2. Benefits from Diversification into Emerging Markets

Theories and Evidence*

Research on international investing has focussed predominantly on developed markets. There is extensive evidence on diversification and risk in international investments, in the context of European markets and American markets. Emerging markets have come into sharp focus only in the 1990s. Research on emerging markets is not as extensive, nor have all the issues been examined in detail. The lack of availability of data on emerging markets was an important deterrent to empirical research. The setting up of the IFC's Emerging Markets Data Base, and the growing coverage of emerging markets by the media, have spurred research in the recent years.

This chapter examines research on international diversification and the research issues in the context of both developed and emerging markets. The varied strands of evidence on international diversification are put together, while evolving research issues for the present study. The chapter is divided into two parts. In sections 2.1 to 2.6 we review research on diversification benefits and examine alternate approaches to understanding risk and asset pricing in the international context. Sections 2.7 to 2.9 describe the research problem and the data set. This chapter

provides an overall perspective on the research issues that have been examined in the context of international investments and emerging markets. Specific work that focuses on the very set of experiments that we have undertaken, and research methodology that is used, is discussed prior to each set of results presented in the subsequent chapters.

2.1. The Case for International Diversification

The seminal works of Markovitz (1959) and Sharpe (1964) have contributed significantly to the understanding of risk, return and diversification and the application of these concepts in management of portfolios. It is now well accepted that a rational investor would hold the market portfolio; would diversify away unsystematic risks in his portfolio; and as long as assets that dominate the mean-variance frontier exist, can achieve a superior risk-reward ratio through diversification into such dominating assets. Investing internationally essentially means expansion in the opportunity set of risky assets available. Therefore, the core question is whether foreign risky assets impact the risk of a portfolio in a manner similar to the behaviour of domestic assets, or if there is a significant difference.

The case for international diversification was first presented in Levy and Samat (1970), Lessard (1973) and Solnik (1974a). The major arguments for international diversification are as follows:
a. The relative independence of world markets as evidenced by the lack of correlation in returns causes a reduction in portfolio risk, because it is the value of the covariance that determines the extent of portfolio risk. Therefore, as long as markets exhibit low correlation with one another, international diversification should provide significant risk reduction possibilities.

b. If the relative independence of markets is caused by the dominance of domestic factors in the pricing of securities, then international diversification would provide the opportunity to diversify away the systematic risk that is not diversifiable in the domestic markets.

c. If markets are independent, in a portfolio sense, it would mean that there are more asset classes with varying levels of risk and return. From this point of view, international diversification can achieve risk reduction without sacrificing the expected returns, leading to a superior risk-return trade off.

Lessard (1974) provided early evidence of the case for international diversification, by pointing out that world factors do not dominate asset returns, and that dominance of local factors keeps markets segmented and enables diversification across markets. Solnik (1974a) is the most widely cited paper on the case for international diversification. The risk in a portfolio drops as number of stocks in the portfolio increases, but beyond a certain point, the risk curve flattens out indicating that a certain level of systematic risk has to be borne, irrespective of the size of the portfolio. Solnik illustrated, using the price movements of 300 European stocks and all shares quoted on the New York Stock Exchange, that markets differ in terms of
how much of risk can be diversified away. Importantly, he showed that the level of systematic risk is lower in an internationally diversified portfolio.

Solnik and Noetzlin (1982) compared the performance of passive and active strategies for US investors over the period 1970-1980, using the Markovitz portfolio optimisation framework. They showed that diversifying internationally reduces risk. A pure passive strategy of investing in the Morgan Stanley Capital International World stock Index would have produced 50% higher returns, while reducing the risk. They also showed that the world market portfolio was not on the efficient frontier and that active asset allocation strategies would pay off in international diversification.

Ibbotson and Siegel (1983) illustrated the benefits of international diversification, by constructing a World Wealth portfolio. This portfolio comprised of all asset classes that were available to investors in the US. They demonstrated that this portfolio outperformed the median US pension fund, in both risk and return terms, over a twenty year period 1960-1980.

Other studies such as Jorion (1985), Grauer and Hakansson (1986) also indicate that active asset allocation strategies in international portfolios would produce superior risk-adjusted returns. Tapley (1986) provides a discussion of the case for international investments, and recommends a 20-40% exposure to foreign markets, and argues that objections to international diversification such as taxes and indirect barriers do not weaken the case for international investing. More recently, Solnik (1994) provides a concise account of the benefits of international diversification, in the context of the choices for the European Union to manage its assets.
2.2. Diversification and Emerging Markets

The surge in international portfolio investments into emerging markets has spurred a series of research into the factors influencing inclusion of emerging markets in international portfolios. (Park and Agtmeal (1992), Claessens and Gooptu (1993), Mobius (1994), and Shashikant and Suri (1996) examine the factors influencing the flow of investments into emerging markets.

