Measuring Risk in Commercial Real Estate Investments

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Reallocating capital expenditures in reported real estate return data can produce improved measures of income and appreciation. These appreciation numbers can then be unsmoothed to provide more plausible risk measures than are otherwise possible. Improved historical risk measures form a basis for improved risk forecasts, which can, in turn, be used to understand and quantify the return implications of the powerful forces propelling market integration.

Analysts in the real estate market encounter difficulties developing estimates of risk and return primarily because of problems inherent in the available reported data. This presentation describes a general framework for understanding and pricing risk in the commercial real estate market. The framework has been applied by Brinson Partners for more than a decade to global equities, global bonds, high-yield bonds, real estate, and venture capital. The presentation will describe making appropriate adjustments to the reported numbers, examining and forecasting risk, and pricing risk using a capital asset pricing model approach.

Adjusting the Reported Numbers

In developing estimates of future risk, an examination of the historical data is often a good starting point. Most commercial real estate return data, however, are based on accounting definitions of income and appreciation and rely on appraisals to measure market-value changes. In their raw form, such data can be misleading. The following techniques can increase the usefulness of the reported numbers for describing the characteristics of the underlying investments.

Reallocating Capital Expenditures

In evaluating the historical performance of an asset, an investor would like a record of its price and income. To an investor, income means cash flow. Securities such as stocks and bonds pay out cash directly in the form of dividends and coupons. Private commercial real estate investments are different. By convention, they do not pay out cash income when it is earned; so, an investor will have difficulty knowing how much of the return was income and when it was earned.

The first adjustment attempts to provide differentiation between price change and income. Income is defined here as distributable cash that does not reduce principal. Removing capital expenditures from reported income and adding them back to appreciation results in an improved measure of distributable cash. Conventionally, income is reported gross of capital expenditures. The capital expenditures are then netted from the ending market value before the price change is calculated. The following formulas show the Russell–NCREIF (National Council of Real Estate Investment Fiduciaries) reporting convention for calculating income and appreciation returns:

$$\text{Income} = \frac{\text{NOI}}{\text{BMV} + \tfrac{1}{2}\text{CI} - \tfrac{1}{2}\text{PS} - \tfrac{1}{3}\text{NOI}},$$

and

$$\text{Appreciation} = \frac{\text{EMV} - \text{BMV} + \text{PS} - \text{CI}}{\text{BMV} + \tfrac{1}{2}\text{CI} - \tfrac{1}{2}\text{PS} - \tfrac{1}{3}\text{NOI}},$$

where BMV is beginning market value, CI is capital improvements, PS is partial sales, EMV is ending market value, and NOI is net operating income.

Reporting the income component net of capital expenditures and the appreciation component gross

of capital expenditures provides the investor a more accurate breakdown between income and appreciation than the conventional method. Subtracting capital improvements from net operating income and adding them back to appreciation adjusts the reported numbers for this effect. The following formulas show the adjusted components:

$$\text{Adjusted income} = \frac{\text{NOI} - \text{CI}}{\text{BMV} + \tfrac{1}{2}\text{CI} - \tfrac{1}{2}\text{PS} - \tfrac{1}{3}\text{NOI}},$$

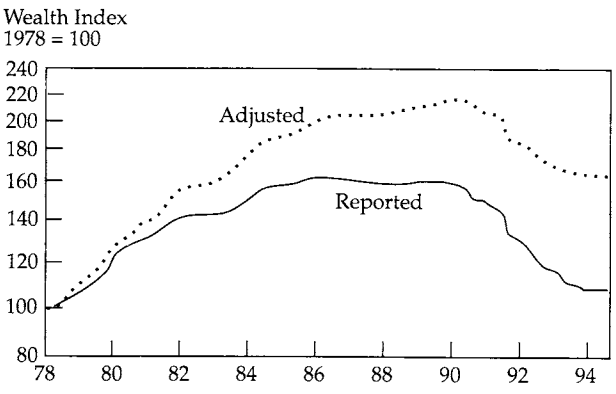
and

$$\text{Adjusted appreciation} = \frac{\text{EMV} - \text{BMV} + \text{PS}}{\text{BMV} + \tfrac{1}{2}\text{CI} - \tfrac{1}{2}\text{PS} - \tfrac{1}{3}\text{NOI}}.$$

The result of the adjustment is simply a reallocation between income and appreciation; total return does not change. The adjusted data are more comparable than unadjusted data to the stock and bond concepts of income and price change.

