Are Appraisers Rational?
— Evidence from T-REITs

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Abstract

A herd mentality is driving financial events worldwide. The great damage that the current financial crisis has brought to the world has revealed the excessive optimistism characteristic of financial bubbles in the boom phase of economic cycles. It also leads to the re-evaluation of appraisal smoothing. In times of prosperity, do appraisals have to fluctuate with the market? Most of the previous studies examined appraisal smoothing from an aggregate level and used extensive data sets to de-smooth. This paper uses individual re-appraisal data of T-REITs and modifies the partial adjustment model developed by Quan and Quigley (1991) to observe appraisers' rational behavior in Taiwan. The results show that the confidence parameter is 0.85 and verifies that partial adjustments existed. We find that appraisers in Taiwan place less weight on market information because of market noise.

Key words: Partial adjustment, Appraisal behavior, REITs

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1. Introduction

An appraiser's proper role is to offer rational value information in the market. Theoretically, appraisers should estimate the unbiased market value of property. However Fisher et al. (1999) found that property sales prices exceeded the appraised values in up markets, and the reverse in down markets. Yiu et al. (2006) argue that the persistence of estimate errors will greatly affect investors' judgments. That means that appraised values have insufficiently reacted to market fluctuations (so-called appraisal smoothing). The recent financial tsunami shows excessive optimism accompanying a "prosperity bubble". Akerlof and Shiller (2009) indicate that a herd mentality seems to be driving investors' behavior. So much for investors, but what about professional appraisers, whose behavior one would expect to be more rational? Their rationality should be different. If appraisers, just as Fisher et al. (1999) and Geltner (1998) mentioned, tend to underestimate in prosperity and overestimate in recession, is appraisal smoothing still a bias or a rational expectation?

Previous appraisal smoothing studies have mostly used an aggregate level index and have concluded that there are two major characteristics: lower volatility and lag structure. They have always tied lower volatility and lag features to appraiser lack of confidence or anchor on previous appraised value. This paper adopts disaggregate data to find out whether appraisal smoothing has existed, and what behavior causes the insufficient reaction to market fluctuation.

This paper is organized as follows: in addition to this preamble, the first part reviews the appraisal smoothing and partial adjustment literature. We modify the rational partial adjustment model developed by Quan and Quigley (1991). Section 3 briefly introduces T-REITs market and data description. An empirical model and its results are then presented, and finally our conclusions.

2. Literature review

2.1 Appraisal smoothing

Appraisal smoothing can be studied from aggregate and individual levels. Geltner (1989a), based a study upon aggregate level or asset portfolio calculation, defined appraisal smoothing to be the situation when the ratio of the transaction price index to the appraisal standard deviation is greater than 1, or when the appraisal price index falls behind the transaction price index such that when the market price has a different trend the appraisal price index does not catch up immediately. Fisher et al.(1999) found that when the market reverses the trend to a growing market, the appraisal price index is lower than the market price index; while the market declines, the appraisal price index is higher than the market price index.

Previous appraisal smoothing research studies have all assumed the existence of appraisal smoothing. This assumption is criticized by Lai and Wang (1998). They showed that the use of appraisal based data can result in a higher variance than that of true returns. They suggested studying the characteristics of real estate as possible explanations for the low variance observed between appraisal and transaction indexes. Geltner (1998) argued that Lai and Wang (1998) did not distinguish between disaggregate level random error and systematic error which carries over to the aggregate index. A broader perspective for conceptualizing the problem of appraisal smoothing and more productive directions for future research is recommended.

Using the de-smoothing model to study the time varying characteristic of appraisal smoothing, the smoothing coefficient may be different in various economic cycles. Too much past information may cause appraisal smoothing. Brown and Matysiak (1998) relaxed the constant smoothing coefficient assumption to calculate the time varying smoothing coefficients, and used the State Space Model (SSM) to study the rational adjustment model. Clayton et al.(2001) is based on individual appraisal data, using the

Quan and Quigley (1991) partial adjustment model to study 202 reappraisal reports for 33 real estate cases. By setting the confidence level as the transaction price data available to the appraisers, they found that the confidence level varies over time. In different economic conditions, appraisers will have different confidence levels and use different appraisal adjustments. Therefore, a de-smoothing model should use different coefficients over time. Previous appraised results can affect appraisers' valuation on the same real estate in consecutive periods and have more lagging than the first time appraisals. Rotating appraisers may be a good way to avoid the lagging effect by the previous appraisal on the same appraiser.

