부동산연구 : 제19집 제2호 2009. 12(313~338)

The Relationship Between REITs and Financial Markets: Evidence from Korean CR-REITs*

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〈 목 차 〉

< Abstract >

Keywords : REIT, stock market, bond market, co-integration, error correction model

This paper examines the relationship between Korean REITs and stock/bond markets. CR-REITs differ from ordinary trust structurein terms of limited operating period and its portfolio of assets. The CR-REITs should invest only in the specified real estates. The life span of CR-REITs is limited.

This study tests whether CR-REITs - KOCREF I, REALTY, MERITZ, KOCREF III, and MACQUARIE - have similar characteristics to common stocks/bond or not, using the co-integration analysis and error correction model.

The empirical tests show that, for the bivariate cointegration, there is no cointegrating vector between REITs and stock/bond marketsexcept for MERITZ-construction sector index. However, for the multivariate cointegration, at least more than one cointegrating vectors for each CR-REITs are found.

The error correction models show that, for MERITZ, and KOCREF III, there is a long-term equilibrium relationship. For REALTY and MACQUARIE, however, there is not a long-term relationship. And in two of CR-REITs, a short-term lead/lag relationship with bond markets is found.

The relationship between REITs and financial markets may depend on characteristics of REITs. In addition, the evidence found in this paper suggests that REITs provide a useful way to diversify portfolio.

* 이 논문은 2008년 정부(교육과학기술부)의 재원으로 학술진흥재단의 재원을 받아 수행한 연구임(KRF-2008-B00142).
* 본 논문을 위해 유익한 조언을 해주신 익명의 심사위원님들에게 감사드립니다.

개 요

본 연구는 CR리츠와 주식시장/채권시장간의 상관관계를 공적분 분석 방법을 이용하여 실증분석하였다.

CR리츠는 일반리츠와 비교할 때 운용기간이 5년으로 제한되어 있고 기업구조조정과 관련된 부동산에만 투자하도록 하는 등 운용면에서 규제를 받고 있다. 하지만 세제혜택면에서 일반리츠에 비해 유리한 편이다. 또한 투자자들에게 유동성 또는 환금성을 제공하기 위해 주식시장에서 상장해야 한다.

연구대상은 KOCREF I, REALTY, MERITZ, KOCREF III, MACQUARIE CR-리츠 5개종목이다. 주식시장 변수는 종합주가지수이며 건설업지수이며 채권시장 변수는 3년 만기 회사채 수익률을 이용하였다.

이변량 공적분 분석결과 대부분의 경우 CR리츠와 주식시장 그리고 채권시장간에 공적분 관계가 없는 것으로 나타났다. 다변량 공적분 분석결과에서는 KOCREF 1경우를 제외하고는 공적분결과가 발견되었다.

오차수정항모형 분석과 분산분해분석 실증결과는 CR리츠 자체가 가장 설명력이 높은 것으로 나타났다.

본 연구결과는 CR 리츠는 주식시장과 채권시장과 상관관계가 낮아 분산투자 수단으로 유용하다고 할 수 있다.

Ⅰ. Introduction

REITs(Real Estate Investment Trusts) can be defined as a kind of mutual fund which raises funds from investors to invest in real estate and distribute profits generated from managed properties to investors as dividends.

In April 2001, Korean REITs Act was legislated to provide investment opportunities in real estate properties and to vitalize the real estate market depressed since Asian financial crisis in 1997. There are two types of REIT - Corporate Restructuring REITs, or CR-REITs, and the ordinary trust structure, called K-REITs. 〔Whiting (2007)〕

There is, however, no restriction on investment for K-REITs. CR-REITs were unique because they should invest at least 70% of their assets in companies undergoing restructuring due to insolvency or companies that intended to use the proceeds to pay off debt. CR-REITs was introduced to help cash trapped firms sell their property as a way of corporate restructuring.

K-REITs were given 50% exemption from acquisitions tax and registration tax, but received no corporate tax benefits. But CR-REITs received a waiver on acquisition taxes and were able to use dividends as deduction from corporate tax if it distributes at least 90% of its taxable income. Because CR-REITs have more favorable tax benefits than K-REITs, only CR-REITs have ever been introduced.[1)]

K-REITs have no limited operating period whereas CR-REITs have limited operating period. That is, CR-REITs are allowed to exist for five years. Thus, most of CR-REITs invest in prime office buildings for the short term period of 5-7 years.

By revised REIT Act in 2005, both CR-REITs and K-REITs could borrow to fund new investment, which was a serious impediment to growth.

The previous studies examine whether or not the REITs have similar characteristics to common stock or whether there are the significant relations between the REIT and the

1) The REIT Act, in April 2005, was revised to extend the tax benefits of CR-REITs to K-REITs.[Ooi, Newell, and Sing (2006)] Authorities also allowed two types of REITs to be formed: a self-managed REIT and a paper company REIT, for which the management functions are delegated to a third party asset manager.

stock market, or between the REIT and economic variables.〔Gyourko and Keim (1992), Li, Mooradian, and Yang (2004)〕. Because REITs are traded on the stock exchange, REITs and stock market can be believed to have common factors. Paladino and Mayo (1998) find a high correlation between REITs and the general stock market. Previous research such as Glascock, Lu, and So (2000), Li, Mooradian, and Yang (2004) show that there is a (positive) relation between stock market returns and REITs returns.

And another issue related to REITs is whether there is diversification benefit by adding REITs stock in a portfolio. 〔Gyourko and Nelling (1996), Chandrashekaran (1999), Goodwin (2007), Lee and Hwa(2008)〕 Whitting (2007) reports that analysts point to evidence that in the established US market, REITs have diverged over time from average stock behavior, with investors increasingly hedging characteristics.

The relationship between REITs and stock/bond markets is examined. This paper is expected to contribute to empirical evidence on the behavior of the REIT returns in two aspects. First, this paper analyzes REITs in Korean market. Thus, this paper is expected to contribute on understanding the relation between REITs and stock markets in a specific country basis. Second, most previous papers examine are ordinary structured REITs. But this paper investigates a unique REIT structure - so called CR-REITs. Whether CR-REITs have similar characteristics to common stocks is examined. CR-REITs differ from ordinary trust structure in terms of limited operating period and its portfolio of assets.

This study finds that in the bivariate co-integration analysis, it is found no co-integration vector except for MERITZ-construction sector index. However, multivariate co-integration tests show that there is more than one co-integrating vector, suggesting that there is a common trend between CR-REITs and stock/bond markets. The error correction model shows that some CR-REITs have a long-term equilibrium with stock/bond variables, while some have not. And there is weak evidence for short-term lead/lag relationship between CR-REITs and stock/bond variables. Thus, CR-REITs can be a

useful tool for diversifying portfolios.

The remainder of this paper is organized as follows: Section II reviews previous studies. Section III explains the data and methodology. Section IV presents the empirical results. Section V offers the conclusion.

II. Literature Review

The past research studies examine the return and risk characteristics of REITs.〔Liow and Sim (2006), Kryzanowski and Tcherednitchenko (2007)〕 And whether or not REIT are systematically exposed to general stock market risk and interest rate risk is examined.