One of the earliest studies on the benefits of investing in emerging markets was Levy and Samat (1970), illustrating the diversification benefits using the local stock market indices over the period 1951-1967. Lessard (1973) studied the Latin American markets over the period (1958 -1968) and found that including Latin American stocks in a US portfolio would provide significant diversification benefits. Errunza (1977) found that benefits from including emerging markets in a portfolio persist over long time periods, studying data from 1957-1972. Other early studies that have highlighted the diversification benefits from emerging markets are Agtmael and Errunza (1982) and Errunza (1983).

Bailey and Stulz (1990) analyse the benefits of diversifying into the Pacific rim markets, in the context of the increasing dominance of Japan in the world market capitalisation. Their study however includes 6 emerging markets in the Pacific Rim, apart from Japan and Hong Kong. They illustrate that a US investor holding the S&P Index would have reduced the standard deviation of his portfolio by a third, by diversifying into the Pacific Rim markets. Solnik (1991b) also looks at the diversification benefits from Pacific Basin markets, and draws similar conclusions.
The efficient frontier which excludes the Pacific basin markets is found to be strongly dominated by the efficient frontier which includes them. Significantly, investing in the emerging markets in the Pacific Basin was found to improve the risk-return trade-off substantially.

Rudd (1991) finds evidence of very little correlation between emerging markets and developed markets, and also highlights the pre-dominance of market factors in the returns from the emerging markets. Bailey and Lim (1992) and Diwan, Errunza and Senbet (1992) have studied the benefits available to international investors subscribing to the country funds from emerging markets. Divecha, Drach, and Stefek (1992) examined the risk and return attributes of about 4000 emerging market stocks and find that though the volatility in individual markets is high, low correlations that are exhibited with developed markets implies that modest investments can bring about substantial reduction in risk. They also find evidence of homogeneity within the markets, in that the domestic market factor dominates the return in these markets.

Spiedell and Sappenfield (1992) draw out the additional benefits from emerging market investments, by pointing out that developed market correlations are increasing while emerging markets remain rather segmented, offering superior diversification opportunities. Wilcox (1992) points out that even after assuming additional taxes and trading costs, a 15% allocation to emerging markets will benefit a typical pension portfolio. Errunza (1994) provides an overview of research and summarises the concerns in emerging market investments. He argues that diversification benefits from emerging markets are likely to persist and emphasises
country selection rather than stock picking as the strategy for performance enhancement. Harvey (1995b) demonstrates that emerging markets constitute a distinctive asset class in international investing, and that adding emerging market assets to a portfolio problem, significantly shifts the investment opportunity set. Studying more than 800 equities from 18 emerging markets over the period 1976-1992, Harvey illustrates that emerging markets are not integrated with the world capital markets, and therefore provide scope for superior diversification benefits. There seems to be virtual consensus on the benefits on international diversification in general and diversifying into emerging markets in particular.

2.3. Measuring Diversification Benefits

There are two well documented approaches to measuring and evaluating the benefits of international diversification. The first approach has been called the "non-asset-pricing approach" (Akdogan 1995 furthers this classification) because it observes the statistical relationships between markets, without making any assumptions regarding the asset pricing model that may underlie the returns. The most commonly used of these approaches is the examination of correlation coefficient of asset returns across countries. There have been many studies that have illustrated the benefits of diversification using the correlations between returns from markets in various countries. The integration or segmentation of markets has been illustrated using the magnitude of the correlation coefficient. Lower correlation coefficients essentially mean that risk reduction through diversification would accrue irrespective of whether the assets are correctly priced or not. It can therefore be
established that unconditional portfolio risk can be diversified by adding emerging markets to a portfolio.

The prevalence of low correlation between markets has focused attention on the return generating process in the markets, and many studies have examined the influence of global and domestic factors on asset returns. If returns are influenced by domestic rather than global factors, low correlation between markets would persist, and it would be difficult to explain returns using an international asset pricing model. If global factors become increasingly important, returns can be explained using an international asset pricing model.

