RANKING THE PERFORMANCE OF COUNTRY FUNDS USING RISK ADJUSTED PERFORMANCE MEASURES; TREYNOR INDEX, SHARPE INDEX, JENSEN INDEX

A THESIS

SUBMITTED TO THE DEPARTMENT OF MANAGEMENT

AND THE GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

OF BILKENT UNIVERSITY

IN PARTIAL FULFILLMENT OF REQUIREMENTS

FOR THE DEGREE OF

MASTER OF BUSINESS ADMINISTRATION

BY

HILMİ IŞIK

JULY, 1990

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Hilmi Işık

tarafından bağışlanmıştır.

I certify that I have read this thesis, and in my opinion, it is fully adequate in scope and in quality, as a thesis for the degree of Master of Business Administration.

Assoc. Prof. Dr. Kursat Aydogan

I certify that I have read this thesis, and in my opinion, it is fully adequate in scope and in quality, as a thesis for the degree of Master of Business Administration.

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ABSTRACT

H. ISIK BOG

Ranking the Performance of Country Funds
Using Risk Adjusted Performance Measures:
Treynor Index, Sharpe Index, Jensen Index

MBA in Management

Supervisor: Assoc. Prof. KURSAT AYDOGAN

Sept., 1990, pages

This study ranks the performance of country funds within the international context using risk adjusted performance measures, namely Treynor Index, Sharpe Index, and Jensen Index. Results of the three performance measures are similar and correlation among these measures are quite high. Moreover, the relation between risk measures and performance measures is tested. Only, Treynor Measure seems to be sensitive to systematic risk, β. Other measures are insensitive to both systematic risk and standard deviation of returns.

Keywords: Jensen Index, Treynor Index, Sharpe Index, Country Funds, International Diversification

ÖZET

Ülke Fonlarının Riske Ayarlanmış Verimlilik Ölçüleri -Treynor Endeksi, Sharpe Endeksi ve Jensen Endeksi- ile Performanslarına Göre Sıralanması

H. IŞIK BOĞ

Yüksek Lisans Tezi : İşletme Enstitüsü

Tez Yöneticisi : Doç. Dr. KURŞAD AYDOĞAN

Eylül 1990

Bu tez çalışmasının amacı ülke fonlarını riske ayarlanmış verimlilik ölçülerini kullanarak sıralamaktır. Riske ayarlanmış verimlilik ölçüsü olarak Treynor Endeksi, Sharpe Endeksi ve Jensen Endeksi seçilmiştir. Verimlilik ölçüm metodlarının sonuçları birbirine yakın çıktığı gibi bu metodlar arasındaki korelasyon katsayısı da oldukça yüksek çıkmıştır. Ayrıca, verimlilik ile risk ölçümleri arasındaki ilişki test edilmiş ve Treynor Endeksi dışındaki diğer endekslerle sistematik risk ve getirilerin standard sapması arasında anlamlı bir ilişki bulunamamıştır.

Anahtar Kelimeler: Treynor Endeksi, Sharpe Endeksi, Jensen Endeksi, Ulke Fonları, Uluslarası Portföy Çeşitlendirmesi.

ACKNOWLEDGEMENTS

I would like to thank Dr. Kursat Aydogan for his supervision in development of the thesis. I would also like to thank Dr. Gokhan Capoglu and Dr Umit Erol for their help. Special thanks go to Elvan Gocmen, Deniz Ercoskun and Isil Bog for their encouragements and supports during the development of the thesis. Finally, I would like to thank Department of Management of Bilkent University for providing me an invaluable MBA education.

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I. INTRODUCTION

The fact that different national equity markets often perform very differently in any given period has led to increased investor interest in international diversification of investment portfolios. Following this trend, some investment companies have started to establish a special portfolio called country funds.

A country fund is a mechanism through which resources originating from one or several countries are invested in securities of the countries other than those from which the respective resources originate.

As noted above, a country fund is similar to other investment funds. It is interesting that although a country fund is a kind of investment fund we don't see any risk adjusted performance ranking of the country funds like domestic mutual funds. The purpose of this study is to apply three major portfolio evaluation techniques, namely Treynor Index, Sharpe Index, Jensen Index to country funds.

A. BASIC DEFINITIONS

It is necessary to mention important points of investment companies for the sake of clarity.

An **Investment Company**[1] is a pool of funds belonging to many individuals that is used to acquire a collection of individual investments such as stocks, bonds, and other publicly traded

[1] The definitions are taken from Reily Chapter 21 [17].

securities. Each of the individuals who bought shares of the investment company would own a percentage of the total portfolio of the investment company. In other words, they would have indirectly acquired shares of a diversified portfolio of securities. The value of the investor's shares depends upon what happens to the portfolio of assets acquired by the managers of the fund.

Investment companies are begun like any other company by selling an issue of common stock to a group of investors. In the case of an investment company, however, the proceeds are used to purchase the securities of other publicly held companies. Investment companies are classified as closed-end investment company and open-end investment company.

A **closed-end** company operates like any other public firm, since its stock is bought and sold on a regular secondary market and the market price of the investment company shares is determined by supply and demand. There are typically no further shares offered by the investment company, and it does not repurchase the shares on demand. There are no subsequent additions to the funds of the investment company unless it makes another public sale of securities.

The market price of shares in the fund is determined by the relative supply and demand for the investment company stock in the market. In closed-end funds net asset value[2] and market price are almost never the same.

[2] **Net Asset Value (NAV)** **NAV** is equal to the total market value of all the assets of the fund minus any liabilities divided by the number of shares of the fund outstanding.

Horch (1989) asserts that market price to net asset value ratio does not necessarily correlate to the actual performance of the underlying portfolio of closed-end funds. Rather, it reflects investor perceptions of the future trends of portfolio performance and other, extraneous elements. Thus, a discount from asset value might result from an investor perception of an overvalued securities market or, in the specific case of country funds, an overvalued exchange rate. A premium on asset value would typically reflect the opposite view. However, a premium also arise in a situation in which a particular investment mechanism operates under priviledged conditions viz-a-viz the rest of the market or enjoys a monopoly position. This is exactly what has happened in the case of the various Korea country funds. They represent the only, generally available mechanism for access to portfolio investment in the Korean securities market.

Open-end Investment Companies are the funds for which shares continue to be bought and sold after initial public offering is made. They stand ready to sell additional shares at the NAV of the fund with or without sales charge.