Geltner (1991) claimed that most of the aggregate level research studies commercial real estate. Transaction prices of commercial real estate are hard to collect. Most of the research can only use appraisal prices to study risk and return relationships or portfolio analysis. Most of the research at the aggregate level has focused upon appraisal data adjustments to construct price indexes and develop a de-smoothing model under the assumption of the existence of appraisal smoothing. Brown et al. (1998) criticized this assumption. Without more detailed analysis of the reason for appraisal smoothing we can't make sure to de-smooth and can't state whether appraisers are using the wrong methods, do not have enough experience, or do not use all of the market information.

In order to understand the characteristics of appraisal smoothing, some research studies focus on the individual level to study the appraisal process and appraiser behavior in order to better understand the factors for appraisal smoothing. Under the assumption of incomplete information, costly search, and varying expectation, Quan and Quigley（1991）introduced a real estate pricing model. The buyer and seller of real estate have less experience than the appraiser. The appraiser should extract useful information from the market. When the market noise is bigger, and it is harder to observe market price, the appraiser should adjust the price more conservatively. Contrary to the perception of previous research, appraisal smoothing by the appraiser is both rational and consistent with an optimal updating behavior.

Mcallister et al. (2003) used a qualitative interview survey to study appraiser behavior in commercial real estate return performance. The appraisal smoothing may be due to the market environment. Previous research studies have claimed that appraisal smoothing is because of the appraisal process, rather than market inefficiency. Future research should understand that market information is hard to obtain, the appraisal process or lack of appraisal ability are not the only reasons for appraisal smoothing. Reappraisal not only need to consider weighted average prices, but also many other factors.

2.2 Appraisal behavior

Using either the previous transaction price (Ibbotson and Siegel, 1984:222) or the previous appraisal (Ross and Siegel, 1987; Geltner, 1989) may cause auto correlation and appraisal smoothing. During the appraisal process, appraisals may also be constrained by past appraisals. Hansz (2004) used a controlled experiment to study the impact of past transaction prices on partial adjustment behavior of expert appraisers and non-appraisers. It is found that past transaction price knowledge induces partial adjustment behavior on expert appraisers. It could be for that reason that the Uniform Standards of Professional Appraisal Practice (USPAP) required formal documentation of appraisal practice, such that the appraiser cannot ignore either previous appraisal prices or transaction prices. Diaz (1997) and Geltner et al. (2001) also found other people’s opinion may also have impact on appraiser’s partial adjustment behavior.

Anchoring means that people will use a quantitative reference as a basis for appraisal and adjustment. However, anchoring may cause partial adjustment problems (Kahneman and Tversky, 1973). Diaz and Wolverton (1998) used a longitudinal experiment to study reappraisal and found partial adjustment phenomenon of the appraiser due to past appraisal prices. Hansz (1004) found past transaction prices also have an impact upon appraiser’s partial adjustment behavior. However, behavior research can only show partial adjustment behavior caused by past information, but cannot explain appraisal smoothing due to the appraiser's lack of confidence. Only Clayton et al. (2001) has shown that the appraiser's confidence can cause appraisal smoothing. The motive of partial adjustment remains an area for further study.

When an appraiser uses sales comparison methods, collects comparison cases, or obtains capitalization rates from the market, he or she is using past transaction information. This is very likely to result in an appraisal lag problem. Although de-smoothing is a technical issue, appraisal smoothing is caused by appraiser behavior. Previous aggregate level studies can only have limited and indirect implications as to the causes appraisal smoothing. We need to focus on appraiser behavior to study the motive for appraisal smoothing. This paper uses individual reappraisal cases on real estate securitization to study appraiser behavior.

2.3 Partial adjustment model

Quan and Quigley (1991) used a transaction model which is the weighted average of reservation prices and offer prices to develop an individual appraiser partial adjustment model to explain the appraiser's reappraisal behavior in the real estate appraisal market.

