IDIOSYNCRATIC RISK OF REITS IN THAILAND

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A THEMATIC PAPER SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION
(BUSINESS MODELING AND ANALYSIS)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2010

Thematic Paper
entitled

IDIOSYNCRATIC RISK OF REITS IN THAILAND

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for the degree of Master of Business Administration
(Business Modeling and Analysis)
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ACKNOWLEDGEMENTS

This thematic paper has been successfully completed with the great support and assistance of my major advisor, Dr. Atthapong Sakunsriprasert, and my co-advisor, Dr. Worapong Janyangyuen. I wish to thank them for their kind advice and great guidance all along this research.

I also would like to thank Dr. Athapol Ruangkanjanases, who is the external examiner of this thematic paper defense, for his helpful suggestions in improving the research.

I would like to thank all my MUIC lecturers for their valuable lessons and knowledge and all of the MUIC staff members at the Sathon campus who provided such great facilities and environment for my study.

Finally, I wish to thank my family, especially my wife, for her kind encouragement in helping me to complete my master degree with love and warm care.

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ABSTRACT

The purpose of this study was to investigate idiosyncratic risks of real estate investment trusts (REITs) in Thailand and its relationship with various determinants from the perspective of undiversified REIT investors. Since the performance of REITs is intimately linked with the underlying illiquid real estate properties, and the fact that REITs have a different organizational structure and must payout high dividends to enjoy corporate income tax benefits, the relevant determinants derived from the regression model are different from other industrial firms. Results suggest that type of fund is the important determinant of idiosyncratic risk, whereas size, performance, liquidity and type of property do not.

KEY WORDS: IDIOSYNCRATIC / RISK / REITS / THAILAND

30 pages

ความเสี่ยงที่ไม่เป็นระบบของกองทุนรวมอสังหาริมทรัพย์ในประเทศไทย
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บทคัดย่อ

งานวิจัยชิ้นนี้จัดทำขึ้น เพื่อตรวจสอบความเสี่ยงที่ไม่เป็นระบบของกองทุนรวมอสังหาริมทรัพย์ในประเทศไทยรวมทั้งศึกษาตัวแปรที่มีผลต่อความเสี่ยงจากมุมมองของนักลงทุนที่ไม่ได้มีการลงทุนแบบกระจายความเสี่ยง เนื่องจากผลประกอบการของกองทุนรวมอสังหาริมทรัพย์ขึ้นตรงกับตัวอสังหาริมทรัพย์ซึ่งเป็นทรัพย์สินที่ไม่มีสภาพคล่อง และจากการที่กองทุนรวมอสังหาริมทรัพย์มีลักษณะการบริหารองค์กรที่แตกต่างจากองค์กรในอุตสาหะกรรมอื่นๆ รวมทั้งมีการกำหนดให้กองทุนรวมอสังหาริมทรัพย์ต้องจ่ายเงินปันผลในอัตราที่สูงและไม่ต้องเสียภาษีเงินได้นิติบุคคลทำให้ตัวแปรที่มีผลกับความเสี่ยงที่ไม่เป็นระบบของกองทุนรวมอสังหาริมทรัพย์จะแตกต่างจากอุตสาหกรรมอื่นๆ ผลการวิจัยพบว่าปัจจัยที่มีผลต่อเสี่ยงที่ไม่เป็นระบบของกองทุนรวมอสังหาริมทรัพย์ได้แก่ ประเภทของกองทุนรวม แต่ไม่พบว่า ขนาดของกองทุน ผลประกอบการ ประเภทของอสังหาริมทรัพย์ และสภาพคล่องของกองทุนรวมอสังหาริมทรัพย์มีนัยยะสำคัญ

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INTRODUCTION

1.1 Overview

REITs in Thailand exist as Property Funds for Public Offering, and are publicly listed as closed-ended mutual funds. They were established as a recovery vehicle for the 1997 financial crisis. All publicly traded REITs in Thailand are classified as equity REITs, that is, they own real estate assets and their primary source of income comes from the rents earned on that real estate. REITs in Thailand specialize in holding particular property types, such as hotels, office buildings, airports, residential properties, industrial properties, or retail properties.

Since its first introduction in the Stock Exchange of Thailand, real estate investment trusts (REITs) has gained greater interest and become a growing role in investment practice. The reason is that REITs provide opportunities to invest in diversified portfolios of real estate properties with liquidity similar to other traded stocks but with much greater liquidity than direct ownership of real property. Additionally, REITs have been shown to provide protection during recession and to act as defensive stocks. Thai REITs offered investors a weighted average annualized yield of around 9% as of the end of 2009. During this period of low interest rates Thai investors have been seeking opportunities other than bank deposits to achieve capital growth. Property funds are seen as an ideal alternative as they can offer higher returns than deposit rates, which are currently at 1.25%. Table 1.1 exhibits REITs listed in Thailand and their performance as of end of 2009. Since this market has become more popular, understanding the return characteristics and volatility for REITs is important to any investors. As commonly known, the volatility of any asset returns can be decomposed into market volatility so called “systematic risk” and firm-specific volatility so called “idiosyncratic risk”. The traditional CAPM approach argues that only systematic risk should be incorporated into asset prices.