B. PURPOSE OF THE STUDY

As stated previously, although there is a great deal of interest on portfolio performance measures and application these measures to mutual funds, there is no application of risk adjusted performance measures to the country funds. Hence, in this study, closed-end country funds are ranked using Jensen Index, Sharpe Index, Treynor Index within international context. Moreover, some of these funds' performance are compared with

the performance of the respective countrys' market portfolio.

This study proceeds with literature review on performance measures in Section II. Definitions and importance of country funds are presented in Section III, and brief description on international diversification is given in section IV. Then, methodology is explained in section V, and findings are presented in the following section, i.e. Section VI. Finally, in Section VII, conclusions and remarks are given.

II. STUDIES in PORTFOLIO PERFORMANCE EVALUATION

Evaluating the performance of portfolios of risky assets has been one of the major problems in portfolio management. The simplest way of evaluation is to calculate average rate of return. However, all portfolios' average rate of return vary widely over time as the market alternates between bullish and bearish periods. Therefore, average rates of return are not satisfactory measures with which to classify mutual funds' risk and return. Moreover, since risk and return are positively correlated, they also furnish an indication of whether the portfolio can be expected to earn a high, medium, or low rate of return in the long run. Hence, we need a **risk-adjusted measure of performance** that is insensitive to the risk of a portfolio.

Treynor (1965) realized that, associated with each fund there was a range of combinations of expected portfolio return and risk which are consistent with any specified level of market rate of return . He used portfolio-possibility line which measures the rate at which the individual investor increases the expected rate of return of his portfolio as his burden of portfolio risk increases. A comparison of slopes among funds provides a means of rating funds which transcends variations in individual investors' attitude toward risk. Treynor claimed that differences in ranking based on characteristic lines can be quite significant for individual investors, even though they take varying attitudes toward risk.

Sharpe (1966) showed that the performance could be evaluated

with a simple yet theoretically meaningful measure considering both average return and risk This measure precluded the discovery of differences in performance due solely to differences in objectives. For highly diversified funds Treynor and Sharpe Index are similar, however for some relatively undiversified funds, results are different, since Treynor Index can not capture the portion of variability that is due to lack of diversification. If mutual funds hold well-diversified portfolios, any major discrepeancies between the variability of their returns and that portion due to movements in the market are likely to be due to transitory effects. Given some reasonable assurance that a fund will perform its diversification function well, the Treynor Index may provide better predictions of future performance then revard to variability ratio (Reily,1989).

The other most commonly used performance measure has been devoloped by Jensen (1968). The Jensen Index (1969) uses the security market line as a benchmark. The index actually is the difference between expected rate of return on the portfolio and what its expected return would be if the portfolio were positioned on the security market line. It has been also shown that the single-period models can be extended to a multi-period world in which investors have heterogenous horizons and trading takes place continously.

Following the work of Treynor, Sharpe and Jensen, Fama (1972) proposed a somewhat finer breakdown of performance. Similar to previous measures, Fama's evaluation model assumes that the returns on managed portfolios can be judged relatively to those of naively selected portfolios with similar levels of

risk. Fama's technique uses the simple one-period version of two-parameter model, all the perfect market assumptions, and derives the ex ante market line. The ex post market line provides the benchmark used to evaluate managed portfolios in a sequence of more complex measure. He mainly has suggested that the return on a portfolio can be subdivided into two parts: the return from security selection (*Selectivity*)[3] and the return from bearing risk (*Risk*)[4]. He has also presented finer subdivisions of both *Selectivity* and *Risk*.

In practice, a serious problem has been found in the use of Jensen's, Treynor's and Sharpe's composite measures. This is the systematic bias demonstrated by Friend and Blume (1970) and Gaumnitz (1970). They showed that, historically, all three composite measures exhibited systematically biased relationship with the risk measures. Friend and Blume (1970) concluded that this is due to invalidity of an assumption -the existence of equal lending and borrowing rates and opportunities for all investors-used in the development of the composite measures. Ever since the composite performance measures were proposed, some researchers (Arditti, 1967; Arditti,1971; Arditti,1975; Bower, 1969; Ingersoll, 1975; Jean, 1971; Jean, 1973) have argued that the performance may be inadequate because of the failure to consider higher moments of the distributions of investment returns. Arditti (1967), Ingersoll (1975), Jean

[3] Selectivity measures how well the chosen portfolio did relative to naively selected portfolio with the same level of risk.

[4] It measures the return from the decision to take positive amounts of risk.

(1973) tried to include higher moments. These efforts have produced multiple criteria for performance evaluation.

Ang and Chua (1979) developed an Excess Return index as a performance measure based on a mean-variance-skewness model. Moreover, they tested this index with other composite measures for systematic biases. They claimed that the performance measures which also considered the asymmetry of return distributions, in addition to mean and variance, were better. Furthermore, they studied the effect of changing the holding period length on the systematic bias.

Asymptotic distributions of the estimators of the Sharpe and Treynor performance measures are derived by Jobson and Korkie (1981). Multivariate performance comparison measures, based on the traditional Sharpe and Treynor measures, are developed with their corresponding asymptotic distributions. The behaviour of these new performance measures were evaluated in small samples. They have found that for single comparisons, a Sharpe z statistic was well behaved and for multiple comparisons a Sharpe chi-square statistic was reasonably well behaved.

Recently Moses, Cheyney, and Veit (1987) developed a portfolio performance measure that likewise considers the various components of performance that are selection, diversification, and timing. Beyond the measure of performance that considers selectivity, diversification, and timing, the authors suggest that it is preferrable to employ an asset-weighted benchmark portfolio that is similar to the one being evaluated rather than an aggregate market portfolio. The main idea is to combine in the appropriate weights, portfolios for various asset classes such as common stocks, bonds,

preferred stock, and cash.

Application of the composite measures (Jensen, Treynor, Sharpe Indexes) on international portfolios has been discused by Solnick (1989). He points out that although Sharpe Index is both simple and intitutive, it can only be used for the investor's global portfolio. A portfolio whose objective is to be invested in foreign assets to diversify risk of the domestic assets can not be evaluated separately from the total portfolio. The standard deviation of the potfolio will get partly diversified away in the global portfolio, so it is not a relevant measure of the total risk of the foreign portfolio. The application of these methods posses serious problems in an international context, where we lack an asset pricing theory that precisely defines what is meant by market risk.

Reily (1989) stress on the benchmark criticism. He claims that the benchmark problems that were noted by Roll (1981) do not negate the value of CAPM as a normative model of equilibrium pricing. The theory is still viable. According to Reily, the problem is one of the measurement in the usage of portfolio performance evaluation. He suggests to use better proxy for the market portfolio such as world stocks, world bonds or to adjust measured performance for these benchmark errors. As an alternative he asserts that since Sharpe portfolio performance measure does not depend so heavily on the market portfolio, one can consider it giving greater weight.

