the Standard and Poor's 500 (S&P500), and the NASDAQ for the USA; the FT-100 (FTSE-100) for England; the CAC40 for France; the DAX for Germany; the General Index for Spain; the NIKKEI(225) for Japan and the Heng Seng for Hong Kong.

Data were collected for a period of six months starting Jan.1, 1996 and ending June 30,1996. We disregarded the days of holidays in any of the stock exchanges chosen; i.e., when one stock exchange is closed, we assume that all stock markets are closed , for example we disregarded the data of May 5, 1996 because the German and Frensh markets were closed. We further disregarded days when we couldn't find the Wall Street Journal issue for that day. The total number of observations was 103. In total, only a small number of days were disregarded in our study and it doesn't affect the results obtained.

Stock prices are very volatile and show rapid responses to international developments; therefore, daily data can provide more accurate information about the behavior of stock market indices than can any kind of organized data like monthly or quarterly. The choice of daily comovements was made for several important reasons; first, daily horizons are important for risk management purposes and used especially by portfolio managers whenever dynamic hedging strategies are used. Second, the degree of integration of international financial markets changes over time. Third, the determinants of the cross-country covariance

change over time, e.g., barriers to international investment have changed, so using returns for a long period might be inappropriate to study these covariances without modeling how and why these covariances change over time. [14]

However, the major disadvantage of using daily returns in assessing the daily comovements of two markets is the nonsynchronous trading periods of time for different markets around the globe. This issue is particularly very important when we look at the Japanese stock exchange and that of the United States, since the two markets are never open at the same time.

After presenting the investment concepts, we deduce that a good investment plan must have major features that mainly are: risk avoidance, income potential, liquidity, diversification, and tax avoidance. Thus, the ultimate goal of a money investor is to evaluate and manage an investment portfolio that provides an appropriate balance of these characteristics. Moreover, whether the balance achieved is appropriate depends on the stategy used to manage the portfolio; i.e., the investors' needs and the characteristics of the investment program devised to meet these needs.

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(14) Karolyi G.,Andrew and Stulz M., Rene, "Why Do Markets Move Together? An Investigation of U.S.-Japan Stock Return Comovements", Journal of Finance, vol LI, July 1996.

The model used in this study is based on many simplifying assumptions that support the strategy selection and, in turn, our model. These assumptions simplify our study a great deal, and some of them may seem unrealistic. However, these assumptions make the model more tractable from a mathematical standpoint. The model assumes 1) that throughout the time elapse chosen there is no distribution of dividends in any of the markets included in our study, 2) that there is no transaction costs 3) that the strategy followed in hedging is a zero hedge strategy and 4) that we have a perfectly replicated portfolio whereby the tracking error is negligible. Such a portfolio is called a pure index fund.

The investment strategy to be tested is discussed below. Since it is believed that domestic markets are efficient whereas there is skepticism about the efficiency of international markets a passive investment strategy must be pursued on the domestic level; i.e., accept investing in the domestic stock index as a representative of the domestic market. On the other hand, the portfolio in the world is allocated market on efficiency measurements bases. In fact, there are two types of passive strategies. The first is a buy-and -hold strategy. This strategy is simply to buy a portfolio

of stocks based on some criteria and hold it for a period of time. There is no active buying and selling of stocks once the portfolio is created.

The second passive strategy and the most commonly followed in the index fund management is popularly known as simply indexing. In this strategy, the money manager doesn't attempt to identify undervalued or overvalued stock issues nor attempts to forecast general movements in the stock market and then structure the portfolio in order to take advantage of this movements. Instead, the money manager who follows this strategy attempts to design the portfolio as a replicate of a certain stock index and try to track the total return performance of this index. This strategy was followed in the allocations on the domestic level in this study.

