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From Theory to Practice

A New Approach to Real Estate Risk, Part II

Executive Summary

- **The new model allows investors to measure real estate risk similarly to other asset classes.**
- **Investors now can determine the composition of risk for individual properties and whole portfolios.**

In "Finding Equal Footing" (*The Institutional Real Estate Letter,* September 2005), we outlined a model that measures private equity real estate risk using a securities-market approach. It is a second-order model designed to directly forecast the uncertainty of returns at the property level. Property-level risk forecasts then can be aggregated to the portfolio level and further aggregated with other asset types, such as stocks and bonds. It also provides estimates of the usually unobservable correlations between the returns of different properties and with other asset classes. In addition, the model can be used as a framework to estimate the incremental contribution of individual properties and groups of properties to the portfolio.

By presenting the output of the model in a way that is familiar to risk managers in other asset classes, we aim to provide the missing link between private equity real estate and other more liquid asset classes in terms of risk evaluation. Such a bridge should allow real estate managers to operate with equal footing in the slippery worlds of risk management and asset allocation.

REVIEW OF THE MODEL

The model breaks the risk of each property into four pieces, which are evaluated in the Northfield Everything Everywhere (EE) model — similar to what would be done with comparable risks arising in marketable securities. First, we project the future cash-flow stream from the property, inclusive of appropriate treatments of vacancy rates, tenant rollover and tenant defaults. We then can measure directly how changes in interest rates (and, hence, congruent changes in capitalization rates) affect the valuation of the cash flows. This is akin to the way a bond portfolio manager evaluates risk.

Our approach to forecasting cash flows is similar to that found in software packages such as Argus and Circle but with less detail and precision. Cash flows are based on projected net operating income (NOI), which is driven primarily by occupancy, rent levels and expenses over time. Recognizing that inflation and rental growth are not correlated perfectly in the short run, in future versions of the model we will impose a rent forecast for the first five-year period and then revert to inflation-driven rents in the out years. This should help improve the model's robustness. NOI also depends on occupancy levels because vacant space generally is costly to the landlord. Therefore, a building's vacancy is assumed to move from its current level to a long-term equilibrium structural vacancy rate, which varies by property type. The model assumes reversion to the mean with respect to market factors, such as occupancy.

"Forecast Cash Flows" (page 36) shows a building whose current vacancy rate is well below the market's. As the building trends toward market equilibrium, cash flows decline to reflect the loss of tenants to other buildings. Once it approaches market occupancy, it is assumed to trend with the market thereafter.

Lease renewal rates for existing tenants also are inversely related to market vacancy levels. The higher the market's vacancy rate, the more options a tenant has and the less likely a new lease will be signed. Downtime between leases needs to be incorporated, and it also is a function of the vacancy rate at the time of renewal. Finally, rents are assumed to move with inflation in the long run, and the useful life of a building is assumed to be 50 years from the start of the analysis.

Similarly, we next can analyze the outgoing cash flows associated with the provisions of the financing structure. This process is comparable to that of a bond portfolio manager with a short position in a set of fixed-interest securities. If it is cross-collateralized, we bundle like properties together and create a composite asset consisting of the cross-collateralized properties. The issues of fixed versus adjustable rates are modeled. Prepayment options also are incorporated and are similar to having embedded call options, where the exercise price is the prepayment penalty plus the outstanding loan amount at that time. A conservative approach with respect to the borrower is taken by assuming that default is not an option.

The next step is to include the impact of tenant credit risk on the uncertainty of expected returns. As the effect of tenant defaults on cash flows already has been accounted for, this step concentrates on forecasting volatility in capitalization rates. One cause is changes in the credit quality and diversity level of the tenant mix. Another cause is that general investor confidence varies through time, sometimes demanding more or less incremental yield from investments of perceived lower quality.

Anchor credit risk is represented with the parameters estimated by the EE model based on the anchor's credit rating. All other tenants are considered "generic" tenants, and their credit risks are determined by weighting EE credit-risk parameters by employment-sector share in the local economy. Corporate credit ratings provide a conservative measure of tenant risk — economic losses due to corporate bond defaults typically are higher than economic losses arising from tenants defaulting on rent.

Finally, we look at the impact of rent and occupancy volatility. Rather than try to assess this through Monte Carlo simulations of the cash-flow stream, we model this aspect in an option-like framework, where the property owner takes risk by betting that rent and occupancy will be constant.

The rent and occupancy volatilities are projected from a supply-and-demand model. Supply statistics are based on the current conditions in the local market; variability of demand is based on the volatility of financial performance for the economic sectors that contribute to the local economy. Demand volatility for Palo Alto, Calif., office space, for example, would be projected based on the observed volatility of financial performance of the high-tech sector that dominates economic conditions in that area.