III. COUNTRY FUNDS

A country fund[5] can be defined as a special investment fund through which resources originating from one or several countries are invested in securities, primarily equities, issued by enterprices domiciled in countries other than those from which the respective resources originate. These "host" countries may be countries with either mature and seasoned or with emerging or developing securities markets. Briefly, the term of "country funds" is applied to funds investing in specific countries with emerging markets or developing securities. It is necessary to make a distinction between "cash" or "new money" country funds and "debt conversion" funds. New money funds are the funds through which foreign exchange resources contributed by the fund's participants from abroad are invested in securities of the host country, whereas debt conversion funds are those in which either original holders or secondary market purchasers of sovereign debt of a developing country convert such debt into securities denominated in local currency.

Generally, the investors in country funds are nationals of, or entities domiciled in, countries other than the host country. However, at least in some countries, off-shore funds are permitted or are otherwise known to have invested in country funds established for portfolio investment in their own countries.

[5] These definitions are taken from Horch (1989).

A. LEGAL STATUS OF COUNTRY FUNDS

The country funds may be established either as an open-ended or a closed-ended fund. The investment in these funds may be represented by either participation units or by shares. However, it is more common to see units being issued by open-ended funds and shares by closed-end funds than vice-versa.

Open-ended trusts offer a higher degree of flexibility and adaptability to changing conditions of growth and development in emerging and developing markets than the closed-end fund. However, open-ended funds are also more vulnerable to price oscillations in volatile markets. Sharp declines in local market price levels may induce investors abroad to ask for redemption which then would either require a correspondingly higher share of the portfolio to remain invested in liquid securities other than equities, or might oblige fund management to divest in a declining and often shallow market.

In contrast, closed-end funds are not directly destabilized as a consequence of local market price oscillations since, whatever the net asset value of the fund, its own share capital remains unaffected in a legal sense, as these funds do not offer redemption options.

In order to reduce the potentially destabilizing effect of an open-ended fund in the early stage of emerging market development, several country funds have been established initially as closed-end funds but provide for their potential transformation in to open-ended funds at a later stage.

Securities in open-ended funds are generally valued at market prices, unless specific rules would require different approach. In the case of closed end funds either the same approach or the

lower of cost or market might be applied.

Finally, the choice between the two basic legal forms to be adopted for a country fund may also be influenced to a substantial degree by different levels of tax incidence of dividend, interest income or capital gains, etc. , depending upon the country of origin.

B. COUNTRY FUND DOMICILE

The country in which country fund is domiciled is a major problem for both fund management and host country developmental benefits. The foreign investment legislation, tax aspects, different levels of access to eligible investments determine whethere country fund is adopted as *on-shore* (within the country) or *off-shore* (outside the country). An on-shore fund could be expected to provide for a larger share of administrative activities to be performed. A somewhat larger contribution to securities market development could be achieved and a more significant support be given to financing of local human advancement.

However, regulatory or administrative obstacles to efforts aiming at the attainment of acceptable levels of fund management efficiency may offset advantages of the on-shore concept. Hence country funds frequently are being established as off-shore funds for reasons of facilities and convinience for internationally coordinated management. As a further variant, an off-shore fund may be established for the sole purpose of investing the proceeds from the placement abroad of its publicly or privately offered shares of preferred stock in an on-shore investment fund for foreign investors. This alternative approach

was adopted in the case of the Thai Prime Fund Ltd.

C. TARGET HOST COUNTRIES

Country funds look for markets of developing economies, whose actual and projected growth rates would at least be equal to, but optimally higher than, those available in the respective targetted investor countries.

Their securities markets would be less developed than those of the investors' home countries. Moreover, some adequately developed and performing domestic equity markets are closed to direct foreign investment. Here, country funds are granted priority or even exclusive permission to acquire, hold and trade in equities and other securities issued in such markets. As long as such exclusivity would prevail, the normal return on investment from performance of the underlying securities would then tend to be supplemented and possibly even overshadowed by capital appreciation in its home market of the country fund's own shares as the only vehicle for obtaining access to a specific host market, provided, of course, that the performance of the latter is sufficiently positive to generate excess demand for investment in such a market. High premium over underlying asset value paid on shares of the various Korea Funds and Trusts prove this point very convincingly.

D. BENEFIT AND RISK TRADE-OFFS

Country funds offer significant benefits to their targetted host countries. They also represent certain risks. Portfolio investments in minority equity positions by country funds may make positive contributions towards a better equilibrium and

would represent much less of a potential political liability than may be the case with direct investments.

Country funds also provide host countries with variety of access routes to international financial markets. This may lead to increasing inflows of additional financial resources, but certainly will have a positive impact upon improving, in the host country, levels of financing techniques and related procedures.

In host countries with major privatization programs, country funds would enlarge the basis for demand by institutional domestic investors with its desirable stabilizing effects on gradual absorption of the respective securities by the market. Hovewer, this function of a country funds could be most effectively performed on the basis of a long term investment strategy. However, in the absence of a sufficiently large absorption capacity of a market, the injection of a relatively significant volume of country fund resources might have destabilizing effect of variying magnitude on the market of the host country.

Moreover, country fund is a professionally managed mechanism for international risk diversification. Furhermore, equity investments in emerging and developing markets have proven to offer investors rates of return which they may not easily find in the markets of their home countries. Previous experiences have shown that, narrow and especially shallow markets reacted strongly in expectation of the establishment of a major country fund. This may have resulted in essentially undesirable speculative upward pressure on price levels prior to the formation of such a fund and may have caused unwarrented

expectations of continuously advancing prices among both local investors and country fund participants.

Risks faced by foreign participants of a country fund concern the possibly lower level of political stability in the host applicable rules, but also add to the volatility of their even normally somewhat less stable economies.

IV. INTERNATIONAL DIVERSIFICATION

The logic of diversifying a portfolio across countries is no different than that of diversifying along any other dimension -whenever returns on different assets are not subject to exactly the same risks, the risks of a diversified portfolio can be less than the risks of the typical individual security. However, international diversification is of special interest for two reasons. First, emprical evidence suggests that it may represent one of the most powerful dimensions for risk reduction through diversification. Second, it is subject to a number of obstacles, including currency and political risks, additional taxes and transactions costs, etc. Thus, international portfolio selection involves complex trade-offs between the potential for reducing risk through diversification and the costs and risks unique to international investment.

