THE RELATIONSHIP BETWEEN REIT PROPERTY TYPES AND STOCK EXCHANGE OF THAILAND INDEX

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ABSTRACT

This research employs the monthly data of 24 REITs as they were traded in the stock market over a period of time from 2006 to 2010. The data were subdivided into six portfolios by the nature of each property type: airport, hotel, industrial, office, residential, and retail. The research concentrates on finding the relationship of REITs with the SET Index and selected variables in order to look for evidence to support the benefits of using REITs to hedge against the SET Index. The results reveal REITs of each property type have a positive relationship with the SET Index, and with no clear sign of a hedging strategy. Nonetheless, only equity, industrial and retial REITs show significant positive relationship with the SET Index. The value of REITs in terms of providing hedging against the SET remains doubtable until future research on REITs can be developed to prove otherwise.

KEY WORDS: REIT / STOCK EXCHANGE OF THAILAND / HEDGE

52 pages

กรณีศึกษาความสัมพันธ์ระหว่างกองทุนรวมอสังหาริมทรัพย์แต่ละชนิดกับดัชนีของตลาดหลักทรัพย์แห่งประเทศไทย

THE RELATIONSHIP BETWEEN REIT PROPERTY TYPES AND STOCK EXCHANGE OF THAILAND INDEX

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บทคัดย่อ

งานวิจัยชิ้นนี้ศึกษาตลาดของกองทุนรวมอสังหาริมทรัพย์ทั้ง 24 กองทุนโดยนำข้อมูลรายเดือนตั้งแต่ปี2549 ถึง ปี2553 มาวิเคราะห์หาความสัมพันธ์กับดัชนีตลาดหลักทรัพย์แห่งประเทศไทย โดยทั้ง 24 กองทุนนั้นได้ถูกแบ่งเป็น 6 กลุ่มการศึกษาตามแต่ละชนิดของกองทุนรวมอสังหาริมทรัพย์ดังนี้คือ กลุ่มอาคารสนามบิน กลุ่มอาคารโรงแรม กลุ่มอาคารอุตสาหกรรม กลุ่มอาคารสำนักงาน กลุ่มอาคารที่พักอาศัย และกลุ่มอาคารศูนย์การค้า โดยมีวัตถุประสงค์เพื่อหาความสัมพันธ์ระหว่างกลุ่มอสังหาริมทรัพย์ข้างต้น กับตัวแปรของดัชนีตลาดหลักทรัพย์แห่งประเทศไทย และตัวแปรทางเศรษฐศาสตร์มหภาค ทั้งนี้เพื่อหาความเป็นไปได้ของการใช้กองทุนอสังหาริมทรัพย์เพื่อป้องกันความเสี่ยงของการลงทุนในตลาดหลักทรัพย์ โดยผลจากการศึกษาพบว่าทุกชนิดของกองทุนรวมอสังหาริมทรัพย์มีความสัมพันธ์ในเชิงบวก หรือมีทิศทางการเคลื่อนไหวในทิศทางเดียวกันกับดัชนีตลาดหลักทรัพย์แห่งประเทศไทย อย่างไรก็ตามตัวแปรที่มีความสัมพันธ์เชิงบวกอย่างมีนัยสำคัญมีเพียง 3 กลุ่มกองทุนคือ กองทุนรวมอสังหาริมทรัพย์ทุกกลุ่ม กลุ่มอาคารอุตสาหกรรม และ กลุ่มอาคารศูนย์การค้า โดยเนื่องจากความสัมพันธ์ที่อธิบายได้มีเพียง 3 กลุ่มของกองทุนรวมอสังหาริมทรัพย์จากทั้งหมด 7 กลุ่มจึงทำให้ยังมีข้อสงสัยเพื่อนำไปสู่การศึกษาในอนาคตในการใช้กองทุนรวมอสังหาริมทรัพย์เพื่อลดความเสี่ยงในการลงทุนในตลาดหลักทรัพย์แห่งประเทศไทย

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1.1 Introduction of the Study

Property Funds (PFUND) or Real Estate Investment Trusts (REITs) are companies or trusts that acquire and/or operate income-generating real estate(s), and distribute income from their own properties as dividends. REITs are regarded as a hybrid of stocks and bonds because they have both stock and bond characters. Even though they are publicly traded in stock exchanges, their returns are bond-like and have the same state variables as the bond market because the trusts are legally required to distribute a minimum of 90% of their cash flow in dividends to their investors.

In Thailand, Property Funds were established in 1997 to rescue real estate investors and developers from the so called *Tom-Yum-Kung crisis*. Nine years later in 2006, Real Estate Investment Trusts were issued as Property Funds for Public Offering, and listed in the Stock Exchange of Thailand (SET) as closed-ended mutual funds. Most of the publicly traded REITs in Thailand are classified as equity REITs, which hold particular property types such as private airports, hotel/resorts, industrials properties, office buildings, residential properties, or retail properties.

Because of their unique hybrid character, REITs have multiplied their interest and become a growing part of investment exercises. Not only offering constant returns and diversifying investors' portfolios, but REITs also provided protection during Thailand's stock recession in 2009. During this period, investors were seeking opportunities to alter their investments from government bond and bank deposits in order to gain their capital. REITs seem to be a pleasant alternative since the trusts could offer higher returns than government bonds and deposit rates in that period. Thai REITs offered investors a weighted average annualized yield of around 9% as of the end of 2009.

Besides being affected by stock recessions, the unit prices of these trusts are also believed to respond sensitively to economic news like most others stocks and

can be influenced by a variety of unanticipated events. Therefore, some events may have a greater effect on REIT prices than others.

Table 1: REITs data collected as of end of year 2010

REIT TYPE	NAME	PRICE INDEX DATA			
		Start Date	End Date	Price Index at start date (THB)	Price Index as of December 31, 2010 (THB)
Airport	SAMUI ARPT.PR.FUND (LH.)	30-Nov-06	31-Dec-10	99.00	98.00
Hotel	CENTARA H&R.LH.PR.FD.	31-Oct-08	31-Dec-10	97.90	90.50
	LUXERY REAL ESTATE IF.	30-Jun-08	31-Dec-10	101.50	83.20
	QLT.HOSPLTY.LH.PR.FUND	30-Apr-08	31-Dec-10	98.00	82.20
Industrial	TICON PROPERTY FUND	31-Jan-06	31-Dec-10	100.00	111.00
	THAI INDUSTRIAL FD.1	31-Aug-09	31-Dec-10	100.00	79.80
	TPARK LOGISTICS PR.FD.	31-Jan-06	31-Dec-10	97.50	107.90
	MFC-STRATEGIC STRG.FD.	31-Dec-09	31-Dec-10	102.00	98.10
Office	BANGKOK COML.PR.FUND	31-Jan-06	31-Dec-10	95.70	106.50
	MILLIONAIRE PROPERTY FD.	31-Jan-06	31-Dec-10	101.00	108.70
	QUALITY HOUSES PR.FUND	29-Dec-06	31-Dec-10	97.10	94.70
	SALA @ SATHORN PR.FD.	31-Aug-09	31-Dec-10	72.90	62.90
Residential	101 MONTRI STRG.PR.FD.	31-Aug-09	31-Dec-10	95.20	98.10
	GOLD PROPERTY FUND	31-May-07	31-Dec-10	101.00	80.80
	TU DOME RESD.CMX.PR.FD.	29-Dec-06	31-Dec-10	98.00	77.50
	MFC-NICHADA THANI PR.FD.	31-Jan-06	31-Dec-10	100.00	81.00
	UOB APARTMENT PR.I (LH.)	31-Jan-06	31-Dec-10	70.30	39.10
	PROPERTY PERFECT FUND	31-Mar-08	31-Dec-10	99.00	96.10
	MULTI-NATIONAL RSDI.FD.	31-Oct-07	31-Dec-10	100.00	99.00
	NICHADA THANI PR.FD.2	30-Jun-08	31-Dec-10	100.00	100.00
	URBANA PROPERTY FUND	30-Apr-09	31-Dec-10	100.00	69.50

Retail	CPN RETAIL GW.LH.PR.FD.	31-Jan-06	31-Dec-10	100.90	99.60
	FUTURE PARK PROPERTY FD.	29-Dec-06	31-Dec-10	91.40	124.90
	MAJOR CINEPLEX LFY.FD.	31-Jul-07	31-Dec-10	100.00	104.00

Nonetheless, there are controversies in using REIT hedges against the Stock Index. Gilibrto (1993), a famous real estate journal, acclaimed the use of the REIT Index hedge against the stock market. Moreover, Thai researcher Sirilukh Thumrongrukkul (2008) found the SET Index and Exchange Rate to have negative relationships with the monthly closing prices of REITs. This study showed some evidence that investors may use REITs as part of a hedging strategy against the SET Index.

However, from two previous studies, Liang, Seiler and Chatrath (1998) and Chung, Fung, Shilling and Simmons-Mosley (2008) found that when using REITs as part of a hedging strategy in the United States stock market, REIT prices have a strong relationship with the stock market, especially large REITs, but they have a negative relationship with Hedge Funds in the US market. In conclusion, these researches could not confirm whether REITs could be used to hedge against stock market fluctuations.

This, therefore, causes curiosity about the relationship of equity REITs and the SET Index in Thailand, and also about the relationship of REITs in each property sector with similar economic events, as well as whether or not evidence exists of using REITs as part of a hedging strategy in Thailand.

1.2 Research Objectives

The objective of this research is to search through REITs to find evidence and relationships of these Funds with SET Index and macroeconomic factors. This research also expands upon the previous Thai REIT research of Sirilukh Thumrongrukkul (2008), to find trends and relationships between each property type of equity REIT Price Index in Thailand. Furthermore, the research also observes the Thai market to determine whether investors view REITs as they were meant to be

used, i.e. to create stability for the market situation in 1997, and as an alternative for investors to lower the risk in their investment portfolio by adopting a hedging strategy.

1.3 Limitations of the Research

This research mainly focuses on analyzing the REIT market in Thailand, and provides alternative solutions by subdividing REITs into each property type. The data are collected from Datastream as a Price Index at the end of each month. Since Thai REITs were formally announced on the SET in 2006, a problem of inadequate data may also exist.

For macroeconomic factors, most of these factors are recorded monthly and quarterly. Compared to the periods of REIT trading in the Stock Exchange of Thailand, the research my face a situation of insufficient data.

1.4 Significance of the Study

The significance of this research is to encompass previous researches by employing the monthly data of 24 REITs as they were traded in stock market within a fixed period of time from 2006 to 2010. The data will be subdivided into six portfolios by the nature of each property type: airport, hotel, industrial, office, residential and retail. The research concentrates on finding the relationship between REITs and the SET Index and selected variables in order to understand REIT behavior and investor behavior when using REITs as part of a hedge strategy against fluctuations in the SET Index.