However, on the international level, seven countries were selectively chosen and the portfolio was allocated accordingly. The linkages among stock prices in major stock exchanges of the world were studied using daily prices of stock indices over a specified period of time. In the study, two basic concepts of international portfolio management have been tested. The first is the world market cointegration and second is whether it is better to construct an internationally diversified portfolio than to construct a domestically diversified one. In fact, the two concepts are related in an ad-hoc strategy; that is, we have to examine the cointegration

of the world markets in order to know if it is better to diversify internationally or not. Furthermore, throughout the analysis, a portfolio combination with GDP weighting is used.

A-Cointegration Test

Cointegration is a property possessed by some non-stationary time series data. Generally, two variables are said to be cointegrated when a linear combination exists between them even if each variable is non-stationary. In terms of cross-border equity market efficiency cointegration implies that national stock market indices are linked even if stock market indices are non-stationary [15]. This concept is used in this study to test cross-border market efficiency by determining if one national market index is cointegrated with the US stock index and if any of these indices is cointegrated with the Nikkei 225 index.

First, The correlation coefficients of the daily percentage return of index prices is measured. Because these indices are denominated in different currencies, These returns have been adjusted to the fluctuations of each national currency to the US$. However, the daily exchange rates of the Hong Kong Dollar are considered less important in our study

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(15)Archanapalli, Bala and Doukas, John, "International Stock Market Linkages: Evidence from the pre- and post-October 1987 Period", Journal of Banking and Finance, vol. 17,1993.

because the HK$ has been pegged to the US$ since October 1983 through the linked rate system introduced by the Hong Kong government at a rate of HK$ 7.8 to US$1. Although under this system the exchange rate of HK$ to the US Dollar is allowed to change in the foreign exchange market but only in very small changes. [16]

We measure change in return adjusted to the exchange rate which includes change in stock index prices together with the change in exchange rates. Thus, to account for both returns we to use the following equation:

$$\%\Delta R = ((1+\%\Delta K)*(1+\%\Delta X))-1$$

Where ΔR is the change in the return , ΔK is the change of the stock index price, and ΔX is the change of the exchange rate [17].

B-International Diversification

The next concept investigated is the concept of international diversification. Because market capitalization is not necessarily reflective of a country's economic strength, the GNP and GDP country weights are

(16) Tang Y. N., Gordod, "Diversification Effect on Skewness and Kurtosis of Stock Returns on Exchange Rate Risks: Empirical Evidence", Journal of Financial Management and Analysis, Jan 1996.

(17) Shapiro, C., Alan, Foundations of Multinational Financial Management, (Allyn and Bacon , Massachusetts), 1991, pp 366.

used instead. This is an interesting point, since it gives each country a weight proportional to its economic strength. Even though market capitalization is widely used , investors started using GDP and GNP weights after the remarkable run-up in the Japanese stocks which made extreme effects on the EAFE(Europe, Asia, Far East) and other indices in the late 1980's [18]. In this study, GDP weights were used to construct the optimal portfolio, these weights were taken from the "Japan International Study", a publication obtained from the Japanese Embassy in Lebanon.

To introduce the model, the basic statistics used to measure the effectiveness of internationally diversified portfolio must be presented. The rate of return of our portfolios has been calculated from the stock index prices collected. This can be formalized as:

$$R(p) = \Sigma^n_{i=1} W (i) R(s)$$

Whereby $R(p)$ is the rate of return of the portfolio, $W(i)$ is the weight of the stock index in the portfolio -here we use GDP weights, and $R(s)$ is the rate of return of the stock index. Then $\sigma(p)$ of the distribution of $R(p)$ is calculated.

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(18) Solnik, Bruno, <u>Intrnational Investment</u>, 1997 , pp 585

Moreover, the rate of return on each stock index used is calculated as follows. After collecting the data in time series, the daily price change of each stock index was calculated. Then, the rate of return that a stock index provides starting on January 2, 1996 was calculated. After collecting and analyzing the data, each domestic index portfolio was classified according to the Sharpe performance index. This index is an investment performance index that measures the risky asset's or portfolio's excess return (in excess of risk free rate "r") per unit of risk, as represented by the standard deviation. Formally, the Sharpe performance index (PI_s) is given by the following equation:

$$PI_s = \frac{R_p - r}{\sigma_p}$$

Where r is the risk free rate, PI_s is the Sharpe Performance Index, σ_p is the standard deviation of the portfolio and R_p is the portfolio rate of return.

