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The Relationship between Real Estate Investment Trusts and Real Estate Markets[1]

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Abstract: The mechanism of Real Estate Investment Trusts in Taiwan (or T-REITs) was launched in 2005, however, T-REITs market did not perform as well as expected. The purpose of this study is to explore the short-term and long-term dynamics between REITs and direct real estate markets in Taiwan. For comparison, we also conduct similar analysis in the U.S. to determine the reasons for the different market performance. Results imply that the diversification properties of these two assets are likely to be similar over the long horizon. According to the causality test, REITs leads direct real estate markets due to the information efficiency. These findings are consistent with those of previous studies. Besides, no cointegration and lead-lag relation between T-REITs and commercial real estate is found. Moreover, the current commercial transaction prices are affected by both of their previous prices and T-REITs.

There are several possible explanations for the different results between the U.S. and Taiwan, including difference in sample period, market capitalization, concentration risk, and most importantly, the potential agency problem existing in T-REITs market. The underperformance of parent-related management T-REIT is verified through the volatilities of stock and T-REIT returns. Therefore, we conclude that the limited development of T-REITs may be caused by the agency problem in REITs market. Results of this study may provide T-REITs market for improving its efficiency, as well as for the governance in other REIT-developing markets.

Keywords: Real Estate Investment Trusts (REITs); Agency problem; Cointegration; Granger Causality; Capital Asset Pricing Model (CAPM)

JEL Classifications: G12, N20, R31, R51.

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1. Introduction

Since Real Estate Investment Trusts (REITs) are characterized by liquidity and diversification, the global REITs have expanded substantially over the past decade. By the end of 2013,the number of REITs in the U.S. has reached over 150 companies, with a total market capitalization of US$389 billion according to the National Association of Real Estate Investment Trusts (NAREIT).[2] On the other hand, in Taiwan, the first case of REIT (Fubon No. 1) was launched to the public in 2005. In 2011, there were eight REITs outstanding and the accumulated market capitalization of T-REITs has reached NT$62 billion.[3] However, the new issuance of T-REITs ceased since 2007, and three of them were liquidated by 2014. The limited development of T-REITs may be caused by the restraints of the investment scale and financial leverage, the limited object properties, the reward mechanism, and consequently the resulting poor performance.

Most existing literature has focused on the relationship between REITs and direct real estate markets among different countries, for example, the FYSE/NAREIT Equity REITs Index (NAREIT) and the appraisal-based NCREIF index (NCREIF) in the U.S. Since the conventional NCREIF Index is likely to exhibit appraisal smoothing problem, the transaction-based NCREIT Index (TBI) is included in the analysis. In Taiwan, however, few studies with shorter sample period have reported on the actual performance between T-REITs and commercial real estate. Therefore, it is imperative to examine the reason to the limited development of T-REIT markets in contrast to the successful experiences in the U.S.

The aim of this study is to investigate the short-term and long-term dynamics between REITs and direct real estate markets in the U.S. and Taiwan for the explanations to the different performance between the mature and developing REIT markets. Since most REITs in Taiwan are managed and operated by the management related to their original property owners, we thus intend to discover the potential agency problem existing in the T-REIT market, and provide the feasible solution to improve the market efficiency.

2. Literature Review

2.1 Dynamics between REITs and Direct Real Estate

The linkage between REITs, direct real estate, stock, and bond markets has been intensively studied since the late 1980s. Since REIT is the financial asset derived from real estate, many previous studies have focused on the correlation between REITs and direct real estate, and the conclusions are quite inconsistent. For example, Giliberto (1990) found that the residuals from regressions of REITs and direct real estate returns on financial asset returns are significantly correlated. This implies that both REITs and direct real estate returns are affected by the common real estate factor that links their performances together (Gyourko and Keim, 1992; Mei and Lee, 1994).

Instead, Goetzmann and Ibbotson (1990) indicated that both return and volatility of REITs were far above that of direct real estate, and two series were only weakly correlated. Since then, the low correlations between REITs and direct real estate in the U.S. have been confirmed in many studies (Ross and Zisler, 1991; Gyourko and Keim, 1992; Barkham and Geltner, 1995; Geltner and Kluger, 1998). Moreover, the same argument has been verified in several countries (Hoesli,

[2]The exchange rate of NT dollars to US dollars in 2014 is around 30:1.

[3]In 2015, the number of T-REITs was reduced to five due to the liquidation of three T-REITs, Kee-Tai Star (2011), Trident (2011), and Gallop No. 1 (2015).

Lekander, and Witkiewicz, 2004; Newell, Chau, Wong, and McKinnell, 2005).

In contrast with previous studies, the relationship between REITs and direct real estate has become more closely-related over the past two decades. This argument is supported by Clayton and MacKinnon (2001) who found that REIT returns exhibit an increasing sensitivity to real estate returns over time. Due to the dramatic growth and maturation of the REIT sector, REIT have been more like real estate and less like stock (Ghosh, Miles, and Sirmans, 1996; Ziering, Winograd, and McIntosh, 1997; McIntosh and Liang, 1998). With better information about REITs available, REITs have begun to better reflect their "true" nature, stated by Clayton and MacKinnon (2001). More recently, Morawski, Rehkugler, and Füss (2008) found that correlations between REITs and direct real estate are clearly higher for longer holding periods. Since direct real estate is deemed as a long-term investment, it should also influence the performance of REITs in a similar manner.