Figure 1 shows the historical appreciation series for the Russell–NCREIF All-Property Index from 1978 through June 1994 before and after this adjustment is made. The two series paint distinctly different pictures of commercial real estate price behavior during this period. According to the reported data, the most recent price level is not much different from 1978. Commercial real estate during this period, therefore, appears to have provided little in the way of price appreciation, and nearly all of its return came from income. The adjusted series reveals, however, that the most recent price level is nearly 60 percent higher and peaks later than the reported series—1990 versus 1985. When the adjusted price series is used, capital appreciated 2.9 percent annually—a significantly greater figure than the 0.4 percent annual price change calculated from the reported data.

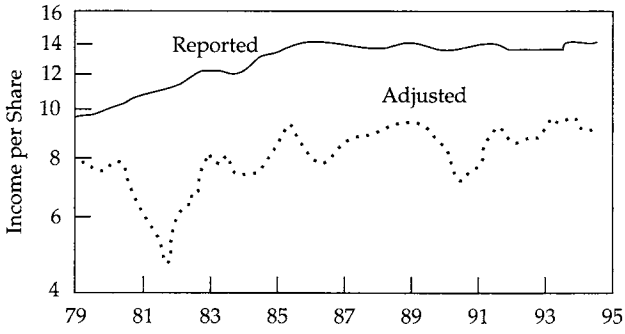
Figure 1. Russell–NCREIF Appreciation: Reported and Adjusted for Capital Expenditures, December 31, 1977, through June 30, 1994



Source: Brinson Partners, based on the Russell–NCREIF Index.

The other part of the return is the income or cash flow that investors receive from real estate. **Figure 2** shows income per share for a holder of the Russell–NCREIF Index from 1979 through June 1994. It depicts the income stream available to a theoretical holder of the entire index at a value of 100 at the beginning of 1978 on a trailing four-quarter basis. This method of showing income reveals the pattern of growth in the income stream better than looking at income in terms of yield. Because of the removal of capital expenditures, the adjusted income stream is lower than the reported series of data and its pattern is significantly different. The adjusted pattern shows cash flow declines associated with the 1981–82 and 1990 recessions.

Figure 2. Russell–NCREIF Trailing Four-Quarters Income: Reported and Adjusted for Capital Expenditures, December 31, 1978, through June 30, 1994



Note: The *y*-axis is based on the 1978 wealth index in Figure 1. For example, an investor with $100 in that index would receive an adjusted income per share of $8.

Source: Brinson Partners, based on the Russell–NCREIF Index.

As Figure 2 indicates, capital expenditures have had a dramatic impact on investor income. They averaged more than 2.5 percent of capital value annually during the period and reached nearly 4.5 percent in 1982. This perspective reveals that income, when shown on a distributable cash flow basis, is a much lower proportion of total return than the reported numbers suggest. The adjusted line also shows that the income growth rate, although positive, was only 1.9 percent annually, compared with 5.4 percent for inflation during this period.

Unsmoothing Appreciation

The next step in the process involves unsmoothing the appreciation series. Conventional appraisal techniques smooth the impact of new market information on appraisals. Unsmoothing is an attempt to estimate the full impact of the new information.

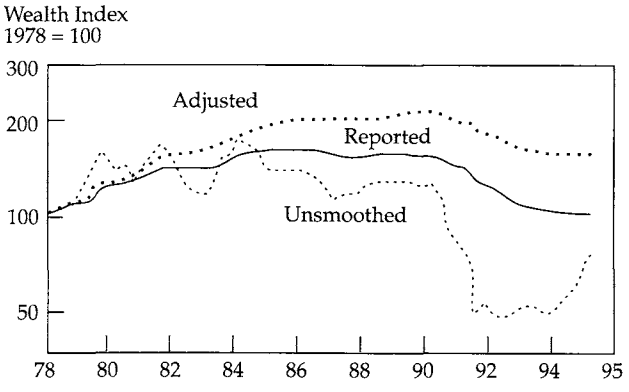
This technique identifies serial-correlation prop-

erties in the data and attempts to remove their effect to isolate the new information in the data. The technique is based on the work done by David Geltner.[1] The unsmoothed appreciation is calculated using quarterly data adjusted for capital expenditures and the following equation:

$$\text{Unsmoothed appreciation}_t = \frac{\text{Appreciation}_t - 0.3(\text{Appreciation}_{t-1}) - 0.5(\text{Appreciation}_{t-4})}{1 - 0.3 - 0.5}.$$

