OPTIMAL PORTFOLIO ALLOCATION OF MALAYSIAN REAL ESTATE INVESTMENT TRUSTS DURING ECONOMIC DOWNTURN

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Abstract

The aim of this paper is to investigate the impact of Real Estate Investment Trusts (REITs) on portfolio diversification in Malaysia. REITs is known to bring about a stable and optimal return but less evidence on the portfolio allocation of Malaysian REITs in maximizing investors benefit. Four year data is use comprising daily of price quotes of thirteen REITs and twenty three common stock counter for comparison purposes. Through analysis of expected return (ER) and standard deviation (SD) and the establishment of efficient frontier (EF), this paper suggest that Malaysian REITs are able to contribute higher possible return in portfolio diversification as compared to those asset portfolios without REITs participation by optimal allocation of REITs in portfolio between 41.54 to 49.44 percent. This paper also suggest during downturn economic situation higher allocation is advisable to be made in REITs for maximizing investor return as its perfectly negatively correlated to general market. Yet, the uniqueness of Malaysian REITs in term of its properties diversification strategies and size of fund made it difficult for the investors to evaluate its potential.

Keywords: *REITs, efficient frontier, risk, return, performance*

1.0 INTRODUCTION

Malaysian Real Estate Investment Trust (REIT) was regulated under Securities Commission's (SC) guidelines released in January 2005, which superseded the earlier guidelines on Property Trusts Funds issued in November 2002. As at November 2006, the market capitalization of the first five Malaysian REITs worth about US$550 million, lagging behind REITs in Singapore and Hong Kong which worth US$13 billion and US$6.5 billion, respectively and Malaysian REITs offer an attractive annual yield which averaged 7.3 percent and have steady trading volume in Bursa Malaysia.

While as at 31st December 2013 the market capitalization of Malaysia REITs worth US$10,800 million and 64 percent of the asset is specialized property type (Abdul J. and Hishamuddin, 2015). This seem aligned with prior study on Malaysia REITs which revealed that equally weighted REITs portfolio give some diversification benefits and return enhancements under the mean-variance and downside risk framework but in recent year it have diminished (Lee and Ting, 2009).

Yet, Malaysian REIT remains less favourable to local investors and non-resident investors. The lack of support in term of property trust structure and unfavourable tax regulatory had been the influenced factor of slow development and poor performance of the trust (Newell *et al.*, 2002). The South Korean REITs also experienced a poor performance over the entire period of 2002 until 2010 compared to shares, bonds and property companies, in which result in a less inclusion of REIT in a mixed-asset portfolio (Pham, 2011). Meanwhile, the institutional investor participation in Malaysian listed property trust (LPT)/REIT found that poor participation is due to small trading volume of

LPTs (Lee *et al.,* 2006), small market size of LPT market and slow capital appreciation. The growth of REITs in Asia had been considered by both local and international real estate investors (Ooi *et al.,* 2006), as greater REITs market such as China and India are expected participate and conduct their own REITs soon.

There are many factors affect the value of REITs' share price. It can be influenced by the predicted earning, growing stream of rental revenue and also by a capital appreciation of real estate assets. From the level of growth of rental revenue, it very much depends on economic fundamentals of demand and supply. Different location might have different impacts of rents and occupancy rates in which will effects the earning and property values (Abdul Hamid, 2006). Investing in REIT share historically has increases total portfolio return and minimize overall portfolio risk for both equity and fixed income investors. Their research shows that, when REIT shares are located to a diversified portfolio, the efficient frontier of the portfolio will move upward. In other words, when portfolio investments are efficient, the risk adverse investor can expect to realize higher portfolio return with the same level of portfolio risk they prefer, meanwhile the risk tolerant investors can expect to realize lower risk along with the high level of return. The inclusion of Malaysian REIT in portfolio diversification had rarely brought into discussion both locally and internationally. Prior study that analyzed the inclusion of both public and private real estate in a mixed-asset portfolio revealed that REITs able to enhance efficient frontier significantly and may demand a larger allocation (Mueller and Mueller, 2003). Meanwhile study on REITs function on optimal allocations to portfolios of stocks, bonds and bills, showed that higher optimal allocation to REITs, in which monthly and quarterly returns seems to understate the variability of REITs that results in to higher portfolio allocation. (Waggle and Moon, 2006). Therefore this paper aims to evaluate the optimal allocation of REITs in portfolio diversification in Malaysia using portfolio combination made between common stock (CS) and REITs of data during economic downturn from 2006 until 2009. Efficient frontier is used as mechanism to optimize the best frontier for maximizing investor return.

2.0 REAL ESTATE INVESTMENT VEHICLE

The correlation of REIT with the stock market is generally low. Price movement of equity REIT is also affected by the general movement of the stock market. However, Equity REIT (EREIT) cannot be perfectly substitutes for unsecuritized real estate because their risk and return characteristics are not the same. Therefore, many researchers have looked at this issue and have found significant benefits by adding REIT to their investors' portfolio. There are significant benefits of adding REIT to establish efficient portfolio as the investor's return target will rise. More aggressive investors should increase the allocation of REIT in the portfolio and decrease the allocation of private real estate and bonds.

The variability and covariability of REIT returns with the common stock and bond market are lower (or higher) when the REIT index is rising (or ailing) (Chandrashekaran, 1999). This indicates that investor should allocate more of their portfolio to REIT after an upward move in the REIT market and less after a downward move when the asset allocation benefits of REIT stocks are lower. Diversification may provide flexibility to within-real estate portfolio allocations by helping build in risk-return trade-off to the investment decision, for example high Fund from Option (FFO) payout firms has lower systematic risk.

Therefore REIT size is shown to affect the risk premium in EREIT pricing and the systematic risk of EREIT varies by the type of underlying property. REIT betas did show a pattern similar to small cap stocks and exhibit asymmetry across advancing and declining markets. There was some evidence of stability in the risk components of REIT securities over time. However, no significant relationship was found between REIT betas and returns. For example by switching between real estate, large and small stocks could improve risk and return so that investors should diversify into commercial real estate and international equity. In general,

returns on both high and low-risk REIT exceeded Treasury bills returns. Yet, stock market data provided no evidence that REIT diversification across property type or geographic regions resulted in diversification and that diversification across property types could adversely affect value as there was no consistent correlation between inflation and EREIT returns. REIT returns and stock market returns were shown to be highly correlated whereas the same correlation did not hold for an index of properties and the stock market. Through obtaining the best-practice frontier of REIT return and risk as a piecewise linear combination of all observed REIT return and risk combinations (Devaney, 2005).

