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Memo

To: Jim Clayton,
Director of Research,
Pension Real Estate Association

From: Anish Goorah,
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Subject: 2008 PREA Research Review
Bond and Hwang, REE, 2007

Date: 3/31/2008

Title: Smoothing, Nonsynchronous Appraisal and Cross-Sectional Aggregation in Real Estate Price Indices

Author: Shaun A. Bond and Soosung Hwang.

Citation: Bond S.A., and Hwang S., "Smoothing, Nonsynchronous Appraisal and Cross-Sectional Aggregation in Real Estate Price Indices", *Real Estate Economics,* 2007 35(3), pp. 349-382

Reviewer: Anish Goorah and Jin Shi

Related Topics: Index Valuation, Smoothing

1. General Description of the Research

This paper deals with some of the limitations real estate valuation indices suffer from. Smoothing, nonsynchronous appraisals and cross sectional aggregation are three typical challenges real estate valuation indices pose. Smoothing is responsible for inertia and downward bias in volatility the valuation indices exhibit. Nonsynchronous appraisals arise because the entire universe of properties cannot be traded or valued or traded at the same time. Therefore, the value of the property has to be inferred in some manner. The combination of smoothing and nonsynchronous appraisals implies that the aggregation of properties to form the index is no longer a straightforward exercise.

2. Description of Data and Methodology

The presence of smoothing (inertia) in the index suggests that the asset returns follow an autoregressive process. Since assets are not continuously valued (nonsynchrnous appraisals), the natural estimate of the value of the asset is an average of past valuations and comparative appraisals. When the smoothed and non synchronous assets are combined together, a higher degree of persistence than the usual autoregressive moving average process emerges. The higher persistence "long memory process" justifies a more robust modeling approach. In this case, the authors opt for an ARFIMA (Autoregressive Fractionally Integrated Moving Average) model.

A useful starting point when modeling asset returns is the Geometric Brownian Motion (GBM) process. While the GBM naturally leads to market efficiency, different stochastic processes are used to relax this assumption. It is shown that the first moment – the expected return – is not affected by the index smoothing. This is because on the index level, the return differences between the assets are nonsystematic. These differences tend to disappear in a large enough sample. However, the second moment – the variance - , suffers from a systematic downward bias. A biased variance affects the series autocorrelation and by extension, the sample correlation with other indices as well. Since actual transaction based returns are not observed, correcting for this bias is not a trivial process.

Although smoothing and nonsynchronous appraisal are related, the difference between them is that nonsynchronous appraisal is the time difference between the property valuation and the reported valuation date while smoothing is about the latest informational content of prices. In contrast to smoothing, non synchronous appraisals result in the mean and standard deviation differing from the

true process. Further, the authors show that inferring property specific smoothing from the overall index smoothing is only valid when the degree of smoothing is the same across the property and the index.

A Monte Carlo simulation is used to study the effects of smoothing and nonsynchronous appraisal separately. The results are subsequently aggregated in a cross sectional manner. Simulation evidence shows that aggregation of the two factors lead to higher persistence, thereby justifying the use of the ARFIMA model. Finally, the authors report statistical evidence which shows a generally superior performance for the ARFIMA models. The authors use the IPD UK and the NCREIF series to empirically confirm the simulation findings. In most cases, the findings are robust across both set of indices.

3. Application to Investors

The results in this paper have various applications to investors. First, since various investors associate volatility with risk, a downward bias in volatility from the indices would imply a downward bias in risk as well. Further, from a portfolio allocation perspective, biases in the volatility will affect correlations and asset allocation. In addition, the high persistence exhibited in the series could also be used to create better models for the indices. Finally, the lower volatility could also the pricing of impact property options.

4. Caveats

As is the case in standard econometric literature, Maximum Likelihood Estimation (MLE) is used to estimate the various models. However, the difficulty lies in the behaviour of MLE in small samples. It would have been useful for the authors to present simulation evidence showing the sensitivity of the estimates to the sample size. Notwithstanding the above, the work done in this paper is of very high quality.