The Present Value Model with Time-Varying Discount Rates: Implications for Commercial Property Valuation and Investment Decisions

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Questions of investment "timing" and the possibility that real estate returns may be somewhat predictable have recently moved to the forefront of the concerns facing institutional investors in real estate. This is largely a consequence of the experience of many investors who made substantial property investments during the mid 1980s, only to see these assets lose much of their value when the property markets experienced several years in succession of substantial losses in value during the late 80s and early 90s. Even "optimal" diversification (for example, if an investor could have held the Russell-NCREIF Index) would not have saved investors from this historical loss of value.

The present report seeks to address this concern by presenting some tools from modern financial economics which can be useful in predicting real estate returns and applying this predictability in the investment decision-making process. We also use these tools to analyze the nature of risk and return in the private (i.e., "unsecuritized") property market. In particular, the present report accomplishes four major tasks:

Develops a Forecasting Model for predicting real estate cash flows and returns;

Applies the forecasting model to demonstrate its use in developing a simple "Buy/Sell" decision rule to help with investment timing decisions;

Demonstrates how the forecasting model can be imbedded in an "improved" present value model to account for the time-variability and predictability of real estate returns in the valuation of property;

Uses this improved present value model to develop a simulated historical series of real estate "present values," to show the relative importance of changes in return expectations versus changes in cash flow expectations in causing real estate value changes.

1. Developing the Forecasting Model:

The objective of this part of the analysis is to develop a model for forecasting the total nominal return and the operating cash flow of privately traded commercial property. The return forecasts from this model will then comprise the "expected" returns or "discount rates" applied in the present value model of property value. The cash flow forecasts will represent the "numerators," or cash flow expectations in the present value model. The analysis is conducted on annual returns and cash flow data from 1975 through 1992 (18 observations). The real estate returns are based on Russell-NCREIF returns (extended back to 1975 by splicing PRISA returns onto the series prior to 1978), corrected for appraisal smoothing. The cash flow series (NOI level) is derived from the income and appreciation return components of the Russell-NCREIF/PRISA data.

The forecasting model we develop is a first-order Vector Autoregression (VAR) with five variables. In addition to the real estate returns and cash flows, we use REIT returns, appraisal-based returns, and appraisal-based yields. The model predicts the (unsmoothed) real estate market returns with an adjusted R^2 of 56%, and the cash flows with an adjusted R^2 of 94%.

2. Market Timing:

The forecasting model described above can be used to develop market timing rules. For example, the rule:

Buy, if model predicts 2 years of above average returns;
Sell, if model predicts 2 years of below average returns.

results in the buy/sell signals indicated in Figure 1 when applied to historical data. Figure 1 is a graph which shows the historical market value profile of commercial property (unsmoothed), with the Buy/Sell signals indicated. The model and rule gave "Buy" signals in 1976-80, and "Sell" signals in 1981 and 1984-90. Interestingly, a "Buy" signal was given again in 1992 for the first time in 10 years.

3. Improving the Present Value Model:

In the present value model used to value commercial property in a discounted cash flow framework, the discount rate is traditionally assumed to be constant. This discount rate is supposed to represent expected total returns to the property investment. Much recent financial economic research into the stock market, as well as the return forecasting model described above, suggests that expected returns are not constant over time, and can in fact be forecasted to some extent, as with our VAR model. Indeed, we find private property market returns to be particularly forecastable, much more so than REIT or stock returns (e.g., the 56% R^2 in our VAR model return forecasts is much greater than what is typically obtained in forecasts of risky securities returns).

In the present report we present a log-linear approximation to the traditional present value model which enables return forecasts to be included in the discounted cash flow framework along with the cash flow forecast. The result is a present value model that takes account of the time-variability and predictability of property return expectations. We have applied this approach to historical data using our VAR model. The resulting simulated historical "present values" agree much more closely with actual unsmoothed historical property market values than does the appraisal-based index. The model also demonstrates that most of the changes over time in property values have resulted from changes in future total return expectations rather than from changes in future operating cash flow expectations. This is seen in Figure 2, a graph which shows the simulated historical present value series with and without allowing the expected returns (discount rates) to be variable over time (forecasted by the VAR model). Note that when we allow the cash flow forecast to vary over time but hold the expected returns artificially constant, real estate values appear to have very little volatility. This suggests that changes in risk perceptions or risk tolerances among real estate investors have driven much of the recent "boom and bust" in the commercial property market, rather than changes in operating cash flow expectations.