Another similar performance measure worth using in this study is the Treynor's performance index. Treynor's performance index (PI_t) is an index that is supposed to measure the reward-to-volatility ratio, and is given by the following equation:

$$PI_t = \frac{ER_i - r}{\beta_i}$$

Where ER_i is the expeced return of portfolio "i", "r" is the risk free

rate and β_i is the measure of variability of portfolio "i" to the market or

standard portfolio. But if an investor holds a portfolio other than the

assumed market portfolio he or she has to compare returns and variation

of portfolio "i" to portfolio that the investor holds. In this study, β_i is

calculated from the comparison of returns and variability of each domestic

portfolio to our managed portfolio which is calculated by using GDP

weights. So β_i is calculated as such :

$$\beta_i = \frac{cov(R_i, R_p)}{\sigma_p^2}$$

Where R_i is the rate of return on the domestic portfolio "i" and R_p is

the rate of return on GDP weighted portfolio -called the standard portfolio

in this study-, and σ_p^2 is the variance of return of the standard portfolio.

The cavariances and correlation coefficients of index returns of the

selected portfolios are then calculated. The characteristics of each index

correlation when combined with the standard portfolio are then

determined. The covariance is simply the basic measure of association.

The covariance measures how two random variables vary together.

1-Because the correlation coefficient, just as the covariance, measures only the degree of association, it tells us nothing about causality. The direction of causality has to come from theory and be supported by specialized tests.

2-The correlation coefficient can vary from -1.0, perfect negative correlation, to 1.0, perfect positive correlation.

The determinants of the covariance and in turn the correlation coefficient are discussed. The types of shocks that cause the returns among international markets to change will be explained. In particular, we distinguish between two types of shocks, "global" and "competitive" shocks for asset returns. Global shocks are those shocks that affect the value of all firms in the same direction but not necessarily in the same amount. Competitive shocks, on the other hand, increase the market value of firms in another country. Given these definitions, global shocks are associated with high return covariances, whereas competitive shocks are associated with low covariances. These shocks will be elaborated on in the next chapter and relevant examples from the sample we are testing will be given.

Chapter 4
Results and Findings

In the study it was found that strong relations among various indices in the world equity market exist. The model developed in chapter III included the change of the exchange rate relations in the decomposition of the real return relation among index funds. Explaining relationships, established from the analysis of data, requires a critical look at each step of the development process.

Exchange Rate Effect

Table.1 displays the results of the change in exchange rates of each country's currency with respect to the Dollar over a period of six months, from January 1, 1996 to June 30, 1996. The currency volatility of a country with respect to other currencies matters. Here the most volatile currencies with respect to the dollar are the Spanish Peseta and the German Mark. The standard deviation of the Deutsche Mark and Spanish peseta are 3.77% and 3.71% respectively; the mean exchange rates are 1.49 Deutsche Marks to a dollar and 124.95 Pesetas to a dollar.

	DAILY % CHANGE IN EXCHANGE RATE(BASEJAN4)					
	DEM	HG$	STP	ESP	FRF	JPY
MEAN=	2,5038%	-0,5851%	0,0421%	2,6218%	2,0234%	1,3024%
VAR=	0,001418	6,85E-05	1,75E-06	0,001375	0,000819	0,001049
STD=	3,7656%	0,8274%	0,1325%	3,7079%	2,8615%	3,2384%
	DEM	HG$	STP	ESP	FRF	JPY
DEM	1,00	-0,90	0,27	0,96	0,80	0,67
HG$	-0,90	1,00	0,05	-0,90	-0,70	-0,72
STP	0,27	0,05	1,00	0,14	0,26	0,03
ESP	0,96	-0,90	0,14	1,00	0,79	0,70
FRF	0,80	-0,70	0,26	0,79	1,00	0,54
JPY	0,67	-0,72	0,03	0,70	0,54	1,00

Table 1. Correlation coefficients among currencies

The change in exchange rates has an important effect on the correlation of returns among investments in different countries. Figure 1 below shows a sketch of the movement of currency rates of the German Mark and French Franc against the US Dollar.