Table 1.1: REITs listed in the Stock Exchange of Thailand as of end of year 2009

Name	Date Listed	Offer Price (THB)	Closing Price as of Dec 09 (THB)	Yield as of Dec 09
UOB Apartment Property Fund I	29-Oct-03	10.00	4.84	4.89%
Bangkok Commercial Property Fund	19-Nov-03	10.00	9.00	7.78%
Millionaire Property Fund	08-Mar-05	10.00	11.20	8.39%
Ticon Property Fund	12-May-05	10.00	10.30	7.86%
Thai Industrial Fund 1	29-Jun-05	10.00	7.55	7.75%
MFC-Nichada Thani Property Fund	11-Aug-05	10.00	9.60	7.40%
CPN Retail Growth Leasehold Property Fund	23-Aug-05	10.00	9.25	10.53%
Baan Sansiri Property Fund	26-Sep-05	10.00	9.90	7.35%
Samui Airport Property Fund	24-Nov-06	10.00	8.35	10.40%
T.U. Dome Residential Complex Property Fund	06-Dec-06	10.00	9.50	1.77%
Future Park Property Fund	07-Dec-06	10.00	9.70	10.32%
Quality Houses Property Fund	12-Dec-06	10.00	8.20	9.70%
JC Property Fund	05-Jan-07	10.00	10.00	6.00%
Gold Property Fund (Leasehold)	22-May-07	10.00	7.60	9.76%
Major Cineplex Lifestyle Leasehold Property Fund	18-Jul-07	10.00	8.65	10.60%
Urabana Property Fund (Leasehold)	18-Oct-07	10.00	7.55	11.94%
Property Perfect Property Fund	20-Mar-08	10.00	10.10	8.32%
Quality Hospitality Leasehold Property Fund	03-Apr-08	10.00	7.10	10.85%
Luxury Real Estate Investment Fund	29-Apr-08	10.00	8.50	7.76%
Multi-National Residence Fund	19-Jun-08	10.00	9.70	7.94%
Centara Hotels & Resorts Leasehold Property Fund	13-Oct-08	10.00	7.90	9.23%
Nichada Thani Property Fund 2	31-Mar-09	10.00	9.90	4.96%
Sala @ Sathorn Property Fund	10-Aug-09	10.00	4.86	-
MFC-Strategic Storage Fund	11-Aug-09	10.00	10.00	7.04%
101 Montri Storage Property Fund	14-Aug-09	10.00	9.90	-
TPARK Logistics Property Fund	16-Dec-09	10.00	10.30	-

Idiosyncratic risk, on the other hand, is completely excluded through diversification according to modern portfolio theory. CAPM must surely hold if investors are alike and can hold a combination of the market portfolio and a risk-free asset as the theory prescribes. In reality, however, institutional investment managers will often deliberately structure their portfolios to accept considerable idiosyncratic risk in order to obtain extraordinary returns. For individual investors, transactions costs are likely to prevent them from holding large numbers of individual stocks in their portfolios.

Given the fact that the performance of REITs is intimately linked with the underlying illiquid real estate properties that are prone to booms and busts and the fact that REITs have a different organizational structure and must payout high dividend (at least 90% of its taxable profit) to enjoy corporate income tax benefits, there may be some significantly unique features that REIT stocks have that other common stocks do not. According to Thai PFPO code, Thai REITs cannot hold debt, must be distributed on “small lots first” basis, which hampers its acquisition by institutions. Other characteristics of a Thai REIT are no limitations on foreign ownership, external management by licensed managers, 75% real estate investment requirement in at least 80% developed property, 90% net income distribution. Hsieh and Sirmans (1991) find that captive REITs have a lower performance than the non-captive REITs. Capozza and Seguin (2000) note that internally advised REITs outperform the externally advised companies. According to Capozza and Sequin, this may be a reflection of higher expenses due to the use of higher levels of debt for the externally advised REITs. Some other researchers suggest that the performance of REITs improves if more security analysts follow these stocks, since the stock market is expected to efficiently incorporate the impact of information on the underlying real estate assets into the stock prices when compared to the product market, which is dependent on less efficient property appraisals (Below, Kiely and McIntosh, 1995). Gyourko and Keim (1992) report that REITs differ from other organizational structures in three aspects. (1) Agency problems are more severe in REITs, because of high dividend payouts. As a result, REITs have to frequently obtain funds from the external capital markets, which lead to more intense scrutiny of REIT performance. (2) There are corporate control differences when compared to other industries. (3) REITs differ in how fast the

information is disseminated and incorporated into their stock prices, which may be because of the limited holding of REIT stocks by institutional investors. As a result, REITs do not embody the same level of monitoring and pricing mechanisms as do other firms that have greater institutional holdings (Wang, Erickson and Chang, 1995). Although aggregate volatility may be important for understanding the risk and return relationships for a portfolio of stocks, the characteristics of markets (such as REITs), where results are inconclusive with respect to comovements with broader markets, market risk might comprise only one component of risk. For individual stocks, however, market and idiosyncratic risks are both relevant. Furthermore, as pointed out by Campbell, Lettau, Malkiel and Xu (2000), some investors are unable to diversify, especially those who are the managers of the firm or those who have stock options. Second, some other investors may own a small number of stocks, which may not have a high correlation with the aggregate market. Third, there may be some arbitrageurs who may try to exploit the mispricing of REITs. This may make the role of idiosyncratic risk very important for such investors. Finally, if options were written on the real estate stocks, the pricing of these options would require knowledge of the market, as well as idiosyncratic risk.

