

# Modern Portfolio Theory: Is There Any Opportunity for Real Estate Portfolio?

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## Abstract

Modern Portfolio Theory (MPT) has become the backbone of finance as it gives better understanding of the best possible investment portfolio for financial assets. Since the idea was introduced by Harry Markowitz about five decades ago, the applicability of MPT to real estate analysis have been widely discussed by many real estate researchers with some pro and con outcomes. As MPT was developed through some “unrealistic” assumptions, the results from previous studies could not give a decisive generalisation of real estate investment decisions. This paper presents the issues of the applicability and implication of employing MPT on real estate portfolio analysis. The discussion is merely looking into some previous empirical studies with mixture of findings. The new paradigm of real estate investment has been shifted from ‘tactical and operational’ to ‘strategic and tactical’ style of management. Therefore, MPT could give a sound analytical view of real estate portfolio analysis which may offer more opportunities for further research particularly in Malaysia.

*Keywords:* Portfolio Theory, Real Estate Portfolio, CAPM, Asset Allocation

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## 1. Introduction

Since Markowitz (1959) introduced Modern Portfolio Theory (MPT), many researchers have attempted to model the benefits of establishing diversification strategies for portfolio investments. MPT is part of the branch of finance known as Investment Management. Most of the applications of MPT deal with paper investments such as stocks, bonds, options and futures rather than real investment like corporate investment projects and real property. Early works focused on potential gains from combining different stocks into a single portfolio, but since then, research has been extended to bonds, currencies, real estate, and international stocks and bonds. MPT is one of the theoretical breakthroughs in financial research and has had a profound impact on the practice of investment management.

Diversification has been a vast issue since MPT has been accepted as a tool in managing real estate portfolio. As real estate carries a large proportion of specific risk, diversification in real estate investment has become more important than before. As such, the applicability of MPT in real estate portfolio has been widely debated by many researchers. The purpose of this article is to explore the implications and applicability of MPT in real estate portfolios. The next sections will discuss the environment of real estate investment with a comparison of real estate and share markets. The article proceeds by discussing the application of portfolio and capital market theories on real estate. The most important aspects, including issues on the implementation and application of MPT, will be highlighted, as well as the implications on real estate research.

## 2. The Environment of Real Estate Investment

Real estate has its own characteristics, which significantly affect the environment of real estate portfolio management. Unlike real estate investment, stocks, bonds and other paper investments are purchased merely for investment purposes; whereas investors purchase real estate for an operational purpose including for capital appreciation. For example, some people prefer to pay the instalment of buying a house rather than paying the rental with expectation that the value may increase in the future.

Heterogeneity is probably the main feature of real estate interests that formed real estate portfolio at its own characteristic. The real estate portfolio seems very difficult to construct compared to other sectors. For instance, every real estate carries its own unique location, even two similar terrace houses which are built next to each other.

Unlike other investment media, a large amount of capital is required to acquire land and buildings. Investors in the capital market have a wide choice of well-documented issues of paper securities and may invest in the new issues or purchase in the market (Scarrett, 1991). Anyone involved in real estate transaction is unable to divide his or her investment into small units. Therefore, real estate transaction involves transferring legal interests by which the costs of transfer are invariably relatively high (Millington, 1995). The costs include taxes on transfer such as stamp duty, real property gain tax, advertising, estate agent and legal fees and professional opinion of value by which are substantially higher compared to the transaction costs in the capital market.

A fundamental economic feature of real estate is the inelasticity of supply (Enever and Isaac, 1994). Planning control, building construction and finance arrangement causes the supply to react slowly to increases in demand. The public-listed company or government can issue more shares or bonds in the capital market to fulfil their demand. The description of supply and demand shows that the transactions of real estate market are small but the amount of money involved is generally high. The information on transactions is quite limited and not efficient to respond to any news or data that will affect the real estate market.

The daily transactions of the capital market can be easily retrieved from various sources, for instance through daily reports in newspapers and screen-based computer systems such as Bloomberg, which easily accessible in the library of Bursa Malaysia. The real estate price and return can only be constructed yearly and monthly, but usually based on appraised real estate values (Hassan, 1990).

Imperfection of the real estate market is unable to help the potential purchaser or seller where it only represents many local markets rather than one large market. The participants themselves have extremely divergent expectations on real estate in that they might have their own reasons and strategies for any real estate acquisition. Other reason cited by Roulac (1978) for real estate market inefficiency is the uniqueness and lack of comparability among various types of real estate investments. Although, the capital and real estate market operate differently, both of them exhibit their own market trends even if they are highly correlated. It is still dubious whether the capital market returns will be good indicators for real estate returns. Financial decision tools can reasonably be employed for real estate valuation and investment, provided the information is adequate to develop the valuation models. Further discussion regarding the relationship between real estate market and stock market is in the next section.