As shown in **Figure 3**, the unsmoothed capital appreciation line differs dramatically from the reported and adjusted lines. The unsmoothed line reflects the full impact of all adjustments. It is very volatile and reflects both the dramatic drop in the market in 1991 and the subsequent U-shaped recovery. This line suggests that values bottomed in 1992 and 1993. Although the series is derived from changes in reported data, it seems to be a good indicator of market values.

Figure 3. Russell–NCREIF Appreciation: Reported, Capital Expenditure Adjusted, and Unsmoothed, December 31, 1977, through June 30, 1994



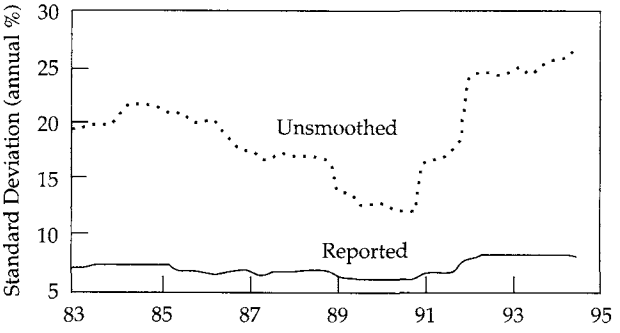
Source: Brinson Partners, based on the Russell–NCREIF Index.

An unsmoothed total return series can be derived by (1) restating appreciation and income to adjust for capital expenditures, (2) unsmoothing the adjusted appreciation, and (3) adding the unsmoothed appreciation back to the adjusted income.

Impact of the Data Adjustments on Risk Measurement

The next step is to reexamine risk after the data adjustments. For this purpose, risk is defined as annualized standard deviation of quarterly logarithmic returns. Using the reported and unsmoothed returns for the Russell–NCREIF Index, Figure 4 plots the trailing five-year risk measure for all five-year periods from 1978 through June 1994. The risk exhibited by the reported returns has varied historically in a fairly narrow range around 3 percent. The unsmoothed return data reveal a higher and more variable risk, averaging about 17 percent and ranging from below 10 percent to more than 20 percent, than the risk produced by corresponding reported data.

Figure 4. Russell–NCREIF Risk: Trailing Five-Year Standard Deviation, Reported and Unsmoothed, December 31, 1977, through June 30, 1994



Note: Based on quarterly logarithmic returns.

Source: Brinson Partners, based on the Russell–NCREIF Index.

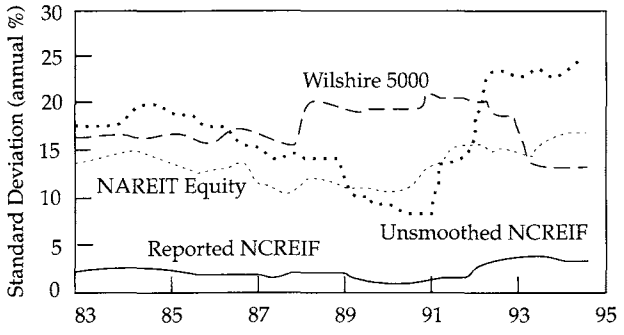
As it declines gradually through the 1980s and into 1990 and then rises dramatically, the unsmoothed pattern is intuitively appealing. As capital from pension funds, foreign investors, banks, and insurance companies gradually flowed into real estate during the 1980s, prices gradually rose. In 1990, these capital sources quickly dried up and prices came crashing down.