A. RISK REDUCTION THROUGH DIVERSIFICATION

The argument often heard in favor of international investment is that it lowers risk without sacrificing expected return. A prerequisite for this argument is that the various capital markets of the world have somewhat independent price given market tend to move up and down together, whereas stocks in different national markets as a rule do not (Solnick, 1989). This provides opportunities for the expert international investor to time the markets by buying those markets that he expects to go up and neglecting the bearish ones. It also

allows naive investors to spread risk, since some foreign markets are likely to go up when others go down. Actually this reasoning is simply a variation on the traditional domestic diversification argument, except that it is extended to a larger universe of fairly independent markets.

B. CURRENCY RISK

Another argument against international diversification is that currency risks (i.e., exchange risks) more than offset the reduction in security risks achieved by international diversification. Indeed, currency fluctuations affect both the total return and the volatility of any foreign currency-denominated investment. From time to time, in fact, its impact on the investment return may exceed that of capital gain or income.

However, currency risks can be hedged by borrowing in the local currency or selling it to forward. Thus, the benefits of international equity investment can be obtained without any significant currency exposure.

C. POLITICAL OR SOVEREIGN RISK

Political or sovereign risk is viewed by many as a major obstacle to international investment. Clearly, political factors are a major determinant of the attractiveness for investment in any country. Countries viewed as likely countries for international political upheaval or with a pronounced trend toward elimination of private sector will be unattractive to all investors, foreign and domestic alike. As a result, securities of these countries should be priced accordingly and little new

private real investment will take place.

D. TAXES, RESTRICTIONS ON OWNERSHIP, AND OTHER INSTITUTIONAL OBSTACLES

There are several institutional obstacles that can make international investing costly, undesirable, or in some cases, impossible. They include formal barriers to international transactions, such as exchange controls that do not allow investors in one country to invest overseas or that limit overseas investment to a fixed pool, double taxation of portfolio income for certain investors in particular countries, and restrictions on ownership of securities according to the nationality of the investor. These obstacles also include informal barriers, such as the difficulty of obtaining information about a market, differences in reporting practices that make international comparisons difficult, and, perhaps most important, subtle impediments to foreign investment based on traditional practice.

V. METHODOLOGY

As stated previously in the introduction, Treynor, Sharpe and Jensen's performance measures are used to rank country funds both in international context and to compare funds with market index within respective countries. Since only closed-end funds are ranked, closing prices of funds in last Friday of each month are collected. All the data covers the period between August 1988 and February 1990.

Then, to compare funds in the international context all prices are converted into US dollars. Later returns are calculated. During calculation of returns stock split adjustments have been made. For domestic comparisons, returns are computed in the respective countries' currencies.

Finally, the three performance measures are applied and funds are ranked.

A. CALCULATION OF RETURNS, RISKFREE RATE AND SELECTION OF INTERNATIONAL STOCK MARKET INDEX

The prices of funds which are traded in New York Stock Exchange and AMEX are collected from Wall Street Journal, and the prices of others which are traded in London Stock Exchange, are obtained from Financial Times.

A Mathematical Model For Measuring Return

The basic unit of measurement is the rate of return. In calculating the rate of return, one should consider the fact

that funds are traded in different countries with different currencies. Hence, investors are exposed to exchange rate risk[6] in investing country funds.

The base-currency rate of return is used to consider the exchange rate risk. The base-currency rate of return is the translation of all prices into base currency o at the exchange rate Sj:

$$R_{jo} = \frac{P_j^t S_j^t - P_j^{t-1} S_j^{t-1}}{P_j^{t-1} S_j^{t-1}} \qquad (1)$$

where,

R_{jo} = is the rate of return in country j in base currency o.

P_j^t = Price of the asset in country j at time t.

P_j^{t-1} = Price of the asset in country j at time t-1.

S_j^t = Spot exchange rate of country j at time t.

S_j^{t-1} = Spot exchange rate of country j at time t-1.

Since all prices are converted into the base currency prices, exchange rate risk is implicitly incorporated. In this study US$ is set as the base currency and UK Pound returns are translated into US$ returns using the formula (1). UK Pound - US$ exchange rates are collected from the Wall Street Journal.

$$Rj = \frac{P_t - P_{t-1}}{P_{t-1}} \qquad (2)$$

[6] Exchange rate risk is the uncertainty of returns on securities acquired in a different currency. This particular risk is a major consideration for investors who buy and sell assets around the world.

For domestic comparisons, returns are translated into home country's currency using the formula (2) also.

As it is seen in the formulas, dividends are not included. There are two reasons for ommiting them:

i. It is not possible to trace exact month, in which dividends are paid, in the journals,

ii. Dividends are negligibly small.

However stock splits are considered and returns are adjusted accordingly.

Calculation of the Risk Free Rate

To apply Treynor and Jensen Measures for international portfolio ranking, a global risk-free rate is needed. However, as far as we know, such an instrument is not available. In this situation, it is better to use zero-beta model. Zero-beta model developed by Black (1972) does not require a risk free rate, if the market portfolio is mean-variance efficient. Specifically, within the set of feasible alternative portfolios there will be several portfolios where returns are completely uncorrelated with the market portfolio; the beta of those portfolios with the market is zero. While the availability of the zero-beta portfolio will not affect the CML (Capital Market Line), it will allow the construction of the a linear SML. Furthermore, Huang and Litzenberger (1988) demonstrated that return of the zero-beta portfolio can be used as a risk-free rate in CML also.

In order to calculate zero-beta portfolio, different portfolios are formed and their covariances with the

international market portfolios are calculated. It is found that combination of Australia Fund and Spain Fund with the percentages of 80.75% and 19.248% respectively forms a zero beta portfolio.

For the performance comparison of the funds with respect to performance of the home countries' market, risk-free rates of the home countries should be collected. These rates are obtained from IFS and they are adjusted for monthly returns.[7]

Selection of the International Market Index

Reily says that if a better proxy for the market portfolio is found, CAPM is applicable in the international context. Hence, as an approximation for the global market index, the world index published in Financial Times is used. This index contains several stock markets and instruments such as common stocks, bonds etc. Since this world index is calculated in US$, there is no need to translate the returns.

Furthermore domestic market index of each country is needed for domestic analysis of the country funds. These returns are obtained from IFS (International Financial Statistics). Since stock market index of each country is not published, this study is restricted to nine countries only.