## 3. Real Estate Market versus Stock Market

The question of whether real estate and stock markets is integrated or not is important in measuring performance. Both the real estate and stock markets' activities form significant elements in business cycle fluctuations. A common approach has been to study the separate influences of each market on business cycle activity. The study of price volatility on the stock market has a rich history, with recent studies focusing on the use of single equation time series models in the identification of speculative bubbles (Dezhbakhsh and Demircug-Kunt, 1990; Evans, 1991; Topol, 1991), and tests of the mean reversion hypothesis and its use in predicting stock market volatility (Engel and Moris, 1991; Jegadeesh, 1991; Kim et al., 1991; Randolph, 1991). Sagalyn (1990) and Hartzell and Mengdon (1987) found a positive correlation between dividends produced by a Real Estate Investment Trust (REIT) portfolio and the cash flows from the Prudential Real Estate Investment Separate Account. However, contrary to expectations, no significant correlation was found between the National Council of Real Estate Investment Fiduciaries (NCREIF) Index cash flows and REIT dividends. More studies emphasise the relationship between real estate returns and stock price returns by correlation tests on return components such as cash flow, yield rates (Moss and Schneider, 1996; Mueller and Lapos, 1995) and other variables producing returns (Gyourko and Kim, 1992; Young, 1994).

In the US, many studies have focused on the nature of REIT returns owing to their common use as proxies for real estate returns (McCue and Kling, 1994). Some studies have attempted to relate REIT returns to other measures of real estate returns such as the NCREIF Index

returns. Giliberto (1990) studied the relationship between the National Association of Real Estate Investment Trusts (NAREIT) Equity Index returns and the NCREIF Index returns. Giliberto found no significant correlation between the NCREIF Index returns and the NAREIT returns. In order to remove non-real estate variation from the two series, Giliberto regressed both the NCREIF Index returns and NAREIT Equity Index returns on stock market, bond market, and seasonal variables. Giliberto found the residuals of the two regressions were significantly correlated, which suggesting there is extraneous variation masking the correlation. Giliberto also found that the NCREIF Index residuals were correlated with lags of the NAREIT residuals. The separate regressions were partially removing the effects of time and seasonality from the series.

Gyourko and Keim (1992) analysed the relationship between the NCREIF Index returns and REIT returns, concluding that REIT returns did correlate on a lagged basis with the NCREIF Index returns. Gyourko and Keim noted the problems with volatility, appraisal timing and appraisal smoothing in the NCREIF Index returns. The authors argue that due to infrequent appraisals, the NCREIF Index is slow to react to macro economic information. They argue that transaction-based series, such as REIT returns, react quickly to new information and should therefore lead the NCREIF Index.

Real estate company performance and direct real estate performance can identify the linkage between real estate market and stock market. In the UK, this has been an area of considerable interest in recent years (Barkham and Geltner, 1995; Eichholtz and Hartzell, 1996; Lizieri and Satchell, 1997; Newell et al., 1997; Venmore-Rowland, 1990; Wang, 1998). Typically, UK real estate company performance has been poorly correlated with direct real estate but highly correlated with shares. This trend has also been evident in many other countries (eg: USA, Australia, Hong Kong).

#### **4. Modern Portfolio Theory and Capital Asset Pricing Model**

The literature on MPT in real estate analysis is considerable and contains many important studies of its suitability and application to establish an optimal allocation of property portfolios (Friedman, 1971; Draper and Findlay, 1982). In the early days of the acceptance of property as one of the asset classes, most of the studies dealt with stocks and bonds and generally did not include real estate investments. The main reason stems from the unavailability of a centralised market for real estate where continuous information on real estate markets is provided. Hassan (1990) noted in one of his conclusions on the relationship between real estate analysis and MPT

that real estate assets generally outperform stocks and bonds in risk and return measurement. He added real estate assets provide excellent diversification potential for portfolio investors and also a good inflation hedge.

Mean-variance optimisation indicates that, to achieve the ideal trade off between risk and return, 9 to 20 per cent of pension fund assets should be in real estate (Brown and Schuck, 1996; Fiedler, 1992; Fogler, 1984; Hoesli and Hamelink, 1996; Kallerg et al., 1996; MacGregor and Nanthakumaran, 1992; Sweeney, 1988). Most pension funds today only allocate about 5% of their portfolio in real estate equity assets (Smith, 1992). Obviously, real estate is an under-utilised asset class. Why is real estate under utilised when it offers such proven opportunities to minimise risk and simultaneously accomplish an acceptable return? Such investment characteristics certainly offer opportunities for diversification that are incomparable with other asset classes. MPT has also something to offer in Malaysian perspective. Hishamuddin et al. (2003) found that by adding Malaysian real estate investment trust (REIT) in the investment portfolio can provide higher return at the same level of risk. In other words, by including listed REIT in the investment portfolio would offer better performance.