Fig.1

GermanMark   French Franc
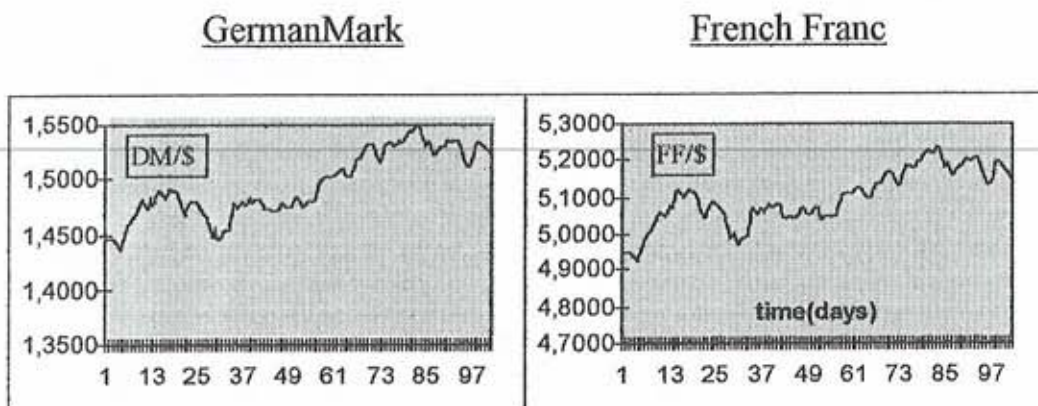
The figures show that the exchange rates tend to change over time. This movement will certainly affect return on investment and the allocation of investment among various countries of the world. one can notice that the German Mark, for example, fluctuates between DM 1.55 to a US Dollar, being the highest price, and DM 1.45 to a US Dollar, being the lowest during the period of six months.

As shown in table 1, there are high correlations among European currencies like that of France, Germany, and Spain. The correlation coefficients of the French Franc and German Mark ,the French Franc and the Spanish Peseta , and the German Mark and the Spanish Peseta, are 81%, 80%, and 96% respectively. Exchange rate changes of the Japanese Yen are correlated with that of the Sterling Pound and shows respectively low correlations with the exchange rate changes of all currencies included in our study .

The standard deviation,as developed in chapter 2, is used to measure the risk of an internationally diversified portfolio. It is calculated by the following equation:

$$\sigma^2(R) = \sigma^2(RL) + \sigma^2(RS) + 2\rho(RL,RS)\,\sigma(RL).\,\sigma(RS).$$

Table 2 that presents the combined risk of investing in each country index fund -domestic return risk and exchange rate risk. it can be seen that the "General Index " index fund has the greatest risk or variability, followed by the CAC40 index fund and the Nikkei index fund.

Table 2

Table of variation in variance of domestic portfolio including foreign currency variation			
INDEX	VAR(pr)	VAR(ex)	TOT VAR
DAX	0,2200%	0,0022%	0,2222%
HG SG	0,0699%	0,0000%	0,0699%
FTSE-100	0,0327%	0,0014%	0,0341%
GN IN	0,4679%	0,0021%	0,4701%
CAC40	0,2796%	0,0187%	0,2983%
NIKKEI	0,2699%	0,0039%	0,2738%

N.B. "2 ρ (RL,RS) σ (RL). σ(RS)" of the equation approximates nil.