The high level of risk demonstrated by this risk measure and its increase since 1990 have been very much in line with what Brinson Partners considers to be normal short-term behavioral characteristics of the asset. Therefore, we have found the unsmoothed series more useful than the reported series in helping us understand commercial real estate risk. We had been using an estimate of 14 percent for the long-term annual standard deviation of unleveraged commercial real estate before this latest risk jump and, in 1991, lifted our estimate to 14.5 percent.

The same risk measures are available for other assets, so the unsmoothed risk for real estate can be compared with risk for other assets. **Figure 5** shows the reported and unsmoothed Russell–NCREIF risk data and data for the Wilshire 5000 Index and the National Association of Real Estate Investment Trusts (NAREIT) Equity Index. The volatility level

[1] See Mr. Geltner's presentation, pp. 43–49.

Figure 5. Risk Comparison: Trailing Five-Year Standard Deviation, Reported and Unsmoothed, for the Russell–NCREIF Data, Stocks, and NAREIT Data, December 31, 1977, through June 30, 1994



Note: Based on quarterly logarithmic returns.

Source: Brinson Partners, based on the Russell–NCREIF Index.

and pattern of the unsmoothed Russell–NCREIF Index line are reassuringly similar to those of publicly traded equities, particularly publicly traded real estate equities. Note the rise in five-year trailing risk of U.S. equities associated with the October 1987 market crash. This rise drops out of the data after the fourth quarter of 1992. Volatility hovered around 16 percent before the crash, rose near 20 percent when the crash was included, then dropped below 15 percent after the influence of the crash quarter fell out of the data.

Using Adjusted Historical Data to Forecast Risk

Historical data can be very useful in making long-term risk and correlation forecasts for the real estate market segments. Interpretation, however, must be approached carefully. The following guidelines have been helpful to Brinson Partners in interpreting historical data:

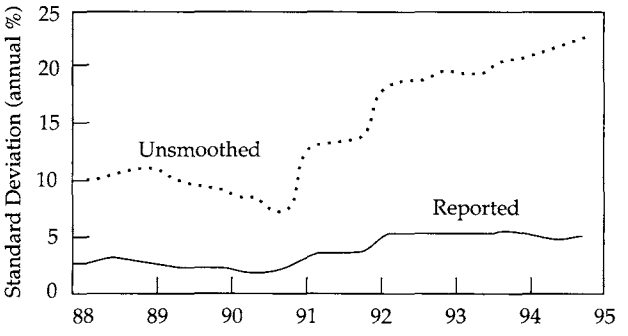
- The objective is to develop *forward-looking, long-term* risk and correlation estimates. Historical analysis should be used as a departure point for discussion. Understanding and interpreting the history is only the beginning point for making a forward-looking forecast, not the ending point.
- Because of the difficulty of selecting the relevant time period and knowing how far back to look, all available data should be used and at least one "full market cycle" should be included. In real estate, a full market cycle may be 20 years, so the available data for commercial real estate may not yet reflect a full cycle.
- Nothing can replace an understanding of the fundamentals. Data do not come out of the sky. They describe the activity of participants in the market for commercial properties in response to specific market conditions. Detailed knowledge of the behavior of these participants and the market environment is extremely valuable in interpreting the historical data.
- Individual data points and unusual conditions can be overrepresented in long-term historical measures. For example, Figure 5 showed how a single day's events in October 1987 influenced the trailing risk measures for the subsequent five years. Such events, particularly in the context of short total data histories, tend to be given much greater weight in the data than their underlying probability of occurrence justifies.
- Finally, be alert for structural changes that may reduce the usefulness of all or part of the data. A tax law change, because of its impact on the behavior of market participants, can alter the pricing structure in a real estate market segment and immediately reduce the usefulness of the pre-change data. We did not observe a direct impact on measured volatility of the commercial real estate segment as a result of the Tax Reform Act of 1986, but if such changes become more frequent and uncertain, we would expect a structural increase in risk.

In addition, the use of historical data to forecast risk within a real estate portfolio requires the selection of a unit of analysis. A top-down perspective would characterize portfolio risk exposure by common factors, such as location—region or MSA (metropolitan statistical area)—and type. A bottom-up perspective would focus on each property. The analysis in this section will take the top-down perspective of analyzing data at the levels of region/type and MSA/type.