1.2 Motivation

Given the fact that there are some unique characteristics that REITs have when compared to other firms, REITs therefore can be considered as an asset class. As a result, it is necessary to examine the role of idiosyncratic risk so that any investors can incorporate the information into their investment strategies.

1.3 Objective

The objective of this study is to investigate idiosyncratic risks of all REITs listed in The Stock Exchange of Thailand and to determine the determinant variables that influence those risks so that any investors can incorporate the finding into their investment strategy.

1.4 Scope of Work

In this paper the idiosyncratic risk of REITs is determined. Then it is analyzed whether some of the characteristics of REITs are related to the idiosyncratic risk measures. These characteristics include various accounting-based variables, such as size, type of property fund, type of property, performance and liquidity. The remainder of the paper is organized as follows. The theoretical model of idiosyncratic risk is presented, followed by a discussion of the data, methodology, results and concluding comments.

CHAPTER II
LITERATURE REVIEW

The traditional CAPM theory (Sharp, 1964; Lintner, 1965; Black, 1972) prescribes that only systematic risk matters in asset pricing because it is non-diversifiable. Idiosyncratic risk, on the other hand, should not be priced because it can be completely diversified away. Nevertheless, risk diversification through the addition of more stocks in a portfolio involves a tradeoff between the benefits of further diversification and higher transaction costs, which rises with the number of the stocks in the portfolio. In situations where investors do not have complete information of all the securities in the market, Merton (1987) theorizes that idiosyncratic volatility is relevant to asset pricing. Since it is costly to learn and follow the performance of individual stocks, he argues that it is not optimal for an investor to track the information of all the securities in the market. Consequently, investors (both individuals and institutional) only know a small subset of the securities in the market and construct their portfolios from these known securities; resulting in them holding under-diversified portfolios. Furthermore, institutional investors, fund managers and arbitrageurs may also choose not to hold well-diversified portfolios due to contractual reasons or deliberately structure their portfolios to accept considerably high idiosyncratic risk in an attempt to gain extraordinary returns.

Using a variation of the CAPM model, Malkiel and Xu (2006) demonstrate that if one group of investors fails to hold the market portfolio for some reasons, the remaining investors will also be unable to hold the market portfolio. In their model, idiosyncratic risk is priced to compensate rational investors for their inability to hold the market portfolio. Empirically, a key study supporting the CAPM theory is Fama and MacBeth (FM, 1973) who observed that idiosyncratic risk does not play any significant role in explaining the cross-sectional returns of common stocks. However, more recent studies have yielded contrasting results. Using the same methodology as

FM but over a different time period, Malkiel and Xu (2006) observe a weakly positive relation between idiosyncratic risk and the cross-section of expected stock returns.

Fu (2005) shows that idiosyncratic risk varies substantially over time and indicates that the previous literature cannot identify a positive relation because the conditional idiosyncratic volatility in earlier studies does not capture the time-varying property. Using daily data, Fu estimates the conditional idiosyncratic variance of stock returns based on the EGARCH model and finds a significantly positive relation.

Goyal and Santa-Clara (2003) also find a significant positive relation between average stock variance, which they demonstrate to be largely idiosyncratic, and the stock market returns. The positive relation is consistent with Merton (1987) and Malkiel and Xu (2006) argument that idiosyncratic risk could be priced in an incomplete world where investors hold under-diversified portfolios either by choice or by constraints.

A puzzling result was, however, observed by Ang et al. (2006). Dividing stocks into five equal size portfolios according to their idiosyncratic risk in the previous month, they compared the risk-adjusted returns between the highest risk and lowest risk portfolios. Finding the difference to be significant negative, they also conclude that idiosyncratic risk is priced. However, the negative relation is puzzling because it suggests that stocks with lower idiosyncratic volatilities earned higher average returns.

Bali and Cakici (2007) found that data frequency used to compute idiosyncratic risk, weighting scheme used to compute average portfolio returns, breakpoints utilized to sort stocks into quintile portfolios, and screenings for size, price and liquidity play a crucial role in determining the existence and significance of a cross-sectional relation between idiosyncratic risk and expected returns.

Cotter, John and Stevenson, Simon (2004) use a time-varying approach to examine the dynamics of volatility in the REIT sector. The results highlight the attractiveness and suitability of using GARCH based approaches in the modeling of daily REIT volatility. The paper examines the influencing factors on REIT volatility, documenting the return and volatility linkages between REIT sub-sectors and also examines the influence of other US equity series. The results contrast with studies of monthly REIT volatility. Linkages within the REIT sector and with related sectors

such as value stocks are diminished, while the general influence of market sentiment, coming through the large cap indices is enhanced. This would indicate that on a daily basis general market sentiment plays a more fundamental role than more intuitive relationships within the capital markets. The results highlight the linkages between REITs and mainstream stock indices.