The important issue on the problem of direct real estate investment is the lack of liquidity compared with the other major investment media (McAllister and Mansfield, 1998; Smith, 1992). The main reasons are due to large lot size, high transaction costs, no central marketplace, infrequency of real estate transactions and delay due to legal work. In simple terms, this means that the original capital will not always be as quickly obtainable when desired. The problem of relative illiquidity influences the attractiveness of real estate as an asset class. Illiquidity restricts the portfolio managers' ability to switch between real estate and other asset classes. Moreover, the restructuring programme of the real estate portfolio in response to changing perceptions of sectoral and geographical performance potential will be limited. Illiquidity relative to the other major asset classes indirectly reduces the investor's ability to apply formal portfolio theory to real estate portfolio decisions.

Misjudgement of real estate investments has driven most of the institutional investors not to invest more in real estate. Portfolio managers who are familiar with the financial markets are often less confident in the real estate market. Many portfolio managers tend to misjudge real estate investments and the result is that property, more so than other types of investment, suffers from a number of myths and misunderstandings.

The arguments regarding the characteristics of real estate investment have driven most large institutions to

adapt MPT as a standard tool for understanding how the real estate holdings behave, whether independently or as part of the overall investment holdings. The aim of applying MPT is to create a portfolio of investments that produces predictable return. Risk in this system is defined as volatility of return. The idea of the application of MPT to real estate is interesting, as it allows real estate managers to understand both what to expect from real estate investments as a whole, and how those real estate holdings fit into the overall portfolios. However, can MPT be successfully applied to real estate, and how can that be done? There has been some disagreement regarding the suitability of applying MPT to real estate. According to Young and Grieg (1993), it has been proved mathematically that real estate is unsuitable for MPT analysis, as real estate is heterogeneous and the real estate market is illiquid and dissimilar to the stock market. They have added that MPT is an inaccurate guide for real estate asset allocation because investment returns depend on varying circumstances of investment properties. However, they compared the performance of two completely different properties and not surprisingly the returns of the two properties are definitely different. They conclude that diversification by real estate type and location factors may be insufficient to predict expected returns. Nevertheless, suggestions have been made by Young and Grieg (1993) by which further research and more complex models of the interaction between real estate and other investment portfolios are required before MPT can be employed to real estate.

This debatable issue was brought up among real estate's leading portfolio management experts in the US when they had the opportunity to face the "father of MPT", Harry Markowitz, in a 'roundtable' sponsored by Buildings (Reinbach, 1993). In that historical meeting with Markowitz, Reinbach (1993) quoted what had been addressed by Markowitz - real estate can be explained and measured with financial theory tools, subject to a number of issues about the subject. The most identifiable factor is the lack of reliable real estate data. Stock and bond market data have been sufficient to deal with any investment management tools, especially when daily transactions take place with many cyclical price movements. However, most of the real estate market data were derived from a valuation-based index. Another problem with real estate is the effect of illiquidity on pricing and waiting for a best price.

For the moment, most academics and practitioners have accepted MPT as a standard tool to examine the behaviour of real estate holding. From time to time, the understanding of MPT has been improved alongside a number of assumptions and suggestions that have been made by several studies. Most of the studies had suggested that portfolio management within real estate asset class

or sector allocation should be made upon the differences of geographical and real estate-type (Geurts and Nolan, 1997; Pagliari et. al., 1995). However, the suggestions could not satisfy most of the academics and practitioners. At least this is a good start in order to develop and create a stand-alone real estate theory to explain real estate performance, instead of applying other investment media tools to real estate.

MPT has undergone a revolution in the last five decades. The subsequent discussion will be the fundamental ideas of the inevitable trade-off between risk and return, illustrated by the capital asset pricing model (CAPM). Return and risk are defined and illustrated, and total risk is shown to be made up of market risk and specific risk in relation to real estate. Market risk is unavoidable because it arises from movements in the economy as a whole; the specific risk relating to individual real estate can be removed by diversification, and efficient capital markets will therefore offer no rewards for specific risk. Diversification thus makes sense for investors, because they can avoid specific risk.