Mueller and Pauley (1995) find that REIT price movements have a lower correlation with changes in interest rates than with movements in the stock market. Chen, Hsieh, Vines and Chiou (1998) find that the economic variables have little influence on REIT return volatility. Chandrashekaran (1999) find that, using a quarterly data, the conditioning on lagged REIT returns offers investors an improved method of predict volatilities and correlations of REITs with other asset classes. Allen, M., Madura, J., and Springer (2000) report that a negative relation between equity REIT returns and changes in interest rates in their framework of two factor unconditional CAPM.

Ibbotson (2001) reports that the correlation of REIT stock returns with the returns of other common stocks declined significantly over a 30-year time frame the 1970s to the period from 1993 to 2000. The correlation of REIT returns with those of small stocks declined from 0.74 to 0.26 and the large stock correlation decreased from 0.64 to 0.25. The correlation of REIT returns with those of long-term bonds declined from 0.27 to 0.16 during the same period.

Steven A. Wechsler, President and CEO of NAREIT said "As the publicly traded real estate industry evolved in the 1990s, real estate stocks demonstrated characteristics and provided returns that differed from those of other common stocks, as well as fixed-income securities". According to Wechsler, Ibbotson found that the behavior of REITs makes a strong case for their inclusion in portfolios as a hedge

against the volatility and underperformance of other securities. Over time, real estate stocks have provided meaningful diversification benefits by boosting returns or reducing risks. "The Ibbotson analysis shows that, given their low correlation, real estate stocks are an important and effective source of diversification, and are well worth investigating as an addition to many types of investment portfolios," said Wechsler.〔Ibbotson (2001)〕

Glascock, Lu, and So (2002) examine the relations between REITs and the bond and stock returns using monthly data. They investigate the causality and long-run economic linkages among these securities using the co-integration analysis and vector autoregressive models. Their findings show that before 1992 REITs move more like bonds, and after 1992 REITs behave more like small capitalization stocks.

He, Webb, and Myer (2003) examine seven different interest rate proxies to identify effective interest rate proxies for equity and mortgage REITs, using monthly returns. They find that mortgage REITs are sensitive to all proxies, while equity REITs are significantly affected by only changes n yields on long-term U.S government bonds and high yield corporate bonds.

The study reported by Li, Mooradian, and Yang (2004) shows that REIT returns exhibit a strong contemporaneous relation to the general stock market returns, but they do not demonstrate lagged dependence. In addition, REITs also provide significant forward-looking information regarding the economy; REIT performance lead economic performance by at least two quarters.

Ling and Naranjo (2006) examine the effects of weekly and monthly capital flows into the dedicated REIT mutual fund sector on aggregate REIT returns using vector autoregressive (VAR) model. And they also study the effects of industry-level REIT returns on subsequent REIT mutual fund flows. They find no evidence that REIT mutual fund flows do not have significant influence on REIT returns.

Bredin and O'Reilly (2006) find a strong response in both the first and second moment of daily REIT returns to unexpected interest rate movements.

Hoesli and Moreno (2007) focus on how the factors driving stocks, bonds,

and direct real estate influence securitized real estate returns. They use pure factors uncorrelated with each other and a variance decomposition approach. Securitized real estate returns appear to be positively related to pure stock factors. However, real estate factors are found to be negatively associated with the pure bond factors.

Ⅲ. Data and Methodology

1. Data

This paper examines the daily returns of five CR-REITs - KOCREF I, REALTY, MERITZ, KOCREF III and Macquarie. Table 1 shows the date of listing, capitalization, and the asset management company (AMC) of each

Table 1: Characteristics of REITs (100M KRW)

	KOCREF I	REALTY	MERTIZ	KOCREF III	MACQUARIE
Sample period	2002.8.20 -2007/5/3	2003/5/12 -2008/4/17	2003/8/29 -2008/8/1	2003/8/29 -2008/8/7	2004/1/7-200 9/1/30
Number of Observation	1,168	1,223	1,219	1,223	1,249
Equity	1,330	660	500	680	763
Other capital	1,020	773	828	882	948
Total Capital	2,350	1,433	1,328	1,562	1,711
Put back option	No	Yes	Yes	No	No
AMC	KORAMCO	Real Advisors Korea	KOREITs	KORAMCO	Macquarie

REITs.

KOCREF I was listed on May 30, 2002 and delisted May 3, 2007. KOCREF I bought Hanwha Group headquarter in 2002 and resold in at a profit in 2007.

REALTY, which was listed on May 13, 2003, owns Rosedale office block in Seoul, Say Department Store in Daejon City, and Turbotek Building in Seongnam City. REALTY is managed by Real Advisors Korea. MERITZ, which was listed on Aug. 20, 2003, holds Hanshin Sports Center, Jangyoo Waterpia. KOCREF III owns Hanwha Securities building and I-Hillville Town building. KOCREF III bought the Hanwha Securities building on sales-and leaseback basis from the Hanwha Group in 2003. In 2008, KOCREF III had recorded high gains by reselling Hanwha Securities building to the Hanwha Group. The data set also includes the following daily indices:

KOSPI = the daily Korea Composite Stock Price index which is an index of all common stocks traded on Stock Market Division of the Korea exchange.

CONS = the daily Construction Stock Index which consists of 37 stocks related to construction industry. The index includes GS, Hyundai, Daelim, Daewoo, Doosan, Dongbu and so on.

CORP = the daily rate on 3-year Corporate Bond.

To examine daily returns of CR-REITs, closing prices are transformed via a natural log as follows: for example, KOCREF I, LKOCREF I = log(KOCREF I).

Since the performance of REITs may depend on the real estate markets, the construction industry index is added as proxy for real estate market. Lee and Hwa (2008) examine the effects of the property shares on return enhancement and risk reduction in a mixed asset portfolio.[2] The 3-year corporate bonds are selected as proxy for the bond market. The 3-year corporate bond is most actively traded in Korea bond market.

The data are obtained from the Korea Stock Exchange and Korea Stock Research Institute.

Figure 1.a, Figure 1.b, and Figure

2) Lee and Hwa (2008) find that there are no effects of return enhancement and risk reduction by including the Malaysian property shares in the portfolio.

1.c exhibit the prices of KOCREF I and other variables over the sample period. Figure 2.a, Figure 2.b, and Figure 2.c present the prices of REALTY and other variables. Figure 3.a, Figure 3.b, and Figure 3.c display the prices of MERITZ and other variables. Figure 4.a, Figure 4.b, and Figure 4.c show the prices of KOCREF III and other variables. Figure 5.a, Figure 5.b, and Figure 5.c exhibit the prices of MACQUARIE and other variables.

The graph shows that CR-REITs and stock market variables seem to move the same direction over sample period, while CR-REITs and bond market variables look like going the different side over time and in some cases, it seems no particular relationship.