The directional output distance function is used to measure each REITs deviation from the frontier and serves as a measure of inefficiency. REIT inefficiency are measured as the maximum expansion in monthly return and simultaneous contraction in risk that is feasible given the observed best-practice frontier of all REIT return and risk combinations. The results indicate that a REIT management technology which ignores risk results in a significantly different best-practice technology than one that controls for risk. It also found that when risk is incorporated into efficiency estimates most REIT operate in the range of increasing returns to scale and could benefit from expansion. REIT inefficiency is inversely related to the market/book equity ratio in the models which account for risk and the leverage ratio has a positive and significant impact on REIT valuation. In a long run, REIT performance is comparable to a stock market as a whole after adjusting for risk. It appears to be comparable to other types of securitized real estate on a risk adjusted basis. Equity REITs performance has been superior to that of mortgage REIT and hybrid REIT. It appears to have better performance when the rate of inflation is relatively low and when interest rate are falling. Although REIT cannot be considered as perfect substitute for unsecuritized real estate in the investor's portfolio, it could play important role in to the portfolio.

Lesson learnt from US, witness more than twenty years and longer to justify the performance of REIT in short and long run long (Lee and Stevenson, 2005). Their result concluded that REIT behaves like direct real estate in the long run but more like financial asset in the short run. REIT in which were integrated with the stock market up to the 1990s and they behave more like direct real estate market. REITs behave more like large cap stocks in the 1970s and 1980s but since the early 1990s, REIT have performed more like small cap value stocks. The inclusion of publicly traded REIT provides improvement over the entire frontier as the theoretical allocations to real estate exceed 50 percent of the portfolio that the trend for publicly traded REIT to behave more like direct real estate and less like stocks (Mull and Soenen, 1997; Clayton and MacKinnon, 2003). Therefore REIT is a "unique" asset class, whose return cannot be replicated with other assets. It may offer improvement in a mixed asset context, but this is likely to depend on the time period considered and the length of the holding period.

2.1 Risk and Return Analysis

The expected returns of individual security carried some degree of risk which defined as the standard deviation around the expected return (Fred, 1967). The Modern Portfolio Theory (MPT) proved that by diversifying investment assets, investors can minimize the risk of investment portfolio, and obtain higher return for the same amount of undiversified portfolio risk. Mean variance portfolio analysis is used to tell how many holdings should be in a portfolio (Markowitz, 1952). The different conclusions are made based on the size of REIT when more direct real estate are added to the property portfolio that has lower risk/ return profile (Black, 2004). Therefore, efforts to spread and minimize risk take the form of diversification. This approach of portfolio leads to the conclusions that the best diversification comes through holding large numbers of securities scattered across industries (Fisher and Jordan, 1999). For example, many believe that holding fifty such scattered stocks is five times more diversified than holding ten scattered stocks.

Markowitz's approach to coming up with good portfolio possibilities has its roots in risk- return relationship in which in his assumption the investor attitudes toward portfolios depends exclusively upon firstly expected return and risk and secondly quantification of risk.

The expected return is formulated from assessment of historical return and the consideration of trends. The rate of return on a portfolio is computed as the weighted average of the returns on its components assets. The weighting is the ratio of the value of the component asset to the total values of the portfolio. The formula of expected return is:

$$\boldsymbol{R_p = x_1 r_1 + x_2 r_2 + \ldots + x_n r_n}$$

Where,

R_p = Return on the Portfolio;
x_i = Weight of the asset by value;
r_i = Rate of Return on the asset *i*

It is important to determine the risk or uncertainty that may be associated with earning the return. The risk involved in individual securities can be measured by standard deviation. The variance of return and standard deviation of return are alternative statistical measures that are proxies for the uncertainty or risk of return. The reduction of risk of a portfolio by blending into a security whose risk is greater than any of the securities held initially suggest that by deducing the riskier of a portfolio simply by knowing the riskier of individual securities is not possible. This is as to know the inter-activeness of risk between securities. The formula of standard deviation is:

$$\boldsymbol{SD = \sum \sqrt{P_i\left(X - E(R_i)\right)}}$$

Where,

SD = Standard Deviation
P_i = Probability

When more securities are combined, there is a need to identify whether their interactive risk or covariance. If the rate of return of the securities move together, it is considered that their interactive risk or covariance is positive and vice versa. Therefore if the rates of return are independent, the result in covariance is zero. Correlation coefficient is designed to measure the degree of relationship between the behaviours of two variables. The value of the correlation coefficient ranges from -1 to +1 and it is not affected like the covariance by the scale used to measure the variables. The correlation coefficient of to security *A* and security *B* is:

$$\boldsymbol{p = \frac{Covariance(A,B)}{SD_A\, SD_B}}$$

The coefficient of variation provides a direct comparison between a fund's return and risk characteristics. The coefficient of variation is implying the fund's standard deviation divided by its return (Arithmetic). The ratio provides a relative measure of risk and may be used to rank the alternatives available. The ratio allows normalizing risk relative to return. The higher ratio, the greater risk in proportion to return. The formula of coefficient variation is as below:

$$\boldsymbol{CV = \frac{SD}{E(R)}}$$

Markowitz used the techniques of quadratic programming by assuming that one could deal *n*-securities or fewer. Using the expected return and risk for each security under consideration and covariance estimates for each pair of securities, investor are able to calculate risk and return for any portfolio comprising of some or all of these securities. Any specific value of expected return can determine the least risk portfolio. Thus with another value of expected return, a similar procedure again yield the minimum risk combination. Portfolio diversification stress that more securities one holds in a portfolio the better. Not only the number of securities but the right kinds of securities are those that exhibit less than perfect positive correlation. Markowitz diversification technique result in risk can technically be reduced below the systematic level if securities can be found whose rates of return have low enough correlations in which suggest a negative correlation are more ideal.

Markowitz's contribution was to see portfolio selection as a problem of maximizing the utility of an investor's wealth under conditions of uncertainty. By recognizing that each investment could be defined in terms of its risk and return, Markowitz developed a means of efficiently diversifying in order to give the maximum expected return for any given level of risk or the minimum level of risk for a given rate of return. Portfolio risk therefore can be reduced by investing in the minimum of two assets where the cyclical patterns of their rates of return which not move in perfect lockstep. This is because difference types of investment have different degree of risk. The lowest amount of risk, have also a very low return, so does the higher the risk, the higher the investor's expected return. Two investments are said to be perfectly negatively correlated is when their covariance is -1. A positive change in one investment of one dollar is perfectly matched by a negative change in the other and the variance of each asset cancels out the other.