The multiple regression analysis methodology also incorporates 7 financial and macroeconomic factors constructed from 20 components to increase the explanatory power to the model. Moreover, the models have also been controlled with year and month dummy variables and trend to control the noise in the model.

1.5 Benefit

The researcher believes that the results from this research can be used to forecast the trends and relationships of REITs and selected factors. Moreover, the researcher also hopes that this research could help to explain the nature of REITs and behavior of investors in using REITs to hedge their investments against fluctuations in the SET Index.

1.6 Definition of Terms

Equity REIT contains various types of property which have different operating businesses. REITs are classified as a specific property type, or property sector and property subsector if 75 percent or more of their gross invested book assets are invested in that specific sector and subsector. The sectors are diversified, airport, hotel/resorts, industrial, office, residential, retail, and specialty.

Airport REIT focuses on managing private airports in specific destination areas. In Thailand's case, only Samui Airport is available in this REIT type. The business of this type incorporates rental of all commercial spaces in the airport, including airport, retail, restaurants, commercial and office rental spaces in the Samui Airport.

Hotel/resorts REIT specialize in the acquisition, rehabilitation and development of various commercial and leisure hotel properties. These hotels can be operated by third-party management companies or operated under franchises from nationally recognized brands.

Industrial REIT can be divided into industrial, office, and mixed REITs. First, industrial REITs acquire, own, and operate industrial real estate, which is the facility for manufacturing and the distribution of goods. Industrial properties are usually related to the upper or middle stream of industries and give the business activities its economic heartbeat.

Office REIT focuses on acquiring, developing, leasing, and managing office, laboratory or office-oriented space. The business of this type varies widely but

space configuration is relatively similar.

Residential REIT contains serviced apartments and manufactured home REITs. Serviced Apartments REITs focus on the acquisition, ownership, leasing, and management of multifamily apartment properties and sometimes provide housing to college and university students residing off-campus.

Retail REIT includes regional malls, shopping centers, and free standing REITs, which are classified in the order of the size of underlying retailers. These REITs are the owner, operator, and developer focused on various retailers, including department stores, supermarket chains, restaurants, convenience stores, and necessity-oriented retailers such as drug stores or discount retail stores.

Exchange Rate is the price of a currency (i.e., local currency) with respect to another currency. At present, Thailand has implemented a managed-float exchange rate government, in which the value of the baht is unwavering by both on-shore and off-shore foreign exchange markets. In this way, the government could let the currency move in line with economic fundamentals. Most data collected include exchange rates of the Thai Baht against 48 other currencies. Such exchange rate data are obtained from daily foreign exchange transaction reports from some commercial banks while some exchange rate data are collected from New York Closing (REUTERS) and Financial Times.

Leading Economic Index is constructed from 7 components including the authorized capital of newly registered companies, new construction areas permitted, real exports, number of foreign tourists, SET index, real broad Money, and oil price inverse index (Oman)

Business Sentiment Index has been compiled with Bank of Thailand survey data covering 1,500 businesses. The questionnaires are sent out during the last week of each month and are collected by the third week of the following month.

Private Consumption Index is a composite index representing private consumption conditions. It comprises 5 components (from 10 indicators), including VAT at a constant price, import of consumer goods at a constant price, household electricity consumption, a fuel index (sales of benzene and gasohol, diesel, LPG, and

NGV), and a car index (domestic sales of passenger cars, motorcycles, and commercial cars). Each component was seasonally adjusted, and the base year is year 2000.

Private Investment Index is a composite index representing private investment conditions. It is constructed from 5 components, including construction areas permitted in municipal zones, domestic cement sales, imports of capital goods at a constant price, commercial car sales, and domestic machinery sales. Each component was seasonally adjusted with a 3-month moving average except construction area, which had a 12-month moving average. The base year is year 2000.

CHAPTER II

LITERATURE REVIEW

2.1 Theories and Studies

From literature appraisals, inconsistent conclusions have been found on affiliations between REITs and the Stock Index. The consistent results are subject to sample data, methodologies, size of REITs, size of stock, independent variables and period of time. Several methodologies have been applied to find the relationships between REITs and various variables, including the Stock Index to determine potential hedge strategies. Some researchers have found that REITs do not have a significant relationship with the Stock Index and can be used to hedge against securities in investment portfolios, while other researchers have found the opposite to be true. Moreover, some literature found that correlations between REITs and stock returns may vary with property type. The mix-REITs may have a high correlation with stock returns, but REITs in each property types may not have a significant correlation.

In one of the most famous journals of portfolio management, Giliberto (1993) wrote that REITs can be used to hedge against the Stock Return Index in the US, and put together mythologies to find the “Hedged REIT Index”. The researcher concludes that REIT returns have relatively low correlations with stocks and bonds and a competitive rate of return. The results endorse the claim that REITs in a portfolio offer opportunities to enrich expected stock returns. Sirilukh Thumrongrukkul (2008) studied relationships between each of the 13 Property Funds in Thailand with economic factors over a period of January 2006 to December 2007 by using the Coefficient of Variance method, the Correlation Coefficient method on Return Index, and the Price Index of REITs. From the Total Return Index testing, T-REITs have positive relationships with the GDP exchange rate, exchange rates, the SET Index, and the Private Investment Index. On the other hand, the funds have negative relationships with bank interest rates, oil prices, inflation rates, 10-year government bonds, and gold prices. However, when the author also applied the same

test to the Property Fund PRICE INDEX, most economic factors reacted in a similar manner to when using Return Index variables. However, the SET Index and Exchange Rates show negative relationships when compared to previous tests. In conclusion, the author believes the Price Index variable may have accurately responded with Thailand's economic situations in that period. When the economy is unstable, people tend to invest more in bonds and REIT markets. Moreover, exchange rates should create negative impacts on industrial and tourism sectors which are related to some property types in REITs. Myer and Webb (1993) studied the relationships of REITs, Stocks and Commercial Real Estate variables, and also examined skewness and kurtosis, as well as conducting several tests of normality for the return. The time series properties of the return were also examined by calculating the autocorrelation function for each of the series. The author also extended the results of Giliberto concerning the inter-temporal relationship between REIT returns and real estate returns by examining a Vector Autoregressive model in which returns on pairs of assets were modeled as a linear function of lags of their own returns and lags of the returns on the assets in the pair. Moreover, the author also examined the distributional and time series properties of equity REIT returns and compared them with common stock, closed-end stock funds, and unsecured commercial real estate. Finally, the paper reported that REIT returns do not react strongly to the returns on stocks or closed-end funds. The relationship between REIT returns and inflation rates were investigated by Adrangi, B., A. Chatrath and Raffiee, K. (2004). The regression results found that real REIT returns are negatively correlated with the unexpected components of inflation. The research found evidence that REITs have significant negative relationships with inflation and stock returns, but positive relationships with real economic activity.

Chien-Ming Huang and Yen-Hsien Lee (2009) wrote in the International Research Journal of Finance and Economics that they adopted the autoregressive conditional jump intensity model proposed by Chan and Maheu (2002) to capture the characteristics of the time-varying and jump phenomena, and investigate the influence of expected and unexpected crude oil fluctuations on Real Estate Investment Trusts (REITs). Furthermore, this study also observed the relationships between REIT returns and the stock market. The methodical results disclosed that REIT returns rise in

response to increases in expected oil prices and provide a good partial hedge. Moreover, reflect relevant information about REITs or real estate and REITs are negatively sensitive to changes in interest rates and stock market returns.

On the other hand, many researchers found significant relationships between REITs and stocks in different methodologies, and concluded that REITs may react with the same economic variables as stocks. Chung, Fung, Shilling and Simmons-Mosley (2008) studied the behavior of REIT stock price synchronicity for the years 1997 through 2007. The study was conducted based on two theories. First, REIT stock prices should be largely independent of market changes, and second, REITs should have a low covariance with other assets, including other REIT stocks. However the researchers found that synchronicity of the equity REIT market is fairly high, especially among REITs that are larger and more liquid. Moreover, the authors also found that REIT stock price synchronicity is negatively related to hedge fund ownership, but positively related to pension fund and insurance company ownership. Han and Liang's (1995) results indicate that REITs have stronger correlations with small stocks than with large stocks. An alternative to the S&P 500 index in calculating the hedged REIT return is a small stock return index on an equally weighted market return index. Liang, Seiler and Chatrath (1998), from the journal of Real Estate Research, examined the ability of existing futures contracts (S&P 500, interest rate future, T-bill, T-bond, and commodity futures) to hedge the returns on real estate investment trusts (REITs). The results from various hedging strategies suggest that existing futures contracts do not provide the means to effectively hedge REIT returns. Liang, Y., Michael J. Seiler and A. Chatrath (1998) examined the capability of current futures contracts to hedge the returns on real estate investment trusts (REITs). The results from various hedging strategies suggest that existing futures contracts do not deliver the means to commendably hedge REIT returns. REITs could endure unhedgeability until futures contracts written specifically on REITs are developed.

As a final point, Chung, R., Fung, S., James D. Shilling and Tammie X. Simmons-Mosley (2008) studied the behavior of REIT stock price synchronicity from 1997 through 2007. The research found that high synchronicity appears in the equity REIT market, especially among REITs that are larger and more liquid. Furthermore,

the research also found that REITs have negative synchronicity with stock prices related to hedge fund ownership, but are positively related to pension funds and insurance company ownership.

2.2 Critical Analysis/Discussion of Theories

From these inconsistent conclusions, we believe that differences in methodologies, sample data and markets may return dissimilar results even when using the same factors in a deferent period of time. This research will subdivide REITs by property type to find relationships between each property sector. In order to handle time series data, the multiple-regression methodology is selected to analyze the SET Index and designated macroeconomic variables to increase explanatory power. Moreover, the research also incorporates dummy variables and trends to control noise from the model in order to find evidences of using REITs as part of a hedging strategy in Thailand.

CHAPTER III

METHODOLOGY

3.1 Sample Selection

Target data was collected from REITs, common stock, and macroeconomic indexes, as well as the Price Index of individual REITs and the key characteristics that vary across REITs due to their property type focus. The REIT data was retrieved on a monthly basis from a DataStream such as Price Index, starting from the beginning of year 2006 to the end of year 2010, excluding the REITs that had been traded less than one year. For other financial data, we employ the following widely known indices: SET index from Bank of Thailand and the Exchange Rates of commercial banks from the Bank of Thailand in the same period.