For many years, investment advisers and investment managers focused on returns with the occasional caveat 'subject to risk'. MPT concentrates on risk at least as much as return. In fact, MPT could be described as risk management, rather than return management. Decision can be made about the risks which portfolio managers are prepared to take but they cannot decide on the returns that can be achieved. Usually investment decision will be decided by factors beyond the control of portfolio managers, although they would anticipate that the higher the risk, the higher should be the expected return. For example, an investor would like to borrow from the bank in order to invest in equities. The expected return is considerably higher than the bank rate of interest. It may result in considerable gain, but there is a high risk of substantial loss if equity prices fall. In a rational world, an investor should expect a clear trade-off between risk and return. The most widely acclaimed description of this trade-off is the CAPM, which is depicted in Figure 1 by the security market line (SML). This model, which has been developed by Sharpe (1964), was an extension of Markowitz work on MPT.

Portfolio expected returns are measured along the vertical axis, and portfolio risk is measured along the horizontal axis. Real estate portfolio returns include rental income and capital appreciation. The most widely used measure of portfolio risk is beta ( $\beta$ ), which is a measure of the market sensitivity of returns. It represents the extent to which the return on an individual security or portfolio moves with some broad-based market index representative of the total economy.

Figure 1 shows that there is a trade-off between risk and return and that the trade-off is positive and linear, each incremental increase in risk being associated with an increase in expected return. Some investments have virtually zero risk. For example, the return of three-month Treasury bills can be considered as risk free, the probability of default by the government being zero. The return of such risk free investments is represented by  $R_f$ . The portfolio M represents the total economy; it is a weighted average of all quoted equities and is generally referred to as the market portfolio. If an investor invests in this portfolio, he or she expects to earn the return on the market,  $R_M$ . This theoretical portfolio is important in the theory of portfolio management because it is a perfectly diversified portfolio. It is almost certain that nobody ever holds this particular portfolio, but a widely diversified equity portfolio could approximate to the market portfolio.

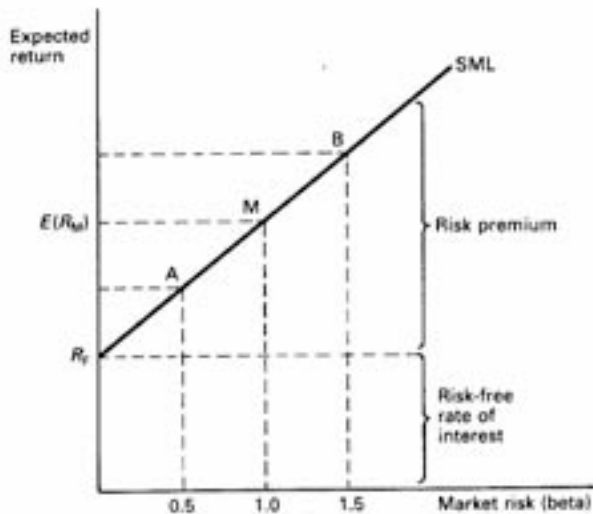


Figure 1: Security market line/capital asset pricing model

### The Risk Elements of Real Estate Portfolio

Risk and returns are two unavoidable elements that have to be considered in real estate investment analysis. Although the characteristic of real estate might turn the risk and return analysis differently compared with other investment media, real estate analysts have to make certain adjustments and consideration in order to accomplish a prudent real estate investment decision. According to Oxford Dictionary (1996), risk is defined as the possibility of loss, injury, or other adverse circumstance or the possibility of business and commercial. If risk is viewed that is common in the management literature is that risk can be thought of in terms of variability or uncertainty of future outcomes (Hertz, 1983; Reilly, 1989). The risk measurement is always concerning with the degree of loss among the investment options, for example, investing in real estate is more secure than investing in

the stock market. However, the perception of risk might be dissimilar among the investors although a standard risk analysis or measurement has been undertaken. Whether investors type are risk-lover or risk-averse, the assumption related to investment decision-making must be based on the rational behaviour of investors. Grundy and Malkiel (1996) noted that most investors think of risk as measuring the chance that returns will be lower than expected and, specifically, that investment will produce a loss. For them, risk is generally defined as the chance that investment outcomes will differ from expectation.

For an investor, the total risk of an investment consists of two components: market risk (systematic risk) and specific risk (unsystematic risk). For any asset, the total risk of any portfolio is the sum of these components such that:

$$\text{Total risk} = \text{market risk} + \text{specific risk} \quad (1)$$

Market risk is affected by economic and market changes which influence all assets and market participants such as inflation, interest rate changes, unemployment, economic recessions, budget deficits, and trade deficits (Brown, 1991; Cho, 1997). This type of risk cannot be eliminated or diversified away. Conversely, specific risk is diversifiable and is usually affected by factors specific to the particular real estate investment such as location, building condition and quality, tenants, legal matters and so on.

The *standard deviation* (or *variance*, which is the standard deviation squared), measures the total risk of an investment (Reilly, 1989). It is a statistical measure of the dispersion or variability of a risk profile, which represents the spread around the expected or historical value of the criterion. In the case of a symmetrical distribution such as *normal distribution* (refer to Figure 2), the criterion is encompassing two-thirds of either actual or expected outcomes (Hertz and Thomas, 1983).