One of the frameworks that has been used in this context is the International Capital Asset Pricing Model. The ICAPM assumes that there is one dominant source of risk that is priced in the international markets, and that this risk can be measured using a benchmark portfolio of international assets. Stocks of various markets would be priced depending upon the beta coefficient that they exhibit with respect to the benchmark index. The ICAPM assumes complete integration of markets such that pricing of assets in the international markets is similar to the pricing of assets in the domestic context.

Lessard (1973), Alder and Dumas (1983), Solnik (1974b), Stulz (1981), provide important papers on ICAPM. Descriptions of recent studies on ICAPM can be found in Dumas (1993), Stulz (1992) and Solnik(1991a). If the cross section of expected returns from the markets is to be explained in terms of the ICAPM network, then the underlying risk has to be the covariance of returns from the emerging markets with
the world market portfolio. This would necessitate the assumption of complete integration, because under the assumptions of the model, assets with the same level of risk will provide the same level of return, irrespective of the market where it is issued or traded.

Lessard (1974) and Solnik and De Freitas (1986) researched the relative importance of industry, domestic and international factors on security returns, and concluded that though international factors had some influence on stock returns, domestic factors were a much stronger influence on them. These studies were before 1973, when the exchange rates were fixed. Subsequent studies also indicate the weaker influence of international factors on security returns. Solnik (1984) and Alder and Simon (1986) suggest a weak correlation between stock market indices and currency movements. In Solnik and de Fritas (1986), correlation of stock indices with world indices, currency movements and domestic indices were studied and it was found that the coefficient of determination was highest in the case of the domestic market index. These studies indicate that security returns are largely influenced by domestic rather than international factors, with the former explaining about 42% of returns on the average and the later explaining 18 - 23% of the returns. Grinold, Rudd and Stefak (1989), Drummer and Zimmerman (1992), and Heston and Rouwenhorst (1994) arrive at similar conclusions on dominance of national factors over global factors in asset pricing.

Ferson and Harvey (1994) study returns in 18 national markets, 16 of them from OECD countries, and Singapore, Malaysia and Hong Kong for risk factors that explain returns. They observe that the world market betas do not provide a good
explanation of the cross-sectional variance in average returns. Global risk factors, ex-post explain 15% to 26% of variance in returns, and vary across countries. They illustrate that a standard one-factor or two-factor asset pricing paradigm leads to large pricing errors and that the betas are unable to explain any of the cross sectional variation in expected returns.

2.3.1. The Special Case of Emerging Markets

The benefits from international diversification into emerging markets can be analysed from two different, yet related points of view. The first is that emerging markets represent an asset choice that has not been optimally used by international investors. This argument means that investing in emerging markets would enhance risk adjusted return and including emerging markets would move portfolios more closer to the efficient frontier. This argument essentially assumes integration, and that returns from emerging markets can be measured in terms of an asset pricing model.

The second argument is based on the segmentation of the emerging markets, and the premise that emerging markets represent a distinct asset class, whose return generating process does not fit into the integration-based asset pricing model, because global factors do not play a significant role in the pricing of emerging market assets. This view means that including emerging markets in the portfolio would not only reduce risk in a given portfolio, but would also shift the investment
opportunity set itself, such that returns are also at a higher level. Given the distinctive features of emerging markets, this view is gaining increasing acceptance.

In the context of emerging markets, the prevalence of higher levels of risk is well established. Therefore, assumption of higher risk can be justified only if, in equilibrium, it results in higher return. It would therefore seem appropriate that the returns from emerging market investment should be analysed in terms of an asset pricing model. The difficulty in pursuing this line of thinking is the fact that emerging markets exhibit certain characteristic features that make it difficult to analyse return in terms of an asset pricing model, that may hold good in the context of developed markets.

Divecha et al (1992), Bekart (1995), and Diwan et al (1992) assume full integration of emerging markets with world markets while examining the benefits of diversification. Chief among the factors that segment emerging markets are the direct and indirect barriers to investment which do not facilitate riskless arbitrage. Diversification benefits that should theoretically accrue, may not be realisable due to the presence of these barriers. There have been tests that have explicitly incorporated barriers in an asset pricing model. Jorion and Schwartz (1986) have classified barriers as direct and indirect, and using a methodology that allows tests of both full integration and full segmentation (see Stelhe 1977) found that the US and Canadian markets are not integrated, due to the presence of direct barriers. They find evidence of mild integration only in the case of inter-listed stocks. Their classification of direct and indirect barriers has been widely used in examining the asset pricing process in emerging markets.
The contribution of Errunza and Losq (1985, 1989) in understanding the effect of barriers on international asset pricing is significant. They assume that direct barriers which disable a class of investors to trade in a subset of securities are the only imperfection in the international markets. They find that such inaccessible securities display risk premiums proportional to the conditional market risk of these assets. They argue that securities which are accessible to domestic and foreign investors are priced as if the two markets are integrated and that securities that are not available to some investors earn superior risk premiums. They thus find a case of 'mild segmentation' in the international markets. Errunza et al (1992) find evidence that many emerging markets are neither completely segmented, nor completely integrated with the developed markets.

