

# Appraisal Smoothing and Appraisers' Partial Adjustment

## Behavior---Evidence from Taiwan REITs\*

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### Abstract

Previous studies defined appraisal smoothing as reduced volatility or the lag structure of appraisal-based index as compared to transaction-based index. Most of these studies examined from an aggregate level and used extensive data sets in order to de-smooth the appraisal-based index. This paper aims to observe smoothing behavior amongst appraisers in Taiwan. It uses re-appraisal data of T-REITs and employs the partial adjustment model developed by Quan and Quigley (1991) to observe smoothing phenomena. The results show that the confidence parameter is 0.63 and verifies that partial adjustments existed. We find that appraisers in Taiwan place less weights to market information because of market noise. And we observe that appraiser has various adjustment strategies, bigger client more conservative.

Keywords: appraisal smoothing, partial adjustment, REITs, re-appraisal

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## **1. Introduction**

Appraisers should estimate the market value of property, theoretically the value estimates should be the unbiased estimator of market value. But some empirical evidence suggests that appraised value differ from the transaction price. Fisher et al. (1999) discuss the appraisal accuracy in NPI database found that property sales price exceeded the appraised values in up market, and the reverse of down market. The phenomena of appraised value insufficiently react to market fluctuate is so-called Appraisal Smoothing. Yiu et al. (2006) consider the persistence of estimate error, or systematic bias, will greatly affect investors' judgments. We are wondering what causes the appraised value deviate from sales price, furthermore differ from market value.

In previous studies, we can observe the appraisal smoothing in aggregate level index, there are two major characteristics of appraisal smoothing, first is the appraisal-based index has the lower volatility compared to transaction-based index. The second feature is the lag structure of the contemporaneous appraisal-based index. The lower volatility and lag feature commonly explained by the appraiser lack of confidence or anchor on the previous appraised value, that is, the appraiser behavior contention, and we will discuss in disaggregate level appraisals.

In the aspect of behavior research by controlled experiment, appraisers did anchor on value reference points like previous appraised value or transaction price with less adjustment toward market change. However the behavior contention still restrains from the empirical data supports (Yiu et al., 2006). The aim of this paper is to find out what causes the appraisal smoothing in disaggregate level, and the influence factors of appraisers' behavior which induce the insufficient react to market fluctuation. T-REITs property reappraisal data provided access to test the hypothesis we developed, the reappraised values enable us to observe how appraiser react to market condition change with the same property characteristics. Furthermore, the appraisers in REITs structure play an important role by transfer the value and income information from private market to public market, that is, the price discovery process

between two markets with common value components (Geltner et al. 2003). Revealing the opinions of market participants about the securitized asset is the appraisers' task, which information provided market participants to measure the return and risk of assets and make the investment strategy. It is important for the appraisal reports users to know the appraiser behavior and background of the appraised value formation.

The purpose of this study is to present the evidence that appraiser partial adjustment will be affected by numerous factors in disaggregate level and that will induce appraisal smoothing in aggregate level. We have organized the rest of this paper as follows: section 2 is appraisal smoothing and partial adjustment literature review. This paper employs the rational partial adjustment model developed by Quan and Quigley (1991). Moreover we not only investigate the confidence of appraisers but the anchoring effect and the client preference in the appraisal industry. Section 3 is the data analysis and we will briefly introduce the T-REITs market. Empirical model and results are then presented. The final is our conclusion.

## **2. Literature review**

### **2.1 Appraisal smoothing**

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

Previous appraisal smoothing research 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 in appraisal index and transaction index. Geltner (1998) argued that Lai and Wang (1998) did not distinguish between disaggregate level random error and systematic error which carries to aggregate index. A broader perspective to conceptualize 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, used State Space Model (SSM) to study the rational adjustment model. Clayton et al.(2001) based on individual appraisal data, using Quan and Quigley (1991) partial adjustment model to study 202 reappraisal reports for 33 real estate cases. By setting confidence level as the transaction price data available to the appraisers, they found that confidence level varies over time. In different economic condition, appraisers will have different confidence level and use different appraisal adjustment. Therefore, de-smoothing model should use different coefficients over time. Previous appraised result can affect appraiser's valuation on the same real estate in consecutive period 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 researches study commercial real estate. Transaction price of the commercial real estate is hard to collect. Most of the research can only use appraisal price to study risk and return relationship or portfolio analysis. Most of the researches on aggregate level focus on appraisal data adjustment to construct price index and develop de-smoothing model under the assumption of the existence of appraisal smoothing. Brown et al. (1998) criticized this assumption. Without more detail analysis the reason for appraisal smoothing we can't make sure to de smooth and can't state appraisers wrong use the methods, does

not have enough experience, or does not use all of the market information<sup>1</sup>.

In order to understand the characteristics of appraisal smoothing, some researches focus on individual level to study the appraisal process and appraiser behavior to 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 fewer experiences and the appraiser has more experience. The appraiser should extract useful information from the market. When the noisy signal is bigger, and it is harder to observe market price, appraiser should adjust the price more conservatively. Different from the perception of previous research, appraisal smoothing of appraiser is rational and is consistent with an optimal updating behavior.