The inclusion of exchange rate , thus , necessitates adjusting the index fund of each country with respect to its currency. Adjustment can be either through hedging or by including the return on the investment in each currency. Table 2, shows the correlation that exists between the exchange rate adjusted return of each country's currency with the other countries. This method assumes one's investing in index funds while using forwards in each country's currency and at the same time assuming 100 % successful hedging

policy; i.e., there exist no losses nor gains from such investment other than interest and capital returns.

Evaluating the Risk/Return Results

Table 3

COR/MAT	R(DJIA)	R(S&P500)	R(NASDAQ)	R(DAX)	R(FT-100)	R(GN IND)	R(CAC40)	R(NIK)	R(HG S
R(US DJIA)	1,00	0,94	0,76	0,74	0,08	0,63	0,66	0,51	0,23
R(US S&P)	0,94	1,00	0,88	0,79	0,07	0,75	0,74	0,59	0,27
R(US NAS)	0,76	0,88	1,00	0,89	0,23	0,90	0,87	0,69	-0,02
R(DAX)	0,74	0,79	0,89	1,00	0,38	0,93	0,96	0,85	0,00
R(HG SG)	0,23	0,27	-0,02	0,00	0,14	-0,11	-0,03	-0,06	1,00
R(FT-100)	0,08	0,07	0,23	0,38	1,00	0,23	0,42	0,28	0,14
R(GN IND)	0,63	0,75	0,90	0,93	0,23	1,00	0,92	0,85	-0,11
R(CAC40)	0,66	0,74	0,87	0,96	0,42	0,92	1,00	0,84	-0,03
R(NIKKEI)	0,51	0,59	0,69	0,85	0,28	0,85	0,84	1,00	-0,06

Table 4 ,Correlation Matrix of return among index portfolio

Table 3, shows the results in a correlation matrix. In the table ,we find correlations that explain, to a great extent, the relation between cross country returns. There seem to be important market factors that are translated in these correlation values. For instance, the European Exchanges have shown significant intra-country commonality. Moreover, researchers have developed several reasons of intra-country movements of investment returns among countries. Among these reasons are, 1)countries whose income tend to move together may generate similar expectations and indirectly link stock prices between countries. 2) Dominant financial centers may facilitate within area

capital flows , reduce real interest rate differentials and stimulate covariation between country indices. 3) Multinational firms represented in two indices give rise to nearly identical price behaviour within limits imposed by impediments to capital flows. The US index funds, those of S&P500, DJIA and Nasdaq, are highly correlated because they are representative of the same economy. The correlations being between S&P500 and DJIA is 94%, between S&P500 and Nasdaq is 88%,and between DJIA and Nasdaq is 76%.

As for the European markets, the covariation existing is probably due, in large part, to the similarity in the income expectations of these countries. another reason which is also of equal importance is the development of the European common market. A departure from this generalisation is the FTSE-100 index which is only slightly related to other European market indices. Thus, The correlation rates between the DAX index fund return and the "General Index" index fund return is 93 % , between the DAX and the CAC40 index fund returns is 87%, and between the " General Index " and the CAC40 index fund returns is 92 % .On the other hand ,we see the correlation between the FTSE-100 index fund return and that of the DAX, General Index,

and CAC40 are 38%,23% and 42% respectively. This suggests that the London-European coupling is not as close as other intra-European market relationships. This is probably due to the impediments to United Kingdom - European capital flow restrictions imposed by the British government. [20]

On the other hand, the more geographically isolated Tokyo and Hong kong markets are not closely coupled with each other. Hong kong markets seem to be unrelated to any of the other world markets included in the study; this may be because of the political instability that faced the country in the year 1996. However, Japanese markets, represented by the Nikkei index fund, presented acceptable covariation results with other countries. This may be due to the open market policy followed in Japan and the huge number of exported products to other countries of the world. The lowest correlation of 28% existed between the Nikkie225 and the FTSE-100 reached and the highest of 85% existed between the Nikkei225 and the German DAX index fund.