Brent W. Ambrose and Peter Linneman (2001) categorize REITs into two competing property management structures: internally advised and externally advised. The study tests the hypothesis that, due to their superior ability to resolve conflicts of interests between REIT management and shareholders, internally-advised REITs will dominate the externally-advised REITs. The results confirm that externally-advised REITs are responding to market pressure to conform to the performance standards set by newer, internally-advised REITs. Regression results indicate that internally-advised REITs do have higher ratios of rental revenue to total revenue, lower payout ratios and lower costs of capital after 1993. However, there is no significant difference in return on capital (ROC), return on book equity (ROE) or profit margins between internally and externally-advised REITs. Thus, it appears that after controlling for firm size and property sector effects, any advantage enjoyed by internally-advised REITs is minor.

Shaun A. BondandPaul Mitchell (2009) finds that evidence of systematic medium or long term out-performance (alpha) amongst real estate fund managers is not compelling. It is periodic and at best focused on a small number of funds. Unlike in most other asset classes, such positive persistence appears not to diminish as the horizon lengthens. Evidence of persistent poor performance is least compelling. This is unlikely to be due to weaker funds winding-up. There is no clear evidence that these tendencies have changed over the past few years although any developments associated with the recent expansion in property fund management may obviously take time to come through. In line with these conclusions, the subsequent performance of top and second quartile funds are, on average, less exceptional. For the three and five year horizons, there is still out-performance (and alpha) but it is relatively modest. Over 10 year horizons, the earlier relative performance advantage is totally eroded whereas for risk-adjusted alpha it is still there but marginal. However, this conclusion is tentative, as the most appropriate way to benchmark fund performance remains an area for further research. In investigating whether fund characteristics may explain

either risk-adjusted or relative performance, it was found that the portfolio yield was an important indicator of future fund performance. However, it is recognized that this variable may proxy for an unidentified source of risk and this reinforces the need for further research on the most appropriate form of risk adjustment. A high development exposure for a fund was not found to impact fund performance in a statistically significant way. Finally, there is little definitive to emerge about fund manager type. Large funds did well in the 1990s, otherwise life funds did poorly, but both these factors have since dissipated. The preponderance of segregated pension funds (and traditional institutions) with persistent top decile performance is interesting and may be signalling something different about the style of some of this group.

CHAPTER III
METHODOLOGY

According to CAPM, returns for REITs stocks comprise of a market aggregate and a firm-specific residual. As a result, the excess return on individual stocks can be written as follows:

$$r_{jt} - r_{ft} = \alpha_j + \beta_{jm} r_{mt} + \varepsilon_{jt} \quad \textbf{(1)}$$

Where r_{jt} is the return on individual REIT stocks, r_{ft} is the risk-free rate and r_{mt} is the market risk premium which equal to the aggregate market return minus the risk-free rate. Since the model uses excess returns, CAPM allows the intercept to be set equal to zero in the following equations:

$$r_{it} = \beta_{im} r_{mt} + \delta_{it} \quad \textbf{(2)}$$

Where r_{it} is the excess return on individual stock, β_{im} is the beta of each REIT, which indicates the relation of REIT's return with that of market return and can be determined from the slope of security market line (SML), and δ_{it} is the firm-specific residual. As a result, idiosyncratic risk can be determined by taking the variance of both sides on Equation (2). This results in the following equations:

$$\sigma^2(r_{it}) = \beta_{im}^2 \sigma^2(r_{mt}) + \sigma^2(\delta_{it}) + 2Cov(r_{mt}, \delta_{it}) \quad \textbf{(3)}$$

In Equation (3), σ is the standard deviation of excess returns. It is assumed that the market return is orthogonal to idiosyncratic risk or the error term is independent and identically distributed (iid). This permits the derivation of a simple variance decomposition in which the covariance term is zero as follows:

$$\sigma^2(r_{it}) = \beta_{im}^2 \sigma^2(r_{mt}) + \sigma^2(\delta_{it}) \quad (4)$$

$\sigma^2(\delta_{it})$ will be employed as a volatility measure for idiosyncratic risk, which will be regressed against the following various REIT characteristics.

3.1 Size

It is hypothesized that the larger a REIT is, the more likely it is that it would be geographically diversified (it may be noted that most REITs specialize in a specific property type). As a result, these firms would be more insulated from fluctuations in the market prices of the underlying real estate properties than smaller firms, which are unable to achieve such a level of diversification. Hence, smaller REITs are more likely to be impacted by the idiosyncratic component of the risk. In this paper, size is measured by the average market value of REITs during year 2005 to 2009.

3.2 Type of Fund

There are 2 types of property funds in Thailand, freehold and leasehold property funds. Freehold has outright ownership of the property while leasehold has only the right to use the property. Currently, there are 14 free-hold and 14 lease-hold property funds listed in the Stock Exchange of Thailand. It is likely that leasehold property fund will be more exposed to idiosyncratic risk. This variable will be assigned as 1 if it is lease-hold and 0 if it is free-hold.

3.3 Type of Property

Different REIT specializes in different property type such as hotels, office buildings, residential properties, industrial properties, or retail properties. However, in this study, type of property is categorized as residential property (assigned as 1) and non-residential property (assigned as 0).