Bailey and Jagtiani (1994) also use this model to find a mild segmentation in the Thailand stocks. Claessens and Rhee (1994), using Stelhe's method over the period 1989-1992 for 16 emerging markets, reject the hypothesis that emerging markets are integrated with world markets. Evidence therefore predominantly suggests that emerging markets are not integrated with world markets, and that ICAPM which imposes a null hypothesis of complete integration cannot explain the return generating process in these markets.

The segmentation of emerging markets is intuitively understood, given the presence of various legal and indirect barriers to investment. Another strand of research therefore focuses on understanding the risk-reward in emerging markets in terms of the peculiarities of these markets. Santis (1993) uses the Hansen-Jagannathan (1991) bounds to test the diversification benefits from emerging
markets, and reports that models which successfully price assets from industrialised countries may fail to price assets traded on emerging markets. Claessens et al (1993) find evidence of predictability in stock returns in emerging markets and some of the anomalies found for industrial countries, such as the small firm effect and turn-of-the-year effects.

The most extensive research on the risk-return trade-off from emerging markets and the risk characterisation of emerging market returns is from Campbell Harvey and Geert Bekaert. Bekaert (1995) reviews the impact of liberalisation and removal of barriers on emerging market risk and return, and finds little evidence of increase in return volatility after deregulation. Harvey (1995a) is one of the most comprehensive in this context. In a study of more than 800 equities from 20 emerging market countries, they find that emerging markets have higher average returns and volatility than developed markets. An examination of risk and returns shows that returns from emerging markets exhibit serial correlations much higher than what can be expected in the case of developed markets and there is evidence of predictability. There also is evidence of departure from normal distribution, in the returns of 14 out of 20 emerging markets examined. The study presents important evidence as to why emerging market equities have higher returns, and highlights the differences between emerging and developing markets.

Bekaert and Harvey (1995) extensively examine volatility in emerging markets and confirm that capital market liberalisation in emerging markets have increased correlation between markets, but have not driven up local market volatility. Bekaert et al (1997) find that traditional risk attributes do not explain emerging market
returns, and propose a multi-factor characterization of risk and return. Bekaert et al (1998) provide evidence that emerging market distributions are non-normally distributed.

Erb et al (1996) develop a country risk model that would establish the hurdle rate for investments with average risk in emerging markets. They find that beta of the country with respect to the market portfolio is not an appropriate measure, and that it can lead to gross under estimation of the cost of equity in segmented markets.

2.4. Sub-Optimal Asset Allocation

Our description of the benefits of international diversification and the risk reduction possibilities and the fact that these benefits have been illustrated by research over the last 20 odd years, would suggest that investors are now holding a substantial part of their portfolio in foreign assets. The fundamental assumption in modern portfolio theory is that investors diversify efficiently, and hold the market portfolio, which dominates the others in the mean-variance frontier. In reality however, the international holdings in many of the institutional portfolios, which are large, and are in most cases professionally managed, is much lower than the allocation that would be ordained on the basis of efficient diversification.

Cooper and Kaplanis (1995) show that for nine major markets, there is a heavy concentration of domestic stocks in the portfolios of investors. Chuhan (1994) points out that despite the demonstrated benefits of diversifying into emerging markets,
institutional investors from seven major industrial countries, invest hardly 0.2 % of
their assets in emerging markets. Tesar and Werner (1993) also show that US
investors' holding of emerging market equity is much lower than what can be
expected if the market portfolio is held.