Other studies have focused on the lead-lag relation between REITs and direct real estate markets. For instance, Giliberto (1990) indicated that the relationship between REITs and direct real estate returns is remarkably stronger when a lead in the REIT returns being considered. Moreover, Gyourko and Keim (1992) suggested that the correlation analysis between REITs and appraisal-based real estate indices seems to be deviated, since the latter is based on valuations conducted every two to four quarters. Hence, the authors demonstrate a significant relationship between the adjusted returns of NCREIF and the one-year lagged returns of NAREIT indices. Other studies supporting this argument are conducted by Myer and Webb (1993) and Barkham and Geltner (1995), which employed Granger causality test. Li, Mooradian, and Yang (2009) and Oikarinen, Hoesli, and Serrano (2011) indicated that NAREIT led both NCREIF and TBI indices after 1990. Myer and Webb (1994) and Newell et al. (2005), however, found no Granger causality between REITs and direct commercial real estate in short sample period.

In addition to the analyses of short-run volatility and lead-lag relations between REITs and direct real estate markets, some studies further examined the existence of cointegration through investigating the long-term dynamics between these two markets. Morawski et al. (2008) showed that there are cointegration relationships among NAREIT, NCREIF and the S&P 500 stock indices from 1978 to 2006. More recently, Oikarinen et al. (2011) presented that NAREIT are cointegrated with both NCREIF and TBI but not with the S&P 500 stock indices from 1977 to 2008. The results suggest that REITs and direct real estate are likely to have similar long-term diversification benefits in a stock portfolio.

Not many domestic studies have examined the existence of long-run dynamics between T-REITs and other markets. Zheng, Chang, and Bai (2008) found that T-REITs index are not cointegrated with the stock index nor be the construction index in two years. The results imply that T-REITs have diversification benefits. Lin and Lin (2011) examined the integration relationship between stock markets and real estate markets in six Asia economies, and concluded that stock and real estate markets show a variety of inter-relationships depending on economic and political policy environments. Lee, Chein and Lin (2012) also discovered that an individual T-REIT may lead orlag behind stock price indices due to its capitalization scale or business type.

Overall, studies on the dynamics between REITs and direct real estate markets in different countries are extensive, especially in the U.S. However, empirical literature on this issue in other countries is relatively limited. Most studies have discussed the relationship between the domestic REITs and stock or construction stock indices as a proxy for the stock market, while few researches analyze the relationship between domestic REITs and direct real estate markets. The purpose of this study is thus to explore the short- and long-run dynamics between domestic REITs in Taiwan (i.e., T-REITs) and direct commercial real estate markets.

2.2 Agency Problem in REITs

There are two competing property management structures for the corporate organization of REITs: internally managed and externally managed. Since one notable characteristic of REIT is the separation of ownership and management, like other securities, agency problem is likely to occur between shareholders and management. Jensen and Meckling (1976) defined the agency relationship as a contract when the principal engages the agent to perform some service on their behalf which involves delegating some decision making authority to the agent. If the incentive or reward mechanism is not well designed, then there is good reason to believe that the agent will not always act for the best interests of the principal. In this case, the agency cost is inevitable. In addition, the authors suggest that the agency conflicts will affect firm performance, and increasing management's ownership can help mitigate agency problems. Therefore, agency theory implies that if agency problems appear in externally-managed REITs, their market performance will also be influenced by the ownership structure.

Conflicts of interest refer to situations where the interests for management and shareholders are misaligned: acting on their self-interests, managers make decisions that will not be in the best interests of shareholders. Sagalyn (1996) identified twelve types of conflicts of interest, which cut across all spheres of REIT decision making, i.e., offering formation, investment management, transaction activity, and property management.[4] The author also argues that a misalignment of incentives exists for externally-managed REITs, while the potential for conflicts of interest will decline with internal management.

On the other hand, agency theory suggests that when corporate managers have a significant ownership stake, managerial incentives are more closely aligned with shareholders and agency costs are reduced (Jensen and Meckling, 1976). Cannon and Vogt (1995) found that self-administered REITs outperformed advisor REITs over the 1987 to 1992 sample period even after adjusting for the differences of market risks. Ownership structure has considerably more effect on the performance of advisor REITs, but less effect on self-administered REITs. The authors suggest that self-administered REITs have been able to reduce agency problems effectively by other approaches, for instance, more standardized financial reporting or incentive-based compensation structures. The same findings of underperformance for externally-managed REITs are demonstrated by Howe and Shilling (1990), Hsieh and Sirmans (1991).

Capozza and Seguin (2000) exhibited that externally-managed REITs consistently underperformed internally-managed REITs due to the high financial leverage over 1985 to 1992. Ambrose and Linneman (2001) examine differences between externally-advised and internally-advised REITs with respect to operating structure, growth prospects, operating revenue and expenses, cash flow and profitability, equity returns, betas and capital costs. Their results are consistent with those found by Capozza and Seguin (2000), and indicate that internally-advised REITs continue to outperform externally-advised REITs. Furthermore, the authors found that internally-advised REITs have significantly higher betas than externally-advised REITs.

In Taiwan, since most T-REIT managements are related to the original property owners (i.e., originators), it is likely to induce conflicts of interest between management and shareholders. By examining the trends of REIT price and Net Asset Value (NAV), Wang and Chang (2009) suggest that conflicts of interest may exist in some T-REITs due to the close business relationships between property management and originators. In more recent studies, Tsai, Chen and Chang (2011) found that REITs in Taiwan are not defensive since investors have not yet been familiar with the

[4] Types of conflicts of interest (COI) contain allegiance, sponsor control, outside partners, over-compensation, resource allocation, competitive affiliates, tie-in business, captivity, tax timing, expense preference behavior, and malingering (Sagalyn, 1996).

characteristics of REITs market. However, we assume that the potential agency problem may be the main reason for the limited development of T-REITs market. Since literature on the agency problem for T-REIT is relatively limited, this study attempts to empirically verify the hypothesis of agency problem.