For macroeconomic indexes, we select leading indexes that are constructed from several components such as the Leading Economic Index, which is constructed from seven financial and economic components; the Economic Growth Index; the Private Consumption Index, which is constructed from five consumption factors; the Private Investment Index, which is constructed from five commodity factors; and the Business Sentiment Index. The analysis employs monthly data as that is the frequency of the REITs' data.

For the first analysis, we construct all 24-REITs as one portfolio to compare with the financial variables and selected macroeconomic factors. The REIT data in each month was created as a mean of the portfolio in that month.

The second part of analysis uses portfolios of REITs formed on the basis of property type. A portfolio of each property type is formed on the mean of the Price Index from each REIT in the same character. Since Thai REITs are in an early stage, each portfolio covers a different period depending on the data available. The portfolio of Airport REIT, formed from one REIT, covers the period from November 2006 to the end of 2010. The Hotel's portfolio, formed from three REITs, covers the period from April 2008 to the end of 2010. The portfolio of Industrial and Office, formed

from four REITs, covers the period from early 2006 to the end of 2010. The Residential portfolio, formed from nine REITs, covers the period from early 2006 to the end of 2010. The Retail portfolio, formed form three REITs, covers the period from early 2006 to the end of 2010.

In the last part, the research compares the relationship of each financial and economic variable that affects the overall REITs with each REIT portfolio formed by property type.

3.2 Methodology

The existing research interprets REITs as a hybrid of stocks and bonds in terms of return and risk exposure in the short-run [Ling and Naranjo (1997), Peterson and Hseih (1997), Karolyi and Sanders (1998)], with increased exposure to real estate revealed in longer term price dynamics [Mei and Lee (1994), Geltner and Rodriguez (1998)]. Intuitively, REIT indexes should be related to stocks because REITs are influenced to some degree by the same macroeconomic variables that affect stock returns.

Based on this intuition we employ multiple regression models in which the return on an REIT index is specified as a linear function of financial variables and macroeconomic factors as follows:

Base Model:

$REIT_{all} = \beta 0 + \beta 1.(SET\ Index) + \beta 2.(Exchange\ Rate) + \beta 3.(Leading\ Economic\ Index) + \beta 4.(Economic\ Growth\ Index) + \beta 5.(Business\ Sentiment\ Index) + \beta 6.(Private\ Consumption\ Index) + \beta 7.(Private\ Investment\ Index) + years' \ dummies + months' \ dummies + trends + u$

The $REIT_{all}$ is constructed from 24 existing Price Indexes of REITs in the stock market. According to the research of Sirilukh Thumrongrukkul (2008), this model has been created to verify the relationships of overall REITs with financial

variables and macroeconomic factors. Moreover, the results of this model will be used to compare the following portfolios.

Model 1:

$REIT_{airport} = \beta 0 + \beta 1.(SET\ Index) + \beta 2.(Exchange\ Rate) + \beta 3.(Leading\ Economic\ Index) + \beta 4.(Economic\ Growth\ Index) + \beta 5.(Business\ Sentiment\ Index) + \beta 6.(Private\ Consumption\ Index) + \beta 7.(Private\ Investment\ Index) + years' \ dummies + months' \ dummies + trends + u$

In model 1, the airport portfolio REIT ($REIT_{airport}$) is tested against the same economic factors. This portfolio is constructed with only one private airport in Thailand: Samui Airport Property Fund.

Model 2:

$REIT_{hotel} = \beta 0 + \beta 1.(SET\ Index) + \beta 2.(Exchange\ Rate) + \beta 3.(Leading\ Economic\ Index) + \beta 4.(Economic\ Growth\ Index) + \beta 5.(Business\ Sentiment\ Index) + \beta 6.(Private\ Consumption\ Index) + \beta 7.(Private\ Investment\ Index) + years' \ dummies + months' \ dummies + trends + u$

In Model 2, hotel portfolio REIT ($REIT_{hotel}$) is tested against the same financial variables and macroeconomic factors. This portfolio is formed from three REITs: Centara Hotel & Resot, Luxuary Real Estate, and Quality Hospitality.

Model 3:

$REIT_{industrial} = \beta 0 + \beta 1.(SET\ Index) + \beta 2.(Exchange\ Rate) + \beta 3.(Leading\ Economic\ Index) + \beta 4.(Economic\ Growth\ Index) + \beta 5.(Business\ Sentiment\ Index) + \beta 6.(Private\ Consumption\ Index) + \beta 7.(Private\ Investment\ Index) + years' \ dummies + months' \ dummies + trends + u$

In Model 3, industrial portfolio ($REIT_{indutrial}$) is formed from four REITs: Ticon Property Fund, Thai Industrial 1, TPark Logistic, and MFC-Strategic. This model is also tested against the same financial variables and macroeconomic factors to find trends and relationships compared with the Base Model.

Model 4:

$REIT_{office} = \beta 0 + \beta 1.(SET\ Index) + \beta 2.(Exchange\ Rate) + \beta 3.(Leading\ Economic\ Index) + \beta 4.(Economic\ Growth\ Index) + \beta 5.(Business\ Sentiment\ Index) + \beta 6.(Private\ Consumption\ Index) + \beta 7.(Private\ Investment\ Index) + years' dummies + months' dummies + trends + u$

In Model 4, office portfolio ($REIT_{office}$) is constructed from four REITs: Bangkok commercial Property Fund, Millionaire Property Fund, Quality House, and Sala @ Sathorn. This model is also tested against the same financial variables and macroeconomic factors to find trends and relationships compared with the Base Model.

Model 5:

$REIT_{residential} = \beta 0 + \beta 1.(SET\ Index) + \beta 2.(Exchange\ Rate) + \beta 3.(Leading\ Economic\ Index) + \beta 4.(Economic\ Growth\ Index) + \beta 5.(Business\ Sentiment\ Index) + \beta 6.(Private\ Consumption\ Index) + \beta 7.(Private\ Investment\ Index) + years' dummies + months' dummies + trends + u$

In Model 5, residential portfolio REIT ($REIT_{residential}$) is tested against the same financial variables and macroeconomic factors. This portfolio is formed from nine REITs: 101 Montri Storage, Gold Property Fund, TU Dome Residential, Nichada Thani Property Fund 2, MFC-Nichada Thani, UOB Apartment, Property Perfect Fund, Multi-National Residential, and Urbana Property Fund.

Model 6:

$REIT_{retail} = \beta_0 + \beta_1.(SET\ Index) + \beta_2.(Exchange\ Rate) + \beta_3.(Leading\ Economic\ Index) + \beta_4.(Economic\ Growth\ Index) + \beta_5.(Business\ Sentiment\ Index) + \beta_6.(Private\ Consumption\ Index) + \beta_7.(Private\ Investment\ Index) + years' dummies + months' dummies + trends + u$

In Model 6, retail portfolio REIT ($REIT_{retail}$) is tested against the same financial variables and macroeconomic factors. This portfolio is formed from three REITs: CPN Retail Growth, Future Park Property Fund, and Major Cineplex.

3.3 Indexes construction and calculation methods

Most of the indexes are employed from the research center[1] of the Bank of Thailand. The total of 7 indexes that are used in the model are constructed and incorporated with 20 components as follows:

Exchange Rate

Since 2 July 1997, Thailand has adopted a managed-float exchange rate[2] regime in which the value of the baht is determined by market demand and supply in both on-shore and off-shore foreign exchange markets to let the currency move in line with economic fundamentals. The Bank of Thailand will intervene in the market only when it deems it necessary in order to prevent excessive volatilities and achieve economic policy targets. The floating regime enhances more flexibility and efficiency in monetary policy implementation, increases the confidence of domestic and international investors, and improves foreign capital flow supervision.

Data collected include exchange rates of the Thai Baht against 48 other currencies. These data are obtained from daily foreign exchange transaction reports from some commercial banks while some exchange rate data are collected from New York Closing (REUTERS) and the Financial Times

All rates are converted to their Thai Baht equivalent using cross rates quoted by Bangkok Market Closing. Nevertheless, from 2nd March 2010 onward, the source for exchange rate data was shifted to REUTERS. Moreover, the BOT publishes exchange rate data in offshore markets pertaining to 11 additional currencies as follows:

1. SRI LANKA (LKR)
2. IRAQ (IQD)
3. BAHRAIN (BHD)
4. OMAN (OMR)
5. JORDAN (JOD)

[1] BOT Research Center - Macroeconomics Team, Domestic Economy Department, Tel. 66(0) 2283 5639
[2] The construction and definition of managed-float exchange rate of Thailand can be find at Bank of Thailand (www.bot.or.th)

6. QATAR (QAR)
7. MALDIVES (MVR)
8. NEPAL (NPR)
9. PAPUA NEW GUINEA (PGK)
10. ISRAEL (ILS)
11. HUNGARY (HUF)

From 7th June 2010 onward, 5 Specialized Financial Institutions (SFI) report average counter rates to the BOT as follows:

1. The Government Savings Bank
2. Bank for Agriculture and Agricultural Cooperatives
3. Export – Import Bank of Thailand
4. Small and Medium Enterprise Development Bank of Thailand
5. Islamic Bank of Thailand

Leading Economic Index

The Leading Economic Index[3] (LEI) is used as a complementary tool in the assessment of the economic trends and short-term economic forecasting. It is especially useful in the determination of the turning points or the peaks and troughs of business cycles as well as the short–term (3 – 4 months) forecast of the economy. The index should be used to evaluate economic conditions in conjunction with other tools such as macroeconomic models or financial programming models.

The Leading Economic Index is constructed from 7 components as follow:

1. Authorized capital of newly registered companies
2. New construction area permitted
3. Real exports
4. Number of foreign tourists
5. SET index
6. Real broad Money

[3] For more information about Leading Economic Index, please visit Bank of Thailand (www.bot.or.th)

7. Oil price inverse index (Oman)

The calculation of this component is created based on theory of the Bank of Thailand. The steps of the calculation process are as follows:

1. Deseasonalize all series components using the X-11 program. Then deflate the nominal term series with the appropriate deflators to obtain the series reflecting real activities.

   $X_{i,t}$ = seasonally adjusted series component i in month t (real term)

2. Compute a symmetrical percentage change of i ($x_{i,t}$) :

$$\mathbf{x}_{i,t} = \left(\frac{\mathbf{X}_{i,t} - \mathbf{X}_{i,t-1}}{\frac{\mathbf{X}_{i,t} + \mathbf{X}_{i,t-1}}{2}} \right) * 100$$

3. Standardize $\mathbf{X}_{i,t}$ to reduce the influence of one indicator on others :

$$\mathbf{S}_{i,t} = \frac{\mathbf{X}_{i,t}}{|\mathbf{A}|}$$

Where,

$$|\mathbf{A}| = \frac{\sum_{t=2}^{N} |\mathbf{x}_{i,t}|}{\mathbf{N} - 1}$$

N = number of data points (months)

4. Compute(symmetrical) percent change (R_t) in index

$$\mathbf{R}_t = \frac{\sum_{i=1}^{n} \mathbf{W}_i \mathbf{S}_{i,t}}{\sum_{i=1}^{n} \mathbf{W}_i}$$

In this stage, it is assumed that all series have equal weight, which is equal to 1.