Assume that the real market price follows a random walk process and cannot be observed. Volatility is exogenous.

$$P_t = P_{t-1} + \eta_t \text{ and } \eta_t \sim N(0, \sigma_\eta^2) \quad \text{(1)}$$

Following appraisal rules, an appraiser can use available information and experience in making a real estate appraisal. Available information set at time t-1 is:

$$I_{t-1} \equiv \{ P_1^T, P_2^T, P_3^T, \ldots, P_{t-1}^T \} \quad \text{(2)}$$

The transaction price and unobservable market price have a long term equilibrium relationship:

$$P_t^T = P_t + \upsilon_t \text{ , where } \upsilon_t \sim N(0, \sigma_v^2) \quad \text{......................... .... (3)}$$

Following this procedure, we can derive an appraiser optimal reappraisal process. Based on information I_{t-1} at time t-1 and additional information P_t^T , appraiser's appraisal result is the expected real estate price at time t

$$P_t^* = E\left[P_t \mid P_t^T, I_{t-1}\right]$$

Information set includes information I_{t-1} at time t-1 and additional market information P_t^T at time t:

$$E\left[P_t \mid P_t^T, I_{t-1}\right] = E\left[P_{t-1} \mid I_{t-1}\right] + K\left[P_t^T - E\left(P_{t-1} \mid I_{t-1}\right)\right] \quad \text{............... (4)}$$

$K\left[P_t^T - E\left(P_{t-1} \mid I_{t-1}\right)\right]$ is the updating component.

The appraiser does not use all the information P_t^T at time t to adjust the real estate price at time t. Appraiser, based on information P_t^T and past appraisal $E\left(P_{t-1} \mid I_{t-1}\right)$, only uses adjustment weight K to partially adjust the real estate price. The appraiser's expected real estate price at time t is the weighted average price of past appraisal prices and market transaction price information.

$$P_t^* = KP_t^T + (1-K)P_{t-1}^* \quad \text{.. (5)}$$

Quan and Quigley only developed a theoretical model. Clayton et al. (2001) defined weight K as the appraiser's confidence parameter to the information. However there is no research on appraisal smoothing in Taiwan. This paper studies the appraisers who, due to lack of confidence in market transaction information, and in valuing the same real estate in consecutive periods anchor onto their previous appraisal values and have partial adjustment results. Quan and Quigley (1991) believed this is a rational behavior when appraisers have market information uncertainties. First, we examine if partial adjustments existed in reappraisal values. A stronger partial adjustment affect will have a more serious appraisal smoothing result. Then we study the factors, such as lack of confidence in available information, that affect partial adjustments. When market noise is stronger, the reappraisal will be more conservative. We also include a proxy variable for market information quality into our model. If an appraiser has ambiguity aversion, rational behavior will give less weight to uncertain market information. When following rational behavior, market information will have lower weight; previous appraisal will have higher weight.

3. Data and methodology

3.1 Descriptive statistics

This paper emphasizes the use of disaggregated data to test appraisal smoothing. There are 8 REITs cases in Taiwan. According to the Taiwan Real Estate Securitization Act, trust properties should be reappraised every three months. If there are more than two appraisal values from different appraisal firms, the average real price is the appraisal value. There are 26 real estate reappraisal cases in these 8 REITs. The first one is FuBan number 1 which was issued in the end of 2005 and the reappraisal in 2006Q1. The last day of a season is the reappraisal date. Our data set is panel data. Since the first T-REIT, real estate is a growing market and does not have many decreasing prices. There are 120 reappraisal samples and we obtained 38. The description is in Table 2. From the dispersion degree, the standard deviation of market value, 0.099723, is higher than the other three methods. It indicates that market information is relatively dispersed, implying a valuation smoothing phenomenon.

Table 1. T-REITs Market (by 2009 October)

Names of REIT	Date Issued	Trust Property	Location	Scale(US$ millions)
FuBon REIT#1	Mar. 2005	2 offices, 1Serviced Apartments,1 retail	Taipei	241.49
Cathay REIT#1	Oct. 2005	1 office, 1 Hotel, 1 retail	Taipei	415.82
Shin Kong REIT#1	Dec. 2005	2 offices, 1 retail, 2 apartments.	Taipei, Tainan	447.76
FuBon REIT#2	Apr. 2006	3 offices	Taipei	217.91
San Ding REIT	Jun. 2006	1 office, 1 retail, 1 warehouse	Taipei, Taoyuan	114.93
Kee Tai REIT	Aug. 2006	1 office, 1hotel and office	Taipei	73.73
Cathay REIT#2	Oct. 2006	3 offices	Taipei	214.93
Gallop REIT#1	May 2007	2 offices, 1 warehouse	Taipei	127.76
Total volume		26		1743.88