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

## **2.2 Appraisal behavior**

Using previous transaction price (Ibbotson and Siegel, 1984:222) or previous appraisal (Ross and Siegel, 1987; Geltner, 1989) may cause auto correlation and appraisal smoothing. During appraisal process, appraisal may also be confined by the past appraisals. Hansz (2004) used control experiment to study the impact of past transaction price on partial adjustment behavior of expert appraiser and non-appraiser. It is found that past transaction price knowledge induces partial adjustment behavior on expert appraiser. It could be that reason that Uniform Standards of Professional Appraisal Practice (USPAP) required formal document on

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<sup>1</sup> Appraisal smoothing literature asked appraisers to be as closed to the transaction price as possible. This concept is different from the market price appraisal practice in appraiser industry.

appraisal practice, such that appraiser cannot ignore previous appraisal price or transaction price. 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 human will use a quantitative number as a reference for appraisal. And use this reference number for adjustment. Anchoring may cause partial adjustment problems (Kahneman and Tversky, 1973). Diaz and Wolverton (1998) used longitudinal experiment to study reappraisal and found partial adjustment phenomenon of the appraiser due to past appraisal price. Hansz (1004) found past transaction price also has impact on 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 appraiser's lack of confidence. Only Clayton et al. (2001) showed that appraiser's confidence can cause appraisal smoothing. The motive of partial adjustment remains an area for further study.

When an appraiser uses sales comparison method, collects comparison cases, or obtains capitalization rate from the market, all uses past transaction information. It is very likely to have 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 study and do not have individual level study on 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 transaction model which is the weighted average of reservation price and offer price to develop an individual appraiser partial adjustment model to explain the appraiser's reappraisal behavior in the real estate appraisal market.

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

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

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

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

Transaction price and unobservable market price has a long term equilibrium relationship:

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

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

$$P_t^* = E[P_t | P_t^T, I_{t-1}]$$

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

$$E[P_t | P_t^T, I_{t-1}] = E[P_{t-1} | I_{t-1}] + K [P_t^T - E(P_{t-1} | I_{t-1})] \dots\dots\dots (4)$$

$K [P_t^T - E(P_{t-1} | I_{t-1})]$  is updating component.

Whoever, 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  $E(P_{t-1} | I_{t-1})$ , only uses adjustment weight K to partially adjust the real estate price. Appraiser's expected real estate price at time t is the weighted average price of past appraisal price and market transaction price information.

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

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 in appraisal smoothing in Taiwan. This paper studies the appraisers, due to lack of confidence on market transaction information, 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 adjustment existed in reappraisal value. A stronger the partial adjustment affect will have a more serious appraisal smoothing result. Then we study the factors, such as lack of confidence on available information, that affect partial adjustment. When market noise is stronger, the reappraisal will be more conservative. We include a proxy variable for market information quality into our model. If an appraiser has ambiguity aversion rational behavior will give less weight on the uncertain market information. When following rational behavior, market information will have lower weight  $K$ ; previous appraisal will have higher weight  $1 - K$ .

### **3. Data and methodology**

#### **3.1 Descriptive statistics**

There are 8 REITs cases in Taiwan. Based on Taiwan real estate securitization Act, trust properties should be reappraised every three months. If there are more two appraisal values from different appraisal firms, the average real price is the appraisal value. There are 26 properties real estate reappraisal cases in these 8 REITs. The first one is FuBan number 1 which issued in the end of 2005 has real estate 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<sup>2</sup>. There are 206 reappraisal samples until the second season of 2008. 136 (67%) cases have reappraisal value remain the same with the previous season. It is because appraisers believe that the value did not change significantly and does not need to give a new real estate appraisal value.

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<sup>2</sup> Only prices of 10 out of 206 reappraisal cases decrease.



We have 94 appraised values of all reports to investigate the reappraisal outcome, T-REIT appraisers tend to adjust the value judgment once 2-3 quarters. They claim that the real estate market didn't sharply change within the time interval. We find that the difference rate of value have a standard deviation 3.52%, the value judgment toward market fluctuation have different pattern.

Table 1. T-REITs Market (by 2008 October)

Names of REIT	Date Issued	Trust Property	Location	Scale(US\$ millions)
FuBon REIT#1	Mar. 2005	2 offices, 1 Serviced 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, Tao-Yuan	114.93
Kee Tai REIT	Aug. 2006	1 office, 1 hotel 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

### 3.2 Appraiser's reappraisal strategy

This paper studies appraisal smoothing at the individual level. We use 94 reappraisal data of T-REITs from the first season of 2006<sup>3</sup>. And we only have the reappraisal abstract which including more than two appraisal methods and weight average to have final appraisal result.