5. Standardize the index to adjust its amplitude consistent to the trend-cycle component of the coincident index as follows :

$$r_t = \frac{R_t}{F}$$

and,

$$F = \frac{\sum_{t=2}^{N} |R_t|}{\sum_{t=2}^{N} |P_t|}$$

Where, F = Standardization factor of Leading Economic Index

6. Calculate the level of the index

$$I_t = I_{t-1} * \left[\frac{200 + r_t}{200 - r_t}\right]$$, and t = 2,3,…

Where; I_{t-1} is the initial month of the series set as 100

7. Rebase it to make 1995 the base year

Private Consumption Index

The Private Consumption Index[4] is a composite index representing private consumption conditions. It comprises 5 components (from 10 indicators). Each component was seasonally adjusted, and the base year is year 2000. The component is constructed from five factors combined with ten components as follows:

1. Value added taxes at year 2000 prices
2. Imports of consumer goods at year 2000 prices
3. Household electronic consumption
4. Fuel index

[4] The structure and model of Private Consumption Index has been setup and calculate by Bank of Thailand. (www.bot.or.th)

   a. Sales of benzene and gasohol
   b. Sales of diesel
   c. Sales of LPG
   d. Sales of NGV
5. Car index
   a. Sales of passenger cars
   b. Sales of Motorcycle
   c. Sales of commercial cars

In this case, the Private Consumption Index has been revised by the Bank of Thailand, and a base comparison set at year 2000 in order to better reflect private consumption expenditure.

Key details of the revision are:

1. The revised series comprises 5 components from 10 indicators. The addition of 4 new indicators, including sales of diesel, LPG, NGV, and commercial cars, aimed to capture the adjustments in the household consumption expenditure to the changing economic conditions.
2. Sub-indices for major expenditure categories are constructed to alleviate the difficulty in monitoring and communicating an increased number of indicators. These included Fuel Index and Car Index.
3. Fixed weights assigned for PCI components are determined from the relevant shares in Private Consumption Expenditure (PCE) as well as the regression equation, in order to correspond with the varied share of PCE categories. However, the revised PCI series still followed the same FIBER methodology as the Private Investment Index (PII) currently released.

Steps to construction of Private Consumption Index

1. Deseasonalize all series components, using the Census X-12 program. Then deflate the nominal term series with the appropriate deflators to obtain the series reflecting real activities.

   $X_{i,t}$ = seasonally adjusted series component i in month t (real term)

2. Compute a symmetrical percentage change of $X_{i,t}$

$$\boldsymbol{X}_{i,t} = \left(\frac{X_{i,t} - X_{i,t-1}}{\frac{X_{i,t} + X_{i,t-1}}{2}} \right) * 100$$

   where:
   $(X_{i,t})$: i = 5 components

3. Standardize Xi,t to reduce the influence of indicators. Volatility

$$S_{i,t} = \frac{\boldsymbol{X}_{i,t}}{|A|}$$

   Where,

$$|A_i| = \frac{\sum_{t=2}^{N} |x_{i,t}|}{N}$$

   N = number of data points (months)
   $|A_i|$ = components' volatility

4. Compute (symmetrical) percent change in composite index (R_t)

$$R_t = \frac{\sum_{i=1}^{M} W_i S_{i,t}}{\sum_{i=1}^{M} W_i}$$

   Where;
   w_i = weight applied to series i
   M = number of components

5. Standardize the index to adjust its amplitude to be consistent with the trend-cycle component of private consumption

$$r_t = \frac{R_t}{F} \quad \text{, and} \quad F = \frac{\sum_{t=2}^{N} |R_t|}{|P_t|}$$

F = Standardization factor of the private consumption index

P_t = Standardization factor of the private consumption cycle from the National Income account

6. Calculate the level of the index

$$I_t = I_{it-1} * \left[\frac{200 + r_t}{200 - r_t}\right] \text{ ; t = 2, 3,…}$$

Where; I_{t-1} is the initial month of the series set as 100

7. Rebase I_t to make 2000 the base year

Private Investment Index

The Bank of Thailand revised the Private Investment Index[5] back to 1995 in order to improve index performance to reflect private investment expenditure. The components of the new index were increased from 4 components to 5 components. As a result, private investment in machinery was comprised of 3 indicators, namely imports of capital goods (at 1995 prices), domestic commercial car sales, and domestic machinery sales at 1995 prices (from VAT database), which were added from 1998 to capture investment in domestically produced machinery & equipment. The remaining indicators represented private investment in construction.

[5] The Construction and method of Private Investment Index were created by macroeconomics Team, Domestic Economy Department of BOT. More information about definitions, data source, and methodology can be found in *www.bot.or.th.*

The Index is a composite index representing private investment conditions. It is constructed from 5 components as follows:

1. Construction area permitted in municipal zone
2. Domestic cement sales
3. Import of capital goods at constant price
4. Commercial car sales
5. Domestic machinery sales

Each component was seasonally adjusted with a 3-month moving average, except construction area, which had a 12-month moving average, and the base year was year 2000.

All indicators—except for in the construction areas permitted in municipal zones, which was averaged for 12 months to reflect the construction work in progress—were seasonally adjusted and averaged for 3 months. Hence, the quarterly index became the indices of March, June, September and December.

Steps to construction of the Private Investment Index

1. Deflate the nominal term series with the appropriate deflators to obtain the series reflecting real activities. Then de-seasonalize all series components, using the X-12 program and 3-month averages.

   $X_{i,t}$ = seasonally adjusted 3-month moving average series component I in month t (real term)

2. Compute a symmetrical percentage change of i

$$x_{i,t} = \left(\frac{X_{i,t} - X_{i,t-1}}{\frac{X_{i,t} + X_{i,t-1}}{2}} \right) * 100$$

($X_{i,t}$): i = 5 indicators

3. Standardize $X_{i,t}$ to reduce the influence of the indicators' volatility

$$S_{i,t} = \frac{x_{i,t}}{|A|}$$

Where,

$$|A_i| = \frac{\sum_{t=2}^{N} |x_{i,t}|}{N}$$

N = number of data points (months)

$|A_i|$ = indicators' volatility

4. Compute (symmetrical) percent change (R_{jt}) in sub index and composite index (R_t)

$$Rj_t = \frac{\sum_{i=1}^{M} W_i S_{i,t}}{\sum_{i=1}^{M} W_i}$$

Where,

w_i = weight applied to series i

M = number of indicators

j = construction investment index and equipment investment index

The weight of each component was determined from the regression equation.

$$R_t = \sum_{j=1}^{2} w_j R_{j,t}$$

Where w_j = weight applied to series j in private investment from the National Income Account

5. Standardize the index to adjust its amplitude consistent with the trend-cycle component of private investment from the National Income Account as follows:

$$r_t = \frac{R_t}{F} \quad \text{, and} \quad r_{j,t} = \frac{R_{j,t}}{F}$$

Where, F = Standardization factor of private investment index

Then,

$$F = \frac{\sum_{t=2}^{N} |R_t|}{|P_t|}$$

Where, P_t = the Standardization factor of the private investment cycle from the National Income account

6. Calculate the level of the index

$$I_t = I_{it-1} * \left[\frac{200+r_t}{200-r_t}\right] \text{; t = 2, 3,…}$$

Where, I_{t-1} is the initial month of the series set as 100 (March 1995)

Business Sentiment Index

Business Sentiment Index[6] has been compiled from BOT survey data of 1,500 businesses. The questionnaires were sent out during the last week of the surveyed month and were compiled by the third week of the next month.

The calculation and the interpretation of the Business Sentiment Index of The Bank of Thailand (the new version) are as follows:

1. The information from the returned questionnaires (obtained by the second week of each month) is divided into 2 main parts. The first part includes information used to compute the index. The information included is as follows:

[6] The Construction and method of Business Sentiment Index were created by Real Sector Statistics Team, Data Management Department of BOT. More information about definitions, data source, and methodology can be found in *www.bot.or.th*.

a. Economic condition or the business performance
b. Total order books
c. Investment
d. Employment
e. Cost of production or the cost of business
f. Production

The Second part includes information that reflects business confidences. However, it is not used as a component of the index. This information is:

a. Inventories
b. Financial conditions
c. Financial market outlook
d. Selling price
e. Export
f. Production capacity
g. Expected inflation
h. Limits of business

The new questions, based on the harmonized questionnaire, that were added to the original questionnaire are (1) Total order books (which is to replace the people purchasing power and export in the original version), (2) Production, and (3) questions 4-8 in the second part. Each question contains three measurement scales (i.e. improved, unchanged, and worsened). Respondents are asked to compare the current situation with that in the last month and the expected tendency in the next 3 months.

2. The representative firms (samples) are acquired from the Stock Exchange of Thailand's and the Ministry of Industry's databases. The samples are large and medium firms, which have registered capital of at least 200 million baht. The samples include the businesses in production, trade, and service sectors. The proportions of the selected firms in the Bangkok Metropolitan area and the provincial areas are 58:42. The response rates between the Bangkok

Metropolitan area and provincial areas are 60.40. Finally, the overall response rate is about 60%.

3. The qualitative data (opinion) obtained from returned questionnaires are converted into quantitative data (numbers). Survey results are presented in the form of diffusion indexes, varying from the minimum value of 0 to the maximum value of 100.

   Index = 50 indicates that business sentiment remains stable

   Index > 50 indicates that business sentiment has improved

   Index < 50 indicates that business sentiment has worsened

4. The calculation process is as follows:
   a. Transform the qualitative data into quantitative data.
      - If the answer is “improved”, the score is 1
      - If the answer is “unchanged”, the score is 0.5
      - If the answer is “worsened”, the score is 0
   b. The processing of the survey is performed by the simple addition of individual answers to all questions with no weighting applied. The sum of all the scores is divided by the number of respondents and then multiplied by 100. We then get indices corresponding to each question (6 questions). The business sentiment index is obtained by summing up the index of all the questions and dividing them by the number of questions (6). The responded indices include:
      - The Present Business Sentiment Index
      - The Future Business Sentiment Index (3 months ahead)

CHAPTER IV
RESULTS AND ANALYSIS

Since REITs are claimed to be a Hybrid of Stocks, and have as secure a return as Bonds do, this research focused on the macroeconomic factors that influence the Price Index of REITs. First, we set up all 24-REITs as one portfolio ($REIT_{all}$). The results will show the relationships and effects of this portfolio with selected variables. Second, sub-division portfolios were also constructed by property type of each REIT. The Price Index of each portfolio was calculated to test the selected factors. The results would determine the magnitude and association of each factor with each property type. Finally, the final results could be used to hypothesize the degree and explanation power of each factor compared to each REIT's portfolio.