It is noted that stock prices of

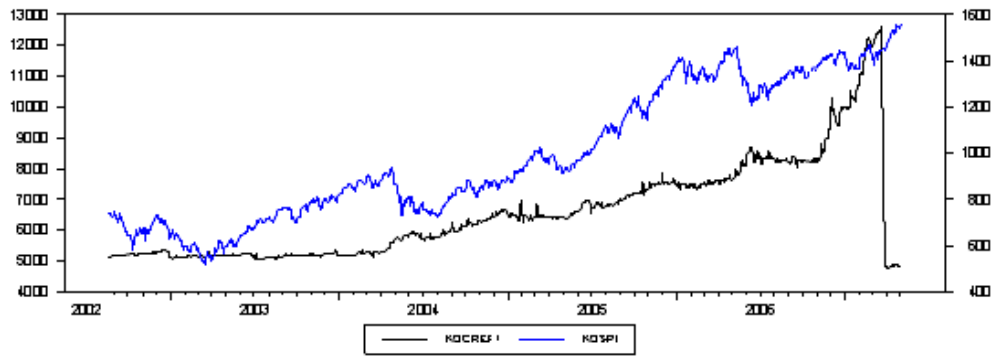

Figure 1.a: KOCREF I and KOSPI

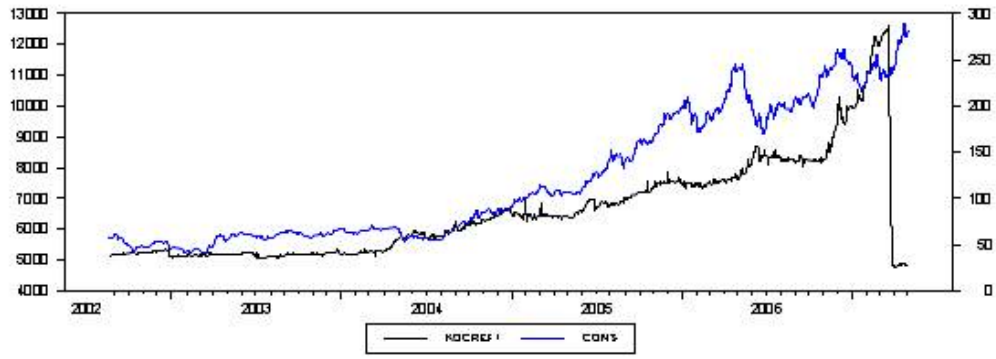

Figure 1.b: KOCREF I and construction stock index

CR-REITs show steep fall as maturity of CR-REITs come near. This sudden fall in stock prices is thought to be due to the liquidation effect. Such stock price behavior is needed for further analysis.[3)]

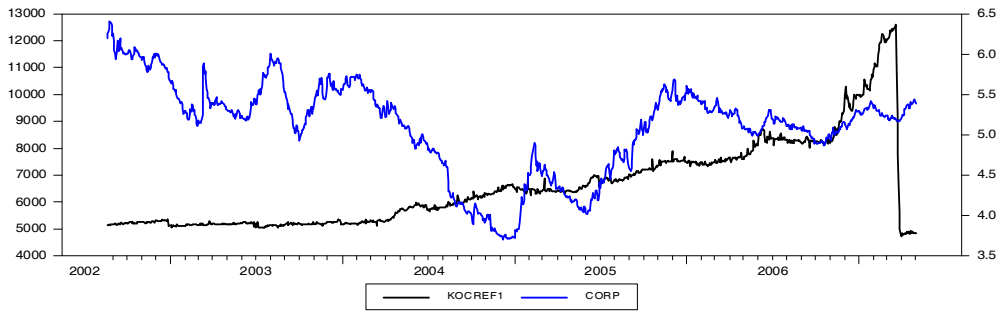

Figure 1.c: KOCREF I and 3 year corporate bond rate

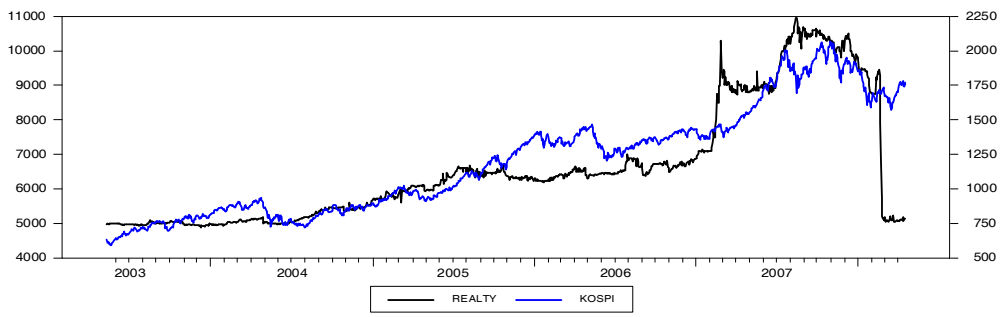

Figure 2.a: REALTY and KOSPI

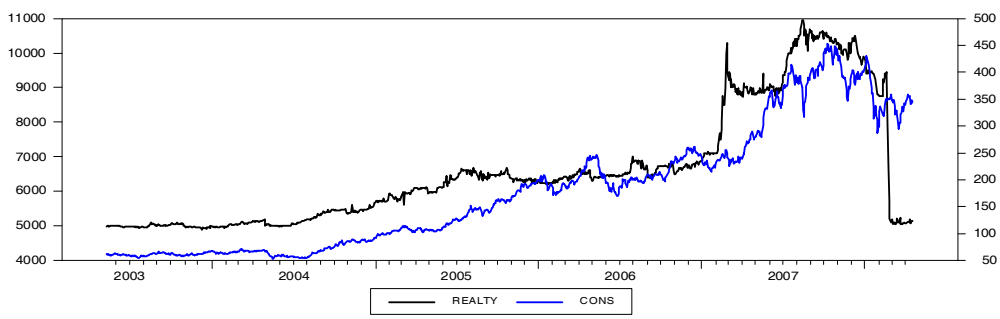

Figure 2.b: REALTY and construction stock index

3) One of referees points out that the steep fall in stock prices might affect the results of this paper. But if the stock price near maturity is deleted, the author is afraid that the results might be distorted.