3. Research Methodology

In order to explore the existence of long-run equilibrium relationship between REITs and direct real estate, we employ cointegration test proposed by Johansen (1988). If there exists a cointegration relationship between these two variables, we could analyze the short-term relation by estimating Vector Error Correction Model (VECM). If there is no cointegration relationship, however, we should examine the interrelation between the variables through Vector Autoregressive (VAR) model. Finally, we conduct the Granger causality test to clarify the lead-lag relation between REITs and direct real estate.

3.1 Cointegration

The Johansen cointegration approach is a maximum likelihood estimation of a fully specified error correction model, which is based on VAR model. This method is more robust for interpreting the multiple long-run equilibrium relationship between variables. Assuming a VAR model of order *p* and *n* variables can be expressed as:

$$X_t = A_1X_{t-1} + A_2X_{t-2} + \cdots + A_pX_{t-p} + \varepsilon_t \qquad (1)$$

where X_t= the n ×1 vector $(X_{1t}, X_{2t}, \cdots, X_{nt})$,

ε_t= an independently and identically distributed n-dimensional vector with zero mean and variance matrix $\sum_\varepsilon$.

After adding and subtracting A_pX_{t-p+1} to the right-hand side, we can continue in this fashion to obtain

$$\Delta X_t = \pi X_{t-1} + \sum_{i=1}^{p-1} \pi_i \Delta X_{t-i} + \varepsilon_t, \qquad (2)$$

Where $\pi = -\left(I - \sum_{i=1}^{p} A_i\right)$ and $\pi_i = -\sum_{j=i+1}^{p} A_j$.

The key feature to note in equation (2) is rank of the matrix π, which is equal to the number of independent cointegrating vectors. If $\mathrm{rank}(\pi) = 0$, the matrix is null and equation (2) is the usual VAR model in first difference. If $\mathrm{rank}(\pi) = 1$, the system exists a single cointegrating vector.

The number of distinct cointegrating vectors can be obtained by checking the significance of the characteristic roots of π. In practice, we can obtain only estimates ofπ and its characteristic roots. In order to determine whether there exists cointegration relationship, we can test the number of characteristic roots by using the following two test statistics:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{n} \ln\,(1 - \hat{\lambda}_i) \qquad (3)$$

$$\lambda_{max}(r, r+1) = -T\ln\left(1 - \hat{\lambda}_{r+1}\right) \qquad (4)$$

where T = the number of usable observations;

$\hat{\lambda}_i$= the estimated values of the characteristic roots (i.e. eigen values) obtained from the estimated Π matrix

The trace statistic tests the null hypothesis that the number of cointegrating vectors is less than or equal to *r*. On the other hand, the maximum eigenvalue statistic tests the null hypothesis that the number of cointegrating vectors is equal to *r*.

3.2 Granger Causality

In addition to cointegration test, we can gain some additional insights into the interrelation between two series by performing Granger causality tests both of REIT on direct real estate and of direct real estate on REIT. The main purpose of this methodology is to examine the existence of lead-lag relations between two variables.

Suppose that two variables in VAR model are stationary, but does not have a cointegration relationship, the Granger causality equation is defined as:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta Z_{t-i} + \sum_{j=1}^{p} \beta_j \Delta Y_{t-j} + \varepsilon_t \qquad (5)$$

where Y_t is the dependent variable; Z_t is independent variable, *p* is lag terms. The null hypothesis is $\alpha_1 = \alpha_2 = \cdots\cdots = \alpha_P = 0$. If the results reject the null hypothesis that *Z* sequence does not lead *Y* sequence, then the inclusion of *Z* sequence in the equation is useful in predicting *Y* sequence.

If there is a cointegration between two variables, the result of causality test would be biased by using equation (5) directly. In order to avoid the distortion, the deviation from the long-run equilibrium level should be taken into consideration. Hence, we employ VECM to estimate by adding error correction term $\lambda\hat{\mu}_{t-1}$ into the above VAR model, as shown in equation (6).

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta Z_{t-i} + \sum_{j=1}^{p} \beta_j \Delta Y_{t-j} + \lambda\hat{\mu}_{t-1} + \varepsilon_t \qquad (6)$$

4. Data Description

4.1 Introduction of T-REITs Market

In Taiwan, the first case of REIT (Fubon No. 1) was offered to the public in March 2005. By the end of 2010, there are eight REITs issued and the total market capitalization of T-REITs has reached NT$ 62 billion, while T-REITs ceased to issue since May 2007. As shown in Table 1, the highest percentage of market capitalization is Cathay No.1, whereas Kee Tai Star, Trident and Gallop No. 1 possess relatively small market capitalization, which were (or will be) liquidated in February 2011, April 2011 and April 2015, respectively. All the REITs in Taiwan are equity REITs, which invest directly in real estate, own and manage the properties, and therefore are responsible for the properties' asset value.

Table 1 Market Value of T-REITs Market

T-REIT	Stock Symbol	Issuing Date	Market Value (NT $billions)	Total Market Capitalization
Fubon No. 1	01001T	03/10/2005	6.94	11.16%
Cathay No. 1	01002T	10/03/2005	16.47	26.49%
Shin Kong No. 1	01003T	12/26/2005	11.46	18.43%
Fubon No. 2	01004T	04/13/2006	7.96	12.80%
Trident	01005T	06/26/2006	4.77	7.67%
Kee Tai Star	01006T	08/14/2006	2.53	4.07%
Cathay No. 2	01007T	10/13/2006	8.09	13.01%
Gallop No. 1	01008T	05/15/2007	3.95	6.35%
Total			62.17	100.00%

Note: In December 31, 2010, there were seven T-REITs listed on the Taiwan Stock Exchange and one traded in the OTC market (i.e., Kee Tai Star).