4.1 Correlation Analysis

The correlation analyses have been allocated into two parts. The first part, as shown in Table 2, is the correlation analysis of all REITs and REIT portfolios subdivided into property types. Then, the second part is the correlation analysis between financial and macroeconomic factors.

From the first analysis, the research found that most of the REITs subdivided into property types have a medium degree of correlation with each other. However, some of them have a very low degree of correlation and a few of them have a negative correlation. For $REIT_{all,}$ this overall REIT Price Index has a high degree of correlation with most REIT portfolios by property types in terms of Price Index, except $REIT_{residential,}$ which has correlation equal to 45.48%. For $REIT_{airport}$, this portfolio has a very high correlation with $REIT_{retail}$ at 91.92%, a low relationship with $REIT_{hotel}$ at 13.86%, and a negative relationship with $REIT_{industrial}$ at (16.54%). For $REIT_{hotel}$, this portfolio has a low relationship with $REIT_{retail}$ at 21.40%. For $REIT_{industrial}$, this portfolio has a medium correlation with most REITs, but a low

correlation with $REIT_{residential}$ at 21.97%. $REIT_{office}$ has a medium correlation with other REITs. However, $REIT_{residential}$ and $REIT_{retail}$ have a negative correlation at (25.56%).

The main purpose of the second analysis part is to find correlations between each of the factors. As shown in Table 3, the analysis found that the SET index has a medium relationship with most factors except Exchange Rate, which has a negative relationship at (41.97%). For Exchange Rate, this variable has all negative relationships with all factors, and a very high negative relationship with the Leading Economic Index and Private Consumption Index at (81%) and (72%) respectively. For the Leading Economic Index, this variable has a medium relationship with most factors and a low relationship with the Private Investment Index at 22.25%. For the Economic Growth Index, this index has a low relationship with the Business Sentiment Index and a negative relationship with Private Consumption and Private Investment at (0.95%) and (20,13%) respectively. For the Business Sentiment Index, this index has a medium relationship with the others. Furthermore, the Private Consumption Index has a medium relationship with the Private Investment Index at 58.26%.

4.2 Multiple regression analysis

According to Table 4, the findings of multiple regressions illustrate that the Price Index of REIT in each property type reacts differently to financial and macroeconomic factors. The results from the regression method are as follows:

Base Model:

$$\hat{REIT}_{All} = -150.5992 + 0.0163(SET\ Index) + 0.0014(Exchange\ Rate) + 2.0425(Leading\ Economic\ Index) - 1.3688(Economic\ Growth\ Index) - 0.2234(Business\ Sentiment\ Index) + 0.2886(Private\ Consumption\ Index) - 0.1139(Private\ Investment\ Index)$$

The Base model has R-square equal to 96.48% and F-Test at 73.18. The regression institute for the SET Index is highly significant to the model with a coefficient of 0.0163 and a p-value of less than 5%. This outcome means that if the SET Index increased by 1 point, the Price Index of $\hat{REIT}_{All}$ would increase by 0.0163 point. The outcome also found the Leading Economic Index and Business Sentiment Index significant to the model with p-values of less than 10%. Economic Growth, on the other hand, is substantial to the model in terms of negative relationships with a p-value of less than 5%.

Estimated Model 1:

$$\hat{REIT}_{Airport} = 14.3054 + 0.0387(SET\ Index) - 1.5348(Exchange\ Rate) + 0.4195(Leading\ Economic\ Index) - 0.2843(Economic\ Growth\ Index) + 0.7331(Business\ Sentiment\ Index) - 0.1691(Private\ Consumption\ Index) + 0.3761(Private\ Investment\ Index)$$

The Estimated Model 1 has R-square equal to 93.98% and F-Test at 237.85. Even though the regression method shows a very high R-square result, and a very high F-Test result, the p-value shows that the selected variables are not correlated with the Price Index of $\hat{REIT}_{Airport}$.

Estimated Model 2:

$$\hat{REIT}_{Hotel} = -276.5730 + 0.0288(SET\ Index) + 1.9786(Exchange\ Rate) + 2.9316(Leading\ Economic\ Index) - 1.1479(Economic\ Growth\ Index) - 0.4576(Business\ Sentiment\ Index) - 0.3121(Private\ Consumption\ Index) + 0.2316(Private\ Investment\ Index)$$

The Estimated Model 2 has R-square equal to 97.13 % and F-Test at 54.73. The regression found that the SET Index is not significant to the model. This outcome means that any increase or decrease of the SET index may not be correlated with the

Price Index of the $\hat{REIT}_{Hotel}$. However, the Exchange rate and Private Investment Index are significant to the model with a p-value of less than 10%.

Estimated Model 3:

$\hat{REIT}_{Industrial}$ = *31.4943 + 0.0324(SET Index) + 0.4688(Exchange Rate) - 0.5642(Leading Economic Index) + 0.1167(Economic Growth Index) - 0.3467(Business Sentiment Index) + 0.4107(Private Consumption Index) + 0.3173(Private Investment Index)*

The Estimated Model 3 has R-square equal to 90.78% and F-Test at 14.55. The regression reveals that the SET Index is substantially significant to the model with a coefficient of 0.0324 and a p-value of less than 5%. From the results, if the SET Index increased by 1 point, the Price Index of $\hat{REIT}_{Industrial}$ would increase by 0.0324 point. The research, moreover, found that others factors are not significant to the model with p-values of more than 10%.

Estimated Model 4:

$\hat{REIT}_{Office}$ = *- 311.8279 + 0.0015(SET Index) - 0.1999(Exchange Rate) + 3.9035(Leading Economic Index) - 2.2823(Economic Growth Index) - 0.0002(Business Sentiment Index) + 0.0985(Private Consumption Index) - 0.1748(Private Investment Index)*

The Estimated Model 4 has R-square equal to 95.72% and F-Test at 73.87. The regression analysis, conversely, reveals that the SET Index is not considerable to the model with a p-value of more than 10%. Nevertheless, the Leading Economic Index, Economic Growth Index and Private Investment Index are greatly significant to the model with p-values of less than 5%.

Estimated Model 5:

$\hat{REIT}_{Residential}$ = - 212.0940 + 0.0040(SET Index) + 0.2921(Exchange Rate) + 2.6255(Leading Economic Index) - 2.2741(Economic Growth Index) - 0.2673(Private Consumption Index) + 0.5391(Private Investment Index) - 0.3702(Business Sentiment Index)

The Estimated Model 5 has R-square equal to 88.84% and F-Test at 33.46. The analysis, on the other hand, shows that the SET Index is not substantial to the model with a p-value of more than 10%. However, the research found that the Leading Economic Index, Economic Growth Index, Private Consumption Index, and Private Investment Index are greatly significant to the model with p-values of less than 5%.

Estimated Model 6:

$\hat{REIT}_{Retail}$ = -123.1694 + 0.0496(SET Index) + 0.5391(Exchange Rate) + 1.4710(Leading Economic Index) - 0.2480(Economic Growth Index) - 0.4468(Private Consumption Index) + 0.2467(Private Investment Index) - 0.0748(Business Sentiment Index)

The Estimated Model 6 has R-square equal to 93.70% and F-Test at 42.73. The regression discovered that the SET Index is decidedly significant to the model with a coefficient of 0.0496 and a p-value of less than 5%. This consequence means that if the SET Index increased by 1 point, the Price Index of $\hat{REIT}_{Retail}$ would escalate by 0.0496 point. The results also show that the Business Sentiment Index is significant to the model with p-value of less than 10%.

4.3 Discussion of the results

According to the results of the hypothesized sign of coefficients from multiple regression analysis as shown in Table 5, each REIT portfolio shows a different relationship with the selected factors. The results show that each property type may react differently compared to the same economic factors. However, the SET

Index is the only factor that shows a positive relationship with all the REIT portfolios. The level of the significance of relationships was as expected for $REIT_{all}$, $REIT_{industrial}$ and $REIT_{retail}$. For the exchange rate, this factor shows a different relationship with each REIT. The interesting point is that the exchange rate shows a significantly positive relationship with the hotel REIT, but a negative relationship with the airport REIT. For the Leading Economic Index, this factor shows a significant positive relationship as expected with $REIT_{all}$, $REIT_{office}$ and $REIT_{industrial}$. Economic Growth Index, on the other hand, results in a negative relationship with most REITs except the industrial REIT. The Business Sentiment Index also shows a negative relationship with most REITs except the airport REIT. For the Private Consumption Index, this factor shows a positive relationship with most REITs except the properties in the tourism sector, which show a negative relationship. For the Private Investment Index, this factor, by some means, shows a significant positive relationship with the hotel REIT, but a significant negative relationship with residential and retail REITs.

CHAPTER V

CONCLUSIONS AND RECOMMENDATION

5.1 Conclusions

The results from this research demonstrate that the Price Index of equity REITs has a significantly positive relationship with the SET Index. Likewise, the portfolios of all REITs subdivided by property type also show positive relationships with the SET Index. $\hat{REIT}_{All}$, $\hat{REIT}_{Industrial}$ *and* $\hat{REIT}_{Retail}$ have substantial positive relationships with the SET Index. According to the graph of Table 6, the Price Index of the REITs appears to move in the same direction as the SET Index by visualizing. From these results, REITs in Thailand could be considered as being in an established or emerging state similar to as in most developing countries. Most investors may have their own interpretation of REITs as a substitute stock investment instead of using REITs to hedge in order to lower the risk in their portfolios. Likewise, the real estate and commodity sectors are major portions and have a high correlation with the SET Index. These two sectors are a naturally representation of the prosperous nature of the real estate market as well as REITs in Thailand. REITs in Thailand, therefore, may have a positively high correlation and significant relationship with the Stock Exchange of Thailand Index.

In contrast to the previous Thai research of Sirilukh Thumrongrukkul (2008), this researcher employed monthly data of existing REITs from 2006 through 2007, and conducted relationship research by using the closing prices of these trusts compared with the SET Index. The research found that equity REITs and the SET Index have a negative relationship with each other.