In most markets, the supply of commercial space changes proportionally with demand over the long run, and although supply spikes are not uncommon, they largely are uncorrelated with the EE model's broad economic factors and are a function of local market conditions. In contrast, demand for commercial space is elastic and can be captured by relating percentage changes in rents to the broad economic factors of the EE model.

Estimating rent volatility is a two-step process. First, regressions are run in which rent volatility is a function of a local market demand-supply gap as well as an initial market conditions variable. Demand volatility is estimated as a function of the EE model factors that represent broad industrial sectors of the economy, weighted by the local market's employment mix. Supply is the change in the metro area's building stock. The initial conditions variable is a moving average of vacancy rates and is important because markets are rarely in equilibrium at any one moment. Therefore, we need to explicitly account for the fact changes in the demand-supply gap have a different impact when vacancies are 5 percent versus 25 percent. Each property's or composite asset's current exposure to rent volatility is related to current vacancy plus annual lease turnover (i.e., space subject to rent negotiation).

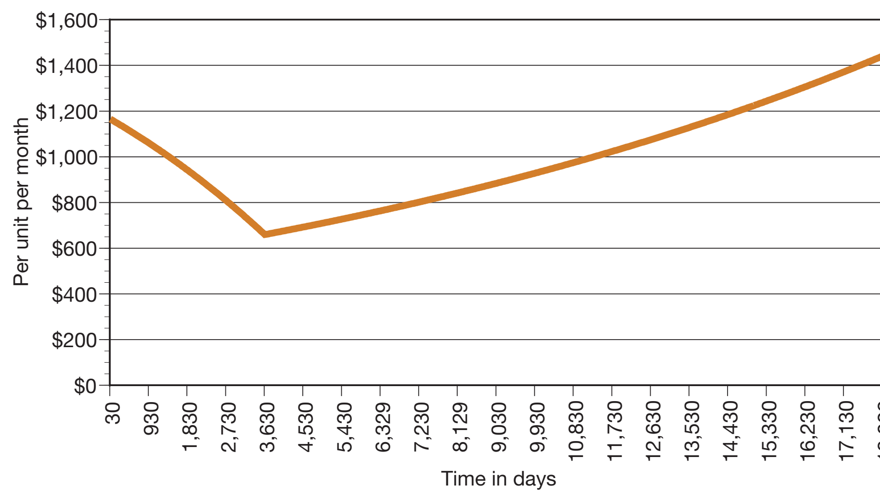
REQUIRED INPUT DATA

To make the model useful, we must define a parsimonious set of input data that can be collected for actual real estate portfolios. The inputs the model uses for each property are dominant property use (apartment, hotel, industrial, office or retail); current occupancy; anchor tenants (square footage, lease renewal date and credit rating); debt (property-only or cross-collateralized, duration, fixed or variable, coupon rate, and prepayment options/penalties); expected capital expenditures; current effective rent; and current estimated property value. Data also is collected on local real estate market conditions for each area in which a property is located.

AN EMPIRICAL EXAMPLE

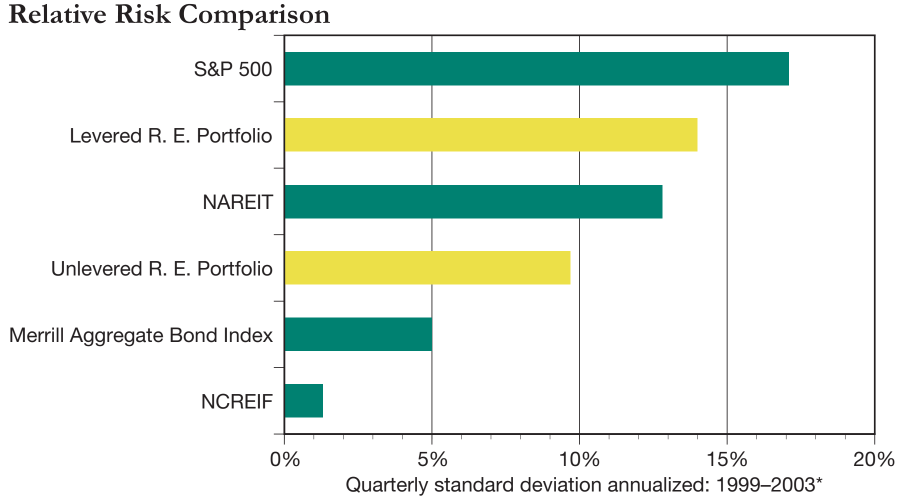
Much of the motivation to create the model came from Investcorp, an institutional investor based in Bahrain. Investcorp sought a methodology to measure real estate risk from various perspectives, including the individual-property and portfolio levels, as well as the amount of risk arising on its own balance sheet as a co-investor. With a statistically more accurate way to aggregate real estate risk relative to its other investments — private corporate equity and hedge fund of funds — it would be able to evaluate capital risk allocation for deals in all

Forecast Cash Flows: Building with Below-Market Vacancy



Sources: Northfield Information Services, Investcorp

Relative Risk Comparison



**Quarterly standard deviation times the square root of 4*

Source: Northfield Information Services stages. Additionally, the Basel II capital accord permits a closer alignment between economic and regulatory risk capital for institutions able to use a model approach for risk assessment, something which Investcorp now can extend to its real estate portfolio.