Figure 6 shows the trailing risk of the properties in the Russell–NCREIF Index for East Coast office properties using data from 1983 through 1994. The raw data were adjusted and unsmoothed in the same manner as for the total index. As in the previous charts, the unsmoothed risk is higher and more variable than the reported risk. The increasing risk since the end of 1990 (a rise from 7.5 percent to more than 20 percent in less than four years) is in line with the significant markdowns that this sector of the market suffered recently. Care must be taken in interpreting this rapid increase as sustainable or indicative of long-term conditions, however, because the data begin only at the end of 1982.

A single point can dramatically influence a lim-

Figure 6. East/Office Risk: Trailing Five-Year Standard Deviation, Reported and Unsmoothed, December 31, 1982, through June 30, 1994



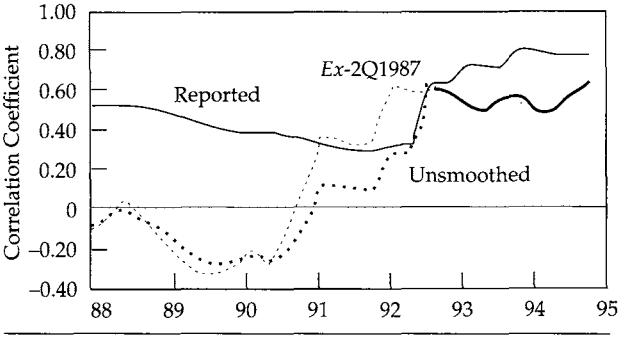
Note: Based on quarterly logarithmic returns.

Source: Brinson Partners, based on the Russell–NCREIF Index.

ited data set, as shown in **Figure 7** for the South region/office property series. In the second quarter of 1987, the Russell–NCREIF Index reported a –12.5 percent capital appreciation for this segment, –30.0 percent in unsmoothed terms. When this quarter falls out of the trailing five-year number in the second quarter of 1992, measured risk drops from more than 18 percent to 12 percent. If the line is recalculated to skip this data point, using the average of the prior and subsequent quarters, the result is quite different (see the line labeled "*Ex*-2Q1987"). Rather than exhibiting a dramatic drop in risk, the series actually shows a gradual increase in risk since the start of the data period. As this series illustrates, a single data point can have an influence on current real estate data series well beyond what the influence of the underlying probability of such an event occurring might be over time. Therefore, estimates of long-term risk in limited data sets should incorporate the probability of such events but not to the degree that they are often represented.

This data point also influences the correlation calculations, but to a lesser extent than it influences risk calculations. **Figure 8** shows the trailing five-year correlation coefficient between East/office properties and South/office properties as based on reported, unsmoothed, and unsmoothed *Ex*-2Q1987 data. The reported numbers are somewhat higher than the others and somewhat more stable.

Figure 8. East/Office and South/Office: Trailing Five-Year Correlation, Reported and Unsmoothed, December 31, 1982, through June 30, 1994

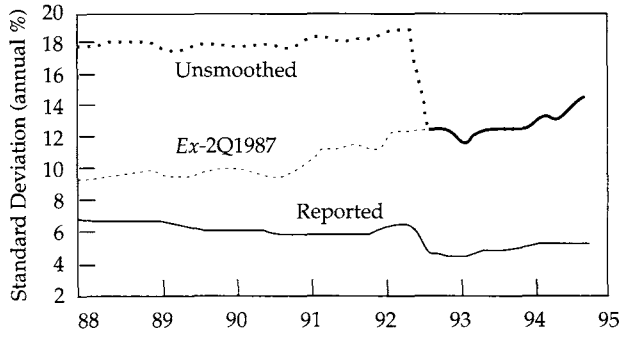


Note: Based on quarterly logarithmic returns.

Source: Brinson Partners, based on the Russell–NCREIF Index.

Figure 9, Figure 10, and **Figure 11** contain the same types of charts on an MSA/type basis (using data for office properties in the Chicago, Illinois, and San Diego, California MSAs). The raw historical and forecasted annual data were provided by Property and Portfolio Research.

Figure 7. South/Office Risk: Trailing Five-Year Standard Deviation, Reported and Unsmoothed, December 31, 1982, through June 30, 1994



Note: Based on quarterly logarithmic returns.

