# IDIOSYNCRATIC RISK AND REAL ESTATE SECURITIES' RETURN

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## Abstract

*As ascertained by the CAPM theory, investors should not be compensated on the idiosyncratic risk as it can be completely diversified away. However, the practicality of the CAPM is compromised owing to the assumption of complete information and no transaction cost. Adopting the single index model, this paper empirically examines the idiosyncratic risk of the REIT portfolio in 3 developed markets and 2 emerging markets in Asia, i.e. Singapore, Hong Kong, Japan, Thailand, and Malaysia. The findings indicate that the idiosyncratic risk of real estate security should not be disregarded either in the developed markets or emerging markets.*

**Keywords:** idiosyncratic risk, real estate securities, Single Index Model, systematic risk, diversification

## บทคัดย่อ

ตามแนวคิดจากทฤษฎี CAPM นักลงทุนไม่ควรได้รับผลตอบแทนสำหรับชดเชยความเสี่ยงประเภทเฉพาะตัว เนื่องจากความเสี่ยงประเภทนี้สามารถกระจายออกไปได้อย่างสมบูรณ์ แต่ในมุมมองของภาคปฏิบัติทฤษฎี CAPM จะถูกประนีประนอมเนื่องจากสมมติฐานว่าข้อมูลมีการกระจายอย่างสมบูรณ์และไม่มีค่าใช้จ่ายในการทำธุรกรรมต่าง ๆ ในการศึกษาวิจัยนี้ใช้แบบจำลองปัจจัยเดี่ยวในการทดสอบความเสี่ยงประเภทเฉพาะตัวของพอร์ตลงทุนในกองทรัสต์เพื่อการลงทุนในอสังหาริมทรัพย์ หรือ REIT ในตลาดที่พัฒนาแล้ว 3 แห่งและตลาดเกิดใหม่ 2 แห่งในเอเชีย ได้แก่ สิงคโปร์ ฮ่องกง ญี่ปุ่น ไทย และมาเลเซีย ผลการวิจัยบ่งชี้ว่าไม่ควรมองข้ามความเสี่ยงประเภทเฉพาะตัวในการลงทุนในหลักทรัพย์อสังหาริมทรัพย์ไม่ว่าจะเป็นในตลาดที่พัฒนาแล้วหรือตลาดเกิดใหม่

**คำสำคัญ**: ความเสี่ยงประเภทเฉพาะตัว หลักทรัพย์อสังหาริมทรัพย์ แบบจำลองปัจจัยเดี่ยว ความเสี่ยงประเภทระบบ การกระจายความเสี่ยง

## 1. INTRODUCTION

The investment objectives are not only targeted for higher return but also the lower the risk. Thus, the investors are adopting the hedging in variety of form such as period based (Hillard & Huang, 2005) or benchmarking with inflation (Park et. al., 1990). Both have offered strong empirical support to the important of diversifying the portfolio with other alternative sector investment. Real Estate Sector were one among many sectors for appropriate diversification. Investors were investing directly to the real estate firms for constructing the hedge portfolio.

Nonetheless, investing directly to real estate sectors investment might not suit every investor, especially the small budgeted investors. Instead of lowering the risk, investor might have to encounter opposite situation from its ability to access and analyze the real estate firm information properly. To avoid such situation, the investor might consider investing in real estate securities which known as property fund or real estate investment trust for mitigating the idiosyncratic risk. However, there might not strongly conclude that the real estate securities were solid alternative for such purpose especially in Asian markets.

This study adopts the Single Index Model (Sharpe, 1963) to examine the monthly returns of Real Estate Investment Trusts or REITs in 5 countries starting from January 2007 until December 2016, which covers a 10-year period. The countries used in the study are Singapore, Thailand, Malaysia, Japan, and Hong Kong. Based on the single index model, the risk of REITs can be divided into systematic risk and idiosyncratic risk (unsystematic risk).

The empirical results show that the proportion of idiosyncratic risk of REIT portfolio in Singapore is very small compared to other countries used in the study. The proportion of idiosyncratic risk of REIT portfolio in Japan and Hong Kong is moderate whereas the proportion of idiosyncratic risk of REIT portfolio in Thailand and Malaysia is relatively large. This implies that the returns of real estate securities like REITs in some countries are highly correlated with the overall security market whereas the returns of real estate securities in some countries do not vary much with the overall security market.

