E C O N O M I C S B U L L E T I N

Exploring the driving force and price adjustment of the J-REIT market

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Abstract

We employ the Log-linearization and VAR method proposed by Campbell and Ammer (1993) to decompose the excess J-REIT equity return into three components: dividends, real interests and future excess returns. We find that the news about dividends combined with future excess returns account most of the movement of the J-REIT equity, while the effect of real interest rates could almost be negligible. We also take the question further to examine whether or not the J-REIT market have fully incorporate those news by adapting the methodology developed by Fu and Ng (2001). The results show that the J-REIT market have assimilated market news fully within a month lag.

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1 Introduction

Since the burst of the real estate bubble in 1990, real estate prices in Japan have been declining all the way through 2004, with some signs of price stabilization and increases in recent two years. Japan has adopted the Real Estate Investment Trust (usually called J-REIT) scheme in 2001, as a way to facilitate investments and transactions in the real estate market. There has been little research about J-REIT, most of which is devoted to the performance analysis.

We are looking at the question of what forces have driven the movement of the J-REIT market by employing the log-linearization and VAR method proposed by Campbell and Ammer (1993) to decompose the excess J-REIT equity return into three components: future dividends, real interest rates, and excess returns. In other words, we would like to identify which type of news (future dividends, real interest rates, or excess returns) has played the most significant part in the movement of the J-REIT return. Moreover, we also take the question further to examine whether or not the J-REIT market has fully incorporated those news immediately, to do so, we will adapt the methodology developed by Fu and Ng (2001). The results indicate that the news about future dividends combined with future excess returns account for most of the movement of the J-REIT return, while the effect of real interest rates are almost negligible. The results also show that the J-REIT market has assimilated market news fully within a month lag. The much quicker price adjustment of the J-REIT market seems to suggest that it helped improve the informational efficiency of the real estate market in Japan. On the other hand, it also suggests that Japan may need to promote the securitization of real estate assets further on the basis of efficient asset pricing.

2 Methodology

2.1 The decomposition of excess J-REIT returns

We decompose the excess J-REIT return into unobservable components by using the log-linearization developed by Campbell and Shiller (1988) and Campbell (1991), in which the news is decomposed as:

$$e^y_{t+1} = \tilde{e}^d_{t+1} - \tilde{e}^r_{t+1} - \tilde{e}^y_{t+1}, \tag{1}$$

$$\tilde{e}^d_{t+1} = (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j}, \tag{2}$$

$$\tilde{e}^r_{t+1} = (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j r_{t+1+j},$$

$$\tilde{e}^y_{t+1} = (E_{t+1} - E_t) \sum_{j=1}^{\infty} \rho^j y_{t+1+j},$$

where y_{t+1}, d_{t+1}, and r_{t+1} denoted the log excess return on the J-REIT equity, the log dividends, and the log return in the money market (the risk-free interest rate) during period t to $t+1$, respectively. The variable e_{t+1} denotes the unexpected part, news, or revisions in expectations during period t to $t+1$: $x_{t+1} - E_t x_{t+1}$. The tilde means a discounted sum defined above, and ρ is the discount factor. Following Campbell and Ammer (1993), we set it as 0.9962.

2.2 Empirical proxies

Since the revisions in expectations are unobservable, we need to construct empirical proxies for the expectations in the above equation (1) to implement the decomposition of excess J-REIT return. We adopt the vector autoregressive (VAR) methodology proposed by Campbell and Ammer (1993) to create proxies for the relevant expectation. In particular, we construct the forecast of variables by VAR; the revisions in these forecasts are then used as proxies for revisions in investor's expectations. We should include at least the variables (two in our case, the excess J-REIT return and the real interest rate) we want to forecast, and other variables useful in forecasting the variables of interest. We roughly follow Campbell and Ammer to include the dividend-price ratio and the relative bill rate[1] into our VAR. In addition, we also include the excess return of the overall stock market:

$$z_{t+1} = A z_t + \epsilon_{t+1}, \tag{3}$$
$$e^y_{t+1} = s_y \epsilon_{t+1},$$

where z is the 5×1 vector containing our endogenous variables of the VAR system, A is the coefficient matrix of the VAR, and ϵ is the error vector.