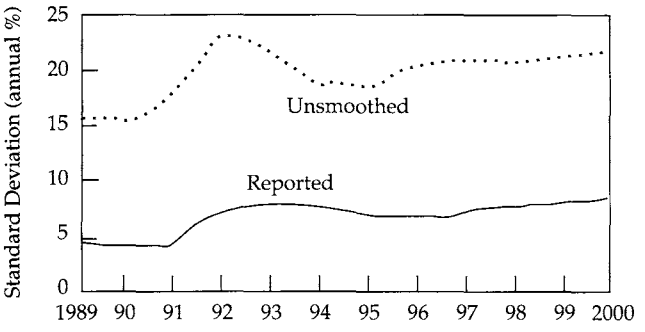
Source: Brinson Partners, based on the Russell–NCREIF Index.

Pricing Using the Capital Asset Pricing Model

The comprehensive and consistent risk structure developed through the methods described in the preceding sections puts analysts in a position to estimate the compensation that is available for bearing this risk. This section addresses pricing for commercial real estate and describes the impact of growing market integration on pricing and, therefore, on available returns.

The capital asset pricing model (CAPM) is a useful behavioral model for understanding how investors measure risk and determine the appropriate compensation for bearing it. The required return is defined as the total return that an investor requires as compensation for investing in an asset. The required return can be described as consisting of three components: an inflation premium to compensate for expected changes in purchasing power, a real risk-free rate reflecting the trade-off between current

Figure 9. Chicago/Office Risk: Trailing Ten-Year Standard Deviation, Reported and Unsmoothed, 1980–2000



Note: Standard deviations based on annual data; forecasts for 1994–2000.

Source: Brinson Partners, based on data from Property and Portfolio Research.

and future consumption, and a risk premium to compensate for taking risk. The inflation premium and real risk-free rate are common to all investments; this discussion will focus on the risk premium, which is unique to each risky asset.

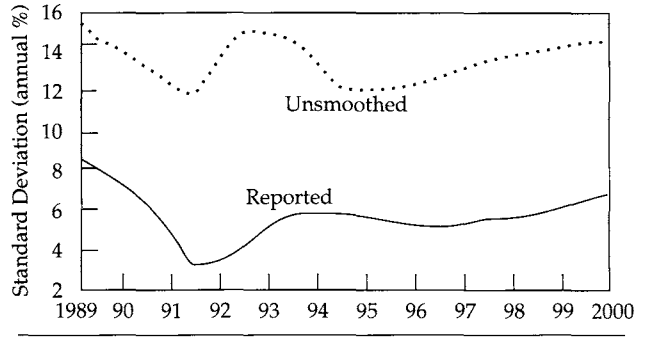
Asset risk can be described in terms of two components: market (systematic) risk, which is related to the risk of the market, and unique (unsystematic) risk, which is unrelated to the risk of the market. The relative importance of each component will depend on the situation. For example, assume an investor is considering the purchase of an office building in Manhattan and defines the market as a portfolio of Manhattan office buildings. Market or systematic risk will be very important to this asset; that is, the return performance of the Manhattan/office market will play a significant role in the return performance of the individual building. If the market is defined more broadly, however, as a portfolio of all U.S. commercial real estate, market risk is less important because the building's performance will be less related to the performance of the broad market than to the performance of Manhattan office buildings. If the definition of the market is broadened further, to that of the U.S. capital markets, market-related performance—and thus market influence—is even lower.

The fact that market risk becomes smaller as the market portfolio broadens has important implications for pricing and the long-term risk premium available from commercial real estate. The two general types of pricing are segmented pricing and integrated pricing. In segmented pricing, investors expect to receive compensation for total risk; for instance, in the Manhattan office building example, compensation would be expected for the entire risk of the building. In integrated pricing, the investor expects to be compensated only for market risk. Therefore, level of integration, or choice of market portfolio, is a very important determinant of the magnitude of the compensation. Direct compensation for risk falls as the market portfolio broadens from Manhattan/office to U.S. real estate and then to all U.S. capital markets.

The CAPM is applied here as a behavioral model that explains how investors measure and demand compensation for risk. A simple example will explain how market integration occurs and affects risk premiums.