The concentration of domestic assets in a portfolio has come to be known as "home-
bias." Home bias refers to a sub-optimal asset allocation in a portfolio, caused by
a concentration of domestic assets rather than foreign assets. If the assumption
that investors behave rationally has to hold, then home-bias must be caused by
factors that offset the benefits from international diversification. Alder and Dumas
(1983) and Stulz (1981b) concur that investors in different countries hold different
portfolios because of the need to hedge against inflation and to avoid possible
foreign exchange risks, because investors in different countries consume different
bundles of goods and pay for them in different currencies. Black (1974), Stulz
(1981b) and Cooper and Kaplanis (1986) identify the costs associated with cross
border investing as the major cause for home-bias. Costs such as with-holding
taxes, restrictions on repatriation, costs of procuring information, and costs of
differential access are typically incurred by international investors, and home-bias is
explained by the reduction in return due to these costs. Eldor, Pines and Schwartz
(1988) and Stockman and Dellas (1987) associate home-bias with the existence of
non-traded goods. They develop a model of general equilibrium incorporating
nontraded goods, and demonstrate that home-bias is caused by the need to hedge
against price uncertainties in the case of non traded goods.
Cooper and Kaplanis (1995) refute the argument that home bias is caused by the investors' desire to hedge purchasing power parity deviations as in Alder and Dumas (1983). They develop a model of international portfolio choice and equity market equilibrium that integrates costs in cross border investing and purchasing power parity deviations. They estimate with this model, the levels of cost required to generate home-bias in a portfolio at about 2.7%. In Cooper and Kaplanis (1995), they argue that dead-weight costs, in the form of withholding taxes and transaction and information costs are the chief source of home-bias. Segmentation of markets is therefore caused by costs and restrictions on international portfolio investment and other informational costs and imperfections.

In the context of the available literature on home-bias, and the evidence that investors do not hold much of emerging markets in their portfolio despite attractive diversification potential, it would be worthwhile to examine the home-bias with respect to emerging markets, and estimate the dead weight costs incurred by investors in these markets. Possible explanations for the low allocations to emerging markets may be available after examining the net return to investors after incurring these additional costs. The prevalence of higher costs of investing would also act as indirect barriers that would segment emerging markets. With the costs of information for instance falling over periods of time, as investors get more familiar with the emerging markets, it may be expected that the dead weight costs, and as a result the segmentation of these markets would reduce.
2.5. **Behaviour Of Cross-country Correlation**

Since diversification benefits are so closely tied to the covariance structure between markets, the key to the exploitation of these benefits would be the ability to forecast the future correlation structure and tailor asset allocation strategies accordingly. The Markovitz framework for portfolio optimisations presumes that ex-post estimates of covariance would be valid ex-ante. The inter-temporal instability of the correlation between market returns complicates this exercise. Evidence on the stability of correlation and covariance is mixed.

Earlier studies such as Levy and Samat (1970) Lessard (1973) show that correlations between markets have remained low over a long period of time. Watson (1980) finds evidence of intertemporal stability in correlation between markets. Bergstrom (1984) using the Capital International indices finds that international correlation structure has not changed significantly over periods of time. Markets that exhibited lower correlations continue to do so, over a large observation period 1959-1983. Shaked (1985) provides evidence that correlations between markets are unstable in the short run, but for longer holding periods they remain stable. Using monthly returns for 16 countries in the period 1960-1979, they argue that the underlying stability in correlation structure is temporarily disturbed by lagged response to economic shocks. Fischer and Palasvirta (1990) find high levels of correlation between 23 world markets in the period 1986-1988. The contagion effects created by the crash of 1987 significantly increased correlation between markets in that period.
Makridakis and Wheelwright (1974) find the correlation structure between 14 major stock exchanges in the period 1968-1970 to be unstable. Maldonado and Saunders (1981) studied the correlation between US and 4 other developed countries, and show that for investment horizons longer than 2 quarters, inter-country correlations are unstable. Kaplanis (1988) fits time series models to rolling correlation of equities in 15 markets. She finds that correlation is not constant over time and that rolling ex-post correlation could be used for asset allocation. Login and Solnik (1993) estimate a multivariate GARCH model and reject the hypothesis that correlation is constant. Erb et al (1994) examine the factors that may cause changes in correlation and find that equity cross-country correlations are related to the coherence between business cycles in the respective countries. They report that correlations are higher during recessions than during growth periods and that correlations are low when the business cycles of two countries are out of phase. Tang (1994) finds evidence of increase in correlation between markets with increase in holding period, and suggests that there may be delayed adjustment among the 11 markets studied, and that benefits of diversification would reduce with increase in the holding period.