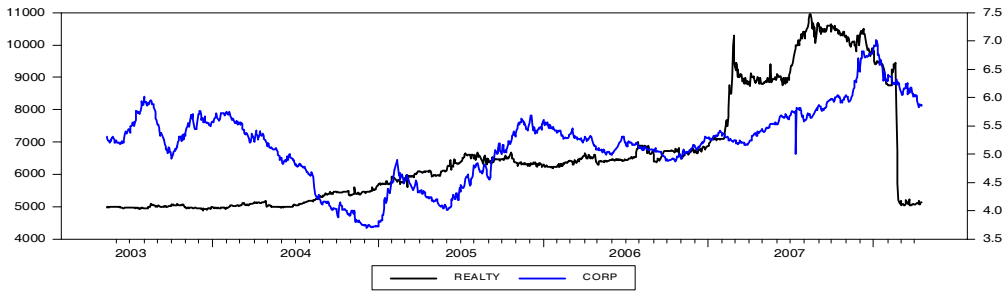

Figure 2.c: REALTY and 3 year corporate bond rate

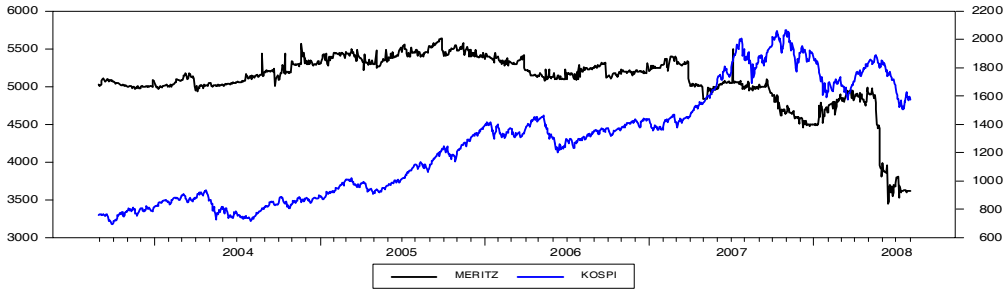

Figure 3.a: MERITZ and KOSPI

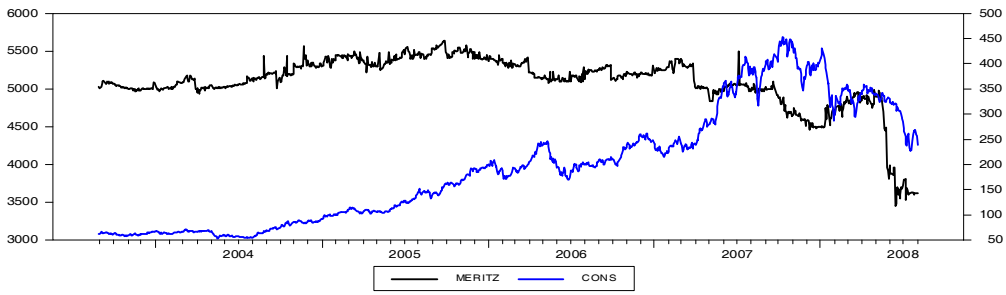

Figure 3.b: MERITZ and construction stock index

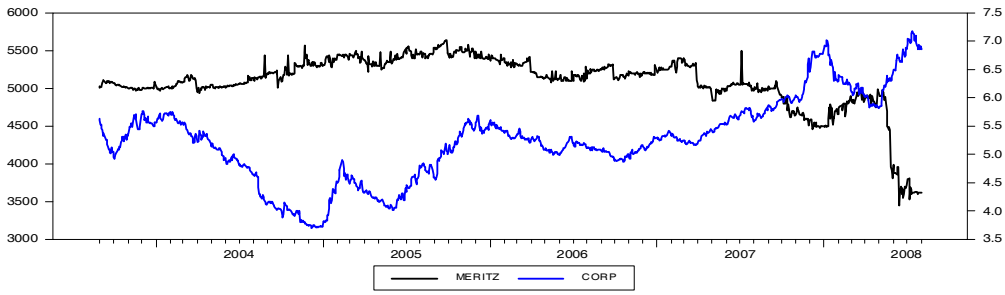

Figure 3.c: MERITZ and 3 year corporate bond rate

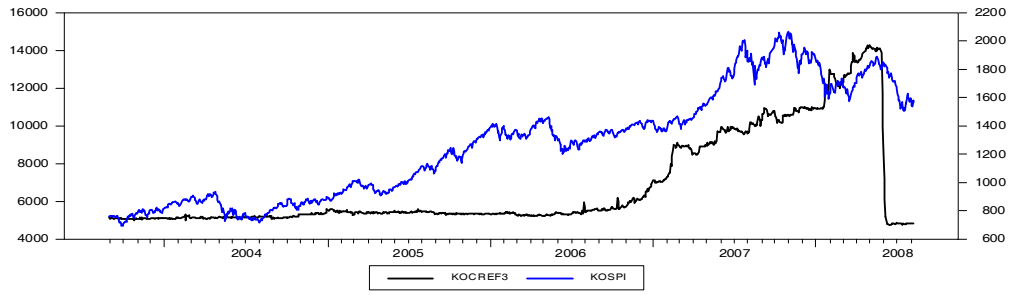

Figure 4.a: KOCREF III and KOSPI

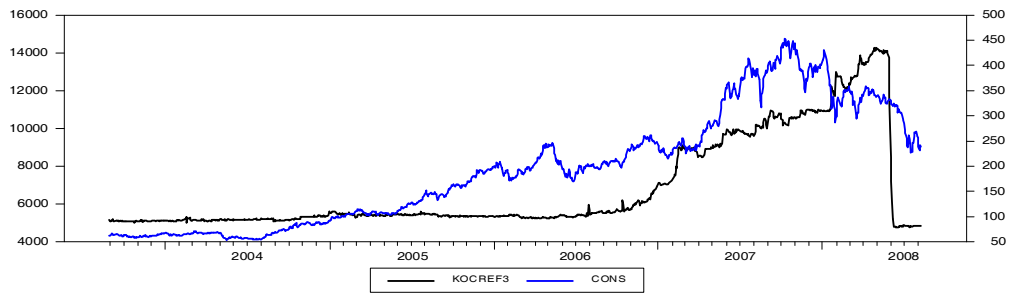

Figure 4.b: KOCREF III and construction stock index

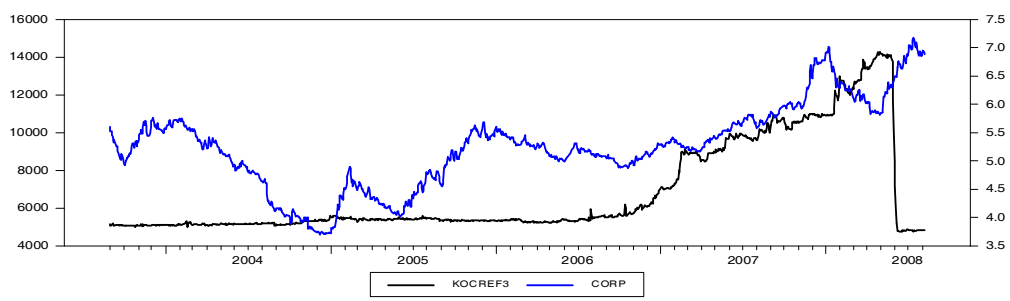

Figure 4.c: KOCREF III and 3 year corporate bond rate

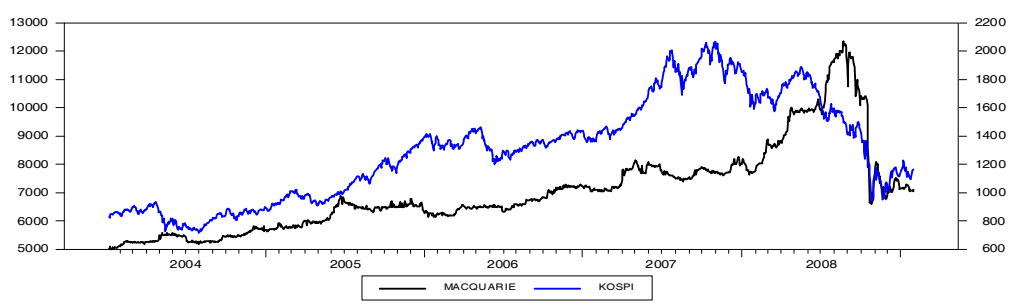

Figure 5.a: MACQUARIE and KOSPI

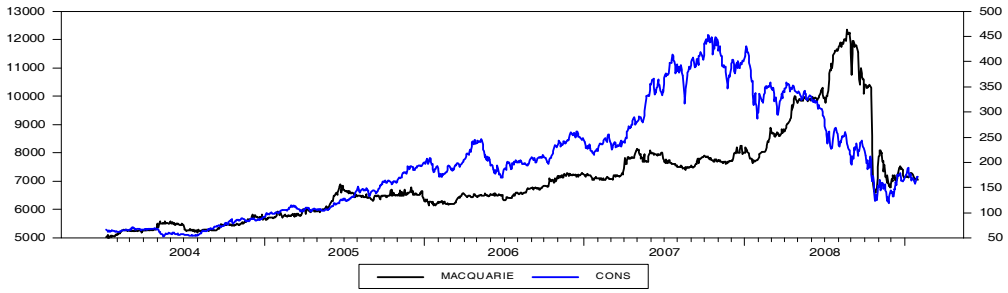

Figure 5.b: MACQUARIE and construction stock index

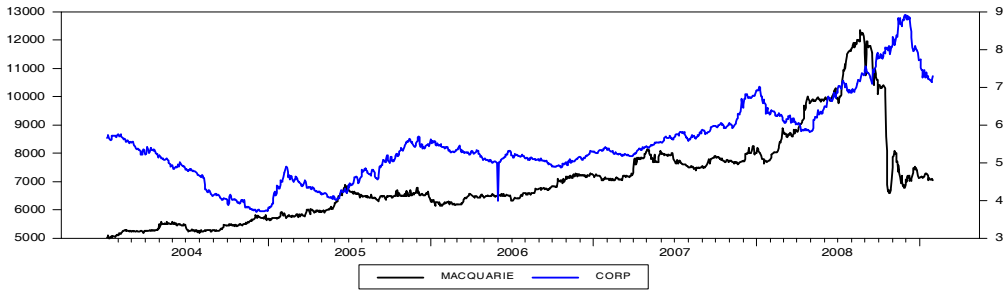

Figure 5.c: MACQUARIE and 3 year corporate bond rate

2. Methodology

To examine the relation between REITs and stock markets, this paper performs unit roots test, co-integration analysis, and error correction model (ECM) or VAR methodology.[4)]

First, this paper tests whether REITs returns are stationary. It is important to check whether the time series data is stationary before moving to VAR and co-integration Analysis. If the variables are non-stationary, there might be a spurious regression between two variables. Even though two variables seem to move together, each series may be non-stationary. That is, if there is a spurious regression, even though the t-statistics appear to be significant, the results are of no economic significance. Granger and NewBold (1974) find that the regression equation is meaningless if the residual series of the variables is non-stationary.

4) In this paper, the statistics results are obtained by using RATS Version 7.0, CATS 2.0, Estima

To test whether time series are stationary or not, two methodologies - Augmented Dickey Fuller (ADF) procedure and Phillips-Perron (PP) test - are mainly used. To determine the appropriate lag length the Akaike Information Criteria (AIC) and the Schwarz Criterion (SIC) procedures are used. This paper reports the lag length obtained by AIC procedure. The augmented Dickey-Fuller test equation can be generally expressed as:

$$\Delta X_t = \alpha_o + \gamma X_{t-1} + \sum_{i=2}^{p} \beta_i \Delta X_{t-i+1} + \epsilon_t \quad (1)$$

where X is a time series sequence, ϵ_t is a white noise process.

It is possible for two or more non-stationary data generating process to share long-term interdependent relationship. Thus, the linear combination of two or more non-stationary series would be stationary. Such series are said to be co-integrated. If the two series are co-integrated, the deviation from long-term equilibrium is corrected over the period through short-term adjustments.