4.2 Data Source and Analysis

Table 2 summarizes the data information used in this study. For the empirical analysis of the U.S., the FYSE/NAREIT Equity REITs Index (NAREIT) and the transaction-based Index (TBI) are employed. This study applies TBI shown in the conventional National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index (Fisher, Geltner, and Pollakowski, 2007), which is established by MIT/CRE Commercial Real Estate Data Laboratory (MIT/CRE CREDL)[5]to avoid the appraisal smoothing problem. On the other hand, the T-REITs price index from the Taiwan Economic Journal (TEJ) is applied for the REITs market in Taiwan. For the direct real estate market, we employ the transaction prices of commercial real estate provided from the one large (Y) realty company in Taiwan. Since most T-REIT properties are located in Taipei City, the transaction prices of direct real estate discussed in this study are those of commercial properties in Taipei City.

Table 2 Variable Description

Country	Variable	Code	Type	Source	Time Period
U.S.	REITs	NAREIT	Quarterly	NAREIT	1991Q1-2010Q4
	Transaction-Based Index	TBI	Quarterly	MIT / CRE	1991Q1-2010Q4
Taiwan	REITs	TREIT	Monthly	TEJ	01/2006-12/2010
	Commercial Transaction Price	CTP	Monthly	Y Realty company	01/2006-12/2010

The descriptive statistics of price indices are reported in Table 3. T-REIT and CTP series are normally distributed at the 1% level.

Table 3 Descriptive Statistics of Price Indices

	U.S.		Taiwan	
Variable	NAREIT	TBI	TREIT	CTP
Mean	107.9080	128.9760	100.3698	56.6030
Std. Dev.	34.0906	40.9019	8.4617	8.7593
Minimum	58.5619	78.9581	76.8402	41.0100
Maximum	207.1900	230.2626	115.5035	75.2617
Jarque-Bera (p-value)	0.0002***	0.0049***	0.1059	0.3144
Observations	84	84	60	60

Notes: 1. The descriptive statistics of CTP are presented in 10 thousand NT dollars per ping (or per 3.24 m^2).

2. *** denotes significance at the 1% level.

[5] The NCREIF Property Index is based on appraised values of the properties in the index. Given the nature of the appraisal process, and because most properties in the index are not fully or independently reappraised every quarter, the index exhibits a degree of “smoothing” and “lagging” relative to the underlying real estate market.

Figure 1 and Figure 2 depict the trends of REITs and direct real estate series for the U.S. and Taiwan, respectively. It appears that NAREIT and TBI indices have the similar volatility over the sample period. In other words, REITs may be positively associated with direct real estate in the U.S. While both T-REIT and CTP series show a relatively steady trend with slight fluctuations. In addition, we can observe from the two figures that all indices reached the peak around mid-2007, and then plummeted in the early 2009. It suggests that the significant dynamics both in REITs and direct real estate markets could be attributed to the U.S. subprime mortgage crisis.

5. Empirical Results

5.1 Results of the U.S. Case

(1) Cointegration Test

According to the trace and maximum eigenvalue tests, the null hypothesis of no cointegrating vector (r=0) can be rejected at the 5% significance level, as reported in Table 4. The results of cointegration test indicate that NAREIT are cointegrated with TBI in the sample period. In other words, the long-run equilibrium relationship exists between the NAREIT and TBI indices. As expected, it appears that there is a long-term price co-movement between these two series. This finding is not only consistent with the long-run relationship between NAREIT and TBI as we conjectured from Figure 1, but also in line with the recent findings by Oikarinen et al. (2011).

Since the REITs and direct real estate indices are cointegrated, it implies that there exists a common real estate factor driving the REITs and direct real estate markets in the long run. In addition, the diversification properties of these two assets are likely to be similar over the long horizon. It appears that REITs and direct real estate are substitutable assets in a portfolio of long term. The cointegration results could provide investors with implications in determining the investment portfolio allocation.