The practical as well as the theoretical importance of portfolio selection stems from the fact that while the observed security returns for any

(20) Hilliard, Timmy, "The Relationship Between Equity Indices on World Exchanges", The Journal of Finance, March 1979

particular country are positively correlated , they are not perfectly correlated, which implies possible reduction (although not elimination) of risk through diversification .

Table 4

	USA	GER	GB	SPAIN	FRANCE	JAPAN	HK	TOT(GDP)
GDP(bill)=	7245,8	2977,7	699,57	69722	7677,3	541971,1	1110,198	
X(4/1/96)=	1	1,2337	0,662	144,5315	4,993	106,0505	7,7258	
GDP$(bill)=	7245,8	2413,634	1056,752	482,4	1537,613	5110,5	143,7	17990,4
GDP(%)=	40,2759%	13,4162%	5,8740%	2,6814%	8,5469%	28,4068%	0,7988%	100,00%
HPR(r)=	0,0248=	2,48%						

Table 4, GDP distribution (in million U.S. Dollar) and the risk free holding period interest rate

In table 4, the GDP distribution over the countries used in the study is shown. The US has the highest share of the total GPD, 40.28%. Then Japan's GPD follows with a 24.8%, then Germany 13.4% and the others follow. These percentages are multiplied by each index fund return to obtain the return of the portfolio equalling 7.3% (this portfolio called the Optimal Portfolio). The standard deviation of the portfolio is 0.91% .

Reading Performance Indexes

As previously mentioned, in this study, the Sharpe's Performance Index (PI$_s$) and the Treynor's Performance Index (Pi$_t$)can be used to measure the performance of each portfolio. The performance are shown in descending order of the index funds according to both performance indexes.

Table 5

DOM POR	PIs	DOM POR	PIt
USA	62,4841	GER	0,1093
GER	60,9684	SPAIN	0,0974
FRANCE	42,6930	HK	0,0905
JAPAN	39,7231	FRANCE	0,0884
SPAIN	36,1477	USA	0,0844
HK	6,2174	JAPAN	0,0836
GB	-74,2897	GB	-0,1669

Table 5, Sharpe's and Treynor's performance index
measures of each portfolio.

According to the Sharpe performance index the US index fund is best while it ranks fifth according to the Treynor's Performance index. This is due to the use of the β measure of risk in Treynor's Performance Index instead of using standard deviation of the index on hand. It appears that there exist a large proportion of diversifiable risk because after using the β (presenting only systematic risk) in the Treynor's Performance Index the arrangement was dramatically changed. Thus, this supports over preference in internationally diversifying our portfolio.

The Optimal Portfolio Selection

In figure 2, the average return and standard deviation of return of each index fund are plotted. The assumed optimal portfolio, calculated previously, is also plotted. The graph seems vague, in that we cannot say which is better

than the others , except for few of them. In the process the graph is devided
into four zones represented by I, II, III and IV separated by dashed lines. The
point of intersection is the assumed market portfolio we managed.