Table 2 Statistic description of market value and appraised value

	value from market information	Value from market approach	Value from Direct capitalization method	Value from DCF
Mean	1.073399	1.039535	1.022582	0.970929
Std. Dev.	0.099723	0.04508	0.03403	0.028827
Kurtosis	0.363228	1.351678	1.127277	3.022518
Skewness	0.114974	-0.60712	1.028876	-1.08782
Min	0.890836	0.900626	0.967509	0.872841
Max	1.33396	1.131285	1.120968	1.029453
N	38	38	38	36

3.2 Appraiser's reappraisal strategy

Following the specification in Equation (5), we can test the null hypothesis by estimating the simple linear regression model.

$$P_{j,t}^{*} = \alpha_0 + \beta_1 P_{j,t-1}^{*} + \beta_2 P_{j,t}^{M} + \varepsilon_{j,t} \qquad (6)$$

Where dependent variable $P_{j,t}^{*}$ is the appraised value of property j at time t. Independent variable includes $P_{j,t-1}^{*}$ and $P_{j,t}^{M}$. $P_{j,t-1}^{*}$ is the appraised value of property j at time t-1, namely previous value. $P_{j,t}^{M}$ is a proxy market value variable of property j estimated by equation (7).

$$P_t^M = \frac{NOI_i \times (1 + \Delta RENT_{t-i})}{\overline{CAP_t}} \quad \text{……………………………………………} (7)$$

Where NOI_i is net operation income at time i, $\Delta RENT_{t-i}$ is the rent difference between time i and time t, $\overline{CAP_t}$ is the mean value of capitalization rate at time t.

To reduce variance heterogeneity problems caused by large scale, this study will take the natural logarithm on each variables, and thereby avoid coefficient estimates bias. The double−log model is：

$$Ln(P_{j,t}^*) = \alpha_0 + \beta_1 Ln(P_{j,t-1}^*) + \beta_2 Ln(P_{j,t}^M) + \varepsilon_{j,t} \quad \text{………………………..……} (8)$$

4. Empirical Result

4.1 Reaction on market information

Table 3 presents the result of our test of the smoothing hypothesis in the T-REITs re-appraisal database. It shows in both coefficient estimates that there is not much difference between the two models equipped with appropriate well-adjusted R square, 0.99. However both Jarque-bera test and Breusch-Pagan chi-square test indicate that we can reject the null hypotheses, and from lower J-B value we find a linear model can't fit the requirement of normality and variance heterogeneity. Therefore we used the double log model for continuing analysis.

As table 3 shows, we can reject the null hypothesis at a 1% significance level. There exists in the data partial adjustment behavior. Appraisers give higher weight, 0.83746, for the market information, and less weight, 0.158595, for previous appraised value. This is similar to the result Clayton et al. (2001) did (see table 4).

Table 3 Empirical result of partial adjustment model

	linear regression model			log−log model		
	Coefficient	Std Err.	t value	Coefficient	Std Err.	t value
constant	-32419100	3.38E+07	-0.958984	0.095861	0.342829	0.279617
Previous value	0.869221	0.0935231	9.29419 ***	0.83746	0.076572	10.9369 ***
Market information	0.159572	0.0745773	2.13968 **	0.158595	0.071715	2.21146 **
N	38			38		
Adjusted R^2	0.99508			0.99085		
F-test	3743.64 ***			2003.73 ***		
Skewness	0.8359			0.5458		
Kurtosis	6.2438			3.669		
J-B test	21.08549 **			2.5953		
B-P value	69.3716 ***			3.8233		
				Jointly Null H: $\beta_1 = 0, \beta_2 = 1$ F（2,35）= 72.2454***		