The more properties are added to the portfolio it is possible that its risk class will change (Brown, 1991). The extent of the change will be affected by the value weighting of its components properties. The equations for each of the sectors and shows the impact of increasing the number of properties in a portfolio on the standard deviation of returns. The risk class of the portfolio will be established very quickly. Therefore the correlation structure and total risk of individual properties within a property portfolio will differ from the average it is evident that the risk of a value-weighted portfolio will dominated by those properties which have the largest capital value. Depending on the return characteristics of individual properties, portfolio risk could be either increased or decreased. In the absence of any information concerning risk, portfolio managers will be unaware of the direction of change following the acquisitions of each new property. The problem will be most acute with small sized portfolios. As the number increase the effect of large value properties can be diversified away.

The performance of individual properties is affected to a large degree by the unsystematic components of risk (Brown, 1991). Property market effects play a relatively small part in explaining periodic returns. If however the average holding period for property tends to be long then it is likely that the effect of intermediate variations in returns can be diversified away. Unless individual properties become marginal, one of the consequences of long holding periods is that as properties age they will suffer a decline in systematic risk. Thus if portfolio is inactively managed its expected returns will decline over time. The unsystematic components are dominated by location factors which are specific to each property. These tend to produce low correlation coefficients between properties which are helpful in terms of reducing risk. If these are constant over time then it would seem to indicate that there is little advantage to be gained by diversifying across sectors. Therefore in this paper the evaluation of risk (standard deviation) and return (expected return) in term of portfolio diversification is necessarily to deter ability of REITs to participate in portfolio diversification.

3.0 METHODOLOGY

This research comprised four years period of study that are 1st January 2006 until 31st December 2009 and for the comparison of the benefit between portfolio with and without REITs participation in each year two portfolio shall be developed. The main reason this time period is chosen, is to evaluate the ability of Malaysian REITs diversification during economic downturn. Therefore in order to evaluate which portfolio is superior, efficient frontier (EF) will be used to study whether at a given level of risk, which portfolio will bring about better return. The EF can be computed by using SOLVER of Microsoft's Excel for Windows spreadsheet. SOLVER is capable of determining the maximum or minimum value of one cell by changing other cell. This means that in each period two EF shall be generated namely are EF-A for Portfolio without REITs Participation and EF-B for Portfolio with REITs Participation. Each portfolio only consist twenty counter, therefore in order to select the best counter for each portfolio beta coefficient

measurement is used in determining the expected return and risk associated in stock.

As much as thirteen REITs and twenty three common stocks have been selected for the comparison of the study and measurement of beta coefficient been carried out in order to select the best twenty for each portfolio. Meanwhile the selections of these 23 common stocks are based on its major role as components of Bursa Malaysia Composite Index. It comprises of all industry and listed in main board of BM which at the same time represent for Composite Index Component. The data of daily prices quotes had been gathered from Bursa Malaysia (BM). The REIT investment only started in Malaysia actively after the adoption of Guidelines of Real Estate Investment Trusts by Securities Commission Malaysia in 2005, the REIT investment in Malaysia are considered new and limited data are available. However, 60 percent of the REIT started to be listed in Bursa Malaysia in beginning of 2006 and hundred percent in 2007, 2008 and 2009 therefore the data of daily REIT price quotes will be segmented according to four year time period as below:

(i) Period 1: 1st January 2006 until 31st December 2006
(ii) Period 2: 1st January 2007 until 31st December 2007
(iii) Period 3: 1st January 2008 until 31st December 2008
(iv) Period 4: 1st January 2009 until 31st December 2009

Through the measurement of beta coefficient the selection of twenty counters per portfolio been made and further used for evaluating the efficient frontier. Beta can be generated through the following equation.

$$\boldsymbol{\beta_s = \frac{n\sum xy - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}}$$

where;

β_s = the security 's beta (systematic) risk
n = number of observation
x = the market return
y = the stock required return
Σx = sum of market return
Σy = sum of stock return

Therefore the beta less than 1.00, mean that the security is less volatile and less responsive to changing return in the market. The following are counters which had been taken into consideration for portfolio combination; Table 1 is Beta Coefficient according Period. The higher the beta, the better but it also indicate that higher beta correlated to general market which is riskier. Therefore, this study adopted normal practice of security selection that beta +2.0 is excluded from the portfolio combination, by assuming that large positive beta coefficient might be sold short and "more" volatility relative to the market. Thus it result in, combination of the portfolio are as Table 2 shows the list of portfolio combination which consist of twenty counters in each portfolio.

4.0 DATA ANALYSIS

4.1 Analysis of Expected Return and Standard Deviation (Risk)

This study had calculated expected return and standard deviation of each common stock (CS) and REITs for analysis. The Table 3 shows the expected return and standard deviation according to period in which the expected return portfolio (ERp) and standard deviation portfolio (SDp) of the portfolio without and with REITs according to period. On the first period, the ERp and SDp of both EF 1A and EF 1B are almost the same that are 0.57 and 1.17 percent, respectively, this could be due to immaturity of REITs in BM.

However, in the second period the ERp and SDp of EF 2A is higher that EF 2B. But during third period, EF 3B is better than EF 3A although the ERp EF 3B is lower but positive and the SDp is at 0.54 percent compared to SDp EF 3A which is at 0.95 percent. The same scenario happen in fourth period, where SDp 4B is at 0.30 percent compare to SDp 4A which is 0.04 percent only.

4.2 Efficient Frontier

The establishment of efficient frontier (EF) in this study enable to evaluate whether at a given level of risk, which portfolio will bring about better return. From Panel A of Figure 1 shows efficient frontier of period 1, 2, 3 and 4 in which EF represents the two set of portfolios which without REIT (EF 1A) and with REIT (EF 1B) that has the maximum rate of return for every level of risk, or minimum rate of return for every level of risk. Correspondence to the introduction of REITs in 2005 in Malaysia as one of investment instrument had results seven REITs trade in the BM. In which Amanah Harta Tanah PNB (AHP) and Amanah Harta Tanah PNB 2 (AHP 2) been established before 2005. The introduction of Malaysian REIT Guidelines in January 2005, few REITs been admitted and listed in BM, namely Axis REIT on 3rd August 2005, Starhill REIT on 16th December 2005, followed by UOA REIT on 30th December the same year. In 2006, Malaysian witness another two more REITs traded on the BM which are TOWER REIT on 12th April 2006 and Al- 'Aqar KPJ REIT on 10th August 2006.

Meanwhile in Panel B of Figure 1, which represent EF for period 2 shows two sets of portfolios which without REIT (EF 2A) and with REIT (EF 2B). In this graph it shows at lower level of risk, EF 2B is superior to EF 2A, but as the line going upward both almost the same point. During 2007, there are six additional REITs traded in BM and give more options for the investors to evaluate the REITs as investment vehicles. These REITs are Hektar and AmFirst REITs which listed on middle December 2006, QCapita REIT on 8th January 2007, Al-Hadharah Bousted REIT on 8th February 2007, Amanah Raya REIT on 26th February 2007 and Atrium REIT on 2nd April 2007.