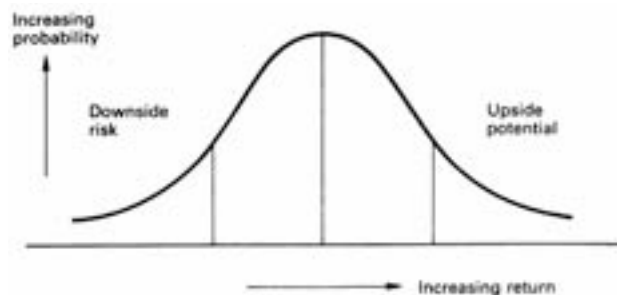
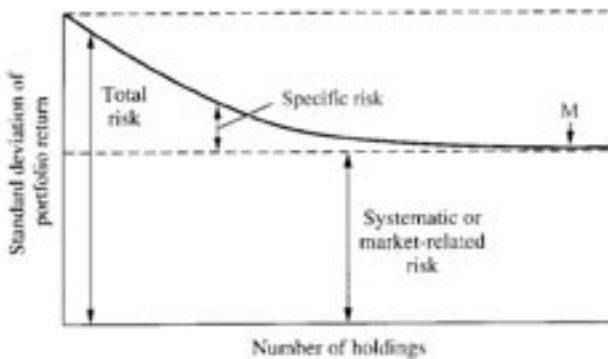


Figure 2: A normal distribution

It is not necessary for an investor to accept total risk of an individual stock; investors can and do diversify. Some of the risk associated with individual investments can be avoided by diversification. Figure 3 shows how some of the total risk associated with individual stocks can be avoided by diversification. Investment in a single stock implies the acceptance of total risk, so putting all their funds into a single investment is not advisable for investors as this exposes them to more risk than is necessary for the expected return. Figure 3 shows that by increasing the number of investment holding, then considerable portfolio risk reduction can be achieved. This happens because one company with good performance is offset by other non-performance company. These good and bad stocks specific to individual companies cancel out each other. These specific events generally cancel out, and the result of diversification is reduction in portfolio volatility, that is, reduction in portfolio risk. As the number of holdings increases, a good deal of total risk is removed by diversification; and this risk is called specific risk because it is specific to individual companies. Specific risk is one of the crucial ideas in MPT in that investors should not expect to be rewarded for taking on risks which can be avoided. They should expect to be rewarded only for taking market risk.



**Figure 3: Risk reduction by diversification.**

Not all risk can be removed by diversification. To some extent, the fortunes of all companies move with the economy. Changes in the money supply, interest rates, exchange rates, taxation, the prices of commodities, government spending and overseas economies tend to affect all companies to a greater or lesser extent. The risk associated with movements in the economy is generally referred to as market risk. In Figure 3 a great deal of specific risk is removed for certain number of stocks, but thereafter only a small amount of risk is removed by holding additional stocks. Eventually, by holding a weighted average of all stocks, all specific risk can be removed. M, the market portfolio, which has no specific risk and the value of the portfolio would move in perfect lockstep with the economy.

This is a very important idea in MPT - the expected return of a stock or portfolio should be directly related to the level of market risk associated with that stock or portfolio. The CAPM shows that the expected return of an investment is a linear function of market risk (measured by beta). In next two sections, there will be a further discussion on market risk issues.

Using the basic premise that investors prefer higher rather than lower returns, and prefer lower risk to higher risk, Markowitz (1952) showed that assets can be combined to produce an “efficient” portfolio. It will give the highest level of portfolio return for any level of portfolio risk, as measured by the variance or standard deviation. These portfolios can then be connected to generate what is termed an “efficient frontier”. The efficient frontier (EF) represents the boundary of the risk/return set of asset combinations (portfolios). An inefficient portfolio is then one which has a higher risk level for a given return, or one which has a lower return at a particular risk level. All such portfolios lie inside the EF.

### ***CAPM and Market Risk (Beta)***

Before CAPM <sup>1</sup>, risk was normally estimated by measuring the variability of the past returns for each individual stock. Since the middle of 1960s, CAPM has been the backbone of financial asset valuation. The model simply states that the expected return of an asset, in excess of the risk free rate, is positive, linear function of its covariance of return with a portfolio of all risky assets (Draper and Findlay, 1982).

CAPM is the equilibrium of the stock price that should be in a rational market. The expected return by using CAPM can be given by:

$$E(r_A) = r_f + \beta_A [E(r_M) - r_f] \quad (2)$$

where  $E(r_A)$  and  $E(r_M)$  are the expected returns on stock A and the market portfolio,  $r_f$  is the return on the risk free asset and  $\beta_A$  is the beta of stock A.