*** Significant at the 1% level.
** Significant at the 5% level.

Table 4 Comparison of appraiser's confidence on market information

	method	Reference point	Confidence level, K	Familiar with the market
Hansz（2004）	Control experiment	Past transaction value(higher one)	0.48	Not familiar
Diaz & Hansz（1997）	Control experiment	Other appraiser's estimate	0.54	Not familiar
Hansz（2004）	Control experiment	Past transaction value(lower one)	0.66	Not familiar
Clayton, Geltner, and Hamilton（2001）	Empirical	Past appraisal value	0.69	Familiar
Diaz & Wolverton（1998）	Control experiment	Past appraisal value	0.70	Not familiar
This paper	**Empirical**	**Past appraisal value**	**0.86**	**Familiar**
Clayton, Geltner, and Hamilton（2001）	Empirical data	Past appraisal value	0.87	Familiar
Diaz（1997）	Control experiment	Past appraisal value	0.88	Familiar

Source：Hansz（2004）

4.2 Reaction on information quality

In this section we will investigate adjustment influence factors. Firstly, we test the rational behavior of appraisers reacting to low quality information. We replace the "noise" proxy variable with the difference rate of market-extracted values. As the value information extracted from the market has greater variation, the appraiser will take insufficient comparatives and know less about the market, or need to place far more adjustment magnitude on property characteristics. Secondly, the type of reference point may have a different impact on the appraiser's level of conservatism; appraisers could have more confidence in their own appraised value rather than in others' valuations. Finally we investigate whether the client background will affect the adjustment pattern, a hypothesis that the size of clients will affect the adjustment parameters will be tested.

From equation (4), we rewrite Quan-Quigley model to be equation (9). That is, appraisers will partial adjust to the market change, the difference of contemporaneous market information and last appraised value.

$$P^{*}_{j,t} = P^{*}_{j,t-1} + K\left[P^{M}_{j,t} - P^{*}_{j,t-1}\right] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$$

then $K_{j,t} = \dfrac{P^{*}_{j,t} - P^{*}_{j,t-1}}{P^{M}_{j,t} - P^{*}_{j,t-1}}$

The parameter K is what we concern the weight of appraiser put on market information. To avoid K parameter to be zero and not to set aside the unchanged value, we define the dependent variable to be level of conservatism or named anchoring degree (AD), 1-K. The adjustment influence factors model is specified as follow:

$$AD = \alpha \cdot noise + \sum_{l=1}^{n} \beta_l D_l + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (10)$$

Noise is defined as the absolute value of the ratio of the difference between comparison value and capitalization value to the comparison value, $noise = \left| \frac{P_{comps} - P_{cap}}{P_{comps}} \right|$. Higher difference between comparison value and the capitalization value means more noise in the market. A dummy variable set is to test whether reference point and client size affects the adjustment. The variable description is in Table 5.

Table 6 shows that the regression model is significant at 1% level. T-REITs appraisers do react conservatively to low market information as noise increases. The result is the same with Clayton et al. (2001). The dummy set of reference point types shows appraisers refer to transaction prices but not other appraiser's opinion. Appraisers have less anchoring effect to transaction prices, which means that appraisers have more confidence in their own judgment. Moreover, the model result shows the larger the client is, the more conservative the adjustment strategy.

Table 5. Variable description

Variable	Mean	Std. Dev.	measurement	Description
AD*	0.7786	0.4465	continuous	How conservative appraisers are when reappraised trust property
noise	0.0243	0.0219	continuous	Proxy variable of market comparison quality
D1	0.0426		discrete	Categories of reference point (other appraisers' opinion=1, other=0)
D2	0.0213		discrete	Categories of reference point (property transaction price =1, other=0)
D3	0.5957		discrete	Relative size of clients (financial holding co. as originator =1, others=0)

* Notes as dependent variable.

Table 6. Results of $AD = \alpha \cdot noise + \sum_{i=1}^{n} \beta_i D_i + \varepsilon$

Variable.	Coefficient	Std. Err.	T-value
noise	8.772***	2.680	3.273
D1	-.029	0.339	-0.084
D2	-1.064**	0.470	-2.262
D3	.539***	0.118	4.572
R-squared = 0.702	Adjusted R-squared = 0.493		
F（4,90）= 21.883	Prob.= 0.00000***		

***Significant at 1% level.
** Significant at 5% level.

4. Conclusion

Regression results show that we reject the jointly null hypothesis of full adjustment to market fluctuations and the confidence parameter is 0.84. We find that appraisers have partial adjustment strategies. Moreover, we find appraisers give less weight to current market information because of market noise. Market noise does decrease appraisers' confidence. That means appraiser's partial adjustment is a rational behavior in T-REIT's reappraisal. The result is similar to Quan and Quigley (1991).

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