Fig. 2
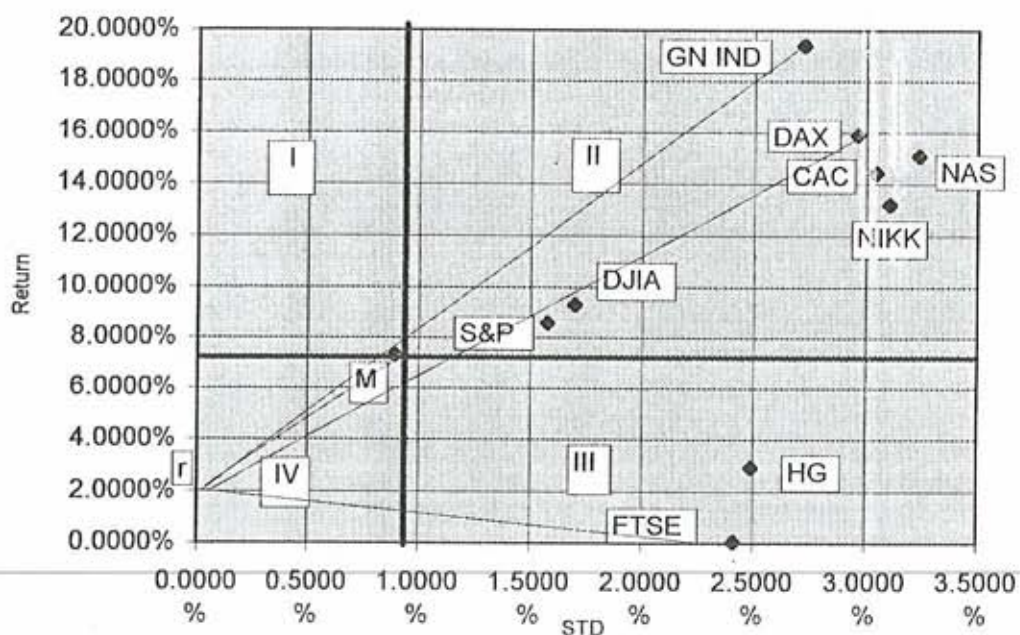
	DJIA	S&P500	NASDAQ	DAX	HG	FTSE-100	GN IND	CAC40	NIKKEI	M	
	1.699	1.577	3.237	2.962	2.491	2.411	2.719	3.243	3.106	0.907	
AN	9.292	8.568	15.07	15.893	2.914	0.052	19.394	14.417	13.202	7.301	
r=	2.48%										

Now if unmanaged portfolios of the S&P, DAX, ..,etc. are allocated the fund performance can be presented by a point in any zone. Should a fund's average return and variability be given by a point in zone I, one can safely conclude that this particular index fund outperforms the optimal portfolio (M), since all points in zone I represent higher returns and lower variability than (M). On the other hand, if a fund has a combination of mean return and variability represented by a point in zone III -like the Heng Seng and FTSE-100,(M) is clearly superior since it has higher return and lower risk than all points in zone III. So, it can be assumed that (M) certainly outperform the Heng Seng and FTSE-100 index funds. The case is less clear, however, with respect to portfolios whose risk and return characteristics place them either in zones II or IV: a point in zone II represent a higher return, but also a higher risk, than point (M),while points in zone IV have a lower risk, but also a lower return, than the chosen (M). [21]

The figure illustrates the application of Sharpe's Performance Index PIs represented by the dashed lines. An investment in riskless security is represented by point (r) and a portfolio comprising the cross-section of randomly chosen index portfolios is represented by point (M). The straight line connecting point (r) and point (M) represents the set of attainable

(21) Performance measures , chapter 15, pp 518

combinations of the riskless portfolio with the market portfolio (M). By the same token the line connecting point (r) with the General Index point represent a combination of riskless portfolio and the General Index portfolio.

So, if we wish to compare the two lines connecting (r) with (M) and with the point (GN IN), it can be concluded that the performance of the General Index Portfolio is superior to that of portfolio (M) since all the points on the line represent a higher return for a given level of risk when compared with line rM. On the other hand, the performance of portfolio (M) is superior to the DAX portfolio as represented by the slopes of the lines connecting point r with that of (M) and (DAX) ,respectively.

Thus, the slope of the line connecting the point of the Index Fund (R_i, σ_i) with the risk-free portfolio is $(E_{ri}-r/\sigma_i)$. This slope provides a convenient measure of performance of index funds plugged in the figure. Steeper slopes, that is, higher risk to variability ratio, indicate better investment performance since the investor can reach higher utility as the slope of the transformation line connecting the risk-free rate and the point representing the risk-return characteristics of index funds becomes steeper. In a reasonably efficient market, one expects all highly diversified portfolios to cluster along the line connecting the risk-free portfolio with the market portfolio (M). If an index fund deviates significantly below this line, it means

that the performance of this portfolio is inadequate; a rational investor will not

choose such a portfolio.

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