3.4 Performance Measure

This variable measures how efficiently the assets of REITs are utilized. More productive firms can be distinguished by their ability to generate income from their operations. The performance of REITs can be measured from increase/decrease in net asset from operation generated from asset. The average return on asset (percentage of increase/decrease in net asset divided by total asset) from year 2005 to 2009, therefore, can be employed as the performance measure of REITs. Since, higher ROA should reduce the riskiness of REITs, this measure is hypothesized to have an inverse (negative) relationship with idiosyncratic risk.

3.5 Liquidity Risk

Market liquidity risk arises if investors or management are unable to sell REIT stocks. This could result from a lack of market depth arising from the fact that fewer analysts tend to follow these securities. This risk measure would be a volume or number of stocks traded daily for each REITs. If the number of stocks traded daily is high, it means low liquidity risk and should result in low idiosyncratic risk. This measure is, therefore, expected to be negatively correlated with idiosyncratic risk.

Using these measures the following models is employed to investigate the idiosyncratic risk:

$$\sigma^2(\delta_{it}) = \theta_0 + \theta_1 Size + \theta_2 \text{Type of Fund} + \theta_3 Type\ of\ Property + \theta_4 \text{Performance Measure} + \theta_5 \text{Liquidity} + \lambda_t \quad (5)$$

In this equation, the independent variables are *Size* [which is computed as the average market value of REIT], *Type of Fund* (which is defined as 1 if it is leasehold and 0 if it is freehold), *Performance* (which measures how efficiently the assets of REITs are utilized and is measured by the average ROA which is the *net income/total asset*), *Type of Property* (which is defined as 1 if it is residential property and 0 if it is non-residential property), and finally, *Liquidity* (which is defined by an average daily number of REIT stocks traded. Also in the above equation (5), θ_0 is the

intercept, θ_1 to θ_5 are the coefficients of the independent variables and λ_t is the residual of the multiple regression model.

However, since determinant variables *Size* and *Liquidity* are expected to have high correlation, idiosyncratic risks will also be examined by dropping variable *Liquidity*. As a result, the following model is also employed to investigate the idiosyncratic risk:

$$\sigma^2(\delta_{it}) = \theta_0 + \theta_1 Size + \theta_2 \text{Type of Fund} + \theta_3 Type\ of\ Property + \theta_4 \text{Performance Measure} + \lambda_t \quad \textbf{(6)}$$

CHAPTER IV
RESULTS AND ANALYSIS

The data used in this study, for all independent variables, are obtained from financial statement. A monthly return index (RI) of each REIT is obtained from DataStream assuming that dividends are reinvested to purchase additional stocks of REITs at the closing price applicable on the ex-dividend date. The time period covered for the market index and the REIT indices is from January 2005 through December 2009.

In the first stage of the analysis, simple monthly return of the market and each REIT is calculated. Excess returns are obtained using Thailand's policy rate downloaded from DataStream as risk-free rate to determine beta (β_{im}) of each REIT. Variance of each REIT's excess return ($\sigma^2(r_{it})$) is calculated as the measures for total risk of each REIT as well as variance of excess market return ($\sigma^2(r_{mt})$). The monthly idiosyncratic risks ($\sigma^2(\delta_{it})$), therefore, can be computed from equation (4). These idiosyncratic risks will be annualized before using as the dependent variables in equation (5) and (6). In the second stage of the analysis, the accounting-based data of the idiosyncratic risk measures—*Size*, *Type of Fund, Performance*, *Type of Property* and *Liquidity*—are collected from financial statement of each REIT from year 2005 to year 2009. The average values of these data are employed as the independent variables. As a result, the measures of annual idiosyncratic risks are used as the dependent variables and the average annual accounting-based measures are used as the independent variables in the regression models shown in Equations (5) and (6). However some REITs are excluded in the analysis as they are withdrawn from the market or there are no enough accounting data as they are just listed.

From Equation 4, idiosyncratic risks of REITs are computed. Table 4.1 presents the descriptive statistics including idiosyncratic risks and market risks of REITs. Figure 1 also shows idiosyncratic risk compared to market risk for individual REIT. The average annual idiosyncratic risk equals 13.978% ranging from 1.965% for

Nichada Thani Property Fund 2 to 33.627% for T.U. Dome Property Fund. The average annual systematic risk equals 5.199% ranging from 0.542% (101 Montri Storage Property Fund) to 12.748% (Samui Airport Property Fund). The result of large idiosyncratic risk compared to systematic risk reinforces the idea of understanding idiosyncratic risk in REITs.

Table 4.1: Descriptive Statistics of REITs

	Mean	**Standard Div**	**Min.**	**Max**
Beta (β_{im})	0.155	0.045	-0.219	0.511
Monthly Return	0.189%	0.541%	-1.200%	1.076%
Market Risk	5.377%	0.177%	0.528%	13.339%
Idiosyncratic Risk	14.496%	0.618%	2.682%	33.350%