[7] For monthly returns, the following transformation is used :

$$R_m = (1+R_a)^{(1/12)} - 1$$

where,

R_m = Monthly return

R_a = Annual Return

B. SELECTION OF COUNTRY FUNDS

Country funds as stated previously are formed as closed-end or open-end funds. The closing prices of closed-end funds are given in journals like Wall Street and Financial Times. However access to information on open-end funds is considerably difficult. Hence, this study is focused on the closed-end funds which are presented in table 1.

Other funds are not considered because of the following reasons:

i. Some of the funds are traded in the markets which the Financial Times and Wall Street don't report and it was difficult to obtain data on these funds.

ii. A number of closed-end funds which were previously traded have been dissappeared from London Stock Exchange such as Opporto Growth Fund, Taiwan (R.O.C) Fund, Bangkok Fund.

C. TREYNOR PERFORMANCE MEASURE

Treynor Measure would apply to all investors regardless of their risk preferences. Building upon developments in capital market theory, Treynor introduced a risk-free asset that could be combined with different portfolios to form a straight *portfolio possibility line*. Rational, risk averse investors always prefer portfolio possibility lines that have a larger slope because such high slope lines would place on a higher indifference curve. The slope of this portfolio possibility line (designated T) is equal to the following:

Fund Name	Principal Market	Listed On
Templeton E.M.	All LDCs	AMEX
Brasil Fund	Brasil	NYSE
India Fund	India	London
India Growth Fund	India	NYSE
Korea Fund	Korea	NYSE
Korea-Europe Fund Ltd.	Korea	London
Malaysia Fund	Malaysia	NYSE
Mexico Fund	Mexico	NYSE
Taiwan Fund	Taiwan	AMEX[8]
Thai Fund Inc.	Thailand	NYSE
Thai-Euro Fund	Thailand	London
Germany Fund	Germany	NYSE
U.K. Fund	U.K.	NYSE
Helvetia Fund	Switzerland	NYSE
Spain Fund	Spain	NYSE
First Australian Fund	Australia	NYSE
Italy Fund	Italy	NYSE
France Fund	France	NYSE
First Iberian Fund	Spain	NYSE
Portugal Fund	Portugal	London

Table 1. Country Funds Which are Considered in the Study

[8] After December of 1988, this fund was quoted in NYSE.

$$T = \frac{R_i - R_f}{\beta_i} \qquad (3)$$

where

R_i = the average rate of return for portfolio i during a specified time period

R_f = the average rate of return on a risk-free investment during the same time period

β_i = the slope of the fund's characteristic line computed during that time period, which indicates the fund's relative volatility.

The larger the T value, the larger the slope and the more preferable the fund is for all investors, regardless of their risk preferences. Since the numerator of this ratio ($R_i - R_f$) is the *risk premium*, and the denominator is a measure of risk, the total expression indicates the portfolio's *return per unit of risk*, and all risk-averse investors would prefer to maximize this value. The systematic risk variable, however, indicates nothing about diversification but implicitly assumes complete diversification, so systematic risk is the relevant risk measure. When this T value for a portfolio is compared to a similar measure for the market portfolio, it indicates whether the portfolio would plot above the SML.

It is important to note that this measure of performance is not affected by changing the Rf. The T values may change, but the ranking of portfolo is not affected. It is possible to have negative T values if the portfolio has a return below the Rf and a positive beta, which would indicate extremely poor management.

Alternatively, if the T value is negative because the beta was negative, and the numerator was not negative, it would indicate *very good performance.* Normally, a portfolio with a negative beta should experience a rate of return below the Rf, so both the numerator and the denominator would be negative, (and the T value would be negative) and the T value woul be positive.

D. SHARPE PERFORMANCE MEASURE

The predicted performance of a portfolio is described with two measures the expected rate of return E(Ri) and the predicted variability or risk, expressed as the standard deviation of return (σi). In order to apply Sharpe measure, following assumptions are made:

i. All investors are able to invest funds at a common risk-free interest rate and borrow funds at the same rate.

ii. At any point of time, all investors share the same predictions concerning the future performance of securities.

Under these assumptions all efficient portfolios will fall along a straight line of the form :

$$E(R_i) = R_f + b\,\sigma_i \quad , \qquad (4)$$

where,

$E(R_i)$: the expected rate of return on portfolio i.

R_f : the risk-free rate of return

b : the risk premium, which will be positive since investors are assumed to be risk averse.

σ_i : the standard deviation of returns for portfolio i.

If an investor can borrow or lend at the risk free rate and/or

invest in a portfolio with the predicted performance (E[Ri],σi), then by allocating his funds between the portfolio or lending he can attain any point on the capital market line,

$$E(R) = R_f + \left[\frac{E(R_i) - R_f}{\sigma_i} \right] \sigma. \qquad (5)$$

Any portfolio will give rise to a complete linear boundary of E(R), σ combinations. The best portfolio will be the one giving the best boundary which is the portfolio with the highest ratio of :

$$\frac{(E[R_i] - R_f)}{\sigma_i}$$

Other efficient portfolios must lie along the common line and give the same ratio.

The capital-market model described above deals with predictions of future performance. For the predictions can not be obtained in any satisfactory manner, the model cannot be tested directly. Instead, ex post values have to be used. Hence average rate of return, and the actual standard deviation of its rate of return is used for its predicted risk in this study.

An intituitively appealing and theoretically meaningful measure of performance is derived with substitution of the ex post measures R and V for the exante measures (E(R), σ), the formula (5) becomes

$$A = R_f + \left[\frac{\bar{R}_i - R_f}{V_i} \right] V \qquad (6)$$

However, in practice, the *Sharpe Measure* or *Reward-to-Variability Ratio* is stated as follows:

$$S = \frac{R_i - R_f}{V_i} \qquad (7)$$

The Sharpe measure can be used to rank the performance of portfolios and will not be affected by changes in the Rf, since such changes will affect all values. Also, this measure can be calculated for aggregate market and this market measure can be used to examine the performance of portfolios relative to the aggregate market.

E. JENSEN PERFORMANCE MEASURE

The measure of portfolio performance described below is derived from a direct application of theoretical results of the capital asset pricing models. All versions of the CAPM are based on the following assumptions :

i. all investors are risk-averse and single period expected utility of terminal wealth maximizers,

ii. all investors have identical decision horizons and homogenous expectations regarding investment opportunities,

iii. all investors are able to choose among portfolios solely on the basis of expected returns and variance of returns,

iv. all transaction costs and taxes are zero, and

v. all assets are infinitely divisible.