The validation of CAPM however, is subject to the underlying assumptions including:

- a) All investors have a risk-averse attitude, which can be summarised by mean and variance of returns only they have a single period time-horizon;
- b) There are no taxes and no market imperfection; there are no transaction costs and all investors

<sup>1</sup> The derivation of CAPM can be referred to many research papers and books. These include Sharpe (1964), Draper (1982), Brown (1991), Copeland and Weston (1992) and many more.

- have all relevant information and this information is free;
- c) The markets are complete by which investors can buy fractions of any stock.
  - d) All Investors have homogeneous expectation about the return distributions;
  - e) Borrowing and lending at risk-free rates are unrestricted.

Every each of the assumptions is important in deriving the CAPM. Some of these assumptions are unreasonable from a theoretical, rather than from an empirical, point of view. When one considers that the majority of investment (including real estate investment) is undertaken by institutions, different institutions clearly have different risk profiles and different liabilities, which leads them to have different investment time horizons. Institutions also see risk in relation to their liabilities, so that it is not the variance and expected return of the asset portfolio which is of interest but the variance and expected return of the surplus after meeting any liabilities which fall due.

Market risk can be measured, and the measure is universally referred to as *beta*. Market risk is the risk associated with general movements in the economy and affects all quoted companies to some greater or lesser extent. Unfortunately, there is no readily available measure of general movements in the economy on a day-to-day basis. To measure the market risk of individual stocks and portfolios, finding a benchmark representing the economy is necessary. Such a benchmark in the UK is the broad-based FTA index. Using this broad-based index as a surrogate for the UK economy, measuring the extent to which returns of portfolios and individual stocks move with unanticipated changes in general economic conditions is possible.

### ***The Application to Real Estate Analysis***

Although these investor surveys remain the primary method for establishing real estate discount rates (Carrol, 1992; DeCain, 1994), the growth in the number of publicly held REITs has made it possible to supplement those estimates with those of discount rates derived from CAPM.

CAPM involves estimating from market data the cost of capital of a public listed company or a group of similar companies and applying that cost of capital to an investment under consideration. The results can be more useful if there is stronger similarity between the investment under consideration and the company or companies, for which a cost of capital is estimated. MPT affirms that the level of discount rates and values should not be affected by unique company risk because this form of risk is diversified away in a well-constructed portfolio,

therefore discount rates should be based on market risk only. DeCain (1994) addressed that CAPM should be considered as a supplement and not as a substitute for traditional investors survey techniques. CAPM is merely an empirical base model and dependent on market results.

In order to estimate the expected return in the real estate sector, most of the investors preferred the measurement, which is based on market expectations. Two reasons why real estate managers favour CAPM.

- i) Most investors were increasingly concerned on real estate in order to secure the value of the company and to expect income streams from the investment. Investment decisions need such indicators, which prompt movements of investments, both within other sectors and between sectors (Dubben and Sayce, 1991).
- ii) Real estate securitization is accepted as investment vehicles to overcome the liquidity problem in real estate investment. Those vehicles have created the possibility of applying CAPM as the performance measurement of real estate investment. CAPM is nor merely rely on the performance of direct real estate investment but also could be measured by the performance of public listed real estate company (PLREC) or other real estate securitizations.

### ***Criticism of Beta and CAPM in Real Estate Analysis***

CAPM has been debated and criticised especially from an empirical point of view. The study by Fama and French (1992) found that the empirical predictions of CAPM do not hold as beta and long-run average return are simply not correlated. CAPM indicates that the risk of the future relies on the risk of the past, which is difficult to accept (Dreman, 1992). Malkiel and Xu (1997) also expressed that in their findings, a simple overall systematic risk measure such as beta, is not likely to be an effective predictor of future returns. Although most of the criticism were on CAPM, Grinold (1993) defended that beta has several uses that are separate from CAPM. While Grundy and Malkiel (1996) found that beta remains a useful tool in forecasting short-term risk in declining markets. More debates have emerged both in favour and criticism of CAPM (Black, 1993; Grinold, 1993). Recently, researchers were turning their attention to issues involving implementation of CAPM. Ibbotson et al. (1997) show that monthly estimates of small firm betas are biased downward. They also show that stock returns are positively related to beta when betas are adjusted to eliminate this bias.

Both efficient frontier analysis and CAPM have been applied to merely real estate and mixed asset with real estates. Firstenberg et al. (1988) and Brown, in MacLeary and Nanthakumaran (1988) discussed the analysis of real estate in this context. Conroy et al. (1986) made a critical appraisal of the application of MPT to real estate. There are probably even more problems with the data inputs when real estate is included among the assets considered in portfolio selection models than when they are applied to stocks. As with stocks, there is likely to be instability in the input parameters.