However difference scenario happens in Panel C of Figure 1 for EF 3A and EF 3B (Period 3), that EF 3B is superior to EF 1A, by plotted at higher return at the same level of risk. The graph shows that EF 3B is the best frontier for example at same level of risk 0.3, EF 3B plot at positive return while EF 3A plot at negative return. Although Malaysian REITs have been its second year trade in BM but the size of REIT is considered small as can be seen in Table 4, the Total Net Asset Value (TNAV) of Malaysian REIT and the percentage of increment of TNAV on the second year.

Moreover on the second half of 2008, Malaysian also face downturn economic situation. The study on the period 4 shows that portfolio with REITs EF 4B is performing better than EF 4A. According to Panel D of Figure 1 for EF 4A and EF 4B (Period 4), that is EF 4B is plotted at higher return at the same given level of risk, which during this period Malaysian economic is in its recovering process where KLCI begin to rise and start changes positively.

The EF establish, the percentage of optimal allocation of REIT on portfolio diversification is generated as shown in Panel E, F, G, H of Figure 2. In period 1, the EF 1B do not outperforming EF 1A which this could due to immaturity and smaller in size of the REITs itself. The portion of REITs allocation in portfolio with REITs participation for period 1 as in Panel E of Figure 2 in which Portion of REIT Allocation in Portfolio for Period 1: EF 1B. In which suggest that optimal allocation for period 1 is 90.98 percent should be Non-REITs counter and only 9.02 percent in REITs counter.

Meanwhile the Panel F of Figure 2 in which Portion of REIT allocation in portfolio for Period 2: EF 2B suggest that optimal allocation for period 1 is 83.36 percent should be Non-REITs counter and 16.64 percent in REITs counter, which indicate an increase of 7.62 percent of REITs allocation compared in period 1. During period 3 also suggest that higher portion for REITs counter on optimal allocation that 49.44 percent. Please refer Panel G of Figure 2 in which portion of REIT allocation in portfolio for Period 3: EF 3B.

Table 1: Beta Coefficient according Period

RANK	2006		2007		2008		2009	
1	GAMUDA (5398)	2.95	PLUS (5052)	4.43	SPSETIA (8664)	1.65	LANDMRK (1643)	3.09
2	IGB (1597)	2.09	GAMUDA (5398)	2.11	IGB (1597)	1.51	PROTON (5304)	3.04
3	DIGI (6947)	1.34	IGB (1597)	2.05	ATRIUM (5130)	1.42	MRCB (1651)	2.39
4	TSH (9059)	1.10	SPSETIA (8664)	1.87	GAMUDA (5398)	1.28	GAMUDA (5398)	1.64
5	TM (4863)	1.04	LANDMRK (1643)	1.54	TSH (9059)	1.26	IGB (1597)	1.63
6	SPSETIA (8664)	1.03	QCAPITA (5123)	1.29	PLUS (5052)	1.21	TSH (9059)	1.62
7	IOICORP (1961)	1.00	TSH (9059)	1.23	TCHONG (4405)	1.17	TCHONG (4405)	1.61
8	AHP2 (6696)	0.85	SHANG (5517)	1.06	MAYBANK (1155)	1.09	MPI (3867)	1.58
9	PLUS (5052)	0.78	IOICORP (1961)	0.84	PBANK (1295)	1.01	KULIM (2003)	1.36
10	TWRREIT (5111)	0.66	AXREIT (5106)	0.77	DIGI (6947)	0.88	SPSETIA (8664)	1.29
11	MISC (3816)	0.66	STAREIT (5109)	0.68	LANDMRK (1643)	0.87	SIME (4197)	1.22
12	MPI (3867)	0.64	BSDREIT (5124)	0.65	AXREIT (5106)	0.77	MAYBANK (1155)	1.21
13	SIME (4197)	0.61	TM (4863)	0.59	HEKTAR (5121)	0.70	SHANG (5517)	1.13
14	PBANK (1295)	0.56	DIGI (6947)	0.56	TWRREIT (5111)	0.63	PLUS (5052)	0.82
15	MAYBANK (1155)	0.54	TCHONG (4405)	0.54	MISC (3816)	0.62	PBBANK (1295)	0.76
16	LANDMRK (1643)	0.51	PBANK (1295)	0.47	UOAREIT (5110)	0.55	ATRIUM (5130)	0.75
17	BAT (4162)	0.48	MISC (3816)	0.42	SHELL (4324)	0.45	IOICORP (1961)	0.73
18	PUNCAK (6807)	0.46	MPI (3867)	0.37	STAREIT (5109)	0.43	TWRREIT (5111)	0.73
19	UOAREIT (5110)	0.45	SIME (4197)	0.35	SIME (4197)	0.42	AXREIT (5106)	0.69
20	SHELL (4324)	0.34	MAYBANK (1155)	0.35	IOICORP (1961)	0.34	BSDREIT (5124)	0.48
21	PETGAS (6033)	0.33	KULIM (2003)	0.31	PROTON (5304)	0.34	QCAPITA (5123)	0.48
22	AHP (4952)	0.24	SHELL (4324)	0.26	AMFIRST (5120)	0.34	HEKTAR (5121)	0.41
23	SHANG (5517)	0.22	PETGAS (6033)	0.22	PUNCAK (6807)	0.29	ARREIT (5127)	0.41
24	PROTON (5304)	0.12	PROTON (5304)	0.20	MPI (3867)	0.19	ALAQAR (5116)	0.40
25	ALAQAR (5116)	0.12	BAT (4162)	0.19	ARREIT (5127)	0.17	SHELL (4324)	0.36
26	TCHONG (4405)	0.09	AMFIRST (5120)	0.11	MRCB (1651)	0.15	STAREIT (5109)	0.36
27	MRCB (1651)	0.07	AHP2 (6696)	0.11	KULIM (2003)	0.13	DIGI (6947)	0.30
28	STAREIT (5109)	-0.06	ALAQAR (5116)	0.09	AHP2 (6696)	0.09	AHP (4952)	0.27
29	AXREIT (5106)	-0.14	MRCB (1651)	0.07	PETGAS (6033)	0.01	AMFIRST (5120)	0.25
30	KULIM (2003)	-0.37	PUNCAK (6807)	0.03	SHANG (5517)	-0.05	UOAREIT (5110)	0.20
31			UOAREIT (5110)	-0.01	BSDREIT (5124)	-0.05	MISC (3816)	0.15
32			ARREIT (5127)	-0.18	QCAPITA (5123)	-0.07	BAT (4162)	0.13
33			TWRREIT (5111)	-0.23	BAT (4162)	-0.10	PUNCAK (6807)	0.10
34			HEKTAR (5121)	-0.57	ALAQAR (5116)	-0.11	PETGAS (6033)	0.07
35			ATRIUM (5130)	-0.58	AHP (4952)	-0.20	TM (4863)	-0.41
36					TM (4863)	-2.08		