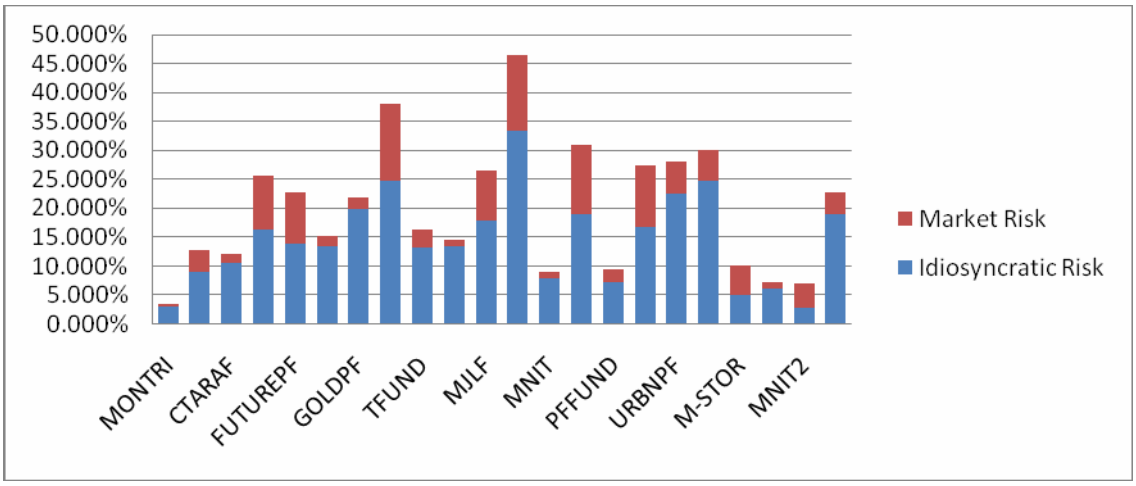

Figure 1: Annual Idiosyncratic Risk and Market Risk of REITs

In order to compute the determinants of idiosyncratic risks, the values of the different independent variables were obtained from financial statement. Table 4.2 presents average accounting-based values of REITs from year 2005 to 2009. Descriptive statistics of the determinants are also summarized as shown in Table 4.3.

Table 4.2: Average Accounting-Based Values of REITs from Year 2005 to 2009

Name	Market Value (Million Baht)	Total Asset (Million Baht)	Increase/Decrease in Net Asset (Million Baht)	Daily Stock Traded
UOB Apartment Property Fund I	614.2007	908.68	4.358	18,914
Bangkok Commercial Property Fund	861.7808	1209.788	99.304	16,289
Millionaire Property Fund	2087.379	2354.992	227.852	72,082
Ticon Property Fund	4876.401	5894.484	422.918	417,032
Thai Industrial Fund 1	674.5133	780.6075	50.6075	35,632
MFC-Nichada Thani Property Fund	1202.706	1361.654	84.926	46,734
CPN Retail Growth Leasehold Property Fund	10883.98	13094.01	930.578	1,204,682
Samui Airport Property Fund	7540	10774.33	948.623	1,287,195
T.U. Dome Residential Complex Property Fund	1017.064	1040.127	-3.14	21,146
Future Park Property Fund	4444.807	5209.655	384.7225	186,906
Quality Houses Property Fund	6560.171	8791.838	635.305	371,533
Gold Property Fund (Leasehold)	1777.394	2394.353	203.603	26,170
Major Cineplex Lifestyle Leasehold Property Fund	2048.917	2759.557	287.46	58,838
Urabana Property Fund (Leasehold)	659.4667	777.96	63.647	53,188
Property Perfect Property Fund	512.2	550.765	42.43	20,471
Quality Hospitality Leasehold Property Fund	1481.704	1946.87	129.255	49,748
Luxury Real Estate Investment Fund	1759.191	2269.45	221.54	34,640
Multi-National Residence Fund	1068.209	1183.805	128.775	24,524
Centara Hotels & Resorts Leasehold Property Fund	2648.533	3440.475	313	22,296
Nichada Thani Property Fund 2	1003.193	1903.21	118.18	15,792
MFC-Strategic Storage Fund	603.136	658.43	24.13	9,049
101 Montri Storage Property Fund	599.382	642.12	38.71	12,500

Table 4.3: Descriptive Statistics of the Determinants of Idiosyncratic Risk

	Mean	**Standard Div**	**Min.**	**Max**
Size	2,496.56	2,729.08	512.2	10,883.98
Performance	7.046%	2.794%	-0.315%	10.582%
Liquidity	182,062	361,753	9,049	1,287,194

Remarks: Size = Market Value (Million Baht), Performance = Increase in Net Asset/Total Asset, Liquidity = Number of REITs traded daily.

The market value of REITs in the sample is range from 512.2 million to 10,883.98 million with an average value of 2,496.56. However, when compared to the size of other firms in Stock Exchange of Thailand, the size of REITs is relatively small. The performance measure of REIT which is increase/decrease in net asset (rent earned from the asset) divided by net total asset so called return on asset (ROA) has an average value of 7.046% with maximum value of 10.582% and minimum values of -0.315%. Liquidity of REIT is measured by the number of stock traded daily. The average number of 182,062 stocks traded daily shows low liquidity compared to stocks in other sectors.

In the regression analysis, the idiosyncratic risks calculated from equation (4) are employed as the dependent variable. The determinants of the idiosyncratic risk measures—*Size*, *Type of Fund, Performance*, *Type of Property* and *Liquidity*—are employed as the independent variables. The expected signs for the variables to be tested in the regression model are given in Table 4.4.