There may be problems with the real estate market indices from which to estimate the market return. Several real estate indices can be applied in assessing real estate returns in the UK such as Jones Lang Wootton (JLW) and Hillier Parker. Richard Ellis, Healy & Baker and Michael Laurie, with the Corporate Intelligence Group, are three of the better known additions at this time. However, the growing volume of different real estate indices led to some difficulties for interpretation. These all were based on comparatively small samples and the construction of each index series have different concepts. Back in Malaysia, the only available real estate index is a limited Malaysian House Index (MHI). While the most attractive real estate investment is commercial, MHI may not that useful for assessing real estate returns. The CAPM application is still in its infancy and so far, no standard method is adopted, as the determination of the discount rate for discount cash flow in real estate analysis is still inconclusive.

### ***The Role of CAPM and Beta in Real Estate Analysis***

The evolution of DCF application in real estate analysis for the last few decades has driven most of the practitioners to undertake a rigorous technique in estimating the expected return. Although the investor surveys remain the primary method for establishing real estate discount rates, the availability of PLRECs and real estate funds has made it possible to supplement those estimates with those of discount rates derived from CAPM.

Despite the criticism on CAPM in recent years, it is still the most widely accepted method of calculating discount rates used in corporate finance (DeCain, 1994). CAPM assumes that markets are efficient and stock prices therefore are strong indicators of true value. This leads to the collateral conclusion that investment portfolio managers should focus their activities on the construction of well-diversified portfolios. The level of discount rates and values should not be affected by specific company risk because this form of risk is diversified away in a well-constructed portfolio. Discount rates should be based on market risk, which is explained by beta. Therefore, the discount rate, as the cost of capital is the sum of a risk-

free rate of return plus a premium for the market risk. However, the conclusive evidence is not available due to the inefficiencies of the market rather than CAPM failure (Draper and Findlay, 1982).

## **5. Managing the Real Estate Portfolio**

Portfolio is simply defined as a list of investment. Managing the portfolio is therefore concerned with the management of a number of asset classes held for investment purposes. Inefficiencies in the real estate market, reflecting the inability to sell short, high transaction costs and wide bid-ask spread, as well as the complexity of individual properties, require active investment management (Scott Jr., 1994). Most of the companies aim to maximise the value of the company. Therefore, it is important to understand how decisions related to the real estate asset affect company value. PLRECs obviously will emphasise, not only aiming to maintain their company value at the highest level, but also to create shareholder value and achieve capital growth and income stream from the real estate portfolio.

Correlation among asset allocation classes may differ, for example stock and real estate markets. Capital market theories such as CAPM and arbitrage pricing model (APT) are capable to guide and justify adjustments to the inputs. On the other hand, correlation among the portfolios within real estate sector or sector allocation is not significantly different within each sector (Brown, 1991). However, diversification across sectors is still needed for hedging strategy to take advantage of any potential changes in the real estate market and to deal with the problem of liquidity.

Managing the real estate portfolio (MREP) is not easy task compare to structuring different asset allocation classes in the portfolio. It may involve real estate acquisitions, disposal and restructuring the portfolio. Rodriguez and Sirmans (1996) emphasised that decisions related to MREP should be made with knowledge of the empirical evidence suggesting the potential market reaction to these decisions. They also highlighted the importance of the consistency between strategic plan and action of the company as MREP is an important issue.

## **6. The Diversification of Real Estate Portfolio : Problems and Alternatives**

In the context of the MPT application, as initially specified by Markowitz (1952), the involvement of real estate as one of the investment media has led to the construction of the portfolio within the multi-asset or the real estate asset class. As discussed in previous section, most of the studies have recommended that the optimum allocation to real estate should be approximately twenty per cent of the multi-asset portfolio. Institutional interest on



real estate has grown and therefore, more sophisticated techniques are increasingly used in order to estimate the risk and returns of the real estate portfolio. Reducing real estate investment risk by portfolio diversification is a crucial part of investment decision to the success of portfolio management strategy.

Within real estate portfolios, the conventional approach to defining diversification categories is to use real estate type (sector) and the geographical region. This is supported by two surveys of institutional investors' diversification strategies, which found that real estate type and geographical spread are the most important diversification criteria. Webb (1984) found that 61 per cent of investors diversified by real estate type and 62 per cent diversified by geography. Other studies, Louargand (1992) found that 89 per cent of the institutional investors surveyed diversified by real estate type and 72 per cent by geography (additionally 41 per cent by economic location) and 54 per cent ranked real estate type as the most important diversification criterion. De Witt (1996) showed that most real estate fund managers diversify their real estate portfolios consciously and rigorously. Real estate fund managers employ a strategic top-down approach rather than letting the portfolio evolve as more buildings are acquired. De Witt also found that to achieve this intentional structure, fund managers rely on either real estate type or location as the predominant criterion for portfolio construction.