5.2 Recommendation

This study has some limitations. For example, firms sampled in this research are from the Thai market from year 2006 to 2010 only, and the REIT market in Thailand is still in an emerging state. Besides, some property types of REIT have only on trust in portfolio, such as $REIT_{airport}$. Furthermore, differences in methodology, sample of data, independent variables and period of time may result in different conclusions. Moreover, additional methodologies to define multicollinearity, auto-correlation and normality can be applied to increase the explanatory power of the models. Therefore, to extend the research's quality, future studies may increase the period of study and input more control variables in to each type of REITs to pursue the meaningful factors that could explain REITs in different property types. The findings for meaning of REITs to hedge or reduce the risk of a portfolio is also expressive for all investors.

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APPENDIX

Table 2: The result of correlation analysis between REIT portfolios

	$REIT_{all}$	$REIT_{airport}$	$REIT_{hotel}$	$REIT_{industrial}$	$REIT_{office}$	$REIT_{residential}$	$REIT_{retail}$
$REIT_{all}$	1.0000						
$REIT_{airport}$	0.7234	1.0000					
$REIT_{hotel}$	0.7118	0.1386	1.0000				
$REIT_{industrial}$	0.8504	0.6038	0.6140	1.0000			
$REIT_{office}$	0.8537	0.5892	0.6451	0.5331	1.0000		
$REIT_{residential}$	0.4548	-0.1654	0.6293	0.2197	0.4970	1.0000	
$REIT_{retail}$	0.7239	0.9192	0.2140	0.6869	0.5359	-0.2556	1.0000

Table 3: The result of correlation analysis between financial and macroeconomic variables

	Set Index	Exchange Rate	Leading Economic Index	Economic Growth Index	Business Sentiment Index	Private Consumption Index	Private Investment Index
Set Index	1.0000						
Exchange Rate	-0.4197	1.0000					
Leading Economic Index	0.3793	-0.7200	1.0000				
Economic Growth Index	0.0629	-0.0071	0.6501	1.0000			
Business Sentiment Index	0.6493	-0.4329	0.6531	0.3606	1.0000		
Private Consumption Index	0.4247	-0.8100	0.6700	-0.0095	0.5886	1.0000	
Private Investment Index	0.6402	-0.3750	0.2225	-0.2013	0.3106	0.5826	1.0000

Table 4: The result of coefficient from multiple regression analysis

	$\hat{REIT}_{All}$	$\hat{REIT}_{Airport}$	$\hat{REIT}_{Hotel}$	$\hat{REIT}_{Industrial}$	$\hat{REIT}_{Office}$	$\hat{REIT}_{Residential}$	$\hat{REIT}_{Retail}$
Intercept	-150.5992	14.3054	-276.5730	31.4943	-311.8279	-212.0940	-123.1694
SET Index	0.0163**	0.0387	0.0288	0.0324**	0.0015	0.0040	0.0496**
Exchange Rate	0.0014	-1.5348	1.9786*	0.4688	-0.1999	0.2921	0.5391
Leading Economic Index	2.0425*	0.4195	2.9316	-0.5642	3.9035**	2.6255**	1.4710
Economic Growth	-1.3688**	-0.2843	-1.1479	0.1167	-2.2823**	-2.2741**	-0.2480
Business Sentiment Index	-0.2234*	0.7331	-0.4576	-0.3467	-0.0002	-0.2673	-0.4468*
Private Consumption Index	0.2886	-0.1691	-0.3121	0.4107	0.0985	0.5391**	0.2467
Private Investment Index	-0.1139	0.3761	0.2316*	0.3173	-0.1748**	-0.3702**	-0.0748
F – Test	73.18	237.85	54.73	14.55	73.87	33.46	42.73
R squared	0.9648	0.9398	0.9713	0.9078	0.9572	0.8884	0.937

Note:

*** Significant level at 5%*

**Significant level at 10%*

The coefficient estimate of years' dummies, months' dummies, and trend are not reported

Table 5: Hypothesized sign of coefficient from multi regression analysis

Variables	Hypothesized Sign						
	$\hat{REIT}_{All}$	$\hat{REIT}_{Airport}$	$\hat{REIT}_{Hotel}$	$\hat{REIT}_{Industrial}$	$\hat{REIT}_{Office}$	$\hat{REIT}_{Residential}$	$\hat{REIT}_{Retail}$
Intercept	Negative	Positive	Negative	Positive	Negative	Negative	Negative
SET Index	Positive**	Positive	Positive	Positive**	Positive	Positive	Positive**
Exchange Rate	Positive	Negative	Positive*	Positive	Negative	Positive	Positive
Leading Economic Index	Positive*	Positive	Positive	Negative	Positive**	Positive**	Positive
Economic Growth Index	Negative**	Negative	Negative	Positive	Negative**	Negative**	Negative
Business Sentiment Index	Negative*	Positive	Negative	Negative	Negative	Negative	Negative*
Private Consumption Index	Positive	Negative	Negative	Positive	Positive	Positive**	Positive
Private Investment Index	Negative	Positive	Positive*	Positive	Negative**	Negative**	Negative

Note:

*** Significant level at 5%*

**Significant level at 10%*

Table 6: Graph of REITs Price Indexes and SET Price Index

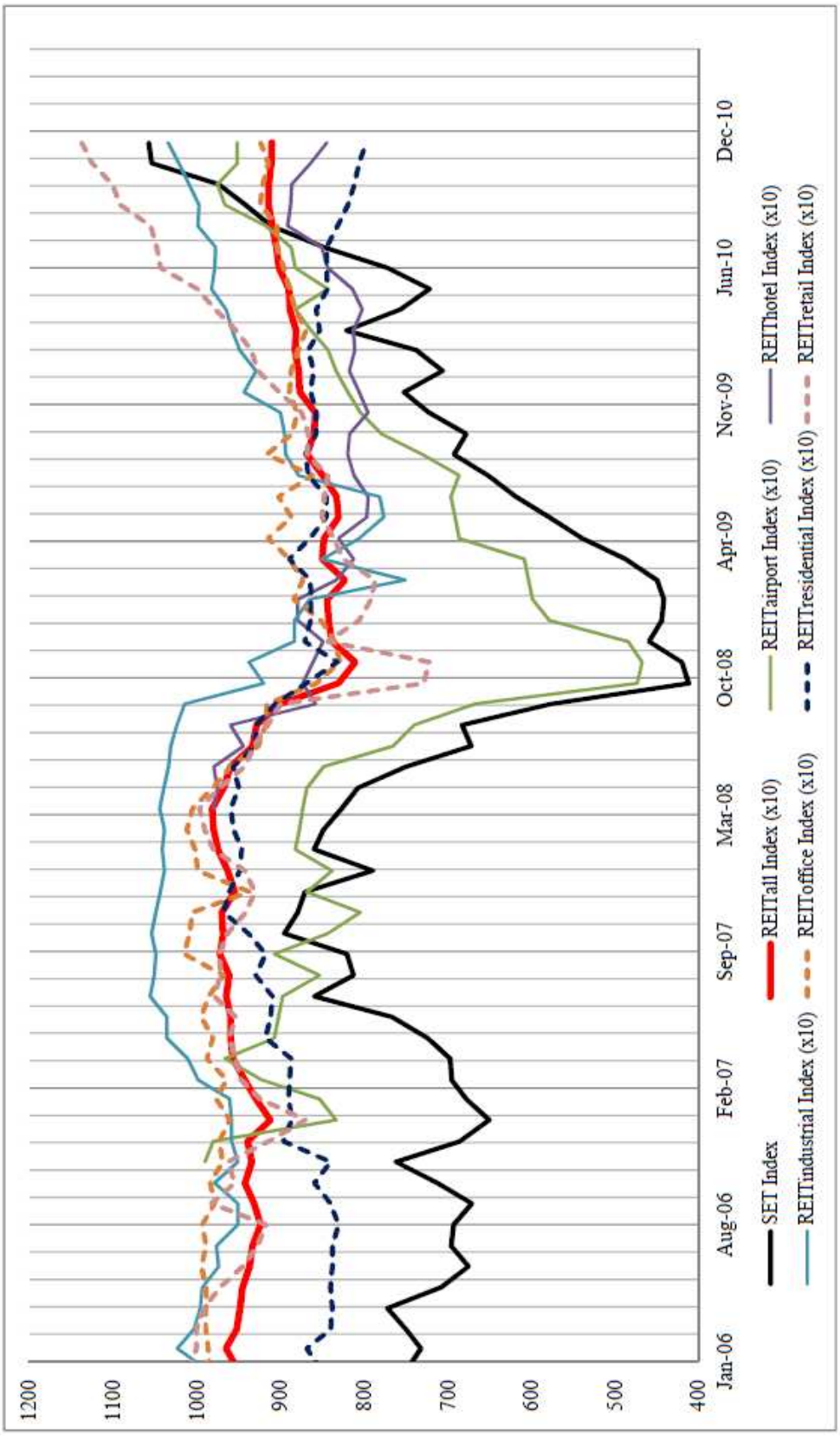


Table 7: Graph of REITs Price Indexes and Exchange Rate

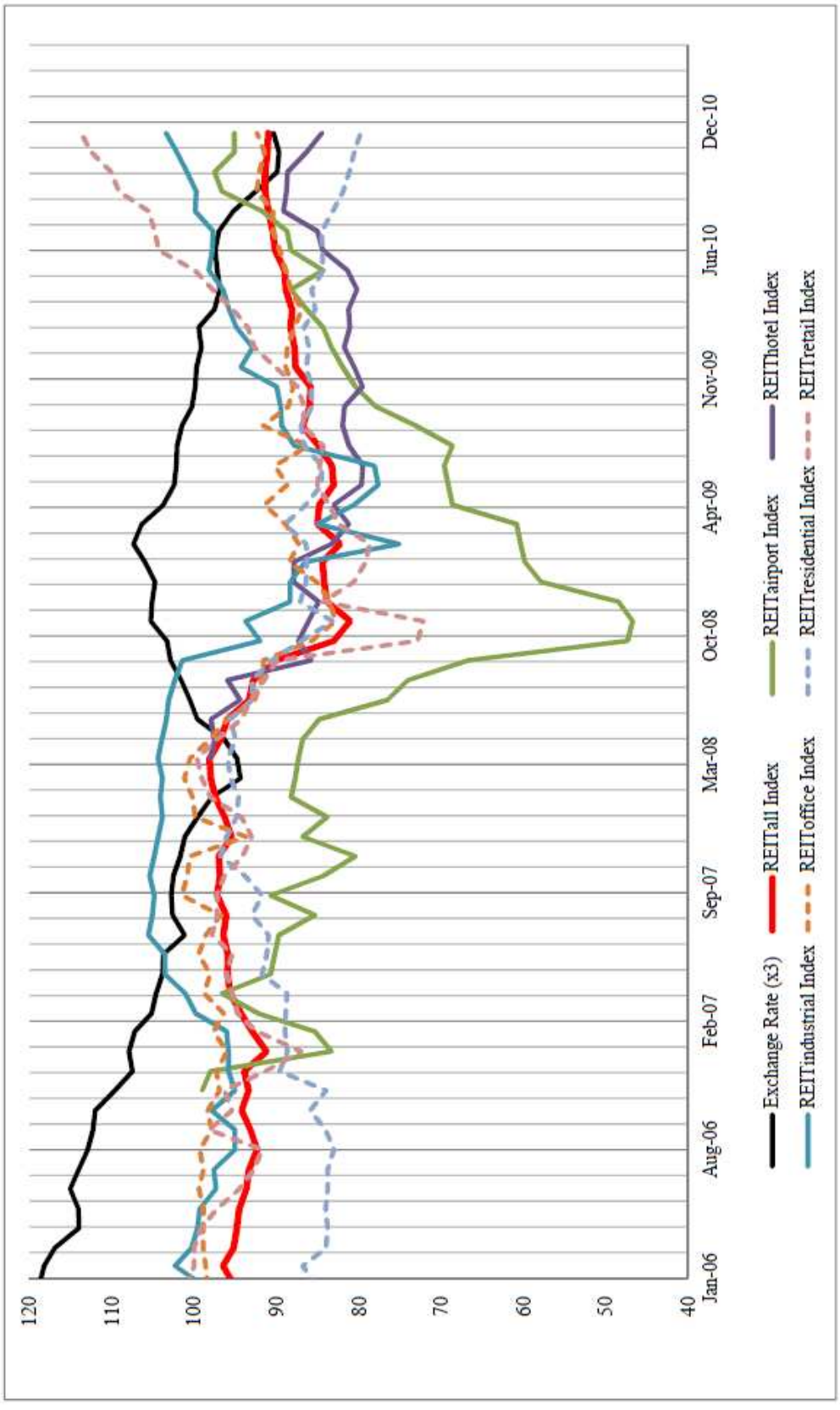


Table 8: Graph of REITs Price Indexes and Leading Economic Index

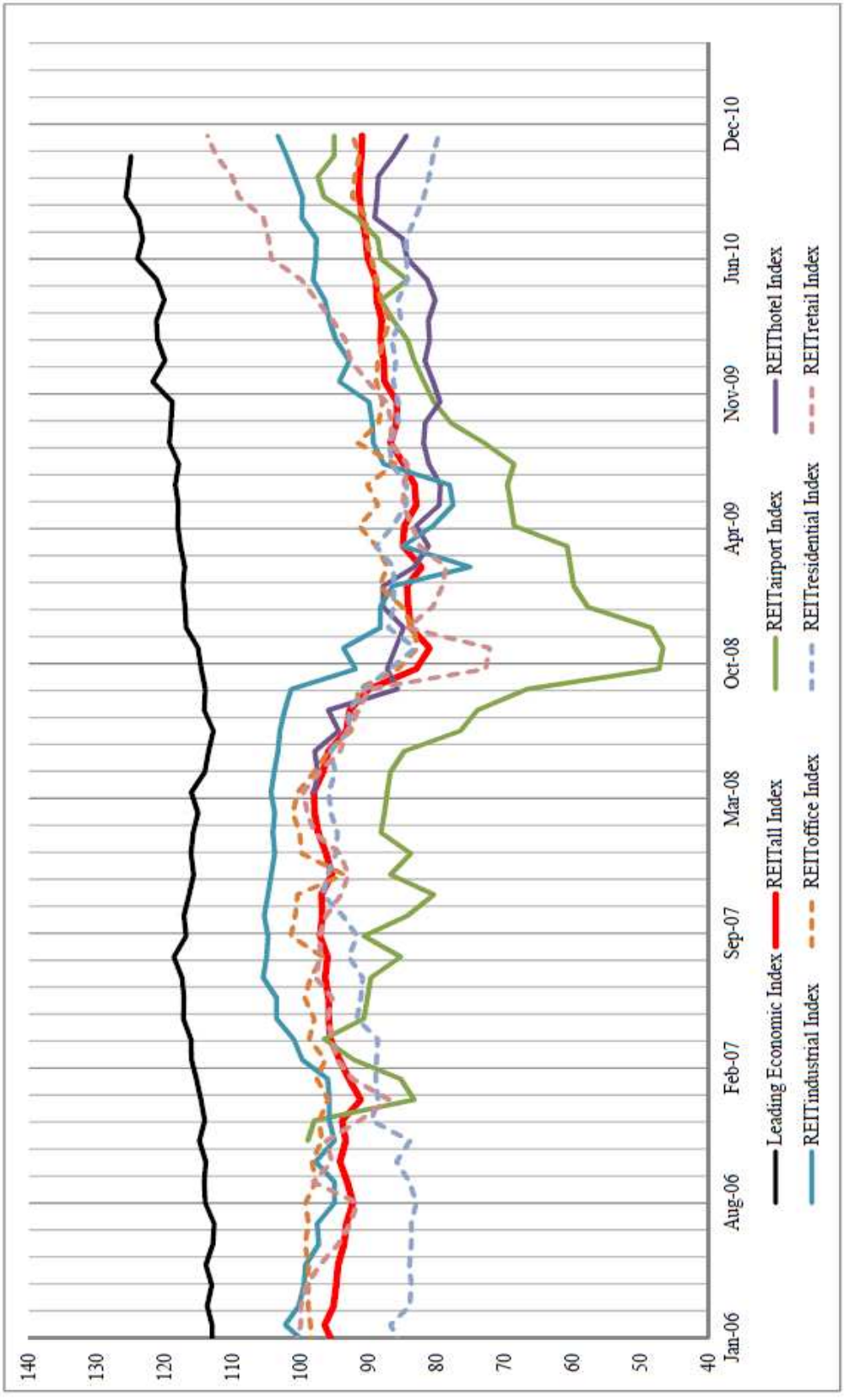


Table 9: Graph of REITs Price Indexes and Economic Growth Index