For co-integration analysis, there are two general methodology - Engle and Granger (1987) or Johansen (1988) and Johansen and Juselius (1988, 1990). It is pointed out that the Granger-Engle methodology has drawbacks such as arbitrary normali- zation of the variables and the difficulty in estimating the appropriate number of co-integrating vectors with a system.〔Brooks (2000)〕 Johansen methodology uses ECM(error correction model) derived from VAR model. The test for the number of co-integration vectors are performed to determine the rank of the coefficient matrix by estimating the number of eigenvalues that are significantly different from zero.

In Johansen methodology, two test statistics - trace and maximum eigenvalue - are used as follows:

$$\lambda_{max}(r, r+1) = -T \times \ln(1 - \lambda_{r+1}) \quad (2)$$

$$\lambda_{trace}(r) = -T \times \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \quad (3)$$

where λ_i is eigenvalues derived from the π matrix, r is the rank of the matrix.

λ_{max} conductsseparate tests on each eigenvalue in which null hypothesis is

that number of co-integrating vectors is r against an alternative r+1. λ_{trace} is a joint test when the null hypothesis is that the number of co-integrating vectors is less than or equal to r against an alternative that there are more than r.

If two non-stationary variables are co-integrated, the error correction model is appropriate while VAR could be misspecified. However, if variables are not found to be co-integrated, tests for causality should be implemented using the following VAR model.

In the equation, the time path of X_t is affected by current and past realization of X_{t-p} the sequence.

$$X_t = \mu + + \Gamma X_{t-1} \Gamma_t t X_{t-1} + \ldots. + \Gamma_p X_{t-p} + \varepsilon_t \quad (4)$$

where X_t is a nx 1 matrix of endogenous variables, μ is a n x 1 vector of constants, Γ is a matrix with elements Γ_{jk} such that one or more of the $\Gamma_{jk} \neq 0$ Γ_i, I = 1…p (where p is the number of lags) is a n x n matrix consisting of beta coefficients, $X_{t-p}$is a n x 1 matrix of the lagged endogenous variables and ε_t is a matrix of white noise error terms. The lags of length are chosen using LR tests.

Finally, to understand the properties of the forecast errors, the variance decompositions from the system are performed. The variance decompositions provide the error variance of explained by variations in the variables. Enders (1995) describes that the forecast error variance decomposition indicates the proportion of the movements in a sequence due to its own shocks versus shocks to the other variables.

IV. Empirical Results

1. Unit Root Test

The unit root tests for five REITs - KOCREF I, REALTY I, MERITZ, KOCREF III, and MACQUARIE - are performed and reported respectively.

Tablet 2 report the results of unit root test for the variables related to the CR-REITs. All variables are examined for their stationary on the level and first difference, respectively.