The model was applied to Investcorp's portfolio of U.S. commercial real estate. Analyses were conducted in early 2004 and in early 2005. At both points, the portfolio contained more than 40 properties, including more than 25 separate combinations of property type (office, retail, hotel and residential) and geographic location. The aggregate purchase cost of the properties was in excess of $1.5 billion, with considerably greater market value. Almost all of the properties had significant financing in place, and in the case of several subgroups, the financing was cross-collateralized.

"Relative Risk Comparison" (page 36) shows, for the overall portfolio, the expected return volatility was about 10.0 percent on an unlevered basis and approximately 14.0 percent given its current financing structure. These compare to about 13.0 percent for the NAREIT Equity Index, 5.0 percent for corporate bonds and 1.3 percent for the NCREIF Property Index during the same period. These volatility values were measured over the trailing five years, which is comparable to the EE model estimation sample period.

At the individual-property level, the forecast return volatilities were between 8 percent and 12 percent per year on an unlevered basis, with forecasts of between 9 percent and 30 percent annual volatility for the returns on equity. To check the reasonableness of the results, we formed two lists of the properties, ranked from least risky to most risky. One list was created based on the unlevered risk values and the other list inclusive of financing. When the lists were presented to the investment professionals who had acquired and managed the properties, the relative risk rankings were found to be highly intuitive and consistent with management beliefs.

Last, we review the risk decomposition of a single property: a medium-size shopping center. Each row of the "Risk Decomposition" table (below left) describes the contributing influence on the property return of a particular factor in the EE model. The exposure column represents the sensitivity of the property's return to the factor, while the factor variance column describes the volatility (in variance units) of the returns associated with this factor. The annual volatility of oil prices, for example, is listed at a variance of about 1,800 percent^2. The product of the exposure squared and the factor volatility would sum to the value of the variance contribution column if the returns to the factors over time were uncorrelated. To the extent that correlations exist among the factors, the variance contribution column also includes the respective covariance terms. The factor contributions sum to a total of 89.96 percent^2. We then add specific tracking variance, which accounts for risk aspects of the property that could not be included in the model. In variance units, we have a total of 90.38 percent^2 or 9.51 percent per year in standard deviation terms.

Risk Decomposition: Medium-Size Shopping Center

Factor	Exposure	Factor variance	Variance contribution
English-speaking countries	0.01	291.21%^{2}	0.20%^{2}
Industrial sector	0.01	367.84%^{2}	–0.19%^{2}
Consumer sector	0.15	196.03%^{2}	2.39%^{2}
Technology and health sector	0	690.97%^{2}	0.03%^{2}
Interest rate–sensitive sector	–0.03	223.17%^{2}	–0.30%^{2}
Non-energy materials	0	402.95%^{2}	–0.02%^{2}
Energy mineral sector	0	285.09%^{2}	0%^{2}
SB world government bond index	0.18	54.68%^{2}	6.43%^{2}
Oil prices in USD	0.01	1,808.21%^{2}	0.67%^{2}
Developing market	0.18	107.66%^{2}	6.69%^{2}
Size	0.32	128.89%^{2}	17.02%^{2}
Dividend yield	0.07	158.19%^{2}	1.44%^{2}
Treasury curve factor 1	–13.4	0.31%^{2}	56.00%^{2}
Treasury curve factor 2	–3.61	0%^{2}	0.11%^{2}
Treasury curve factor 3	–0.79	0.02%^{2}	–0.50%^{2}
Factor Tracking Variance			89.96%^{2}
Specific Tracking Variance			0.42%^{2}
Total Tracking Variance			90.38%^{2}
Return Standard Deviation			9.51%

Sources: Northfield Information Services, Investcorp

THE BOTTOM LINE

The model provides a framework for determining how much of the risk of investing in a property arises from characteristics of the specific property and how much of the risk arises from common influences across all properties. This new level of transparency will encourage investors to be confident in their understanding of real estate and, consequently, to allocate more resources to it.

One interesting use of the model would be the development of synthetic "real estate" by creating securities portfolios that are constructed to some comparable exposure to the economic forces that drive returns. Such products may be an important step in overcoming the illiquid nature of real estate. This approach to estimating real estate risk also provides an avenue for innovations in real estate practice, including better benchmarks, the active hedging of interest rate risk to property values, and the more appropriate inclusion of real estate in optimal asset allocation. ❖

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