Given the additional assumption that the capital market is in equilibrium, the capital asset pricing models yield the expected one period return , $E(R_j)$, on any security (or portfolio) j:

$$E(R_j) = R_f + \beta_j \left[E(R_m) - R_f \right] \qquad (8)$$

R_F = the one-period risk-free interest

$\beta_j = \dfrac{\text{cov}(R_i, R_m)}{\sigma_m^2(R_m)}$ the measure of risk which the asset pricing model implies is curitial in determining the prices of risky assets.

$E(R_m)$ the expected one-period return on the market portfolio which consists of an investment in each asset in the market in proportion to its fraction of the total value of all assets in the market.

Equation (8) then simply tells us what any security (or portfolio) can be expected to earn given its level of systemetic risk, β_j. If a portfolio manager or security analyst is able to predict future security prices he will be able to earn higher returns than those implied by eq (8) and the riskiness of his portfolio.

It has been shown that single-period models can be extended to a multiperiod world in which investors are allowed to have heterogenous horizon periods and in which the trading of securities takes place continously through time.

Hence, eq. (8) can be generalized as follows:

$$E(R_{jt}) = R_{ft} + \beta_j \left[E(R_{mt}) - R_{ft} \right] \qquad (9)$$

Each of the expected returns and the risk-free return are different for different periods. Consequently, we are concerned with the time series of expected rates of return for security (or portfolio) j. In addition, assuming that the asset pricing model is emprically valid, it is possible to express the expectations formula in terms of realized rates of returns as follows:

$$R_{jt} = R_{ft} + \beta_j (R_{mt} - R_{ft}) + e_{jt} \qquad (10)$$

This equation says that the realized returns on any security or portfolio can be expressed as a linear function of its systematic risk, the realized returns on the market portfolio, the risk free rate and random error, e_{jt}, which has an expected value of zero.

When the risk-free return, Rf, is subtracted from both sides, we have

$$R_{jt} - R_{ft} = \beta_j \left[\bar{R}_{mt} - \bar{R}_{ft} \right] + e_{jt} \qquad (11)$$

This indicates that the risk premium earned on the j^{th} security or portfolio is equal to β_j times a market risk premium plus a random error term. In this form, you would not expect an intercept for the regression if all assets and portfolios are in equilibrium. If the portfolio manager is a superior forecaster he will tend to systematically select securities which realize

$e_{jt} > 0$. Hence his portfolio will earn more than the "normal" risks premium for its level of risk. To reveal such superior performance, the regression must not be constrained to go through the intercept (i.e. do not force it to be zero). If we allow for a possible non-zero constant, eq. 10 becomes

$$R_{jt} - R_{ft} = \alpha_j + \beta_j \left[\bar{R}_{mt} - \bar{R}_{ft} \right] + u_{jt} \qquad (12)$$

Thus if the portfolio manager has an ability to forecast security prices, the intercept, α_j, in eq. (12) will be positive. In fact, it represents the average incremental rate of return on the portfolio per unit time which is due solely to the manager's ability to forecast future security prices. It is interesting to note that a naive random selection buy and hold policy can be expected to yield a zero intercept. Moreover, if the manager is not doing as well as a random selection buy and hold, α_j, will be negative.

VI. FINDINGS

In order to calculate Jensen Index and Treynor Index, alpha (α) and beta (β) coeffiecients should be estimated. To estimate these coefficients following regression is carried out.

$$Rit - Rft = \alpha + \beta \left[\bar{Rmt} - \bar{Rit} \right] + \varepsilon it$$

The results of this regression is presented in Table 2. As it is seen alpha values of Malaysia and Australia Funds are significant with the critical value of 0.2. Germany and Thailand Funds have significant α in the level of 0.1 and alpha of the Mexico is significantly different from zero with the critical value of 0.05. Although most of the funds have insignificant alphas, majority of the funds have significant beta values. Only Germany Fund, Templeton E.M. Funds have insignificant beta values. All the F statistics are significant with the critical value of 0.1 except the statistic of Australia Fund. It means CAPM model does not explain the returns of Australia Fund well. This result is also proved by the R^2 of the fund which is 0.96 %. One should notice that R^2 of the U.K. fund is quite high (82.6%). The depth and breadth of London is enormous and it is one of the biggest stock market on the world. Hence, high correlation of the U.K. Fund with the world stock market is not surprising. However, R^2s of the most funds are not so high because these funds are not diversified internationally. Finally, Templeton E.M. Fund shows first order negative auto-correlation.

COUNTRY FUND	AVG RETURN	STD DEVIATION	ALPHA	T-RATIO	BETA	T-RATIO	F-RATIO	R-SQUARED	DW	RISK FREE RATE
MALAYSIA FUND	6.6093	17.6332	5.7548	1.481	0.959	2.752	7.575	0.3213	2.152	0.462282
MEXICO FUND	6.72157	11.3452	6.0599	2.889	0.323	1.714	2.938	0.1552	2.516	0.462282
GERMANY FUND	7.9183	16.8417	6.977	1.825	2.326	0.743	4.672	0.226	2.261	0.462282
KOREA FUND	1.1647	9.893	0.1388	0.061	0.9126	4.43e	19.651	0.5526	1.518	0.462282
PORTUGAL FUND	-0.2945	13.187	-1.29	-0.434	0.866	3.244	10.527	0.3968	1.543	0.462282
U.K. FUND	0.9915	7.03435	-0.10682	-0.082	1.0332	8.715	75.965	0.826	2.579	0.462282
HELVETIA FUND	2.74	5.955	1.7527	1.315	0.85	7.115	50.623	0.7598	1.281	0.462282
TEMPLETON E.M. FUND	4.113e7	13.074	3.0712	1.036	2.953	0.9366	11.755	0.4235	3.429	0.462282
THAILAND FUND INC.	5.045	9.6164	4.021	1.852	0.9859	4.755	22.609	0.5656	1.798	0.462282
SPAIN FUND	7.0936	21.3921	5.5247	1.226	1.7789	4.402	19.379	0.5477	1.37	0.462282
AUSTRALIA FUND	2.261417	13.673	1.7755	1.644	0.9361	4.755	0.156	0.0696	1.6	0.462282
ITALY FUND	5.15045	14.05558	4.0349	1.248	1.0586	3.647	13.304	0.454	2.295	0.462282
THAI-EURO FUND	-0.1991	10.61	-1.54453	-0.761	1.43	7.661	61.788	0.7543	2.032	0.462282
INDIA FUND	-1.96695	19.2306	-2.93284	-0.833	0.767	1.808	3.268	0.1696	1.849	0.462282
THAI-EURO FUND	3.1159	12.2514	2.03668	0.7	0.999	3.632	14.892	0.4765	2.357	0.462282
KOREA-EUROPE FUND	3.6434	12.6423	2.6508	0.853	0.85667	3.082	9.498	0.3725	2.142	0.462282
BRASIL FUND	3.1764	13.29485	2.03049	0.639	1.1071	4.191	17.567	0.5232	1.912	0.462282
FRANCE FUND	5.4503	15.926	1.99675	0.532	1.771	3.998	15.966	0.5331	2.236	0.462282
IBERIA FUND	7.939	14.0975	2.9548	0.892	0.829	2.781	7.734	0.3259	1.879	0.462282
INDIA GROWTH FUND	2.145	11.662	1.1261	0.412	0.9825	4.006	16.048	0.5303	2.06	0.462282