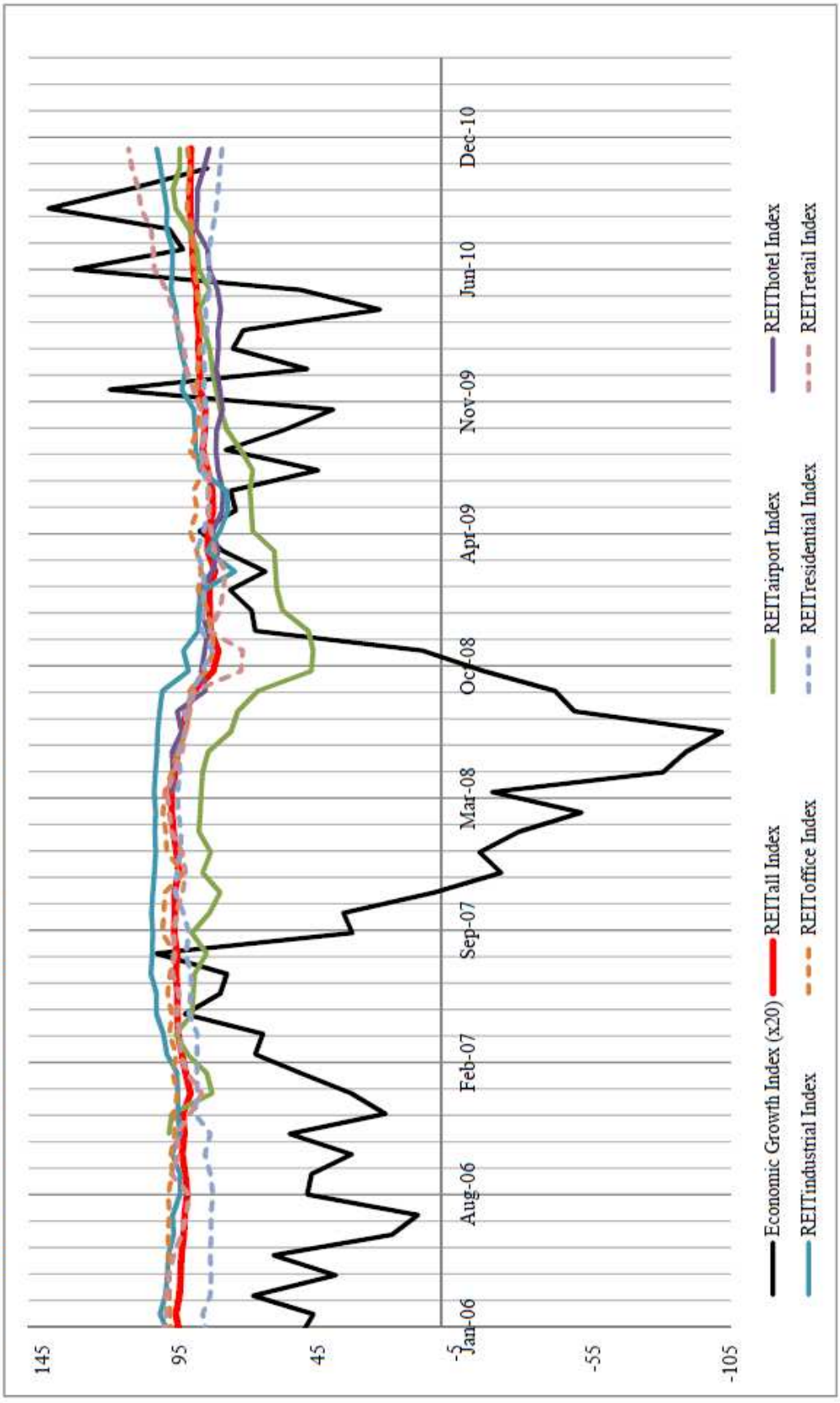


Table 10: Graph of REITs Price Indexes and Business Sentiment Index

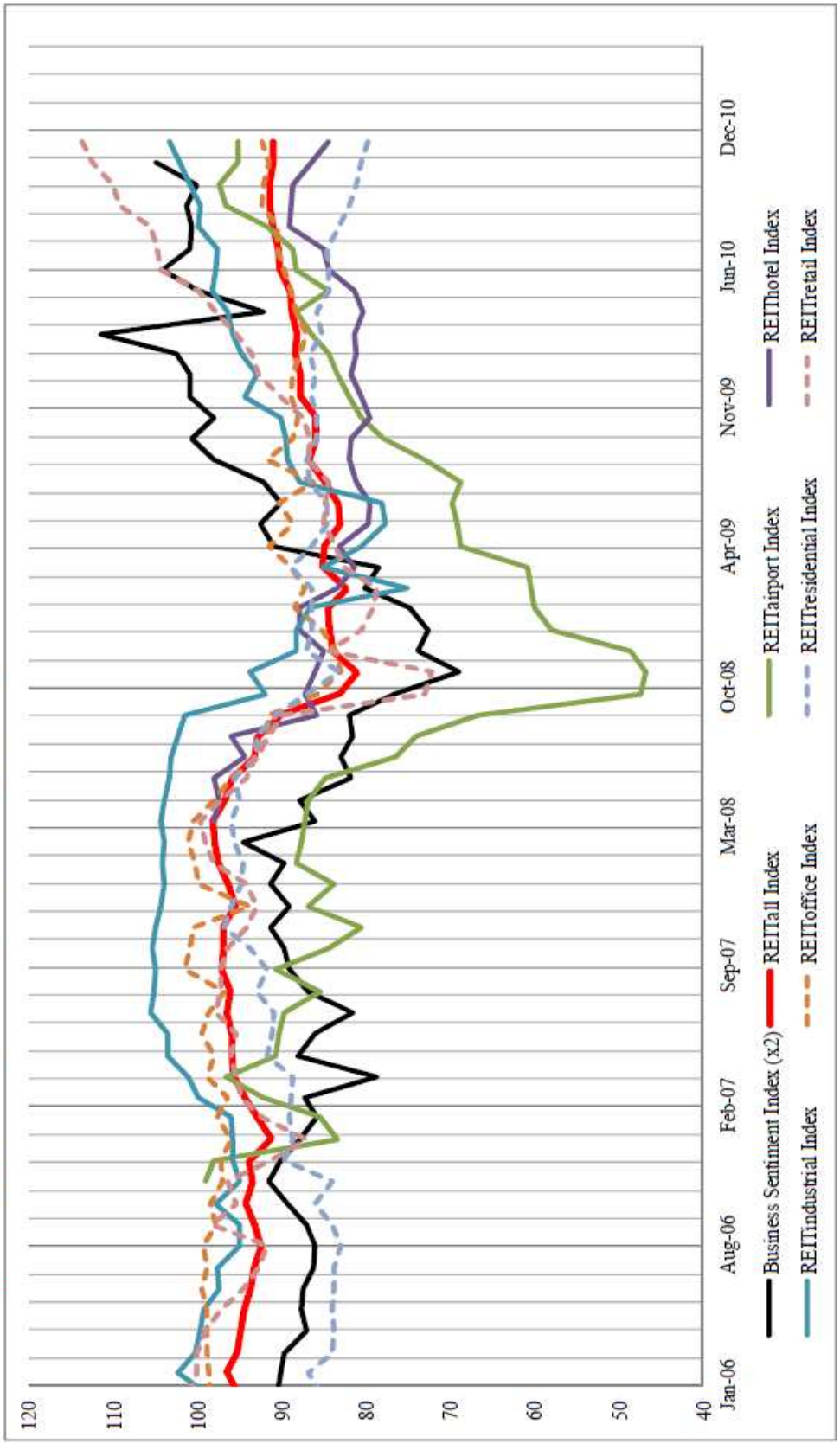


Table 11: Graph of REITs Price Indexes and Private Consumption Index

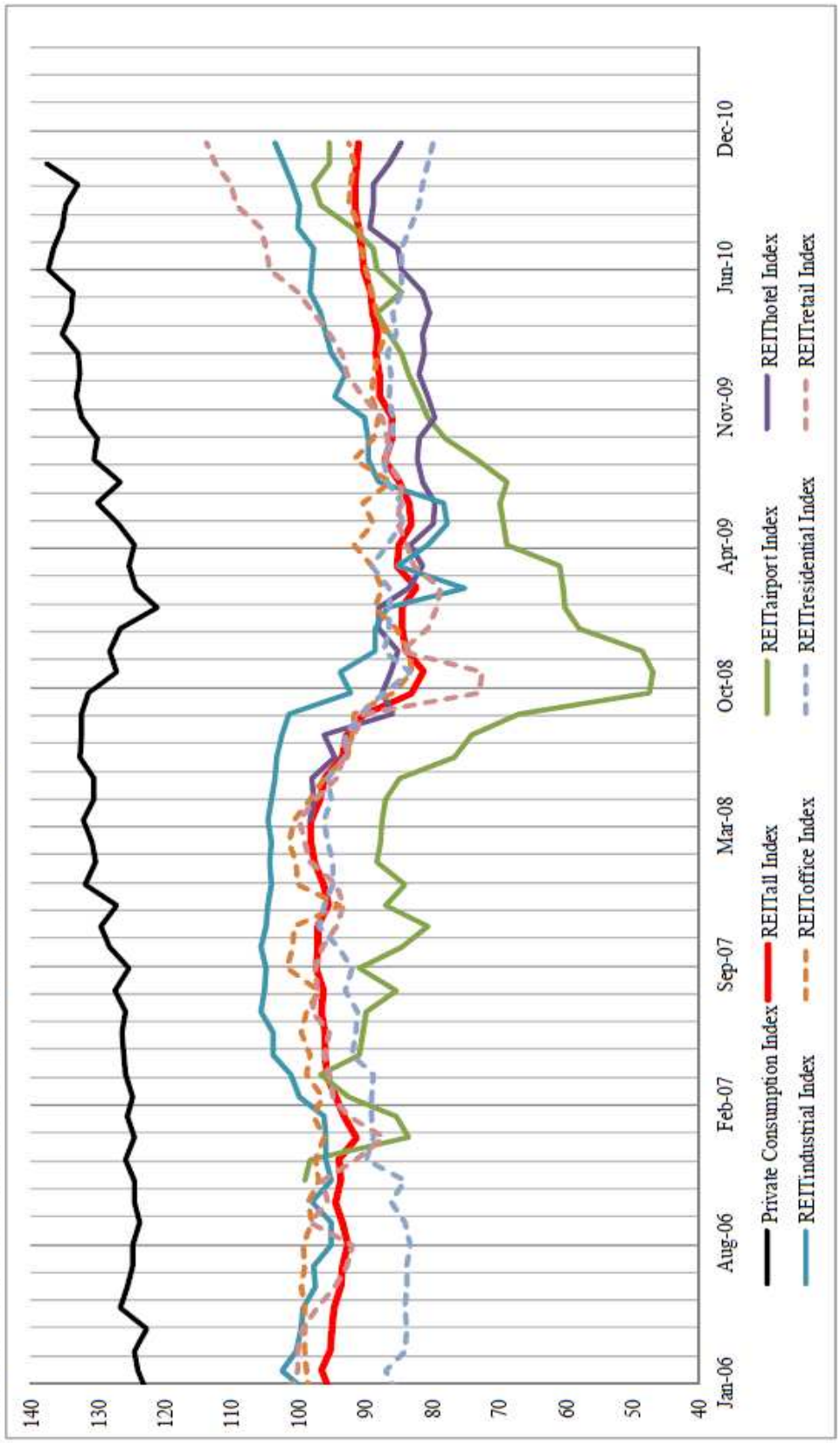
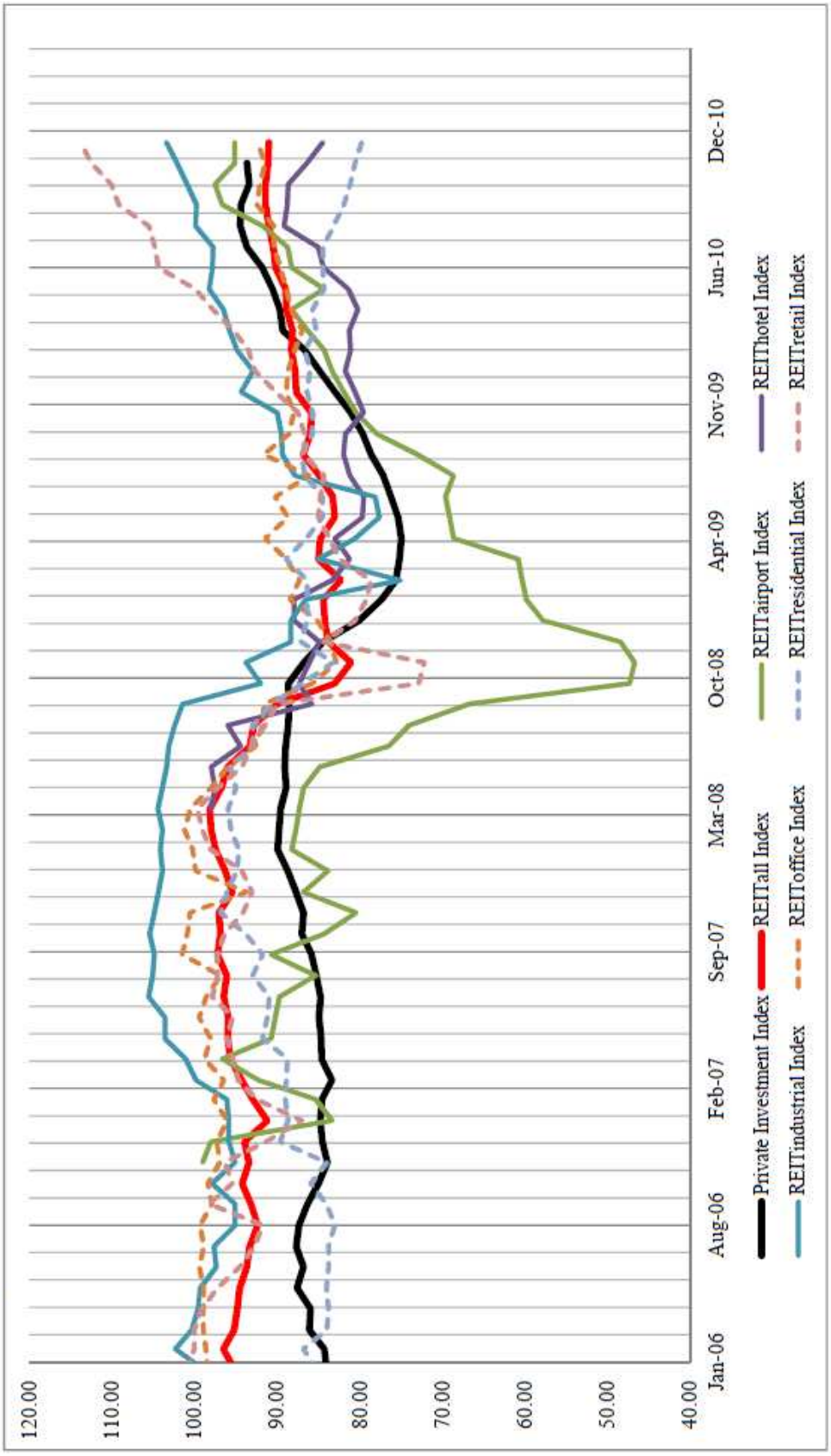


Table 12: Graph of REITs Price Indexes and Private Investment Index



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