The column 2 of Table 2 shows that,

Table 2: Unit Root Tests

Table 2-I: Unit Root Test for KOCREF I				
	ADF(lag=3)		PP(lag=3)	
	Level	First Difference	Level	First Difference
KOSPI	-0.0530	-13.4622***	-0.2006	-27.5507***
KOCREF I	-0.2590	-18.3358***	-0.2198	-40.5494***
CONS	-0.0030	-12.5914***	0.7871	-24.1553***
CORP	-1.9404	-14.9818***	-1.8258	-28.2523***
Table 2-II: Unit Root Test for REALTY I				
	ADF(lag=3)		PP(lag=3)	
	Level	First Difference	Level	First Difference
KOSPI	-0.8628	-15.9578***	-0.7724	-34.1341***
REALTY I	-1.3742	-14.1553***	-1.0018	-27.2560***
CONS	-0.3498	-16.2669***	-0.0025	-31.0614***
CORP	-1.2775	-15.3415***	-1.1058	-34.7085***
Table 2-III: Unit Root Test for MERITZ				
	ADF(lag=4)		PP(lag=4)	
	Level	First Difference	Level	First Difference
KOSPI	-0.9272	-14.1664***	-0.8466	-33.7853***
MERITZ	0.4344	-16.8009***	0.6230	-44.9308***
CONS	-1.2895	-13.4993***	-0.9392	-29.7575***
CORP	-0.7500	-13.8422***	-0.2373	-30.5134***
Table 2-IV: Unit Root Test for KOCREF III				
	ADF(lag=4)		PP(lag=4)	
	Level	First Difference	Level	First Difference
KOSPI	-0.9475	-14.1633***	-0.8653	-33.8592***
KOCREF III	-1.9698	-4.9912***	-1.3493	-20.5414***
CONS	-1.2925	-13.6607***	-0.9455	-29.9911***
CORP	-0.8455	-13.9297***	-0.3157	-30.7037***
Table 2-V: Unit Root Test for MACQUARIE				
	ADF(lag=6)		PP(lag=6)	
	Level	First Difference	Level	First Difference
KOSPI	-1.6028	-12.2222***	-1.0425	-33.4030***
REALTY I	-1.6034	-11.1061***	-1.8147	-31.7656***
CONS	-1.7052	-12.0526***	-1.3174	-31.5372***
CORP	-0.5212	-9.9125***	-0.8004	-36.8212***

Note: Critical value: 1%=-3.440, 5%=-2.864, ***, **, *: indicates significance at 1%, 5%, 10% level. KOSPI = the daily Korea Composite Stock Price index, CONS = the daily construction stock index, CORP = the daily rate on 3-year corporate bond

for all variables on the level, the null hypothesis of non-stationarity cannot be rejected. In column 3, however, the null hypotheses can be rejected since the ADF statistics for the first differen ce of all variables are larger than the critical value. At the column 3 of Table 2, the Phillips-Perron test gives the same results.

The results show that all variables are not stationary in level, but stationary after first difference.[5)]

2. Co-integration Analysis

First, for Johansen co-integration analysis, the appropriate lag lengths are selected using the Akaike Information Criteria (AIC). Second, co-integration tests are performed for five REITs - KOCREF I, REALTY, MERITZ, KOCREF III, and MACQAURIE.

The null hypothesis for the trace test is that the number of co-integrating vectors is less than or equal to r, with the alternative of larger than r. The null hypothesis for the maximum eigenvalue test is the number of co-integrating vectors is r, with the alternative of r+1.

Table 3 showsthe results of co-integration tests for KOCREF I, REALTY, KOCREF III, MACQAURIE and the stock/bond markets. Since, in most cases, the test statistics of both λ trace and λmax are less than the critical value in case of r = 0, the null hypothesis cannot be rejected. In case of MERITZ-KOSPI, it is found no co-integrating vector. However, in case of MERITZ-CONS, the evidence shows that there is more than one cointegrating vector.

This test suggests that there is no long-term relationship between CR-REITs and the stock markets. This evidence is consistent with Cheong, Zurbruegg, and Wilson (2008), in which they report that there is no co-integration vector among the property market index, long-term interest rate, and stock market index.

The Column 7 and 8 of Table 3 shows the results of bivariateco-integration tests for KOCREF I, REALTY, MERITZ, KOCREF III, and MACQUARIE and the

5) Even though the results of unit root test for lag=2,5 are not reported in the paper, the unit root tests for lag = 2,5 show all variables in the sample are non-stationary at the level but stationary at the first difference.

bond markets. Since, except for MACQUARIE, the test statistics of both λtrace and λmax are less than the critical value in case of r = 0, the null hypothesis cannot be rejected. Thus, the evidence shows that there is no co-integration between KOCREF I, REALTY, MERITZ, KOCREF III and the bond markets like 3-year corporate bond rate.

However, in case of MACQUARIE, the evidence suggests that there is a strong long-term relationship between REITs returns and the bond markets.

Table 3: Bivariate Co-integration Tests for KOCREF I, REALY, MERITZ, KOCREF III, and MACQUARIE and Stock/Bond Market Indices

Variables		KOSPI		CONS		CORP	
		λmax	λtrace	λmax	λtrace	λmax	λtrace
KOCREF I	r = 0	17.961 (0.354)	18.096 (0.345)	16.387 (0.470)	16.513 (0.460)	8.545 (0.965)	8.579 (0.964)
	r < 1	8.275 (0.237)	8.745 (0.202)	6.417 (0.420)	6.727 (0.384)	3.092 (0.855)	3.792 (0.769)
REALTY	r = 0	13.982 (0.664)	14.059 (0.657)	12.025 (0.808)	12.095 (0.804)	15.410 (0.548)	15.457 (0.544)
	r < 1	1.382 (0.987)	1.852 (0.956)	0.798 (0.998)	0.850 (0.997)	1.198 (0.991)	4.982 (0.606)
MERITZ	r = 0	20.618 (0.199)	20.689 (0.196)	24.080 (0.081)*	24.171 (0.079)*	11.539 (0.839)	11.569 (0.837)
	r < 1	4.090 (0.729)	4.780 (0.634)	6.222 (0.443)	6.891 (0.366)	3.732 (0.777)	4.529 (0.669)
KOCREF III	r = 0	7.804 (0.980)	7.877 (0.979)	6.989 (0.990)	7.056 (0.989)	8.823 (0.958)	8.862 (0.957)
	r < 1	1.597 (0.977)	1.750 (0.969)	1.236 (0.989)	1.397 (0.985)	1.986 (0.956)	2.435 (0.921)
MACQUARIE	r = 0	6.037 (0.996)	6.070 (0.996)	6.753 (0.992)	6.790 (0.992)	26.485 (0.040)**	26.564 (0.039)**
	r < 1	1.279 (0.988)	1.416 (0.984)	1.351 (0.986)	1.550 (0.979)	7.511 (0.303)	9.117 (0.176)

Note: p-values are in parentheses. ***, **, *: indicates significance at 1%, 5%, 10% level. Critical value for r =0, r <1 is 25.731, 12.449, respectively. KOCREF I lags=3, REALTY lags=3, MERITZ lags=4, KOCREF III lags=4, MACQUARIE lags=4, KOSPI = the daily Korea Composite Stock Price index, CONS = the daily construction stock index, CORP = the dailyrate on 3-year corporate bond

This paper uses restrictedtrend co-integration model which specifies a model with linear trends in the variables. As a robustness check on the restricted trend model, the other models - unrestricted model, restricted constant model, a model with no deterministic components - are tested. Though not reported, the results are the same as the restricted trend model.

Table 4 exhibits the multivariate co-integration tests which includes KOCREF I, REALTY, MERITZ, KO CREF III, and MACQUARIE. The empirical results show that there is at least more than one co-integrating vector except for KOCREF I, suggesting that there is a long-term equilibrium among CR-REITs and stock/bond market variables.

For CR-REITs which haveat least more than one co-integrating vector in multivariate co-integration equation, the error correction model analysis is performed in the next section.