The unexpected excess return can be easily obtained from the error term of the VAR system by selecting an appropriate selection matrix. Given that the excess

[1]It is defined as the risk-free rate minus its 12-month lagged moving average to capture the dynamics of the risk-free rate.

return is the first element of the VAR system, the selection matrix for innovations to the excess return in the case of first-order VAR[2] is just the first column of a 5×5 identity matrix, denoted s_y. Similarly, s_r denotes the selection matrix for innovations to the real interest rate. We could also obtain the proxies for revisions in long-horizon expectations of other variables of interest readily by using equations below:[3]

$$\begin{aligned} e^y_{t+1} &= s_y \epsilon_{t+1}, \\ \tilde{e}^y_{t+1} &= s_y \rho A (I - \rho A)^{-1} \epsilon_{t+1}, \\ \tilde{e}^r_{t+1} &= s_r (I - \rho A)^{-1} \epsilon_{t+1}, \\ \tilde{e}^d_{t+1} &= \tilde{e}^r_{t+1} + \tilde{e}^y_{t+1} + e^y_{t+1}. \end{aligned} \tag{4}$$

2.3 Variance decomposition for the excess J-REIT return

Having obtained the proxies for revisions in expectation, we could use the dynamic accounting identity defined in equation (1) to decompose the variance of the excess J-REIT return into the sum of variance and covariance terms as follows by taking into account the possible correlation among various components. The relative contribution of different components to the movement of the current excess J-REIT return could then be measured by the variance of that component, calculated as the percentage share of the variance of the current excess J-REIT return:

$$\begin{aligned} Var(e^y_{t+1}) =& Var(\tilde{e}^d_{t+1}) + Var(\tilde{e}^r_{t+1}) + Var(\tilde{e}^y_{t+1}) \\ & - 2Cov(\tilde{e}^d_{t+1}, \tilde{e}^r_{t+1}) - 2Cov(\tilde{e}^d_{t+1}, \tilde{e}^y_{t+1}) \\ & + 2Cov(\tilde{e}^r_{t+1}, \tilde{e}^y_{t+1}). \end{aligned} \tag{5}$$

It is worth noting that the Campbell-Ammer (1993) approach treats the dividends component as a residual of the estimation, which means we tend to overstate the return volatility of dividends if the VAR understates the predictability of excess returns.

2.4 Speed of price adjustment in the J-REIT market

Fu and Ng (2001) developed a way to identify the speed of an asset's price adjustment to news within the framework of Campbell and Shiller. Their logic goes as

[2] Any VAR(p) ($p > 1$) process could be represented in the form of first-order VAR.

[3] We are using the fact that: $(E_{t+1} - E_t) z_{t+1+j} = A^j \epsilon_{t+1}$.

follows. If the market is efficient, in the sense that the future innovations in excess returns are independent innovations, they should be negatively correlated with the current innovation. However, suppose it takes another two periods for full price adjustment to the current news (say the news about dividends $\tilde{e}^d$), we would have $\tilde{e}^d = e^y(0) + \rho e^y(1) + \rho^2 e^y(2)$, where $e^y(j) = (E_{t+1} - E_t)y_{t+1+j}$ for $j = 0, 1, 2$. If the existence of future innovations $e^y(1)$ and $e^y(2)$ is only to complete the current price adjustment due to the market friction, they must become positively related to the current innovation. Fu and Ng (2001) proposed that we could view positive correlations between current innovations and innovations in subsequent expected excess returns as the evidence of price adjustment frictions, indicating that the current adjustment fails to assimilate the market news fully.

3 Data

We use the dividends and splits adjusted Quick Reit Index's price change minus the 1-month general collateral repurchase rate (usually called GC Repo rate)[4] to measure the excess return of J-REIT equity (denoted e), and the 1-month GC Repo rate minus the log difference in the non-seasonally adjusted Consumer Price Index (CPI) to represent the real interest rate (denoted r). We should include at least the above two variables, and any other variable that is judged to be useful in forecasting variables of interest. Roughly following Campbell and Ammer (1993), we also include the the dividend-price ratio, the relative bill rate, and the excess return of the overall stock market into our VAR. The dividend-price ratio of the Quick Reit Index (denoted dp) is calculated as total dividends (dividends per share times the total outstanding shares) paid over the previous financial closing divided by the current market capitalization (current stock price times the total outstanding shares). The 3-month GC Repo rate minus its 12-month lagged moving average is used as a measure of the relative bill rate (denoted rb). Finally, the Nikkei 225's dividends and splits adjusted price change minus the 1-month GC Repo rate is used as a measure of the excess return of the overall stock market (denoted en). The monthly Quick Reit Index is obtained from Bloomberg; the monthly GC Repo rate is obtained from the website of the Bank of Japan; the monthly CPI is obtained from the website of the Japan Statistics Bureau; all the other data are obtained from the NEEDS-FinancialQUEST database. The sample period for all these monthly series is from Dec 2001 through May 2007.