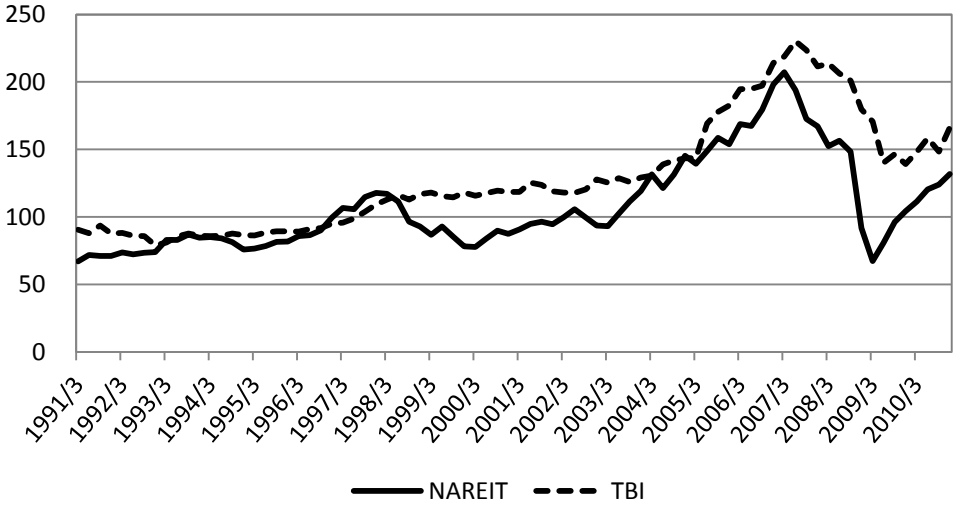

Figure 1 Trends of NAREIT and TBI

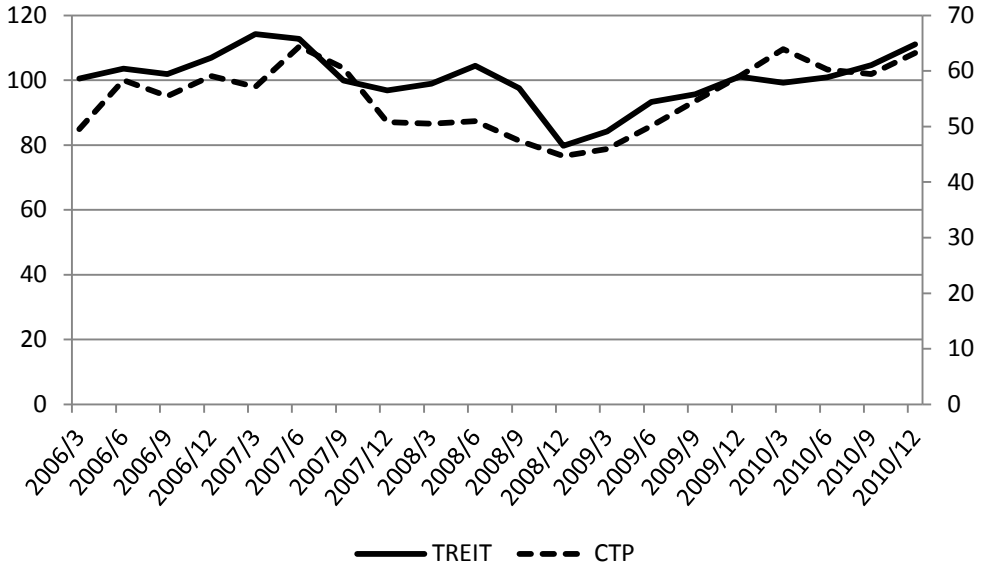

Figure 2 Trends of T-REIT and CTP

Table 4 Test Statistics for the Cointegration between NAREIT and TBI

Null hypothesis：No. of CE(s)	Trace Statistic	0.05 Critical Value	Probability	
r＝0	12.4976	12.3209	0.0467	**
r≦1	0.03850	4.1299	0.8724	

Null hypothesis：No. of CE(s)	Max-Eigenvalue Statistic	0.05 Critical Value	Probability	
r＝0	12.45911	11.22480	0.0302	**
r≦1	0.038498	4.129906	0.8724	

Note: ** denotes that the null hypothesis can be rejected at the 5% significant level.

(2) Vector Error Correction Model (VECM)

As discussed, the cointegration relationship exists between REITs and direct real estate. It is useful to detect the linkage and causality between two cointegrated variables by VECM. This model allows us to investigate the variables' long-run speed of adjustments of deviation from their equilibrium value in the previous period as well as their short-term dynamic relationship.

Table 5 shows that the current NAREIT is affected by the first lag of NAREIT. On the other hand, the current TBI are affected by the first and second lag of NAREIT and the first lag of TBI. The results suggest that the movements in TBI lag NAREIT performance by two quarters.

In terms of speed adjustment parameters, we are concerned about the sign and significance of the coefficients. In Table 5, the signs of regression coefficients of error terms, denoted as "CointEq1", are negative for the NAREIT variable and positive for the TBI variable, respectively. It suggests that NAREIT would decrease while TBI would increase in response to a positive deviation

from long-run equilibrium. The error correction coefficient of TBI is significant at the 1% level. It implies that the adjustment of TBI will be about 16% of the deviation of ΔTBI from its long-run equilibrium value, which is highly sluggish.

The results indicate that only the TBI series adjusts towards the long-term equilibrium relationship with the NAREIT series. It is possible that the REITs market is more efficient than the direct real estate market. In other words, the information about the real estate fundamentals is reflected more rapidly in REIT prices than in direct real estate transaction prices.

Table 5 VECM Analysis on NAREIT and TBI

Variables	ΔNAREIT			ΔTBI		
	Coefficient		t-statistic	Coefficient		t-statistic
CointEq1	-0.0666		-0.6865	0.1574	***	2.7529
ΔNAREIT(-1)	0.4384	***	3.3402	0.1411	**	1.8239
ΔNAREIT(-2)	-0.1517		-1.0957	0.1784	**	2.1862
ΔTBI(-1)	0.1094		0.5941	-0.2431	**	-2.2399
ΔTBI(-2)	0.0350		0.1856	0.1190		1.0693

Note: ***and ** denote significance at the levels of 1% and 5%, respectively.

(3) Granger Causality

Since there is a cointegration relationship between REITs and direct real estate markets, we conduct Granger causality test with the error correction term to examine the existence of lead-lag relations. In Table 6, the result rejects the null hypothesis that NAREIT does not Granger cause TBI at the 1% significant level. As expected and in line with the recent findings by Oikarinen et al. (2011), changes in NAREIT appear to lead movements in TBI without feedback from TBI to NAREIT after 1990. It suggests that NAREIT performance can be employed to predict future movements in the TBI series due to better informational efficiency in the REITs market.

Table 6 Granger Causality Test Results

Independent Variable	Dependent Variable (p value)		
	NAREIT	TBI	
NAREIT	—	0.0139	***
TBI	0.8293	—	

Note: *** denotes significance at the 1% level.