Harvey (1991) measures the conditional risk of 17 countries with respect to a benchmark world portfolio and illustrates that risk exposures change over time and that the world price of covariance risk is not constant. Spiedell and Sappenfield (1992) argue that correlation between markets change over time and that during the happening of certain global events, market tend to exhibit higher levels of correlation. Odier and Solnik (1993) find that during periods of increased volatility, correlations between markets also increase. The volatility of stock prices is
therefore time-varying. However, Iben and Litterman (1994) examine changes in bond market volatilities in the G7 countries, for ascertaining if changes in international bond volatilities have created greater correlations between markets, thus reducing the benefits of diversification. They find the diversification benefits to be stable, despite a marked increase in volatility. Bruno Solnik (1993) provides evidence of predictable time variation in expected returns and risk, across eight developed markets. There was evidence of mean reversion for bonds, stocks and currencies over a 20 year period. The time variation in risk premiums has been attributed either to the lack of efficiency in the international markets or to the changes in investor risk perceptions over time.

2.6. **Linkages between markets: Correlation and volatility**

The globalisation of markets has spawned research on the linkages between markets. Compared to the scenario in the 1970s, there has been considerable globalisation of capital markets, with increase in cross-border listing, international investment, growth in facilitating technology for cross-border activity, and reduction in the concentration of activity in few markets. There have been many studies which examine the dynamics between various markets with a view to understanding the adjustment process of stock prices across the globe. The increasing linkages between markets have important implications for the inter-temporal behaviour of covariance and correlation attributes of returns.

One set of studies on the linkages between markets, concentrates on the dynamics between the stock market indices, with a view to observing changes in the
dependence pattern, over a period of time. Schollmer and Sand (1985) find dependence between European and US markets, using ARIMA cross-correlation analysis. Fischer and Palasvrita (1990) using cross-spectral analysis on 23 stock indices, find strong interdependence between US and European and Asian stock markets. Koch and Koch (1991) and Brocato (1994) find evidence of decline in the leadership of US in the world markets. All these studies point to significant alterations in the linkages between world markets since the 1980s. It is difficult to say whether the dependency exhibited by market indices would be consistent with the hypothesis of increased integration of world markets. But these studies clearly point to changes in the co-variability patterns of markets, particularly in the recent years, with important implications for international diversification.

Another set of studies specifically examine the implications of linkages between markets on the covariance between them. The 1987 crash facilitated the examination of transmission of volatility between markets, and its impact on inter-market correlations. A number of these studies point out that cross-market adjustments to exogenous disturbances get magnified due to the increased linkages between markets. (King and Wadhwani (1990), Bennet and Kelleher (1988), Schwert (1990). These studies have shown that information channels between markets enable rapid transmission of shocks than was previously possible, and create a psychological contagion that triggers simultaneous responses in markets, around the happening of global events.

Roll (1989) argues that results from the various studies of the stock market crash could suffer from a 'selection bias' in that an episode that was characterised by high
volatility and contagion among markets was chosen for analysis. Higher correlations between markets can be isolated to the October 1987 episode, but need not mean that national markets are linked more closely than they were before. Dwyer and Hafer (1988) also present evidence that market correlations have not increased except for the period immediately around the crash. Therefore, covariance among indices is very strong during such events. Solnik, Boucrelle and Fur (1996) study correlations between developed markets over 37 years and the behaviour of correlation during periods of high volatility. They find evidence of market contagion and that correlations increase during periods of high volatility.

In one of the early studies on intertemporal stability of covariance in emerging markets, Cheung and Ho (1991) use the Box's M test to study the stability of covariance structures over periods in time. In another paper that extends this study (See Cheung 1993) they find no evidence of normality in the return series for emerging markets and argue that it would be preferable to use non-parametric tests to check for the stability of the covariance structures. They use the Sen and Puri (1968) tests to examine the equality of the covariances between developed and emerging markets. Studying 7 Pacific rim and 4 developed markets over the period 1977 to 1988, they are unable to reject the hypothesis that covariance matrices are equal over different time periods. They also find evidence of relative stability over time in the ranking of covariance between two markets.

Apart from studying the structure of correlation, recent methodologies for investigating inter-temporal associations between markets include testing for co-integration. Co-integration is a property possessed by non-stationary time series. If
two non-stationary time series are co-integrated, then there exists a linear combination relationship which is stationary. Co-integration means a possible allowance for departure from equilibrium in the short run, but not in the long run. Hung and Cheung (1995) uses the Johansen multivariate co-integration approach to analyse the interdependence of five major equity markets, using weekly observations from 1981 to 1991. They do not find evidence of co-integration when returns are measured in local currency terms, but interestingly find evidence of co-integration when dollar returns are used. They attribute this difference to the depreciation in the US dollar in the 1980s. Chatrath et al (1994) perform co-integration tests on India and developed markets, and find no evidence of comovement.