Note:

1. *During 2006, only seven REITs were traded in BM.*
2. *There are two REITs been excluded; AHP REIT in 2007 and AHP2 REIT in 2009.*

Table 2: List of portfolios combination

Period	1st Jan 2006 – 31st Dec 2006	1st Jan 2007 – 31st Dec 2007	1st Jan 2008 - 31st Dec 2008	1st Jan 2009 – 31st Dec 2009
Portfolio Without REITs Participation	**EF 1A:** 1. DIGI (6947) 2. TSH (9059) 3. TM (4863) 4. SPSETIA (8664) 5. IOICORP (1961) 6. PLUS (5052) 7. MISC (3816) 8. MPI (3867) 9. SIME (4197) 10. PBANK (1295) 11. MAYBANK (1155) 12. LANDMRK (1643) 13. BAT (4162) 14. PUNCAK (6807) 15. SHELL (4324) 16. PETGAS (6033) 17. SHANG (5517) 18. PROTON (5304) 19. TCHONG (4405) 20. MRCB (1651)	**EF 2A:** 1. SPSETIA (8664) 2. LANDMRK (1643) 3. TSH (9059) 4. SHANG (5517) 5. IOICORP (1961) 6. TM (4863) 7. DIGI (6947) 8. TCHONG (4405) 9. PBANK (1295) 10. MISC (3816) 11. MPI (3867) 12. SIME (4197) 13. MAYBANK (1155) 14. KULIM (2003) 15. SHELL (4324) 16. PETGAS (6033) 17. PROTON (5304) 18. BAT (4162) 19. MRCB (1651) 20. PUNCAK (6807)	**EF 3A:** 1. SPSETIA (8664) 2. IGB (1597) 3. GAMUDA (5398) 4. TSH (9059) 5. PLUS (5052) 6. TCHONG (4405) 7. MAYBANK (1155) 8. PBANK (1295) 9. DIGI (6947) 10. LANDMRK (1643) 11. MISC (3816) 12. SHELL (4324) 13. SIME (4197) 14. IOICORP (1961) 15. PROTON (5304) 16. PUNCAK (6807) 17. MPI (3867) 18. MRCB (1651) 19. KULIM (2003) 20. PETGAS (6033)	**EF 3A:** 1. GAMUDA (5398) 2. IGB (1597) 3. TSH (9059) 4. TCHONG (4405) 5. MPI (3867) 6. KULIM (2003) 7. SPSETIA (8664) 8. SIME (4197) 9. MAYBANK (1155) 10. SHANG (5517) 11. PLUS (5052) 12. PBBANK (1295) 13. IOICORP (1961) 14. SHELL (4324) 15. DIGI (6947) 16. MISC (3816) 17. BAT (4162) 18. PUNCAK (6807) 19. PETGAS (6033) 20. TM (4863)
Portfolio With REITs Participation	**EF 1B:** 1. DIGI (6947) 2. TSH (9059) 3. TM (4863) 4. SPSETIA (8664) 5. IOICORP (1961) 6. PLUS (5052) 7. MISC (3816) 8. MPI (3867) 9. SIME (4197) 10. PBANK (1295) 11. MAYBANK (1155) 12. LANDMRK (1643) 13. BAT (4162) 14. PUNCAK (6807) 15. SHELL (4324) 16. PETGAS (6033) 17. AHP2 (6696) 18. TWRREIT (5111) 19. UOAREIT (5110) 20. AHP (4952)	**EF 2B:** 1. SPSETIA (8664) 2. LANDMRK (1643) 3. TSH (9059) 4. SHANG (5517) 5. IOICORP (1961) 6. TM (4863) 7. DIGI (6947) 8. TCHONG (4405) 9. PBANK (1295) 10. MISC (3816) 11. MPI (3867) 12. SIME (4197) 13. MAYBANK (1155) 14. KULIM (2003) 15. SHELL (4324) 16. PETGAS (6033) 17. QCAPITA (5123) 18. AXREIT (5106) 19. STAREIT (5109) 20. BSDREIT (5124)	**EF 3B:** 1. SPSETIA (8664) 2. IGB (1597) 3. GAMUDA (5398) 4. TSH (9059) 5. PLUS (5052) 6. TCHONG (4405) 7. MAYBANK (1155) 8. PBANK (1295) 9. DIGI (6947) 10. LANDMRK (1643) 11. MISC (3816) 12. SHELL (4324) 13. SIME (4197) 14. IOICORP (1961) 15. ATRIUM (5130) 16. AXREIT (5106) 17. HEKTAR (5121) 18. TWRREIT (5111) 19. OAREIT (5110) 20. STAREIT (5109)	**EF 3B:** 1. GAMUDA (5398) 2. IGB (1597) 3. TSH (9059) 4. TCHONG (4405) 5. MPI (3867) 6. KULIM (2003) 7. SPSETIA (8664) 8. SIME (4197) 9. MAYBANK (1155) 10. SHANG (5517) 11. PLUS (5052) 12. PBBANK (1295) 13. IOICORP (1961) 14. ATRIUM (5130) 15. TWRREIT (5111) 16. AXREIT (5106) 17. BSDREIT (5124) 18. QCAPITA (5123) 19. HEKTAR (5121) 20. ARREIT (5127)

Table 3: Expected return and standard deviation according to period

Period 1 (1/1/06- 31/12/06)					
EF 1A			**EF 1B**		
	E(R)	SD		E(R)	SD
DIGI	0.573	1.169	DIGI	0.573	1.169
TSH	0.007	0.082	TSH	0.007	0.082
TM	0.009	0.382	TM	0.009	0.382
SPSETIA	0.110	0.171	SPSETIA	0.110	0.171
IOICORP	0.118	0.171	IOICORP	0.118	0.171
PLUS	-0.016	0.109	PLUS	-0.016	0.109
MISC	-0.068	0.351	MISC	-0.068	0.351
MPI	0.050	0.338	MPI	0.050	0.338
SIME	0.069	0.226	SIME	0.069	0.226
PBANK	0.133	0.246	PBANK	0.133	0.246
MAYBANK	0.055	0.239	MAYBANK	0.055	0.239
LNDMRK	0.070	0.139	LNDMRK	0.070	0.139
BAT	0.368	0.908	BAT	0.368	0.908
PUNCAK	0.394	0.991	PUNCAK	0.394	0.991
SHELL	0.095	0.342	SHELL	0.095	0.342
PETGAS	0.005	0.127	PETGAS	0.005	0.127
SHANG	0.093	0.118	AHP2	0.005	0.015
PROTON	-0.041	0.517	TWRREIT	-0.010	0.038
TCHONG	-0.008	0.062	UOAREIT	-0.008	0.032
MRCB	0.041	0.074	AHP	0.004	0.015
PORTFOLIO	0.573	1.169	PORTFOLIO	0.573	1.169