## 2. REVIEW OF RELATED LITERATURE

A number of researchers have attempted to determine the significance of the idiosyncratic risk of securities in the capital market e.g. Peungchuer and Buranasiri (2015, May), Bartram, Brown, and Stulz (2012), Ooi, Wang, and Webb (2009), Malkiel and Xu (2006), Xu and Malkiel (2003), as there is a debate whether the idiosyncratic risk should be rewarded. Sharpe (1964) stated that since the idiosyncratic risk could be diversified away that investors should not be remunerated for assuming this portion of risk. However, in practice the assumption of complete information underlying the aforementioned proposition is virtually not achievable. Thus, investors should be compensated when they hold under-diversified portfolio, i.e. the idiosyncratic risk should be priced (Merton, 1987). The important implication of Merton (1987) is that the investors who hold the not-well-diversified portfolios of securities should be compensated for assuming the idiosyncratic risk. Thus, the specific characteristics of stocks or funds listed in the exchange should be thoroughly investigated as they theoretically determine the returns of stocks/funds (Peungchuer & Buranasiri, 2014). There are several researchers made an effort to examine the essential determinants of the idiosyncratic risk e.g. Chaudhry, Maheshwari, and Webb (2004) investigated the factors determining the idiosyncratic risk of

un-diversified REITs investors. The findings disclosed that the significant factors are efficiency, liquidity, and earnings variability. Additionally, Peungchuer and Buranasiri (2014) studied the attributes of listed property funds in the Stock Exchange of Thailand (SET) that significantly determined the property funds' returns. The study showed that the only significant determinant of property funds' returns is the size of property funds; however, the findings of Chaudhry et al. (2004) asserted that size is not an important factor determining the idiosyncratic risk of real estate investment trusts (REITs).

Bali, Cakici, Yan, and Zhang (2005) examined the volatility and value-weighted portfolio returns on the NYSE/AMEX/Nasdaq stocks during 1963 to 2001. The study revealed that the idiosyncratic volatility could not explicate the portfolio returns. However, there was an evidence indicating that the idiosyncratic risk could forecast future portfolio returns for the shorter sample. Nonetheless, the significant evidence of the link between the idiosyncratic risk and portfolio returns for both shorted and extended sample periods disappeared when the smallest, least liquid, and lowest-priced stocks were excluded. In sharp contrast, Peungchuer and Buranasiri (2015, May) researched the idiosyncratic risk of property funds and real estate investment trusts (REITs) in the Stock Exchange of Thailand (SET) and Singapore Exchange (SGX) during 2004 – 2014. The examination exposed that the proportions of the idiosyncratic risk with respect to the total risk of both markets are relatively high, 74.41% in the SET and 53.75% in the SGX. However, the generalizability of the study is somewhat limited. The research paper studied only one developed capital market and one developing capital market. Besides, the paper investigated only the proportion of the idiosyncratic risk, Peungchuer and Buranasiri (2015, May) did not statistically test whether the investors in both markets who held the not-well-diversified portfolios of real estate securities consisting of the idiosyncratic risk had been compensated.

The empirical evidences of many research papers support the proposition of Merton (1987), e.g. Liow and Addae-Dapaah (2010), Sun and Yung (2009), Capozza and Schwann (1990), etc. The study of Liow and Addae-Dapaah (2010) investigated the idiosyncratic, market, and total risk of REITs in the US during 1988 to 2008. The results uncovered the evidence of a positive relationship between the REITs' expected returns and its idiosyncratic risk. Inevitably, the findings of Liow and Addae-Dapaah (2010) challenged the implication of the asset pricing model of modern portfolio theory. Sun and Yung (2009) extensively researched on the relevancy of the idiosyncratic risk in determining the expected returns during the absence of complete information to form well-diversified portfolios. Adopting the firm-level data, the relationship between the expected returns of equity REITs and the idiosyncratic volatility was statistically tested. The results of the study exhibited that the equity REITs' expected returns is significantly related the idiosyncratic volatility. However, if the low-priced, illiquid, and small REITs were disregarded from the sample, the positive relationship between the expected returns of equity REITs and the volatility idiosyncratic turned out to be not significant. The findings of Sun and Yung (2009) were in the alignment with those of Bali et al. (2005).

Other researchers who attempted to empirically test the hypothesis of Merton (1987) includes Chiang, Jiang, and Lee (2009). Chiang et al. (2009) examined the REIT idiosyncratic risk in during 1980 – 2006. The study period was decomposed into the vintage REIT era which spanned from 1980 to 1992 and the new REIT era which spanned from 1993 to 2006. The study uncovered that the REIT idiosyncratic risk exhibited the cyclical pattern in which it appeared to have upward ascent during the vintage REIT era whereas it demonstrated downward descent during the new REIT era. Furthermore, there was a positive relationship between the REITs'

excess returns and the REIT idiosyncratic risk prior to 1993, or the vintage REIT era, while there was a negative relationship between the two during the new REIT era, i.e. after 1993.