The study by MacGregor (1990) suggested that the real estate portfolio could be constructed by grouping the region according to economic base. The underlying assumption will cause a similarity within the unit of analysis. By reviewing past and current real estate type diversification information, Mueller and Laposa (1995) found that real estate type allocations may enhance investor returns over real estate market and/or economic cycles. Eichholtz and Hoesli (1995) use the analysis of the EFs and APT to compare the diversification within a real estate portfolio in the USA and the UK. They found that in the USA, office and office/R&D properties have similar performance across regions, whereas the retail sector has greater diversification across regions. In the UK, for the riskiest portfolios, diversification within London is almost as effective as countrywide diversification. In the USA, studies have been undertaken to examine the characteristics of geographical real estate diversification with the consideration of the issue of homogeneity (Hartzell et al., 1986 and 1987; Mueller, 1993). The studies emphasise on the use of the industry employment factors such as manufacturing, transportation, government services and so on.

Another aspect of diversification within real estate is size effect. Kallberg et al. (1996) calculated mean-variance

efficient portfolios using Treasury-bills, bond and stock indices. He found that the diversification benefits were shown to be the greatest with smaller properties and are most advantageous at higher target levels of return. However, Mueller and Laposa (1995) affirmed that real estate size is not a good indicator of a potential diversification determinant since the cost of each real estate type varies greatly.

Attempts to diversify portfolios within real estate by applying MPT have received less attention compared to diversification within multi-asset classes due to data problems (Eichholtz and Hoesli, 1995; Hartzell et al., 1986). Most researchers address real estate diversification question by first estimating return and risk measures for each of the diversification categories and by subsequently deriving the EF using the mean-variance asset allocation model.

The risk and return measures most commonly used by such MPT applications are averages and standard deviations of historic annual or quarterly returns (Mueller and Ziering, 1992; Mueller, 1993; Mueller and Laposa, 1995), monthly returns interpolated from quarterly returns (Gold, 1996), or annualised average quarterly returns and standard deviations (Pagliari et al., 1995). Such measures are within the tradition of the application of MPT theory to stocks and bonds, which are highly liquid investment vehicles.

Real property, however, is highly illiquid, with high transaction costs. Therefore, implementation of MPT generally, tend to be difficult, complicated and the real estate indices data often lacking in uniformity. Strategic decision on real estate diversification is still frequently based on naïve intuitive judgement (Hishamuddin and Ruddock, 2000). Consideration of MPT in real estate analysis may be not routinely part practised by real estate analysts. The paradigm shift of real estate research into a quantitative manner however, has drastically changed the understanding of MREP. Quantitative models can be applied to real estate analyses but the limitation of real estate information may cause difficulties to develop reliable portfolio allocation decisions. It also requires good quality data and need to be supported by a strong research base (Adair, et al., 1994). In order to assure the reliability of the results, adjustments have to be made on any statistical problems that occurred during the analyses. For example, smoothing is one of potential statistical problems associated with real estate indices. A number of studies have attempted to solve the smoothing problem, which include Blundell and Ward (1987) and Firstenberg et al. (1988). Since then, further investigations have been carried out by Barkham and Geltner (1995), Wang (1998) and many more. Such adjustments may be or not reliable dependent to the micro economic factors as real

estate carries high specific risk and most of the real estate market environments are localised in nature.

## 7. Conclusion

The conventional arguments regarding portfolio allocation within real estate have created some inconclusiveness in structuring the real estate portfolio. The emergence of real estate securitization such as REITs in the last decade at least has changed the attitude of fund managers on real estate as one of the best investment options. It has been recognised by investors that the myriad market activities generating the business cycle are interrelated. It is believed that disturbances in market fundamentals in a given market generate movements of capital into and out of the affected market. If various markets are integrated, it is expected that a high degree of asset substitution will take place. As real estate is now one of the asset classes, its needs to be recognised whether the real estate market and stock market are integrated. The fact is that, their integration is still inconclusive and therefore, identifying the precise framework of real estate portfolio construction is difficult. Although there were numerous studies on the application of MPT, studies of the behavioural aspects concerning expectations of the major players, such as PLRECs and REITs, were left behind. The paradigm shift of real estate investment from 'tactical and operational' to 'strategic and tactical' style of management has transformed the perception of real estate from just 'bricks and cement' to more institutional in business environment. Therefore, with the increasing number of REITs in Bursa Malaysia recently, MPT would be able to offer more opportunities for further research to explore the behaviour and performance of real estate market which may lead to better investment decisions.

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