Emerging markets have witnessed contagion during the Mexican Peso crisis of December 1994, though the changes in the covariances have not been studied. It has not been examined whether the dominance of US investors in the emerging markets creates linkages arising out of common inputs used by the dominant investor. The Mexican Peso crisis in December 1994 and the South East Asian crisis in October 1997, caused reactions in many emerging markets. The linkages between emerging and developed markets, and the behaviour of emerging markets during global events would provide additional insights into the diversification benefits from investing in them.
2.7. **Important Research Issues**

Despite overwhelming evidence on the benefits of international diversification, there is little evidence that global investors are holding the market portfolio. This sub-optimal choice has been investigated for over 2 decades, while the specific case of emerging markets has been studied only since the late eighties. It is only in the 1990s that many emerging markets have become available for investment by global investors. Research in this area addresses the distinguishing features of emerging markets, the diversification benefits and their explanation in terms of an asset pricing model, and the inter-temporal stability of risk attributes. (Bekaert et al, 1997).

While it is well accepted that international diversification would enhance the risk-return trade-off in a well diversified portfolio, the quantification of these benefits in the context of emerging markets, involves a study of the following:

A. Risk-return attributes of emerging markets and the distinctiveness, if any, in them. Most research on international diversification focuses on developed markets, and there is limited research on the applicability of these models in the context of emerging markets.

B. By virtue of being new and emerging, these markets are likely to exhibit higher levels of volatility and regime shifts arising from policy initiatives. It would be important to know whether past estimates of risk attributes
can be used in asset allocation, and whether risk attributes exhibit predictability.

C. In the context of the debate on integration and segmentation, and the conjecture that globalisation leads to higher levels of integration, it has to be seen if diversification benefits would persist. The impact of contagious increases in correlations during the happening of global events has to be factored into such an analysis.

D. Given that India is also an emerging market that has been attracting foreign portfolio investments, it would be useful to examine the risk-return process in India, and understand the diversification benefits to international investors. Such an understanding can aid policy decisions significantly.

This study addresses the above 4 objectives, and is an important contribution in the area of international investments in emerging markets.

2.8. Description of the Research Problem

In order to address the above research objectives, we examine the following research problems empirically:

a. In order to understand the distinctiveness of emerging markets, we attempt a comparison of risk and return attributes of a set of developed and

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1 Appropriate research review other than those discussed in this chapter, and discussion or methodology for each of these issues is presented in the chapters that discuss these results.
emerging market returns. We compute log returns for the sample of markets and test the time series for normality, autocorrelation and time variation. We also test whether emerging market returns, risk and other attributes have altered over time, dividing the data set into two non-overlapping periods that represent pre and post liberalisation phases.

b. In order to choose an appropriate model for describing the diversification benefits it is necessary to test the applicability of an asset pricing model for emerging market returns. Using a single factor regression of returns, we test the applicability of the international capital asset pricing model for both developing and emerging markets. This would represent a joint test of integration and asset pricing. The results indicate that a non-asset pricing approach that would use correlations rather than an ICAPM model is superior in the emerging market context.

c. We examine the correlation structure of emerging and developed markets, in order to understand their direction and magnitude over varying holding periods, and verify the possible enhancement of diversification benefits, by including emerging markets as a distinctive asset class.

d. We test the dominance of emerging markets in an international portfolio, by plotting efficient frontiers of various international portfolio combinations.

e. We study the correlation structure of emerging markets for presence of time trend and for the impact of 1987 crash on the correlation pattern.
f. We test the intertemporal stability of emerging market correlations, using a country-by-country analysis of persistence in correlation structure, over varying holding periods.

g. We test for skewness in correlation structure as a possible explanation for contagion in international markets, and test for asymmetry in emerging and developed market correlations, using a semi-correlation analysis.

h. The ability to exploit benefits from international diversification lies in being able to use ex-post estimates for ex-ante asset allocation decisions. We examine the predictability in correlation structures using a multiple regression model of a set of pre-selected instrumental variables. We repeat this test for varying holding periods.

i. Using the model we developed for predictability of correlations we fit the model on ex-post observations and also make out-of-sample forecasts of emerging market correlations.

j. In order to verify the dominance of domestic factors as a possible explanation for persistence of diversification benefits, we first do a principal component analysis, to identify the dominant factors.
k. We do a hierarchical decomposition of variance, using a multiple factor model. We measure the contribution of global and domestic factors to asset variances, using a sample of 84 Indian stocks.

l. We measure the beta coefficients of a sample of Indian stocks, to illustrate the dominance of the domestic market factor on asset returns, and verify the dominance of local factors in asset pricing.