Table 2. Regression Results of Characteristic Line in the International Context

Following the regression results Jensen, Sharpe and Treynor measures are calculated and funds are ranked acording to results of the measures separately. Each method has prevailed similar results. Ranking with respect to Treynor measure is given in Table 3. In this ranking, Australia Fund shows the highest performance with T=19.37. Malaysia, Thailand, Italy, Iberia, Spain, Korea-Euro, Germany, France, Helvetia, Thai-Euro, Brasil, India Growth, Temleton E.M. and UK Funds follow Mexico Fund in order. The last three fund have shown poor management. Since their returns are negative, Treynor index also becomes negative.

Results of ranking obtained by using Sharpe Index are tabulated in Table 4. Mexico demonstrates the highest

Rank	Country Fund	Treynor Measure
1	Australia Fund	47.22
2	Mexico Fund	19.37
3	Malaysia Fund	6.61
4	Thailand Fund	5.05
5	Italy Fund	4.42
6	Iberia Fund	4.18
7	Spain Fund	3.72
8	Korea-Europe Fund	3.70
9	Germany Fund	3.20
10	France Fund	2.81
11	Helvetia Fund	2.67
12	Thai-Euro Fund	2.65
13	Brasil Fund	2.45
14	India Growth Fund	1.76
15	Templeton E.M. Fund	1.27
16	Korea Fund	0.76
17	U.K. Fund	0.51
18	Taiwan Fund	-0.46
19	Portugal Fund	-0.87
20	India Fund	-3.16

Table 3. Ranking of the Country Funds Using Treynor Measure

Rank	Country Fund	Sharpe Measure
1	Mexico Fund	0.55
2	Thailand Fund	0.47
3	Germany Fund	0.44
4	Helvetia Fund	0.38
5	Malaysia Fund	0.36
6	Italy Fund	0.33
7	France Fund	0.31
8	Spain Fund	0.30
9	Templeton E.M. Fund	0.28
10	Korea-Europe Fund	0.25
11	Iberia Fund	0.24
12	Thai-Euro Fund	0.21
13	Brasil Fund	0.20
14	India Growth Fund	0.14
15	Australia Fund	0.13
16	U.K. Fund	0.075
17	Korea Fund	0.07
18	Portugal Fund	-0.05
19	Taiwan Fund	-0.06
20	India Fund	-0.12

Table 4. Ranking of the Country Funds Using Sharpe Measure

Rank	Country Fund	Jensen Measure
1	Germany Fund	6.99
2	Mexico Fund	6.06
3	Malaysia Fund	5.75
4	Spain Fund	5.52
5	Italy Fund	4.03
6	Thailland Fund	4.02
7	Templeton E.M. Fund	3.07
8	Iberia Fund	2.96
9	Korea-Europe Fund	2.65
10	Thai-Euro Fund	2.04
11	Brasil Fund	2.03
12	France Fund	1.91
13	Australia Fund	1.77
14	Helvetia Fund	1.75
15	India Growth Fund	1.12
16	Korea Fund	0.14
17	U.K. Fund	-0.11
18	Portugal Fund	-1.29
19	Taiwan	-1.54
20	India Fund	-2.90

Table 5. Ranking of the Country Funds Using Jensen Measure

performance, Thailand and Germany Funds show the second and third best performance. On the other hand, Portugal, Taiwan, India Funds have shown the poorest performance with negative average returns.

Results of ranking with Jensen Index, in Table 5, are similar to the results of Treynor and Sharpe Measures. Moreover, according to Jensen Index only the managers of Malaysia, Australia, Germany, Thailand and Mexico Funds are superior in market timing and stock selection since alpha values of these funds are statistically different from zero. Performance of the other fund managers are equal to a naive buy and hold policy.

Although results of three measures are similar, there are some differences in rankings. For example, Australia Fund has shown the best performance according to Treynor Index though the same fund has the rank of 13 in Jensen Method and 15 in Sharpe Measure. At this point, it is necessary to test whether these three methods really show the similar results. Thus, correlation matrix[9] of these measures are calculated. Results are given in Table 6.

[9] In order to calculate correlation among mesures a number is assigned for each country fund first. Then these numbers are replaced with the names of the funds in rankings, and correlation matrix is calculated.

	C1 [1]	C2 [2]	
C2	0.678		
C3 [3]	0.764	0.853	

Table 6. Correlation Matrix of the Performance Measures

1 C1 stands for Treynor Measur
2 C2 stands for Sharpe Measure
3 C3 stands for Jensen Measure

All the correlations are positive and quite high. Jensen and Sharpe Measures have the highest correlation. Moreover, high correlation between Treynor and Sharpe Measure is not surprising because both methods considers the systematic risk. It is possible to conclude that these three measures prevail the similar results despite some minor discrepancies.

The question why the results of the ranking methods are not exactly the same, may arise now. The difference between rankings with Sharpe Index and Treynor Index can be explained by the type of risk considered in both methods. The Sharpe Measure uses the standard deviation of returns as the measure of risk, while Treynor Index employs the systematic risk, β. Since the country funds behave as a single security in the global market, their unsystematic risks are higher. This can be seen from R^2s of the regressions. Most of the R^2s are less than 60 %. It means at most 60 % of the total risk can be explained by the fluctuations of the global market, the rest belongs to specific risk of the home country. If these funds were internationally well-diversified, results of the both methods would be the same. Furthermore, these three measures are tested to see whether they exhibit systematically biased relationship with risk

measures. Results are tabulated in Table 7.