5.2 Results of Taiwan Case

(1) Cointegration Test

According to the trace and maximum eigen value tests in Table 7, the null hypothesis of no cointegrating vector (r=0) cannot be rejected at the 5% significance level, indicating that there is no cointegration relationship between T-REIT and CTP in the sample period. It suggests that T-REIT price could not reflect the fundamentals of commercial real estate market. From another viewpoint, there should be diversification function by including both REITs and commercial real estate in the investment portfolio.

Table 7 Test Statistics for the Cointegration between TREIT and CTP

Null hypothesis No. of CE(s)	Trace Statistic	0.05 Critical Value	Probability
r＝0	7.8880	12.3209	0.2455
r≦1	0.5316	4.1299	0.5285

Null hypothesis No. of CE(s)	Max-Eigen Value Statistic	0.05 Critical Value	Probability
r＝0	7.3564	11.2248	0.2201
r≦1	0.5316	4.1299	0.5285

(2) Vector Autoregressive Model

Since there is no cointegration relationship between T-REIT and commercial transaction price, we therefore apply VAR model to explore the short-run interrelationship between these two markets. Table 8 reports the coefficient estimates of the VAR analysis on the T-REIT and CTP series. The T-REIT series exhibit strong autocorrelation at 1% level while it does not display a significant economic relation with the past commercial transaction price. On the other hand, the CTP series is positively related to the first lag of T-REIT at the 5% level, and to the first lag of itself at the 1% level. These results support the argument regarding the better informational efficiency in T-REITs markets, i.e., T-REIT price rapidly and accurately reflect the market information.

Table 8 VAR Analysis on T-REIT and CTP

Variables	ΔTREIT			ΔCTP		
	Coefficient		t-statistic	Coefficient		t-statistic
ΔTREIT (-1)	1.3610	***	10.9190	0.0066	**	1.7602
ΔTREIT (-2)	-0.4965	***	-3.9243	-0.0032		0.8468
ΔCTP(-1)	4.4978		0.9676	0.4503	***	3.2385
ΔCTP(-2)	-1.5178		-0.3425	0.1541		1.1619
C	1.6678		0.1101	1.2514	***	2.7618

Note: ***and ** denote significance at the 1% and 5% level, respectively.

Results of variance decomposition are presented in Table 9. It is apparent that the T-REIT shocks explain almost of the forecast error variance of T-REIT at any forecast horizon. This result suggests that the performance of T-REITs may not be significantly affected by transaction price of commercial real estate. On the other hand, the CTP shocks account for 94% of the forecast error variance of CTP initially while the contribution decreases to 69% in five months.

Overall, the current T-REIT is only significantly affected by its past performance. As discussed, the explanatory power of CTP to T-REIT is insignificant during the sample period. However, the current CTP is influenced by the past realization of T-REIT and itself. The explanatory power of T-REIT to CTP is almost 40%. This result suggests that T-REIT price seems to serve as a leading indicator to forecast the commercial real estate markets. To specifically detect the lead-lag relation between these two markets, we conduct the Granger causality test in the following section.

Table 9 Variance Decomposition Results

Variance Decomposition of TREIT				Variance Decomposition of CTP			
Period	S.E.	TREIT	CTP	Period	S.E.	TREIT	CTP
1	2.93	100.00	0.00	1	0.09	5.85	94.15
5	8.28	99.17	0.83	5	0.13	30.62	69.38
10	9.14	98.94	1.06	10	0.14	38.85	61.15
15	9.17	98.92	1.08	15	0.14	39.39	60.61
20-60	9.17	98.92	1.08	60	0.14	39.41	60.59

(3) Granger Causality

In Table 10, the result of Granger causality test can not reject the null hypothesis, or T-REIT does not Granger cause CTP. It implies that commercial transaction price cannot be predicted by T-REIT performance. The possible explanation is that the REITs market in Taiwan might be too immature or inadequately capitalized to lead the commercial real estate market.

Table 10 Results of Granger Causality Test

Independent Variable	Dependent Variable (p-value)	
	TREIT	CTP
TREIT	—	0.0631
CTP	0.7554	—

Compared with the empirical results of the U.S., there are several possible explanations for the different results between these two REITs markets. The first reason is the difference in sample period. Since it has been only 8 years since the first REIT was launched in Taiwan, the data available for empirical analysis is limited. The results of cointegration test may be distorted due to the lack of observation. Second, the market capitalization of U.S. REITs is substantially greater than that of T-REITs. The long-term dynamics is likely to be insignificant as a result of the small scale in the T-REIT markets.

The third reason may be the difference in the concentration risk. In contrast to the sound diversification in the U.S. REITs, T-REITs may confront the concentration risk in terms of the type and location of REIT properties, which are mostly commercial office buildings in Taipei City. Hence, the performance and volatility of T-REITs seem to be influenced by the concentration risk. Finally and most importantly, we suggest that the agency problem may exist in T-REITs markets because most T-REIT managements are the related parties of originators. With the possible agency problem, T-REIT prices do not reflect the fundamentals of commercial real estate markets. This study further attempts to explore this hypothesis in the following section, and proposes to improve the efficiency of T-REIT markets.

5.3 Agency Problem in T-REIT Markets

(1) Types of T-REIT Management

Appendix A summarizes the originators of T-REIT properties, management and its major ownership structure, and the type of management. Since the T-REITs are not all managed and operated by independent trustee institutions, the types of T-REIT management could be categorized

as the externally-advised REITs and the related-party or affiliated management. If the T-REIT management is the affiliated enterprise of its originator, we then define it as "parent-related management". On the contrary, if there is no relationship between management and originator, then it is defined as "non-parent-related management". As shown in Appendix A, most T-REITs are parent-related management REITs, whereas only Kee Tai Star is non-parent-related management. For instance, in the case of Fubon No. 1, both the major ownership of management and the original owners are from the same group, i.e., Fubon Group. On the other hand, the management of Kee Tai Star is not owned or controlled by Kee Tai Properties or its related parties.