[4] "GC Repo rate"is the typical rate in the money market, and commonly regarded as representing the risk-free rate in Japan.

4 Results

Table 1 reports coefficient estimates for the monthly five-variable first-order VAR. We chose the number of lags through Akaike Information Criterion. It is evident that the joint significances of the explanatory variables in the VAR forecasting are statistically significant for all other than the excess return of Nikkei 225 index. We also find that the dividend-price ratio enter positively and can effectively forecast the excess return of J-REIT equity. The real interest rate process seems to be a simple AR(1) with a coefficient of about 0.4, showing some persistence. The dividend-price ratio is mainly forecast by its own lag, with a coefficient above 0.8, as well as the lagged excess J-REIT return, with a small negative coefficient. The relative bill rate seems to follow a highly persistent AR(1) process with a coefficient of more than 0.9. The results here are quite consistent with the pattern reported by Campbell and Ammer (1993), and Fu and Ng (2001).

Table 2 reports the variance-covariance decomposition of the current excess J-REIT return into the variance of news in expectations of future excess returns, real interest rates, dividends, and the covariances between them. The column "Total" reports the total contribution, while the column "Share" shows the contribution as a percentage of the variance of excess J-REIT returns. It is evident from the table that the news about dividends played the most significant role in the movement of the J-REIT return, and the future excess returns followed. Our results about J-REIT are a little different from the earlier work on the decomposition of stock market (e.g. Campbell and Ammer, 1993; Bernanke and Kuttner, 2005), which reports that future excess returns account for the greatest part of stock movement, while the news about the dividends play only a moderate role. It may attributed to the different characteristics of underlying assets between REIT and common stocks.

The dividends of J-REIT deserve some further comments here. J-REITs are required to distribute 90 percent of their income, while in return they are exempt from corporate income taxation. Therefore, the news about the dividends could be viewed as almost equivalent to the news about the rental income of the underlying properties in the case of J-REIT. It is thus the news about the rental income of the underlying properties that drives the J-REIT market most.

We also find that the effect of real interest rates is almost negligible, which is consistent with the earlier work on the decomposition of stock market. However, we may need some cautions about the role of real interest rates in the J-REIT market, since the nominal interest rate in Japan has been very steady at the level of nearly zero percent in the past few years, due to easing monetary policy of the

Bank of Japan.

We report the R^2 statistics from simple regressions of the unexpected excess return on each estimated component as an alternative measure of the importance of that component at panel B at the bottom. The results are consistent with the above variance decomposition.

Table 3 reports correlation statistics between the current innovation and innovations in subsequent expected returns up to six month horizons (denoted j). As stated earlier, the presence of positive correlations between current innovations and innovations in subsequent expected excess returns may suggest the existence of price adjustment frictions, while the number of periods over which the positive correlation lasts could provide a measure about the speed of price adjustment. We could observe from the table that correlation statistics are negative for all values of j but one. Our results indicate that the J-REIT market has assimilated market news fully within a month lag. In contrast, Fu and Ng (2001) reported strong evidence against the real estate market efficiency that real estate prices need about three quarters to complete the price adjustment. The much quicker price adjustment of the REIT market seems to suggest that it helped improve the informational efficiency of the real estate market in Japan. On the other hand, it also suggests that Japan may need to promote the securitization of real estate assets further on the basis of efficient asset pricing .