Performance Measure		=	a + b Risk Measure	$\bar{R}^2$
1)	T	=	$\underset{(3.20)}{14.5} - \underset{(-2.29)}{8.02}$ X1	18.3 %
2)	T	=	$\underset{(0.55)}{5.08} + \underset{(0.04)}{0.024}$ X2	0.0 %
3)	S	=	$\underset{(2.07)}{0.178} + \underset{(0.65)}{0.0431}$ X1	0.0 %
4)	S	=	$\underset{(1.50)}{0.233} - \underset{(-0.04)}{0.0004}$ X2	0.0 %
5)	J	=	$\underset{(0.98)}{1.21} + \underset{(1.01)}{0.961}$ X1	0.2 %
6)	J	=	$\underset{(-0.1)}{-0.22} + \underset{(1.21)}{0.191}$ X2	2.3 %

Table 7. Regressions of Performance Measures on Risk

S represents the Sharpe Measure of performance;
T represents the Treynor Measure of performance;
J represents the Jensen Measure of performance;
X1 represents beta coefficient of a portfolio;
X2 represents the standard deviation the standard deviation of portfolio return;
$\bar{R}^2$ represents the coefficient of determination adjusted for degrees of freedom. The figures in paranthesis are t-values.

It is found that these measures are insensitive to risk measures except Treynor Index. Coefficients of risk factors are not statiscally different from zero. Moreover, $\bar{R}^2$s of measures are not significant. However, Treynor Measure has shown biased relationship with the systematic risk measures. Since the correlation between systematic risk and Treynor Measure is low, this biase does not affect results much.

When we regress the returns of the funds with respect to the market returns of the originating country, following results are

obtained.

COUNTRY FUND	AVG RETURN	STD DEVIATION	ALPHA	T-RATIO	BETA	T-RATIO	F-RATIO	R-SQUARED	DW	RISK FREE RATES
FRANCE FUND	1.19585	12.4467	-1.11637	-0.313	0.56126	1.089	1.185	0.0975	1.299	1.17831
INDIA FUND	2.763	0.6297	13.956	69.212	0.0775	0.721	0.525	0.0551	0.287	1.2116
GERMANY FUND	2.1836	5.35534	-0.34070	-0.351	0.705	5.038	25.385	0.6977	1.895	1.17194
U.K. FUND	2.2163	5.7773	0.2839	0.229	0.8499	3.082	9.498	0.4674	2.475	1.21597
KOREA FUND	-1.467	22.2421	-2.3481	-0.351	-0.173	-0.177	0.032	0.0029	1.711	1.21152
IBERIA FUND	0.79649	7.92897	0.13475	0.071	1.1901	2.276	5.18	0.2252	1.29	1.23576
SPAIN FUND	4.67981	8.7202	3.65989	1.541	0.425	0.867	0.445	0.0259	1.352	1.23576
ITALY FUND	1.73639	6.47251	0.3171	0.157	0.18	0.655	0.429	0.412	2.779	1.21752
KOREA-EUROPE FUND	6.719	12.339	6.6368	1.883	-0.57926	-1.136	1.242	0.1267	2.395	1.21152

Table 8. The Regression Results of Characteristic Line For The Domestic Market of Country Funds

Alpha values of France, Germany, U.K., Korea, Iberia and Italy are insignificantly different from zero even with the critical value of 0.2. Results also show that β values of India, Korea, Spain, Italy, Korea-Europe Fund are insignificant in the level of 0.2.

In order to compare the performances of the country funds and originating countries' market portfolios, Treynor Index, Sharpe Index, and Jensen Index are calculated for both the country funds and market portfolios. Results are listed in Table 9. All the funds, except Korea Fund, have shown superior performance compared to market portfolios of their originating countries. The reason, why Korea Fund has shown bad performance compared to market portfolio of Korea, can be explained by the appreaciation of Korea's currency with respect to US$. Moreover, share price of Korea Fund is quite higher than its net asset value and any small deviation in net asset value results in higher deviations

in share prices.

Jensen Index of France Fund and Germany Fund are negative. However, this result does not mean that these funds have demonstrated poor performance because alpha values of both funds are not statistically different from zero.

Country Fund	T1	T2	S1	S2	J
France Fund	-0.07	-1.33	-0.003	-2.28	-1.11
India Growth Fund	42.06	3.22	2.53	0.66	13.956
Germany Fund	1.43	1.04	0.17	0.58	-0.34
U.K. Fund	1.15	0.82	0.17	0.19	0.28
Korea Fund	15.48	1.09	-0.12	0.22	-2.35
Iberia Fund	-0.37	-0.42	-0.05	-0.12	0.134
Spain Fund	7.95	-0.42	0.42	-0.12	3.66
Italy Fund	3.99	-0.37	0.11	0.08	0.31
Korea-Europe Fund	-9.33	1.09	0.44	0.22	6.63

Table 9. Treynor Measure, Sharpe Measure and Jensen Measure Results of Country Funds and Market Portfolios of the Originating Country.

Note:

T1 stands for the Treynor Measure of the country funds,
T2 stands for the Treynor Measure of the market portfolios,
S1 stands for the Sharpe Measure of the country funds,
S2 stands for the Sharpe Measure of the market portfolios,
J stands for the Jensen Measure of the country funds.

VII. CONCLUSION

The performance measures have shown similar results when we apply them to country funds. Correlation among the performance measures are positive and high. Jensen Measure and Sharpe Measure have shown the highest correlation, 85.3 %. Correlation between Treynor and Jensen Measures is also quite high since both methods rank funds with respect to systematic risk factor. However, since country funds are not internationally diversified minor differences in rankings of these three measure are not astonishing.

In order to rank country funds, we need a measure that can be used for any portfolio as well as individual securities. Both Treynor and Jensen Measures can be used for this purpose. However, Sharpe Measure are applied to portfolios which are purported to be efficient. Country Funds behave as a single security in the international context, and it may not be an efficient portfolio. Hence, using Sharpe Measure alone may be misleading. It is recomended to rank country funds with Treynor or Jensen Measures. Sharpe Index can be used as a supplemantary information.

Furthermore, it is found that Sharpe, Jensen Measures are insensitive to both systemetic risk and standard deviation of returns. Treynor Index has been found to be sensitive to the systematic risk although it is insensitive to standard deviation of returns. However, correlation between Jensen Index and systematic risk is not much and bias in this method does not affect results significantly.

In this study we assumed all markets are integrated on the world. Hence, International Capital Asset Pricing Model holds. However, in the case of segmented markets hypothesis ICAPM will not hold and these measures would be useless. As a next study, one can develop a performance measure for the segmented market hypothesis. As a further recommendation, this study should be handled with more data in order to see the change in the performance of funds over time.

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