Period 2 (1/1/07- 31/12/07)					
EF 2A			**EF 2B**		
	E(R)	SD		E(R)	SD
SPSETIA	0.273	0.705	SPSETIA	0.273	0.705
LANDMRK	-0.147	1.068	LANDMRK	-0.147	1.068
TSH	0.132	0.214	TSH	0.132	0.214
SHANG	0.013	0.171	SHANG	0.013	0.171
IOICORP	0.252	0.524	IOICORP	0.252	0.524
TM	0.142	0.494	TM	0.142	0.494
DIGI	0.979	1.653	DIGI	0.979	1.653
TCHONG	0.083	0.231	TCHONG	0.083	0.231
PBANK	0.274	0.522	PBANK	0.274	0.522
MISC	0.067	0.284	MISC	0.067	0.284
MPI	-0.100	0.228	MPI	-0.100	0.228
SIME	0.431	0.575	SIME	0.431	0.575
MAYBANK	0.000	0.402	MAYBANK	0.000	0.402
KULIM	0.203	0.756	KULIM	0.203	0.756
SHELL	0.121	0.311	SHELL	0.121	0.311
PETGAS	0.163	0.384	PETGAS	0.163	0.384
PROTON	-0.180	0.609	QCAPITA	-0.142	0.377
BAT	-0.303	1.740	AXREIT	0.004	0.031
MRCB	0.126	0.288	STAREIT	0.003	0.053
PUNCAK	-1.646	5.358	BSDREIT	0.027	0.062
PORTFOLIO	0.979	1.653	PORTFOLIO	0.273	0.705

Period 3 (1/1/08- 31/12/08)					
EF 3A			**EF 3B**		
	E(R)	SD		E(R)	SD
SPSETIA	-0.382	0.747	SPSETIA	-0.382	0.747
IGB	-0.089	0.189	IGB	-0.089	0.189
GAMUDA	-0.228	0.469	GAMUDA	-0.228	0.469
TSH	-0.142	0.273	TSH	-0.142	0.273
PLUS	-0.042	0.169	PLUS	-0.042	0.169
TCHONG	-0.097	0.119	TCHONG	-0.097	0.119
MAYBANK	-0.542	0.948	MAYBANK	-0.542	0.948
PUBBANK	-0.176	0.670	PUBBANK	-0.176	0.670
DIGI	-0.438	1.460	DIGI	-0.438	1.460
LNDMRK	0.071	0.895	LNDMRK	0.071	0.895
MISC	-0.129	0.481	MISC	-0.129	0.481
SHELL	-0.174	0.500	SHELL	-0.174	0.500
SIME	-0.528	0.722	SIME	-0.528	0.722
IOICORP	-0.302	0.715	IOICORP	-0.302	0.715
PROTON	-0.162	0.327	ATRIUM	-0.083	0.181
PUNCAK	-0.195	0.414	AXREIT	-0.056	0.090
MPI	-0.263	0.392	HEKTAR	-0.053	0.103
MRCB	-0.151	0.305	TWRREIT	-0.036	0.075
KULIM	-0.213	1.168	UOAREIT	-0.033	0.062
PETGAS	-0.104	0.190	STAREIT	-0.012	0.018
PORTFOLIO	-0.542	0.948	PORTFOLIO	0.038	0.544

Period 4 (1/1/09- 31/12/09)					
EF 4A			**EF 4B**		
	E(R)	SD		E(R)	SD
GAMUDA	0.071	0.284	GAMUDA	0.071	0.284
IGB	0.048	0.125	IGB	0.048	0.125
TSH	0.035	0.139	TSH	0.035	0.139
TCHONG	0.103	0.143	TCHONG	0.103	0.143
MPI	-0.029	0.637	MPI	-0.029	0.637
KULIM	0.229	0.387	KULIM	0.229	0.387
SPSETIA	0.042	0.336	SPSETIA	0.042	0.336
SIME	0.327	0.309	SIME	0.327	0.309
MAYBANK	0.153	0.488	MAYBANK	0.153	0.488
SHANG	0.014	0.129	SHANG	0.014	0.129
PLUS	0.027	0.129	PLUS	0.027	0.129
PBBANK	0.182	0.422	PBBANK	0.182	0.422
IOICORP	0.134	0.191	IOICORP	0.134	0.191
SHELL	0.223	0.490	ATRIUM	0.018	0.049
DIGI	0.053	0.440	TWRREIT	0.024	0.056
MISC	0.030	0.161	AXREIT	0.075	0.099
BAT (	0.191	1.251	BSDREIT	0.028	0.059
PUNCAK	0.046	0.095	QCAPITA	0.012	0.044
PETGAS	0.005	0.081	HEKTAR	0.026	0.052
TM	-0.007	0.402	ARREIT	0.001	0.043
PORTFOLIO	0.039	0.125	PORTFOLIO	0.301	0.281