Consider the pricing of the Manhattan office building in a segmented market. Market participants assess its total risk characteristics—the fact that it is an office building in Manhattan as well as its specific location, tenant-base potential, lease structure, and so on. The price for the building is set so that investors receive compensation for this total risk of the building.

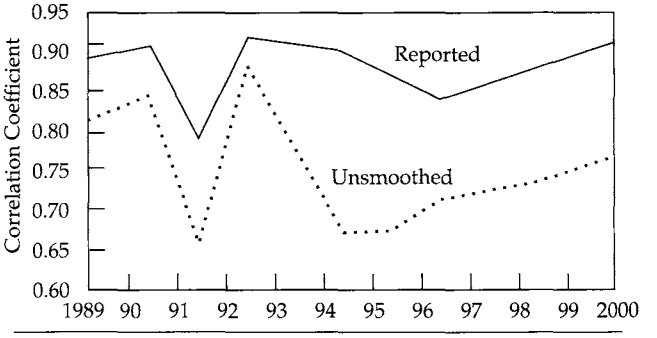
Figure 10. San Diego/Office Risk: Trailing Ten-Year Standard Deviation, Reported and Unsmoothed, 1980–2000



Note: Standard deviations based on annual data; forecasts for 1994–2000.

Source: Brinson Partners, based on data from Property and Portfolio Research.

Figure11. Chicago/Office and San Diego/Office: Trailing Ten-Year Correlation, Reported and Unsmoothed, 1980–2000



Note: Standard deviations based on annual data; forecasts for 1994–2000.

Source: Brinson Partners, based on data from Property and Portfolio Research.

Along comes the manager of a Manhattan/office building real estate investment trust (REIT) to evaluate the building's risk. She does not care about the total risk of the building but, rather, how it contributes to her Manhattan/office portfolio risk. Therefore, she demands compensation for only that portion of the building's risk that is related to the risk of her portfolio. She can diversify away the building's remaining risk (specific location, tenant-base potential, lease structure, and so on) by combining it in her portfolio with other Manhattan office buildings that have unrelated unique risks. Because the market risk is a subset of the building's total risk, she will accept a lower risk premium and thus will pay a higher price for the building than someone who is concerned with the building's total risk. She becomes the new owner of the building.

Now, suppose the new owner of the Manhattan office building is approached by the manager of a multibillion-dollar portfolio of properties of varying types scattered around the United States. This manager is only interested in the contribution of the building to his portfolio risk. Because the correlation between his portfolio and the building is lower than the REIT's correlation with it, his measure of market risk is even lower than the REIT manager's. He is thus able to diversify away more of the building's total risk by including it in his portfolio. In addition to diversifying away the building's specific location, tenant-base potential, and lease structure, he can diversify away the risk associated with it being a Manhattan office building. He can thus accept a lower risk premium and pay a higher price for the building. This manager becomes the new owner of the building.

The pricing for this Manhattan office building has become more integrated with each of these events. To the extent that investors with broader and broader portfolios move into a market and begin to dominate pricing, integrated pricing will become increasingly important.

Increasing information and capital flows are leading to increasing integration in capital markets all over the world, and the U.S. commercial real estate market is no exception. The broadening investor base is increasing the level of integration across and within markets. Therefore, portfolio risk is more important in commercial real estate pricing than ever before and the greater integration should lead to lower risk premiums.

The relationship between a segmented and integrated risk premium can be illustrated as follows:

$$\text{Segmented risk premium} = \text{Price of risk} \times \text{Total risk}.$$

and

$$\begin{aligned}\text{Integrated risk premium} &= \text{Price of risk} \times \text{Beta} \times \text{Market risk} \\ &= \text{Price of risk} \times \frac{\text{Correlation with market} \times \text{Total risk}}{\text{Market risk}} \times \text{Market risk} \\ &= \text{Price of risk} \times \text{Correlation with market} \times \text{Total risk} \\ &= \text{Correlation with market} \times \text{Segmented risk premium}\end{aligned}$$

The price of risk reflects investor utility and is measured in units of risk premium per risk unit. The final equation states that the integrated risk premium is equal to the segmented risk premium times the correlation with the market.