Bartram et al. (2012) analyzed and compared the level of the idiosyncratic risk between the US stocks and comparable foreign stocks. The findings contended that the idiosyncratic risk of US stocks is higher than those of similar foreign stocks. The level of the idiosyncratic risk related to several country characteristics e.g. stability of government, respect for rule of law; in addition, the level of the stocks' idiosyncratic risk related to the company characteristics as well e.g. corporate disclosure quality (Bartram et al., 2012).

In addition to the listed securities in the security exchanges, certain research papers had been conducted in the real sector. Capozza and Schwann (1990) empirically explored the significance of market and idiosyncratic risk in the housing and land market. The value of the urban real estate was examined whether it was determined by the market and idiosyncratic risk. Firstly, the study revealed that the proportion of the idiosyncratic risks in relation to total risk is larger than that of the market risk. Moreover, the findings support the hypothesis of Merton (1987) that the investors who assume the idiosyncratic risk are rewarded. The idiosyncratic risk statistically and highly accounted for the variation of the housing prices; thus, it is a significant determinant of the urban land prices. Other researchers who investigated the idiosyncratic risk in the real sector includes Bourassa, Haurin, Haurin, Hoesli, and Sun (2009). Bourassa et al. (2009) examined the housing market of New Zealand and attempted to identify the determinants of the variation in house prices.

In term of the determinants of idiosyncratic risk, Ooi et al. (2009) extensively examined the size, value, and financial leverage of the listed US REITs during 1990 to 2005 whether either one of the three factors could statistically determine the level of the idiosyncratic risk. Firstly, the empirical results showed that the idiosyncratic risk constituted a relatively large proportion of the REITs' total risk. Moreover, the findings statistically indicated that the small REITs had a larger proportion of the idiosyncratic risk than the large REITs. More importantly, the findings ascertained that there is statistical evidence of a positive relationship between the REITs' cross-sectional returns and the idiosyncratic risk. A piece of consistent evidence was identified in Hung and Glascock (2010). a GARCH-in-mean model was employed to investigate the relationship between the REITs' momentum returns and the time-varying idiosyncratic risk. It was found that the REITs' momentum return was higher when idiosyncratic volatility was higher. The findings of Hung and Glascock (2010) indicated that the REITs' momentum returns exhibited a symmetric volatility.

The ex-ante corporate social responsibility (CSR) activities lead to the lower level of the idiosyncratic risk of European listed real estate companies only for the companies delivering apprehensible indication to investors and markets (Cajias & Bienert, 2011). Cajias and Bienert (2011) extensively studied the dynamics the idiosyncratic risk and the provision of real estate-related sustainability information provided European real estate companies that listed in 13 European countries. Additionally, the empirical findings of Cajias, Geiger, and Bienert (2012) are consistent with those of Cajias and Bienert (2011). The level of sustainability intensity of listed real estate companies possess a statistical linkage with the stocks' idiosyncratic volatility (Cajias et al., 2012). The research papers regarding various determinants of the idiosyncratic risk includes Kim, Gu, and Mattila (2002) and Gu and Kim (2003) which studied the proportion of risk and the risk determinants of the US hotel REIT companies. The results of Gu and Kim (2003) indicated that the idiosyncratic risk of the hotel REITs correlated positively with the financial leverage and dividend payout of the hotel REITs.

In addition, Hsu and Jang (2008) conducted a similar study. The idiosyncratic risk of hotel and restaurant stocks was explored. The empirical evidence revealed statistically significant relationships between the idiosyncratic risk and the size of the firms and the firms' leverage, both operating and financial leverage. Tangjitprom, Chavalittumrong, & Leelalai (2016) found that the beta of real estate funds in Thailand is low implying that the systematic risk of real estate funds in Thailand is small and idiosyncratic risk can be relatively higher.

Many researchers have conducted numerous studies regarding the idiosyncratic risk in various aspects. Yet, the majority of the idiosyncratic researches have been done in the US and Europe. It seems that the number of studies concerning the idiosyncratic risk, especially of the real estate securities, in the developing markets are too few to assertively validate the importance of the idiosyncratic risk in asset pricing as ascertained by Merton (1987). Thus, this paper aims to examine the issue regarding the idiosyncratic risk of real estate securities listed in the Asian countries.