5 Conclusion

This paper employed the log-linearization and VAR method proposed by Campbell and Ammer (1993) to decompose the excess J-REIT return into three components: future dividends, real interest rates, and excess returns, to identify which news has played the most significant part in the movement of the J-REIT return. The results indicate that the news about dividends combined with future excess returns account for most of the movement of the J-REIT return, while the effect of real interest rates is almost negligible. We also take the question further to examine whether or not the J-REIT market has fully incorporated those news immediately by adapting the methodology developed by Fu and Ng (2001). Our results show that the J-REIT market has assimilated market news fully within a month lag. The much quicker price adjustment of the J-REIT market seems to suggest that it helped improve the informational efficiency of the real estate market in Japan. On the other hand, it also suggests that Japan may need to promote the securitization of real estate assets further on the basis of efficient asset pricing.

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Table 1: VAR Coefficients Estimation

	e_t	r_t	dp_t	rb_t	en_t	R^2	Sig
e_{t+1}	0.0281	0.4761	0.2124	6.1104	0.0327	0.285	0.002
	(0.133)	(0.955)	(0.066)	(4.133)	(0.091)		
r_{t+1}	0.0124	0.3756	-0.0492	0.3151	0.0027	0.205	0.030
	(0.011)	(0.111)	(0.094)	(0.409)	(0.008)		
dp_{t+1}	-0.0184	0.0025	0.8263	0.4033	-0.0003	0.994	0.000
	(0.009)	(0.083)	(0.060)	(0.236)	(0.005)		
rb_{t+1}	-0.0000	-0.0079	0.0076	0.9393	-0.0008	0.918	0.000
	(0.002)	(0.012)	(0.003)	(0.051)	(0.001)		
en_{t+1}	0.1027	2.2098	1.5013	-2.3134	0.1448	0.093	0.431
	(0.165)	(1.472)	(1.072)	(4.231)	(0.117)		

Note: This table reports coefficient estimates for a monthly five-variable first-order VAR, which includes the excess return of J-REIT equity, the real interest rate, the dividend-price ratio of J-REIT equity, the relative bill rate, and the excess return of Nikkei 225 index. The excess returns are measured in percentage points per month, while the remaining variables are measured in percentage points at annual rate. The sample period for all these series is from Dec 2001 through May 2007. The number of lags was chosen through Akaike Information Criterion. Numbers below the coefficient estimates (in round parentheses) are heteroskedasticity-consistent standard errors. R^2 is the R^2 in the regression of each endogenous variable on the VAR explanatory variables, while "Sig" denotes the joint significance of the explanatory variables in the regression.

Table 2: A Variance Decomposition of Excess J-REIT Returns

Panel A:	Total	Share(%)
Var(Excess return)	11.28	100.00
Var(Future return)	17.80	157.77
Var(Real rate)	0.29	2.58
Var(Dividend)	24.41	216.41
-2Cov(Dividend, Real rate)	−2.90	−25.74
-2Cov(Dividend, Future return)	−30.77	−272.72
2Cov(Future return, Real rate)	2.45	21.70
Panel B:	R^2	
R^2(Future return)	0.0660	
R^2(Real rate)	0.0012	
R^2(Dividend)	0.2086	

Note: This table reports the variance-covariance decomposition of the current excess J-REIT return into the variance of news in expectations of future excess returns, real interest rates, dividends, and the covariances between them. A five-variable first-order monthly VAR is employed to construct the forecast of future real interest rates and excess returns, and then calculate the proxies for the unobservable components of the unexpected J-REIT return. The column "Total" reports the total contribution, while the column "Share" shows the contribution as a percentage of the variance of excess J-REIT returns. The panel B at the bottom reports the R^2 statistics from simple regressions of the unexpected excess return on each estimated component as an alternative measure of the importance of that component.

Table 3: Price Adjustment Speed

Horizon (j)	1	2	3	4	5	6
Corr$(e^y(0), e^y(j))$	0.209	−0.102	−0.210	−0.248	−0.265	−0.275
T statistics	(1.692)	(−0.813)	(−1.701)	(−2.033)	(−2.185)	(−2.268)
P value	(0.096)	(0.429)	(0.094)	(0.046)	(0.033)	(0.027)

Note: This table reports correlations between the current innovation and innovations in subsequent expected excess returns. The presence of positive correlations could be viewed as the evidence of price adjustment frictions, while the number of periods over which the positive correlation lasts could provide a measure about the speed of price adjustment. T statistics and their P values under the null of zero correlation are also reported below the correlation coefficients.