Table 4: Multivariate Cointegration Tests

Variables		λmax	λtrace
KOCREF I-KOPSI-CONS-CORP	r = 0	38.150(0.898)	38.404(0.891)
	r < 1	16.122(0.994)	17.480(0.986)
REALTY-KOPSI-CONS-CORP	r = 0	61.642(0.074)**	61.985(0.069)**
	r < 1	30.391(0.485)	31.700(0.411
MERITZ-KOPSI-CONS-CORP	r = 0	76.252(0.003)***	76.636(0.002)***
	r < 1	36.674(0.185)	37.424(0.160)
KOCREF III-KOPSI-CONS-CORP	r = 0	77.937(0.002)***	78.061(0.002)***
	r < 1	28.386(0.603)	28.418(0.602)
MACQUARIE-KOPSI-CONS-CORP	r = 0	72.093(0.007)***	72.486(0.007)***
	r < 1	30.487(0.480)	31.014(0.449)

Note: p-values are in parentheses, lags=2, ***, **, *: indicate significance at 1%, 5%, 10% level. KOSPI = the daily Korea composite stock price index, CONS = the daily construction stock index, CORP = the daily rate on 3-year corporate bond

3. Vector Error Correction Models

Given the results at the Table 4, the relationship between REITs and stock market, bond markets is examined using ECM. And for KOCREF I, VAR model is used.

Table 5 reports the results of four ECMs in which REALTY, MERITZ, KOCREF III, and MACQUARIE are dependent variables. The error correction terms are significant for MERITZ, KOCREF III, whereas they are not for REALTY, MACQUARIE. This evidence suggests that MERITZ and KOCREF III have a strong long-term equilibrium price adjustment process with stock/bond variables.

In Table 5, the results show short-term lead/lag relationship between CR-REITs and stock/bond variables. For four ECM, the stockmarket variable - KOSPI - has little explanatory power for CR-REITs for a short-term. Therefore, REITs can be used for a useful tool of diversifying a portfolio.

This evidence is not consistent with Allen, M., Madura, J., and Springer (2000), Glascock, Lu, and So (2002) which report a significant relationship between REITs and the stock markets. However, in case of MACQUARIE, it is found that CR-REITs have a short-term lead/lag relationship with construction company index.

The results show that REALTY and KOCREF have no a short-term relationship with bond market, whereas MERITZ and MACQUARIE has a significant short-term relationship with corporate bond rate at the 10% level. Muller and Pauley (1995) report that there is a low correlation between REIT price movements and changes in interest rates. Cheong, Zurbruegg, and Wilson (2008) also find that Australian REITs (known as Listed Property Trusts) has a no long-run relationship with the bond markets.[6] However, Allen, M., Madura, J., and Springer (2000) findthat a negative relation between equity REIT returns and changes in interest rates.

6) Cheong, Zurbruegg, and Wilson (2008) find that for Australian REMD(Real Estate Management & Development), there is at least a co-integration vector among REMD, the stock market, and long-term interest rates.

Table 5: ECM for REALTY, MERITZ, KOCREF III, and MACQUARIE

model	REALTY	MERITZ	KOCREFIII	MACQUARIE
EC	-0.000(-1.05)	-0.001(-3.92)***	0.000(2.11)**	-0.000(-0.87)
KOSPI{1}	0.029(0.67)	0.036(0.96)	-0.002(-0.05)	0.040(1.05)
KOSPI{2}	0.037(0.89)	0.047(1.33)	0.0075(0.10)	-0.026(-0.72)
REALTY{1}	0.163(5.28)***			
REALTY{2}	0.170(5.52)***			
MERITZ{1}		-0.296(-9.45)***		
MERITZ{2}		-0.197(-6.09)***		
KOCREFIII{1}			0.291(9.25)***	
KOCREFIII{2}			0.217(6.70)***	
MACQUARIE{1}				0.041(1.32)
MACQUARIE{2}				0.197(6.43)***
CONS{1}	0.020(0.72)	-0.004(-0.17)	-0.040(-1.30)	0.045(1.91)**
CONS{2}	-0.005(-0.20)	-0.035(-1.53)	0.014(0.47)	0.031(1.40)
CORP{1}	0.000(0.03)	-0.013(-1.73)*	0.001(0.13)	-0.012(-1.75)*
CORP{2}	-0.011(-1.18)	0.000(0.03)	-0.000(-0.02)	0.004(0.69)

Note: t-statistics are in parentheses. ***, **, *: indicate significant at the 1%, 5%, 10% level. KOSPI = the daily Korea composite stock price index, CONS = the daily construction stock index, CORP = the daily rate on 3-year corporate bond.

Table 6 presents the results of variance decomposition for KOCREF I, REALTY, MERITZ, KOCREF III, and MACQUARIE. This paper has truncated this table to 5 lags for presentation.

The variance decompositions provide the error variance explained by variations in the variables. The findings in Table 6 suggest that 98%~90% of error variations explained by variation in CR-REITs are explained by CR-REITs themselves and stock/bond market variables have little explanatory power.

It is pointedout that the results of variance decompositionanalysis can be different by sequence of variables.For robust check, analysis of variance decomposition for several sequences for CR-REITs, KOSPI, CONS, and CORP is performed.[7)]

7) For robust check, analysis of variance decomposition for several sequences for CR-REITs, KOSPI, CONS, and CORP is performed.

Table 6: Variance Decomposition for CR-REITs

Table 6-I: Variance Decomposition for KOCREF I

steps	KOSPI	KOCREF I	CONS	CORP
1	0.000	100.00	0.000	0.000
2	0.006	99.968	0.020	0.006
3	0.005	99.967	0.011	0.017
4	0.007	99.971	0.010	0.012
5	0.008	99.972	0.011	0.009

Note: KOCREF I is dependent variables and other variables are independent variables.

Table 6-II: The Variance Decomposition for REALTY

Steps	KOSPI	REALTY	CONS	CORP
1	0.000	100.000	0.000	0.000
2	0.226	99.772	0.000	0.001
3	0.391	99.557	0.012	0.040
4	0.444	99.476	0.045	0.033
5	10.471	99.407	0.086	0.036

Note: REALTY is dependent variables and other variables are independent variables.

Table 6-III: The Variance Decomposition for MERITZ

Step	KOSPI	MERITZ	CONS	CORP
1	0.000	100.000	0.000	0.000
2	0.000	99.831	0.028	0.141
3	0.006	99.811	0.026	0.156
4	0.037	99.685	0.047	0.230
5	0.100	99.546	0.099	0.255

Note: MERITZ is dependent variables and other variables are independent variables.

Table 6-IV: The Variance Decomposition of KOCREF III

Step	KOSPI	KOCREF III	CONS	CORP
1	0.000	100.000	0.000	0.003
2	0.120	99.848	0.029	0.009
3	0.160	99.812	0.018	0.005
4	0.283	99.695	0.017	0.005
5	0.299	99.680	0.016	0.004

Note: KOCREF III is dependent variables and other variables are independent variables.