(2) Volatility of Stock and T-REIT Returns

We propose that REITs market is less efficient than stock market in Taiwan due to the agency problem. In other words, T-REIT prices do not reflect the fundamentals of real estate markets because some parent-related management T-REITs may cause the potential agency problem. Therefore, we attempt to test the hypothesis that T-REIT price would rise when stock enters the upward market, while the amount of increase of T-REIT is smaller than that of stock.[6] On the other hand, T-REIT price would fall as stock enters the downward market, while the degree of decrease of T-REIT is comparable to that of stock.[7]In addition, we expect that the severity of agency problem differs between parent-related and non-parent-related management T-REITs.

The empirical model applied in this study is an extension of the model employed by Glascock (1990) and Ambrose and Linneman (2001).Since beta measures the systematic variation in returns relative to the market, we explore the correlation of returns between stock and T-REITs market by estimating the beta. T-REIT betas are estimated using the Capital Asset Pricing Model (CAPM) by regressing the T-REIT returns against the market portfolio:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, \qquad (7)$$

Where R_{it} and R_{mt} represent the monthly returns for T-REIT*i*, and the stock market portfolio in excess of the risk-free rate, α_i is the regression intercept, and $\beta_i$is the estimated equity beta for T-REIT*i*, and$\varepsilon_{it}$is the standard error term.

The market portfolio applies monthly returns of Taiwan Stock Exchange Weighted Index. Monthly returns on three-month Treasury bills of Central Bank are employed for the risk-free returns. The data used in this section covers the period from January 2006 to December 2010, whereas the starting date of test for individual T-REIT depends on its issuing date. The descriptive statistics of these returns are presented in Table 11.

[6] An upward market is defined as "when the returns excluding dividends on the stock market portfolio exceeds the risk-free returns."

[7] A downward market is defined as "when the returns excluding dividends on the stock market portfolio are inferior to the risk-free returns."

Table 11. Descriptive Statistics of Returns

Variable	Mean	Std. Dev.	Minimum	Maximum	Observations
Stock Market	0.7851	7.2040	-18.8307	15.0020	60
Treasury Bill Rate	1.0940	0.7902	0.1200	2.0300	60
T-REITs Market	0.2281	3.5492	-15.4163	8.4272	60
Fubon No. 1	0.6373	4.5036	-11.9431	8.8550	60
Cathay No. 1	0.5957	3.1276	-10.1213	7.4738	60
Shin Kong No. 1	0.3594	4.2389	-19.0219	11.3951	60
Fubon No. 2	0.5577	5.0807	-15.6833	19.9786	57
Trident	0.8772	6.0688	-16.2861	16.3796	55
Kee Tai Star	0.6520	7.3382	-20.2097	20.6684	53
Cathay No. 2	0.6137	4.2511	-16.2220	9.3122	51
Gallop No. 1	0.3866	6.9804	-22.8741	28.3333	44

Table 12 on the next page presents the results of regression the T-REIT returns against the market portfolio. In terms of T-REITs market, the positive coefficient is significant at the 5% and 1% level when stock is the upward and downward trend, respectively. It indicates that the systematic risk of T-REITs would increase both in the upward and downward markets of stock, whereas the increment of risk in the latter is larger than in the former. In other words, the correlation between stock and T-REITs markets is higher in the downward market. This result is consistent with the aforementioned hypotheses, and Tsai et al. (2011) also found that REITs in Taiwan are not defensive.

For parent-related management T-REIT, the positive coefficient of Fubon No. 1, Fubon No. 2, Cathay No. 2, and Gallop No. 1 are not significant for the upward market, whereas they are significant at the 1% and 10% level for the downward market. In addition, as the results of T-REITs market, the increment of risk in the downward market is higher. It indicates that most parent-related management T-REITs tend to have higher volatility in the downward market than in the upward market.

Sagalyn (1996) identified that affiliated institutions of the REITs have business opportunities or involve interests with the REITs. In this study, for instance, both Fubon No. 1, and Fubon No. 2 are managed by Fubon Real Estate Management, potential conflict of interests may exist if the management adopts strategies of asset management or investment from its parent company which may not maximize shareholders' profits.

Furthermore, Sagalyn (1996) noted that potential conflict of interests also exists if the REIT enters into a transaction (acquisition or disposition) with an insider-related party, which involves the conflict type of "self-dealing". For instance, Shin Kong No. 1 acquired Shin Kong Xinyi Building and Shin Kong Zhongshan Building in 2007 and 2009, which original owner is Shin Kong Life Insurance. Since the conflicts of interest exist between T-REIT management and related parties, agency problem is likely to occur between management and shareholders.

Table 12 The Systematic Risks (β) of T-REITs

Panel A: *Stock in the Upward Market*

T-REIT	Coefficient	Std. Error	t-statistic	Adj. R^2
T-REITs Market	0.2427 **	0.1075	2.2588	0.1375
Fubon No. 1	0.2293	0.1509	1.5202	0.0674
Cathay No. 1	0.3685 ***	0.0920	4.0040	0.3338
Shin Kong No. 1	0.2946 **	0.1306	2.2555	0.1372
Fubon No. 2	0.3342	0.1973	1.6936	0.0873
Trident	0.6075 **	0.2285	2.6587	0.1960
Kee Tai Star	0.7569 ***	0.2341	3.2333	0.2650
Cathay No. 2	0.2020	0.1515	1.3336	0.0618
Gallop No. 1	0.1081	0.2830	0.3820	0.0063

Note: ***and ** denote significance at the 1% and 5% level, respectively.