## 3. DATA AND METHODOLOGY

### 3.1 Research Data

This paper aims to provide the empirical evidence about idiosyncratic risk of Real Estate Investment Trusts or REITs that are publicly traded in the national stock exchanges. The previous study about idiosyncratic risk in ASEAN countries focused only two markets, which are Stock Exchange of Thailand or SET as the representative of the emerging market in ASEAN and Singapore Exchange or SGX as the representative of the developed market in ASEAN (Peungchuer & Buranasiri, 2015). This study extends the previous study by including Bursa Malaysia or MYX as another representative of emerging market in ASEAN. Moreover, the study includes other developed market in Asia like Tokyo Stock Exchange or TSE and Stock Exchange of Hong Kong or SEHK to compare the results with ASEAN markets. Similar to previous studies, the REITs in Thailand has just been launched officially in 2014. Therefore, the data from Thailand has combined Property Funds listed in the Stock Exchange of Thailand.

The data used in the study is monthly return of Real Estate Investment Trusts or REITs in 5 countries starting from January 2007 until December 2016 covering 10 years. In order to determine the idiosyncratic risk, the single index model needs the monthly return on market portfolio of the above 5 markets. The major stock indexes in each country has been used to determine the return on market portfolio including Straits Times Index (Singapore), SET Index (Thailand), FTSE Bursa Malaysia KLCI (Malaysia), Nikkei 225 (Japan), and Hang Seng Index (Hong Kong) respectively. All data have been collected from Thomson Reuters Datastream.

### 3.2 Methodology

The returns of each Real Estate Investment Trust (REIT) in those 5 countries have been calculated using natural logarithmic return as follows.

$$R_{i,t} = \ln\left(\frac{RI_{i,t}}{RI_{i,t-1}}\right), \quad (1)$$

where $R_{i,t}$ is total log return of asset *i* at month *t*
$RI_{i,t}$ is total return index of asset *i* at month *t*
$RI_{i,t-1}$ is total return index of asset *i* at month *t-1*

After getting the return of each REIT, the equally weighted portfolio of all REITs for each country would be constructed. The return on market portfolio for each country can be calculated using natural logarithmic return based on the total return index of stock index in each country. To determine idiosyncratic risk, the single index model has been used. The single index model has been developed by Sharpe (1963) and has been widely used to explain the security return in the equity market. The time-series regression would be used as follows.

$$Rp_{j,t} - RF_{j,t} = \alpha_j + \beta_j\left(Rm_{j,t} - Rf_{j,t}\right) + \varepsilon_{j,t}, \quad (2)$$

where $Rp_{j,t}$ is the return on equally weighted portfolio of all REITs in country *j* at month *t*
$RF_{j,t}$ is the risk-free return of country *j* at month *t*
$Rm_{j,t}$ is the return of market portfolio for country *j* at month *t*
$\alpha_j$ is the intercept of the single index model regression
$\beta_j$ is the slope of the single index model regression or the beta of portfolio
$\varepsilon_{j,t}$ is the residual term of the single index model regression=

Based on the single index model in equation (2), the total risk of the portfolio, which can be measured by the variance of the portfolio can be determined as follows.

$$\sigma_j^2 = \beta_j^2\sigma_m^2 + , \quad (3)$$

where $\sigma_j^2$ is the variance of portfolio *j*
$\beta_j$ is the beta of portfolio *j*
$\sigma_m^2$ is the variance of market portfolio
$\sigma_{\varepsilon,j}^2$ is the variance of residual term of portfolio *j*

From the above equation (3), the variance of portfolio represents total risk of the portfolio. The first term of right-hand side of equation (3) is the portion of variance varying with the market variance, which represents the systematic risk of the portfolio. The second term of right-hand side of equation (3) is the portion of variance that cannot be explained by the market, which represents the unsystematic risk or idiosyncratic risk of the portfolio.

To determine the portion of total risk of portfolio that is attributed to idiosyncratic risk can be measured by the portion of the variance of portfolio or total risk that is attributable to the variance of regression residuals or idiosyncratic risk (Anderson et al., 2005). The portfolio with higher portion of idiosyncratic risk means the volatility of the portfolio depends on non-market factors whereas the portfolio with lower portion of idiosyncratic risk means the volatility of the portfolio depends on market factors.