Table 4.4: Hypothesized Relationship between Idiosyncratic Risk and the its Determinants

Variables	Hypothesized Sign
Size	Negative
Type of Fund	Positive
Performance	Negative
Liquidity	Negative
Type of Property	Negative

As shown in Table 4.5, the *F* value of 4.341 at 5% significant level indicates that, cumulatively, these independent variables in equation (5) impact the idiosyncratic risk. Also, the adjusted *R Square*, which indicates the proportion of variation in the dependent variable, is explained by the independent variables has a value of about 44% at 5% significant level. As expected, *Size* has the correct sign (negative), but is insignificant. This may be because most REITs behave like small stocks and, consequently, do not enjoy adequate market power to achieve significant risk reduction. As REITs grow in size, compared against industrial firms, they may enjoy greater market power and expertise to develop risk reduction strategies. The *Type of Fund* is qualitative variable and significant with t-stat of 3.767 at 5% significant level. Coefficient value of 0.1155 implies that lease-hold property fund has higher idiosyncratic risk compared to free-hold property fund. *Type of Fund* variable also has a correct sign since lease-hold property fund do not actually own the property but only has the right in the rental income. The *Performance* variable also has a correct sign but is insignificant. Although *Performance* should be an important factor to determine idiosyncratic risk of REIT, investors might perceive each REIT as defensive stock which provides quite a similar dividend yield across the sector. *Liquidity* has a wrong sign. However if number of stock traded daily are high, it may lead to higher volatility of the stock and finally can result in higher idiosyncratic risk. *Liquidity* is also insignificant, like the *Size,* it may be because REITs behave like small stocks. *Type of Property* factor has negative sign but is insignificant. This implies that residential type of property has lower individual risk than others type of property. However REITs do not adequately reduce idiosyncratic risk through type of property.

The result of regression using Equation (6) is shown in Table 4.6. ***Using*** this model, *F* value improves to 4.673 at 5% significant level but adjusted R^2 reduced to 41%. Result from this model has the same sign as the model in Equation (5) except *Type of Property*. The only factor that is significant is also *Type of Fund* with t-stat of 3.458 at 5% significant level which is also in line with the result from model in Equation (5).

Table 4.5: REITs Idiosyncratic Risk Regression Model using Equation (5)

$$\sigma^2(\delta_{it}) = \theta_0 + \theta_1 Size + \theta_2 \text{Type of Fund} + \theta_3 Type\ of\ Property + \theta_4 \text{Performance Measure} + \theta_5 \text{Liquidity} + \lambda_t$$

Variables	Coefficient	t-Stat
Size	-1.7×10^{-5}	-1.308
Type of Fund	0.1155	3.767
Performance	-0.2965	-0.591
Type of Property	-0.0042	-0.132
Liquidity	1.24×10^{-7}	1.400
F-Value	4.341	
P-Value	0.011	
Adj R^2	44.3%	

Table 4.6: REITs Idiosyncratic Risk Regression Model using Equation (6)

$$\sigma^2(\delta_{it}) = \theta_0 + \theta_1 Size + \theta_2 \text{Type of Fund} + \theta_3 Type\ of\ Property + \theta_4 \text{Performance Measure} + \lambda_t \quad (6)$$

Variables	Coefficient	t-Stat
Size	-9.3×10^{-7}	-0.146
Type of Fund	0.1066	3.458
Performance	-0.3778	-0.737
Type of Property	0.0041	0.127
F-Value	4.673	
P-Value	0.010	
Adj R^2	41.2%	

From the regression it can be summarized that REITs riskiness does not display much variation in terms of *Size, Performance, Type of Property* and *Liquidity* but *Type of Fund* significantly impact idiosyncratic risk. As a result, *Type of Fund* is the variable that undiversified REIT investors should examine carefully when dealing with REIT stocks.

4.1 Assumption Check

Since Equation (5) and Equation (6) are multiple linear regression models, there are 3 assumptions that must be checked, multicollinearity, auto-correlation and normality. Multicollinearlity is checked by calculating Variance Inflation Factor (VIF) for each independent variables. In Table 4.7, it shows that VIF values of all independent variables are less than 10 in both Equation (5) and (6). As a result, there is no multicollinearity or all independent variables are independent from each other.

Table 4.7: Variance Inflation Factor (VIF) of Independent Variables

Independent Variables	Equation (5)	Equation (6)
Size	8.0	1.8
Type of Fund	1.5	1.4
Performance	1.2	1.2
Type of Property	1.6	1.5
Liquidity	6.2	-

Auto-correlation is checked using Durbin-Watson statistic. The results of 1.85 in Equation (5) and 1.82, which is in between 1.5 and 2.5, in Equation (6) indicate that the residuals are independent from each other. As a result, there is no auto-correlation exist in these multiple linear regression models.

Normality is checked by Anderson-Darling Test. Test results show that there is no evident in lack of fit in both Equation (5) and (6) with p value greater than 0.05.

4.2 Robustness Check

The log return is used for robustness check instead of simple return to compute idiosyncratic risk used for a dependent variable in the regression model. As shown in Table 4.8 and Table 4.9, the regression result still show the significant in the model with higher in magnitude of F value. The coefficients of all independent variables have the same sign with *Type of Fund* is the only factor that is significant.