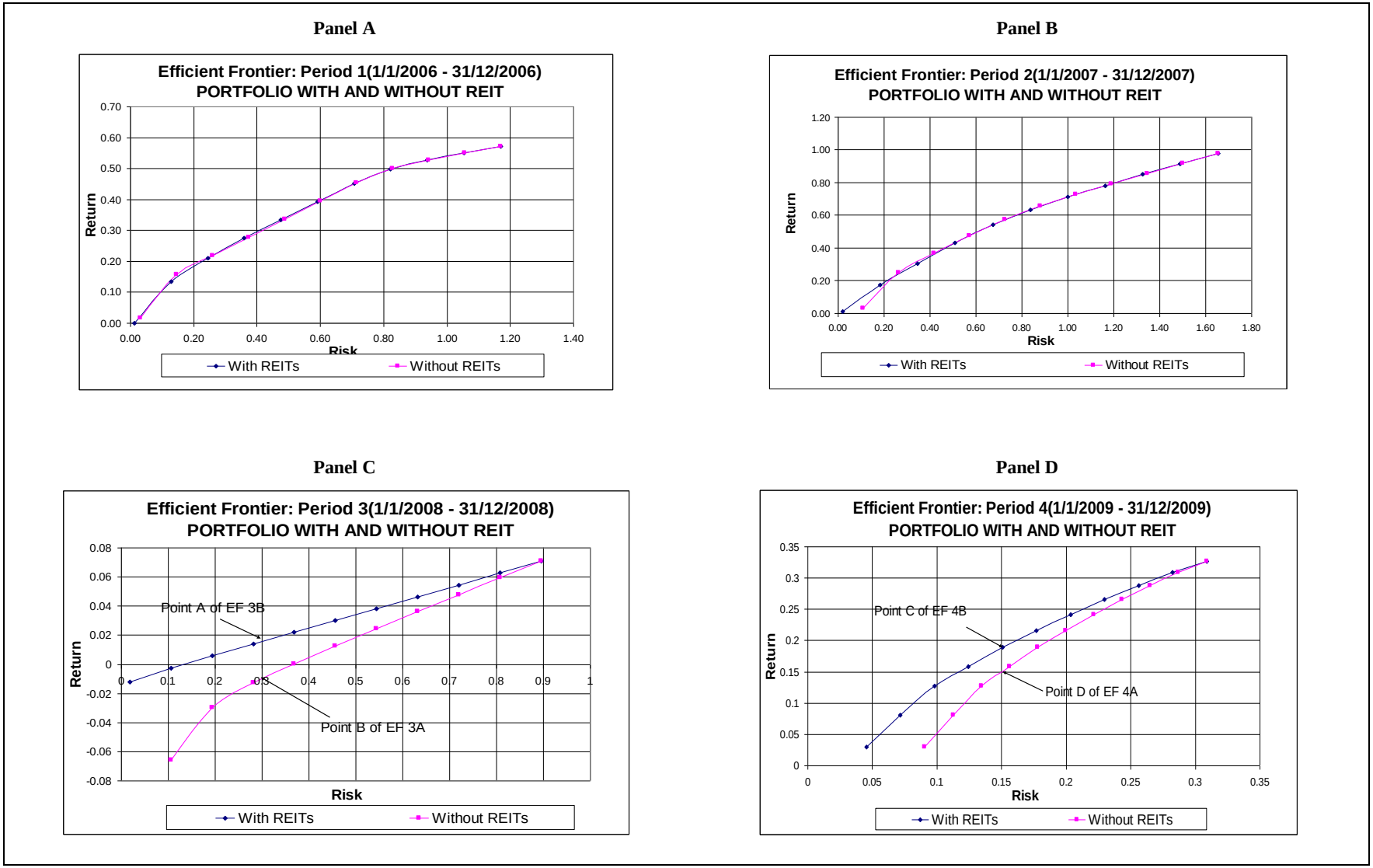
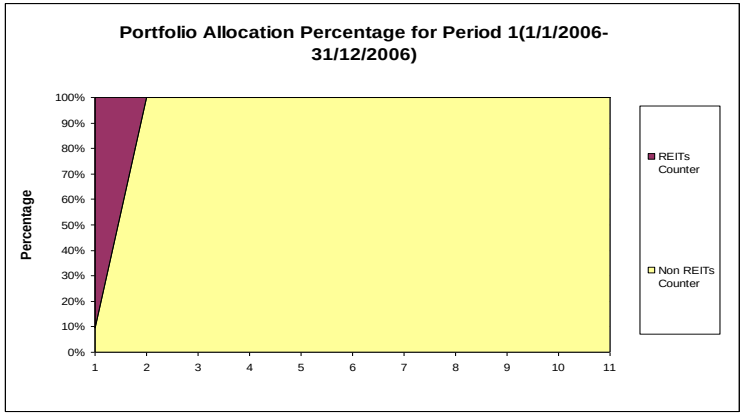
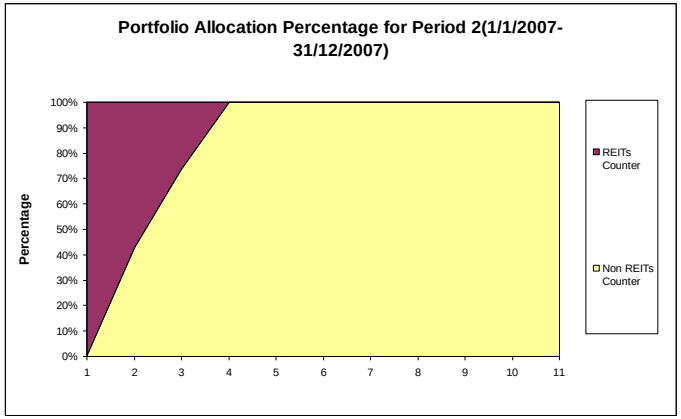