## 4. ANALYSIS AND RESULTS

The data used in the study is monthly returns of Real Estate Investment Trusts (REITs) for 10-year period starting from January 2007 until December 2016. Table 1 reports the descriptive statistics of the monthly return of equally weighted portfolios of all REITs in each of 5 countries used in this study, which are Singapore, Thailand, Malaysia, Japan, and Hong Kong.

**Table 1**
Descriptive statistics of the monthly return of REIT portfolios

| Country | Mean | Min | Max | S.D. |
|---|---|---|---|---|
| Japan | 0.57% | -41.53% | 20.42% | 6.95% |
| Hong Kong | 0.71% | -32.42% | 12.97% | 5.59% |
| Singapore | 0.37% | -32.88% | 26.69% | 7.06% |
| Malaysia | 0.97% | -7.62% | 11.08% | 2.88% |
| Thailand | 0.33% | -7.13% | 5.57% | 1.85% |

From Table 1, the average monthly return of REIT portfolio in Malaysia is highest at 0.97% per month. Although the average monthly return of REIT portfolio in Thailand is lowest at only 0.33% per month, this return reflects the risk-return trade-off as the REIT portfolio in Thailand has the lowest risk measured by the standard deviation of 1.85%. Moreover, the minimum monthly returns of REIT portfolios in Japan, Hong Kong, and Singapore are extremely highest at -41.53%, -32.42%, and -32.88% respectively. It can be clearly shown that all minimum monthly returns of REIT portfolios for all countries happened during the year 2008 as the result of subprime crisis.

Table 2 reports the average monthly return of equally weighted portfolios of all REITs in Singapore, Thailand, Malaysia, Japan, and Hong Kong for each year from the year 2007 to the year 2016.

**Table 2**
Monthly return of REIT portfolios by year

| Year | Japan | Hong Kong | Singapore | Malaysia | Thailand |
|---|---|---|---|---|---|
| 2007 | -1.06% | 0.12% | 0.72% | 1.85% | 0.39% |
| 2008 | -6.31% | -3.58% | -7.60% | -2.47% | -0.64% |
| 2009 | 2.46% | 4.52% | 5.69% | 3.20% | 0.57% |
| 2010 | 2.86% | 2.56% | 1.28% | 1.70% | 0.69% |
| 2011 | -1.51% | -0.26% | -0.44% | 1.29% | 0.43% |
| 2012 | 2.75% | 2.68% | 3.24% | 1.76% | 1.81% |
| 2013 | 3.49% | -0.15% | -0.36% | -0.13% | -0.94% |
| 2014 | 3.02% | 0.67% | 0.94% | 0.98% | -0.11% |
| 2015 | -0.43% | -0.15% | -0.09% | 0.34% | 0.35% |
| 2016 | 0.47% | 0.73% | 0.35% | 1.22% | 0.79% |
| **Total** | **0.57%** | **0.71%** | **0.37%** | **0.97%** | **0.33%** |

From Table 2, the REIT returns in most countries are worst in the year 2008, except Thailand that is worst in the year 2013. Consistent with the result in Table 1, it shows that the effect of subprime crisis is prominent in most countries, except Thailand. This implies that REIT investment in Thailand has been slightly affected by the subprime crisis.

To determine idiosyncratic risk, the single index model has been used in this study. The single index model assumes that any co-movement among stocks can be explained by only one