Panel B*: Stock in the Downward Market*

T-REIT	Coefficient	Std. Error	t-statistic	Adj. R^2
T-REITs Market	0.4889 ***	0.1074	4.5523	0.4635
Fubon No. 1	0.6450 ***	0.1374	4.6931	0.4786
Cathay No. 1	0.4517 ***	0.1072	4.2119	0.4250
Shin Kong No. 1	0.5278 ***	0.1399	3.7731	0.3723
Fubon No. 2	0.4529 ***	0.1493	3.0338	0.2858
Trident	0.5407 ***	0.1897	2.8501	0.2697
Kee Tai Star	1.0789 ***	0.2528	4.2672	0.4766
Cathay No. 2	0.4499 ***	0.1795	2.5058	0.2389
Gallop No. 1	0.5486 *	0.2993	1.8330	0.1650

Note: ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

For non-parent-related management T-REIT, the beta coefficient of Kee Tai Star is significant at the 1% level for both the upward and downward markets. The systematic risk is high but less than 1 in the upward market, while it is greater than 1 in the downward market. The results indicate that Kee Tai Star may be similar to an aggressive stock. In addition, the obvious volatility of beta refers to the high correlation and sensitivity of Kee Tai Star REIT returns to the returns on the market portfolio. We thus suggest that non-parent-related management T-REITs may better reflect the market information or fundamentals of the real estate markets.

By analyzing the type of T-REIT management and applying the Capital Asset Pricing Model, we conclude that the limited development of T-REITs market may be attributed to the agency problem of T-REIT management. The existence of agency problem in T-REITs market will not only influence the performance of T-REITs, but also the willingness for investment. According to the current "Clauses of the Real Estate Securitization Act" for T-REITs, the regulations are insufficient to supervise the management. Therefore, it is necessary to improve the agency problem by amending regulations governing the T-REIT management.

6. Conclusions and Implications

This study examines the short-term and long-term dynamic relationships between REITs and direct real estate markets in the U.S. from 1991 to 2010, and in Taiwan from 2006 to 2010, respectively. Results show that the cointegration relationship exists between the NAREIT and TBI indices in the U.S. It implies that there exists a common real estate factor driving the REIT and direct real estate returns in the long term. Moreover, the diversification properties of these two assets are likely to be similar over the long horizon. According to the Granger causality test, NAREIT leads TBI due to better informational efficiency of REITs market. These findings are consistent with those of previous studies.

On the other hand, there is no cointegration and lead-lag relation between T-REIT and CTP in Taiwan. According to VAR analysis, the current CTP is influenced by the past realization of T-REIT and itself. There are several possible explanations for the different results between the U.S. and Taiwan, including the difference in sample period, market capitalization, types of risk, and most importantly, the agency problem existing in T- REITs market.

To sum up, since the development of REITs market in Taiwan is not mature enough to reflect market information or fundamentals, these findings indicate that there is weak relationship between T-REITs and direct commercial real estate markets. Moreover, the existence of agency problem in the T-REIT markets will influence the performance of T-REITs and the willingness for investment. In order to enhance the equality, efficiency and performance of T-REIT market, it is necessary to improve this problem by amending the regulations governing the T-REIT management. It is expected that the conclusion of this paper will provide marginal contribution in policy implications to T-REIT investors, management and policy makers, as well as for the governance in other REIT-developing markets.

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Appendix A Summary of T-REIT Management

T-REIT	Original Owners of Property (Originator)	Management	Major Ownership Structure of Management		Type of Management
Fubon No. 1	Fubon Life Insurance	Fubon Real Estate Management	1. Taipei Fubon Commercial Bank 2. Fubon Land Development	30% 53.14 %	Parent-Related Management
Cathay No. 1	Cathay Life Insurance	Cathay Real Estate Management	Cathay Real Estate Development	100 %	Parent-Related Management
Shin Kong No. 1	Shin Kong Life Insurance	New Light International	1. Shin Kong Life Real Estate Service 2. Shin Kong Life Insurance 3. Taiwan Shin Kong Real Assets Development 4. Taiwan Shin Kong Security	30% 31% 20% 19%	Parent-Related Management
Fubon No. 2	Fubon Life Insurance	Fubon Real Estate Management	1. Taipei Fubon Commercial Bank 2. Fubon Land Development	30% 53.14 %	Parent-Related Management
Trident	1. Continental Engineering 2. Wellcome Enterprise 3. Eslite Corporation	Eslite Corporation	1. Eslite Interior Design 2. Cross-Century Investment 3. President of Eslite	20.87 % 13.08 % 11.23 %	Parent-Related Management
Kee Tai Star	KeeTai Properties	AURORA Development	1. AURORA Corporation 2. AURORA International	46.67 % 53.33 %	Non-Parent -Related Management
Cathay No. 2	Cathay Life Insurance	Cathay Real Estate Management	Cathay Real Estate Development	100 %	Parent-Related Management
Gallop No. 1	1. Gold Sun Development & Construction 2. Taiwan Secom 3. Well Pool Corporation 4. CTCI Corporation 5. Chai Shin Assets Management 6. Chai Shin Cement Development	Tai Chai International	1. IBT Management 2. Chai Shin International	49% 51%	Parent-Related Management

Note: The information is summarized from the prospectuses of eight T-REITs.