Table 4.8: Statistical Result of Equation (5) using Log Return

$$\sigma^2(\delta_{it}) = \theta_0 + \theta_1 Size + \theta_2 \text{Type of Fund} + \theta_3 Type\ of\ Property + \theta_4 \text{Performance Measure} + \theta_5 \text{Liquidity} + \lambda_t$$

Variables	Coefficient	t-Stat
Size	$-8x10^{-6}$	-1.451
Type of Fund	0.0517	4.049
Performance	-0.0479	-0.230
Type of Property	-0.0008	-0.062
Liquidity	$5.76x10^{-8}$	1.568
F-Value	4.808	
P-Value	0.007	
Adj R^2	47.5%	

Table 4.9: Statistical Result of Equation (6) using Log Return

$$\sigma^2(\delta_{it}) = \theta_0 + \theta_1 Size + \theta_2 \text{Type of Fund} + \theta_3 Type\ of\ Property + \theta_4 \text{Performance Measure} + \lambda_t \quad (6)$$

Variables	Coefficient	t-Stat
Size	$-3.6x10^{-7}$	-0.133
Type of Fund	0.0474	3.653
Performance	-0.0857	-0.397
Type of Property	0.0030	0.224
F-Value	4.969	
P-Value	0.008	
Adj R^2	43.1%	

Another method to perform the robustness check is to change the set of data. In the above analysis, the average annual idiosyncratic risk of each REIT is obtained from return index of year 2005 to year 2009. Like the idiosyncratic risk, independent variables such as *Size, Performance* and *Liquidity* are also obtained as an average value from year 2005 to 2009. As and robustness check for the model, panel data of idiosyncratic risk and REIT's accounting- based data for each year is used in the regression model. Table 4.10 shows statistical results of regression from Equation (5) with F value of 2.365 at 5% significant level with P value of 0.055. While, in the model from equation (6), F value is 2.812 at 5% significant level with P value of 0.036 as shown in Table 4.11. The sign of the coefficient of independent variables from both equations are the same except *Type of Property* which is in line with the above analysis with *Type of Fund* is also the only factor that is significant.

Table 4.10: Statistical Result of Equation (5) using Panel Data

$$\sigma^2(\delta_{it}) = \theta_0 + \theta_1 Size + \theta_2 \text{Type of Fund} + \theta_3 Type\ of\ Property + \theta_4 \text{Performance Measure} + \theta_5 \text{Liquidity} + \lambda_t$$

Variables	Coefficient	t-Stat
Size	-6.7×10^{-6}	-0.850
Type of Fund	0.06696	2.271
Performance	-0.38204	-1.472
Type of Property	-0.00487	-0.147
Liquidity	4.93×10^{-8}	0.813
F-Value	2.365	
P-Value	0.055	
Adj R^2	12.2%	

Table 4.11: Statistical Result of Equation (6) using Panel Data

$$\sigma^2(\delta_{it}) = \theta_0 + \theta_1 Size + \theta_2 \text{Type of Fund} + \theta_3 Type\ of\ Property + \theta_4 \text{Performance Measure} + \lambda_t \quad (6)$$

Variables	Coefficient	t-Stat
Size	-1.9×10^{-6}	-0.370
Type of Fund	0.0680	2.316
Performance	-0.3817	-1.477
Type of Property	-0.0051	-0.156
F-Value	2.812	
P-Value	0.036	
Adj R^2	12.9%	

CHAPTER V
CONCLUSION

Since its first introduction in the Stock Exchange of Thailand as a recovery vehicle for financial crisis, real estate investment trusts (REITs) have gained greater interest and become a growing role in investment practice. The reason is that REITs provide opportunities to invest in diversified portfolios of real estate properties with liquidity similar to other traded stocks but with much greater liquidity than direct ownership of real property. Additionally, REITs have been shown to provide protection during recession and to act as defensive stocks However, unlike other stocks, the performance of REITs is intimately linked with the underlying illiquid real estate properties. REITs enjoy a unique organizational structure with a different tax status when compared to industrial firms. For instance, potential agency problems are more severe in REITs because of the high dividend payout. There are also corporate control differences (when compared to industrial firms) and because of their small size, REITs often do not have the same level of institutional monitoring and pricing compared to other firms. Although aggregate volatility may be important for understanding the risk and return relationships for a portfolio of stocks, because of the special and unique characteristics of REITs, idiosyncratic risks are equally relevant. As a result of unique characteristics, REIT is, therefore, can be considered as another asset class on which its individual risk or idiosyncratic risk should be examined. In addition, investors may not always hold many stocks in their portfolio due to budget constrain or their investment strategy. Understanding idiosyncratic risk of REITs, therefore, should benefit to all investors.

This study has examined various determinants of idiosyncratic risk from the perspective of undiversified REIT investors, managers holding options/other option holders and arbitrageurs. Two regression models were estimated in order to isolate the determinants of idiosyncratic risk.

From this study, the only determinant that is significant is *Type of fund* whereas *Size, Performance, Type of Property* and *Liquidity* are insignificant. This may be because most REITs behave like small stocks and, consequently, do not enjoy adequate market power to achieve significant risk reduction. As a result of the finding, lease-hold property fund has higher idiosyncratic risk compared to free-hold property fund. Therefore the isolation of *Type of Fund* would provide guidance for portfolio managers, institutional and individual investors when mixing REITs with other securities for risk minimization.

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