Because of autocorrelation, variance heterogeneity and variable scale problems. We modify equation (5) into:

$$\frac{P_t^*}{P_{t-1}^*} = K \frac{P_t^T}{P_{t-1}^*} + (1 - K) \frac{P_{t-1}^*}{P_{t-1}^*} \dots\dots\dots (6)$$

Rearrange equation (6), we have the regression model :

<sup>3</sup> 58 cases remain the same price of last season, since appraisers believe that the price does not have significant change.

$$\frac{P_{i,t}^*}{P_{i,t-1}^*} = \alpha + \beta \frac{P_{i,t}^T}{P_{i,t-1}^*} + \varepsilon_{i,t} \dots \dots \dots (7)$$

In equation (7), the constant term  $\alpha$  and parameter  $\beta$  are the weights we concern. We postulate the null hypothesis of full adjustment strategy that constant term  $\alpha$  be zero and parameter  $\beta$  be one. The data descriptive statistics is shown in table 2.

Table 2. Descriptive statistics

Variables.		Mean	Std. Dev.	N
Dependent variable	$P_{i,t}^*$ , the appraised value at time t	1.026163	0.05005	94
Independent variable	$P_{i,t}^T$ , the market info at time t	1.05686	0.06637	94

In the joint test, null hypothesis is that appraiser has full adjustment on new market information and does not rely on previous appraisal value. Alternative hypothesis is that appraiser relies on previous appraisal value and only has partial adjustment. :

$$H_0: \alpha = 0, \beta = 1 \cdot H_1: otherwise \dots \dots \dots (8)$$

Table 3 shows we can reject the null hypothesis at 1% significant level. There exists partial adjustment behavior. Appraisers give higher weight,  $K = 0.63$ , for the current market value, and less weight, 0.35, for previous appraisal value. This is the same with Diaz and Wolverton (1998), who found that there is anchor affect and had partial adjustment. However, Table 4 shows that T-REITs appraisers are more conservative than those of others.

Table 3. Empirical result of partial adjustment model  $\frac{P_{i,t}^*}{P_{i,t-1}^*} = \alpha + \beta \frac{P_{i,t}^T}{P_{i,t-1}^*}$

	Coefficient		Std Err.	T value
$\alpha$	0.3571389	***	0.066873	5.34055
$\beta$	0.6330297	***	0.064758	9.77531
R-squared = 0.704697		Adjusted R-squared = 0.701490		
F(1,92) = 219.54		Prob. = 0.00000***		
Jointly Null H: $\alpha = 0, \beta = 1$				

F(2,92) =96.1186

Prob. = 0.00000\*\*\*

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

Table 4 Comparison of appraiser's confidence on market information

	method	Reference point	Confidence level, <i>K</i>	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
<b>This paper</b>	<b>Empirical data</b>	<b>Past appraisal value</b>	<b>0.63</b>	<b>Familiar</b>
Hansz (2004)	Control experiment	Past transaction value(lower one)	0.66	Not familiar
Clayton, Geltner, and Hamilton (2001)	Empirical data	Past appraisal value	0.69	Unknown
Diaz & Wolverton (1998)	Control experiment	Past appraisal value	0.70	Not familiar
Clayton, Geltner, and Hamilton (2001)	Empirical data	Past appraisal value	0.87	Unknown
Diaz (1997)	Control experiment	Past appraisal value	0.88	familiar

source : Hansz (2004)

### 3.3 Reaction on information quality

This section we will investigate the adjustment influence factors. Firstly we test the rational behavior of appraisers react to low quality of information. The “noise” proxy variable we replace with the difference rate of market-extracted values. As the value information extracted from market has greater variation, appraiser will take insufficient comparatives and knew less about the market, or need to do much more adjustment magnitude on property characteristics. Secondly, the type of reference point may have different impact on appraisers' conservative level; appraisers could have much confidence on their own appraised value rather than the others. Finally

we investigate whether the client background will affect the adjustment pattern, a hypothesis of the size of clients will affect adjustment parameter 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.

$$P_t^* = P_{t-1}^* + K [P_t^T - P_{t-1}^*] \dots\dots\dots (9)$$

$$\text{then } K = \frac{P_t^* - P_{t-1}^*}{P_t^T - P_{t-1}^*}$$

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 conservative level or named anchoring degree, AD. The adjustment influence factors model is specified as follow:

$$AD = \alpha \cdot noise + \sum_{i=1}^n \beta_i D_i + \varepsilon \dots\dots\dots (10)$$

Noise is defined as the absolute value of the ratio of the difference between comparison value and capitalization value to the comparison value,

$$noise = \left| \frac{P_{comps} - P_{cap}}{P_{comps}} \right|. \text{ Higher difference between comparison value and the}$$

capitalization value means more noise in the market. Dummy variable set is to test whether reference point and client size affects the adjustment.

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

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 result shows that we reject the jointly null hypothesis of full adjustment to

market fluctuation and the confidence parameter is 0.63. We find appraisers have partial adjustment strategies. Moreover, we find appraisers give less weight to current market information because of market noise. That is noise does decrease appraisers' confidence in T-REIT's reappraisal. Finally we observe that different client size has various pattern of adjustment strategy. For bigger client appraiser is more conservative in adjustment. We suppose that bigger client has the great influence on appraisal, the client might prefer the stable value and income.

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