2.9. Description of Data

The data set used for analysis consists of monthly returns for 20 emerging markets and 18 developed markets. We have used emerging markets for which data is available for at least 5 years, as at the end of December 1996. Many markets like South Africa, China, Czech Republic, Poland, Russia and Hungary have become important in the recent years, but had to be excluded from the study since data is available only since 1993.

The data for emerging markets is drawn from the Emerging Markets Data Base of the International Finance Corporation. Other available emerging market databases are Baring Emerging Markets Indices and Morgan Stanley Capital International Emerging Market Indices. IFC has created various indices for emerging markets since January 1976. The data we have used is of the IFC Global return index, a market capitalisation weighted index, which is designed to represent the performance of active stocks in the emerging markets studied. The target aggregate
market capitalisation of the index is 60% to 75% of the total capitalisation of the
listed stocks on the local stock exchange.

It has to however be noted that there are some problems with the IFC Indices. The
IFC data for the period January 1976 - December 1981, were actually computed in
1981 when the indices were first constructed. Data for the period 1976-1981
therefore have a "look-back" bias. (Errunza and Losq (1985) and Harvey (1995)
discuss this as a special type of survivorship bias).

Another issue is that the countries that have been chosen for inclusion in the IFC
Index, are those where stock markets have existed and grown to significance over a
period of time. Of the 115 emerging markets that have been identified by the IFC,
indices have been constructed for only 44 markets, of which 9 are frontier markets.
There is therefore a selection bias in the Index.

Thirdly, Goetzmann and Jorion (1996) have detailed a "re-emergence" in the index
for emerging markets. Many emerging markets have a stock market history that is
longer than that of many developed markets. They actually re-emerged in the
1990s, when their role was increased through a reforms process, and were opened
for global investors. Therefore, assessing the returns based on data in the recent
period may create significant differences in the values of the mean and variance
between the pre and post re-emergence.

We use the IFC Global Indices despite these known limitations, since they represent
data that is available for the longest period of time, and have been used by virtually
all well cited work on emerging markets. Bekaert et al (1997) find evidence of broad similarities amongst existing emerging market indices and the correlation between the various emerging market indices to be 95% on the average. Since our objective is to be able to examine emerging markets through the period of segmentation and integration and examine stability, predictability and persistence in diversification benefits, only the IFC Global index with its wide coverage and long time series data serves our requirement.

Monthly return data are available for 9 markets since January 1976 (Argentina, Brazil, Chile, Greece, India, Korea, Mexico, Thailand and Zimbabwe). Data for Jordan is available from January 1979. Indonesia is the market with the least number of data points, beginning January 1990. In the case of Columbia, Malaysia, Pakistan, Philippines, Taiwan Venezuela and Nigeria, data is available from 1985. Data for Turkey is from Jan 1987, and for Portugal from Feb. 1988.

The monthly return for 21 developed markets are from the Morgan Stanley Capital International Perspectives (MSCI). MSCI indices are market capitalisation weighted total return indices and are found to have very high correlations with certain indices like the NYSE Index and the Nikkei Index (Harvey 1991). MSCI is the most commonly used database on developed markets. Monthly return data for 18 developed markets and the MSCI world index is available from January 1976. Data for Finland and New Zealand are from 1988, for Singapore from 1993. Malaysia is included in the list of emerging markets. MSCI excludes investment companies and foreign domiciled companies, to avoid double counting.
All returns are computed on month-end values, assuming dividend reinvestment, and are denominated in US Dollars. All data are up to December 1996.

2.10. Chapter Summary

In this chapter we have reviewed research on international diversification both in the context of developed and emerging markets. Though the case for international diversification has been well established, most empirical research focusses on developed markets. There is limited evidence on the behaviour of emerging markets. We have identified 12 research issues, which we seek to address in this study, through empirical analysis of an internationally accepted data base on emerging and developed market returns, which we have described in this chapter.