Figure 1: Efficient frontier of period 1, 2, 3 and 4

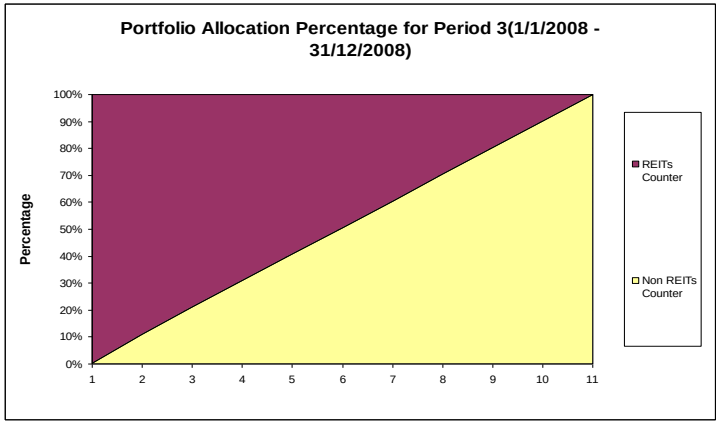
Panel E



Panel F



Panel G



Panel H

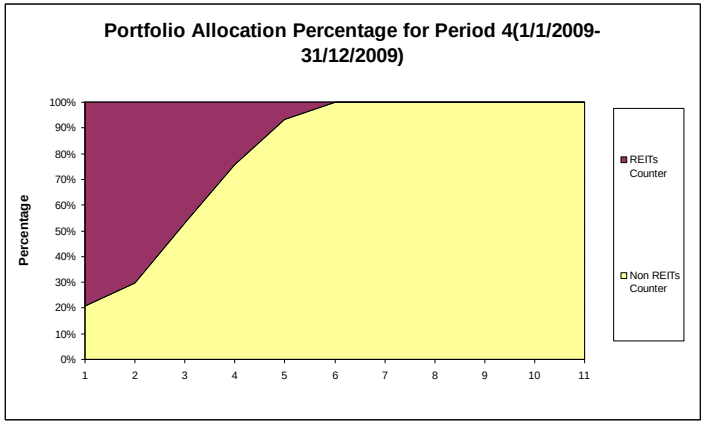


Figure 2: Optimal allocation of REITs in portfolio of period 1, 2, 3 and 4

During the second half of the period, Malaysia had been hit by the economic turmoil due to the U.S sub-prime effect, this witness few counters suffer losses and the Bursa Malaysia Composite Index dropped. Therefore, the inclusion of REITs in portfolio enable to maximize investors' wealth, this lead to further examination on correlation of REITs and the market. During the second half of the period, Malaysia economy is begin to recover through few measures and initiatives taken by the government such as interest rate, incentives made in REITs taxation and so on. This cause decrease percentage of optimal allocation of REITs in Period 4 which suggested that 41.54 percent only, please refer to Panel H of Figure 2.

It suggests that, Malaysian REIT do give impact to the portfolio diversification. It provides the greatest benefits in the low risk and returns optimization of portfolios, with the results less obvious at the high risk/return end of the efficient frontier. The benefit of holding REIT appears to shift as an investor moves across the efficient frontier. Meanwhile at the lower end of the frontier, it would appear that greater benefits are due to the return enhancement qualities of REIT. However, at the higher end of the frontier, the sectors risk reduction qualities is important. This study shows that portfolio with REIT counter can bring about little higher return as compared to portfolio without REIT. This study show mixed result of the performance of REIT in portfolio diversification, the first two period show that portfolio with REIT do not had significant influence on portfolio diversification. But as the REITs increase in number of counter traded, it had convinced the investor of ability of REITs to diversification especially during economic downturn as be seen in Period 3, which suggest that optimal portion of REITs in portfolio as much as 49.44 percent. However on the fourth period, it can be seen that optimal portion of REITs in portfolio is 41.54 percent.

In Malaysia, resulted from the four segmented period, the first period with the inclusion of five REIT is insignificant to give impact to the portfolios as this could be considered a beginning stage of the REIT. However due to improvement on regional economic and stability, REIT began to attract more investor to invest. A clear picture of inclusion of REIT return diversification can be seen as in Period 3 and 4. They indicate that the increase of between 41.54 to 49.44 percent of REITs in portfolio bring about an upward efficient frontier.

This study supports prior study that suggest the inclusion of publicly traded REIT provides improvement over the entire frontier as REITs behaved more like direct real estate and less like stocks (Mull and Soenen, 1997; Mueller and Muller, 2003; Waggle and Moon, 2006). Therefore the performance of REITs is much depending on the time, number of asset in the portfolio, economic environment and tax regulation which took place. However, in this research, only four year data observations have been taken which is considered inappropriate to make fair judgment of the inclusion of REIT in portfolio. Thus, this study unable to identify the behaviour of larger cap REITs on efficient frontier as prior study due to limit of data (Clayton and MacKinnon, 2003). The nature of Malaysian REIT are unique in character, therefore it is difficult for the investor to make comparison. There are differences in the asset allocation style or genre of real estate involved. For example Axis Real Estate Investment Trust focuses on office building and space, while Al-'Aqar KPJ Real Estate Investment Trust is known as the first Islamic REIT and specifically on health care building. Al-Hadharah Boustead Real Estate Investment Trust concentrates on plantation REIT. Each of the those REIT are focusing on only one type of real estate except for Amanah Raya Real Estate Investment Trust which have a mixed real estate allocation involving office, mall, factory, higher education building (HEB) and hotel and still looking for other class of asset for diversification

The difference in the number of real estate holdings by REIT company which some of the REIT have less than three buildings while others might involve a multiple building and types of asset. This is insignificant for the REIT companies to make a better diversification offer to the public that as more properties are added to the portfolio it is possible that its risk class will change. The percentage reduction in risk can be

achieved as more mixed asset adding in the portfolio. This also was supported prior study (Black, 2004) that REIT is more efficient depending on the weighting of property types in which) in his study, the different conclusions are made based on the size of REIT when more direct real estate are added to the property portfolio that has lower risk/return profile. Therefore the size of fund is also important for the investors to make justification on their investment. For instance Al-'Aqar KPJ Real Estate Investment and Amanah Raya Real Estate Investment Trust which make a move on increasing the size of fund available so does others. The location of the properties hold by the REIT also influence the investor decision. This is because REITs income generates from rental of the properties which highly correlated to the economic activities on the location (Abdul Hamid, 2006). As an example certain Malaysian REIT tend to locate their properties in central business district (CBD) while there is some REIT is located at specific location if they serve for single purpose tenant such as hospital, HEB and plantation. Meanwhile there are also few REITs is looking forward to acquire properties outside Malaysia to reduce geographical concentration and diversification by location. This will be possible for diversification in order to reduce risk and consequence dependent on economic of one country. As a result, difference in asset allocation style, number of real estate holdings, size of fund offered and locality of properties have made Malaysian REITs difficult to be evaluate and compare by the investors.

5.0 CONCLUSIONS

There is significant impact of inclusion of REIT return diversification can be seen in Figure 1 and Figure 2 which indicate that the holding between 49.44 to 41.54 percent of REIT assets in portfolio bring about an upward efficient frontier in portfolio. Although REIT do not provide as much stability as direct real estate investment but it can add higher return and volatility toward the top part of the efficient frontier (higher risk, higher return portfolio) which suit the needs of aggressive investor. Therefore this study suggests that to include the REIT in portfolio diversification will benefit the investor as it performs better than portfolio without REIT. It also suggests that inclusion of REITs is benefit during unfavourable economic situation as shown in Period 3. This is proved that the value of REIT as an asset class is time dependent.

However there are many variables which contribute toward the decision making on investing in Malaysian REIT these are such property allocation style such as focusing on certain class of asset types, limited number of direct real estate holding by REIT, size of fund in REIT and locality of properties own by the trust do influence the growth and diversification ability of the REIT. For example focusing on one class of asset types, investment react and behaviour toward the direct real estate investment. REIT behave like equity indifferently from the direct real estate market in the short term but that over the long run, REIT returns equate to those of the direct real estate market. In other words, when considering different types of real estate which have difference momentum of return, mixed class of properties allocation will tend to substitute the others in portfolio of the trust. Therefore this study is believed to be useful for the investors to make their judgment of adding REIT in their portfolio. Hence, the study invites further research in the future on the determinants of Malaysian REITs which influence its performance.

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