Table 6-V: The Variance Decomposition of MACQUARIE

Step	KOSPI	MACQUARIE	CONS	CORP
1	0.000	100.000	0.000	0.000
2	0.708	98.998	0.157	0.136
3	1.069	98.461	0.355	0.114
4	1.557	97.674	0.669	0.100
5	1.879	97.161	0.859	0.102

Note: MACQUARIE is dependent variables and other variables are independent variables.

Thus, this paper runs variance decomposition on several types of sequence for each of CR-REITs. The overall results show that more than 95% of error variations explained by CR-REITs themselves when CR-REITs are dependent variables and stock and bond market variables are dependent variables.

KOSPI = the daily Korea composite stock price index, CONS = the daily construction stock index, CORP = the daily rate on 3-year corporate bond.

V. Conclusions

This study examines the relationships between five Korean REITs - KOCREF I, REALTY, MERITZ, KOCREF III, and Macquarie - and stock/bond markets, using KOSPI, construction industry index, 3-year corporate bond rates.

The feature of REITs (so called CR-REITs) this paper examines is unique in terms of asset classes, life span, and tax treatment. Thus, this paper is expected to provide the additional evidence on the relationships between and REITs and other financial markets.

In this paper, each CR-REIT yields different results for co-integration tests. The evidence shows that there is cointegrating vector for MERITZ- construction company index. However, the rest of CR-REITs show no cointegrating relation with stock market indices. Meanwhile it is foundthat there is no co-integration relation between REITs and corporate bond except for MACQUARIE. But the multivariate cointegration tests show that there isat least more than one cointegrating vector among the variables.

ECM analysis shows that except for REALTY and MACQUARIE, there is a long-term relationshipbetween REITs and stock and bond markets. And only for REALTY, there is short-term relationship between REITs and stock/bond variables.

This paper provides an intriguing result. The relationship between CR-REITs and stock/bond markets may depend on the characteristics such as degree of leverage, ownership, and assets under management.[8] The evidence shown in this paper might result from the characteristics of CR-REITs in terms of investment vehicle, investment period,

8) For this issues, see Redman and Manakyan (1995), Cheng and Roulac (2007).

and management.

These findings suggest that CR-REITs provide a limited benefit of diversification in a portfolio. These results need further investigation.

• 논문 접수일 : 2009. 10. 29
• 논문 수정일 : 2009. 12. 17
• 게재 확정일 : 2009. 12. 17

참고문헌

1. Bredin, D., O'Reilly, G., and Stevenson, S, 2006, "Monetary Shocks and REIT Returns", Paper presented at the Pacific-Rim Real Estate Society Annual Conference
2. Brooks, C., 2002, Introductory Econometrics for Finance, Cambridge
3. Cheong, C. S. R. Zurbruegg, and P. Wilson, 2008, "The Long-Run Performance and Driving Forces of Securitized Listed Property", Paper Presented at the 14th Pacific Rim Real Estate Society Conference
4. Enders, W. 1995, Applied Econometric Time Series, John Wiley & sons, Inc.
5. Goodwin, K, 2007, "Diversification Benefits of Public Real Estate Securities in the Mixed Asset Portfolio", Paper Presented at the FMA Conference
6. Ibbotson, 2001, "REIT's Low Correlation to Other Stocks and Bonds is Key Factor for Portfolio Diversification", NAREITs
7. Lee, Chyi L. and Ting K. Hwa, 2008, "Securitised Real Estate in a Mixed-asset Portfolio: The Case of Malaysia", Paper Presented at the 14th Pacific Rim Real Estate Society Conference
8. Li, Jinliang, Mooradian, Robert M., and Yang, Shiawee X, 2004, "Economic Forces, Fundamental Variables, and REIT Returns", Paper Presented at the AsRES Conference 2004
9. Whiting, Dominic, Playing the REITs Game: Asia's New Real Estate Investment Trusts, John Wiley & Sons, 2007
10. Allen, M. T., J. Madura, and T. M. Springer, 2000, "REIT Characteristics and the Sensitivity of REIT Returns", *Journal of Real Estate Finance and Economics* 21: 141~152
11. Chandrashekaran, Vinod, 1999, "Time-Series Properies and Diversification Benefits of REIT returns", *Journal of Real Estate Research* 17: 91~112
12. Chen, K., C. Hsieh, T. Vines, and S. Chiou, 1998, Macroeconomic Variables, "Firm-Specific Variables and Returns to Equity REITs", *Journal of Real Estate Researc* 16: 269~277
13. Cheng, P. and S. Roulac, 2007, REIT Characteristics and Predictability, *International Real Estate Review* 10: 23-41
14. Engle, Robert and Clive Granger, 1987, "Cointegration and Error-Corrections: Representation, Estimation, and Testing", *Econometrica* 55: 251~276
15. Glascock, J., Lu, C., and So, R. 2002, "REIT Returns and Inflation, Perverse or Reverse, Causality Effects?, *Journal of Real Estate Finance and Economics* 24: 301~317

참고문헌

16. Granger, C. and P. Newbold, 1974, "Spurious Regressions in Econometrics", *Journal of Econometrics* 2: 111~120
17. Gyourko, J. and D. Keim, 1992, "What Does the Stock Market Tell Us About Real Estate Returns?", *Journal of the American Real Estate and Urban Economics Association* 20(3): 457~485
18. Gyourko, J. and E. Nelling, 1996, "Systematic Risk and Diversification in the Equity REIT Market, *Real Estate Economics* 24: 493~515
19. He, Ling T., James Webb, and F.C. Myer, 2003, "Interest Rate Sensitivities of REIT returns", *International Real Estate Review* 6: 1~21
20. Hoesli, Martin and Moreno, Camilo S, 2007, "Securitized Real Estate and its Link with Financial Assets and Real Estate: An International Analysis", *Journal of Real Estate Literature* 15: 59~84
21. Johansen, Soren, 1988, "Statistical Analysis of Cointegration Vectors", *Journal of Economic Dynamics and Control* 12: 231~254
22. Johansen, Soren and Katerina, Juselius, 1990, "Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money", *Oxford Bulletin of Economics and Statistics* 52: 169~209
23. Kryzanowski L. and M. Tcherednitchenko, 2007, "Performance of Canadian E-REITs, *International Real Estate Review* 10: 1~22
24. Ling, David and Andy Naranjo, 2006, "Dedicated REIT Mutual Fund Flows and REIT Performance, *Journal of Real Estate Finance and Economics* 32(4): 409~433
25. Liow, Kim H. and Mong C. Sim, 2006, "The Risk and Return Profile of Asian Real Estate Stocks", *Pacific Rim Property Research Journal* 12: 283~310
26. Muller, G. and K. Pauley, 1995, "The Effect of interest-rate movements on Real Estate Investment Trusts", *Journal of Real Estate Research* 10: 319~325
27. Ooi, J., G. Newell, and T. Sing, 2006, "The Growth of REIT Markets in Asia", *Journal of Real Estate Literature* 14: 203~222
28. Paladino, M. and H. Mayo, 1998, “REIT Stocks do not Diversify Stock Portfolio: An Update”, *Real Estate Review* 27: 39~40
29. Redman, A. and H. Manakyan, 1995, “A Multivariate Analysis of REIT Performance by Financial and Real Estate Asset Portfolio Characteristics”, *Journal of Real Estate Finance and Economic* 10: 169~175