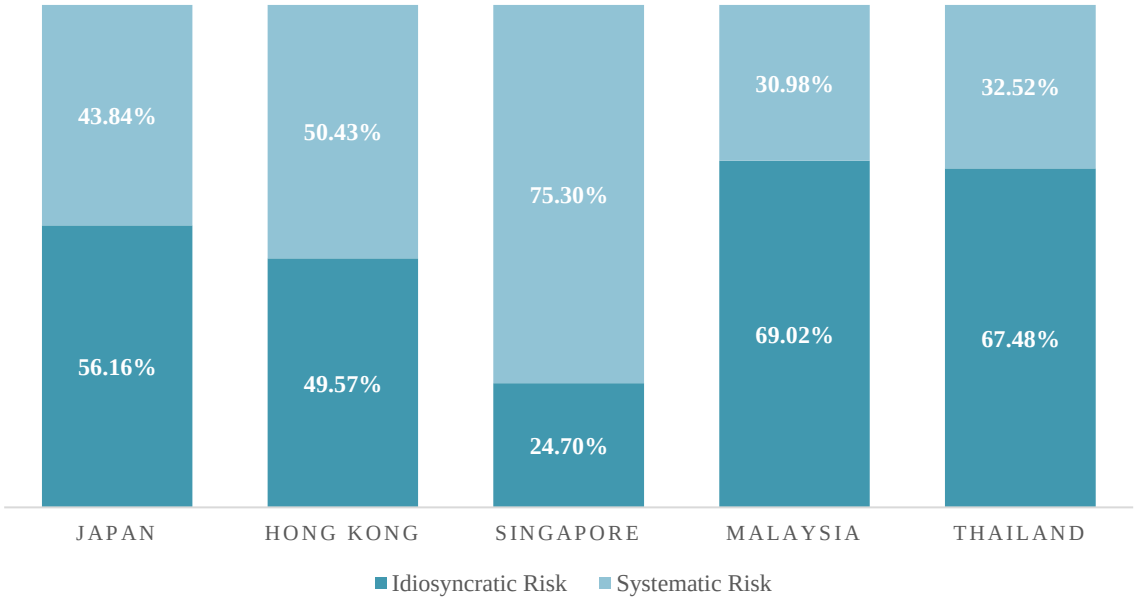
single factor, which is usually market factor proxied by the return of market portfolio. Table 3 reports the result of single index model for REIT portfolios in each country.

**Table 3**
Single Index Model and risk components of REIT portfolios

| Year | Japan | Hong Kong | Singapore | Malaysia | Thailand |
|---|---|---|---|---|---|
| Portfolio Beta ($\beta_j$) | 0.75 | 0.60 | 1.10 | 0.43 | 0.17 |
| Total Risk ($\sigma_j^2$) | 0.004827 | 0.003126 | 0.004979 | 0.000827 | 0.000342 |
| Idiosyncratic Risk ($\sigma_{\varepsilon,j}^2$) | 0.002711 | 0.001550 | 0.001230 | 0.000571 | 0.000230 |

From Table 3, the beta of REIT portfolios represents how the return of REIT portfolios vary systematically with the overall market. The REIT in Singapore has the highest beta at 1.10, which means the return of REIT in Singapore systematically depends on the market return. Meanwhile the REIT in Thailand has the lowest beta at only 0.17, which means the return of REIT in Thailand does not vary systematically with market portfolio. The low beta has also been documented in

**Figure 1**
Proportion of Idiosyncratic risk of real estate securities




In term of the idiosyncratic risk, REIT portfolio of the three developed markets also has higher idiosyncratic risk than the REIT portfolio of the emerging markets. However, the conclusion should not be drawn entirely on the absolute value of risk. The proportion of the idiosyncratic risk with respect to total risk of each market is calculated and illustrated in figure 1. The results reveal that the proportion of the idiosyncratic risk of REIT portfolio in Malaysia and Thailand are 69.02% and 67.48% respectively whereas they are somewhat lower in the developed market, i.e. 24.70%, 49.57%, and 56.16% in Singapore, Hong Kong, and Japan respectively. Amongst the developed markets, REIT portfolio in Singapore possess the lowest proportion of the idiosyncratic risk. In sum, the evidence shows that real estate security's return in emerging market like Thailand and Malaysia has been characterized by idiosyncratic risk,

to some extent, more than more-developed market like Singapore, Japan, and Hong Kong. Therefore, investors in the developed markets must carefully consider and analyze the characteristics of individual REIT as the proportion of the idiosyncratic risk is relatively high.

## 5. CONCLUDING REMARKS

Real Estate Sector were one among many sectors for appropriate diversification. Investors were investing directly to the real estate firms for constructing the hedge portfolio. However, the benefit of including real estate securities into portfolio depends on their risk characteristics like systematic risk and idiosyncratic risk.

The results show that the proportion of idiosyncratic risk of REIT portfolio in Singapore is very small compared to other countries used in the study. The proportion of idiosyncratic risk of REIT portfolio in Japan and Hong Kong is moderate whereas the proportion of idiosyncratic risk of REIT portfolio in Thailand and Malaysia is relatively large. This implies that the returns of real estate securities like REITs in some countries are highly correlated with the overall security market whereas the returns of real estate securities in some countries do not vary much with the overall security market.

Real estate securities investments were proof to be an interesting alternative these selected countries in this research. However, the research could be expanded for comparative study with other regions to recognize the similarities or differences which might result from other conditions. The possible study could be done with different range of time for planning the portfolio to be better efficient hedging for investor. It is also possible to extend the study to compare with other non-traditional financial assets which might be the alternative to for idiosyncratic risk mitigation alternative too.

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