Applying these relationships to the earlier example provides an appreciation of the magnitude of the drop in the risk premium, and associated increase in price, in response to growing integration. The building has a segmented risk premium of 500 basis points (bps), and assuming a 3.5 percent inflation rate and a 2 percent real risk-free rate, the price would be $10 million. If the building has a high correlation coefficient—say, 0.8—with the REIT portfolio of Manhattan office buildings, the REIT manager could accept a risk premium of 400 bps and thus pay a price of $11.7 million. The well-diversified U.S. real estate portfolio might have a correlation of 0.6 with the building, which would allow this buyer to reduce the acceptable risk premium down to 300 bps and lift the price to $14 million. In theory, the premium could decline to zero if a group of, say, Japanese bond investors wanted to buy the building. With an acceptable risk premium of zero, they could pay up to $35 million for the building.

Long-term risk premiums estimated on the basis of segmented pricing assumptions will probably be overstated because segmentation is not a sustainable pricing mechanism. Powerful economic incentives lead to integration in markets. Barriers to integration exist in the form of restrictions on capital and information flows and differential tax rates, but because the economic incentives continue to grow, such barriers will eventually be overcome.

The framework outlined here allows investors to develop a continuum of risk premiums ranging from those applicable in a totally segmented market to those applicable in a fully globally integrated mar-

ket. Risk premiums for all markets exist somewhere along this continuum, and the right answer is unique to each market.

Understanding what kind of market is being analyzed and what types of barriers to integration exist is critical. Investors should begin with an assumption of full integration and work backwards by considering what barriers exist as obstacles to full integration. To determine a given market's degree of integration, investors need to ask, "Who are the dominant market participants that are pricing the market? Are they locals? What types of portfolios do they hold?" As dominant market participants' portfolios broaden, the portfolios become more and more unrelated to the asset being considered for purchase, which places downward pressure on the asset's risk premium. Occasionally, one unusual investor may enter the market and temporarily bid prices up, but such an event would not be part of the sustainable market pricing mechanism.

Conclusion

When analyzing return data, investors can take certain steps to improve their analyses: First, work with the reported numbers to adjust for known methodological deficiencies. Then, combine historical analysis with judgment to produce forecasts. Keep in mind that risk premiums and required returns reflect equilibrium or long-term pricing conditions, not current ones. Pricing assumptions must consider the importance of increasing market integration. Finally, remember that investment analysis for active portfolio allocation involves developing, in addition to required returns, expected returns that incorporate expected market prices and cash flows.

Question and Answer Session

David M. Geltner
Khaled Salama, CFA

Question: Has the smoothing effect in appraisal-based indexes resulted in incorrect conclusions about the risk and return characteristics of real estate and possibly resulted in incorrect asset allocation decisions in the past? Are analysts regularly adjusting for these problems now?

Salama: When real estate was being promoted to pension funds as a diversification vehicle for their portfolios during the 1980s, investment characteristics were often shown based on the raw returns. These appraisal-based returns demonstrated very low risk compared with equities and bonds and almost zero correlations. Even assumptions of 12–14 percent real estate risk, however, and correlation coefficients of 0.3–0.4 with equities and bonds caused most asset allocation models to prefer significant allocations to real estate. Because one did not have to underestimate risk and correlation to produce high allocations to real estate, whether any incorrect asset allocation decisions were made in the past is not clear.

We all learned about risk in the past few years, and I suspect that those who were still using raw numbers to measure risk and correlation are no longer doing so.

Question: When using the unsmoothing models, can analysts be confident that the lower correlation coefficients that tend to occur are reliable?

Geltner: In theory, the smoothing in two subaggregate appraisal-based indexes, such as the Russell–NCREIF retail subindex and the Russell–NCREIF office subindex, would cancel out in the correlation coefficient because the correlation coefficient is a ratio of two second moments and the smoothing would be approximately the same in the numerator and the denominator. So, the correlations typically require no correction for smoothing. The unsmoothed correlations are probably lower than the true correlations. I would go with the Russell–NCREIF correlations directly as long as the two subindexes have sufficient numbers of properties to diversify away purely random error.

Question: Please expand on using REIT prices as a leading indicator of appraisal values; can REITs be used in Mr. Geltner's model as a proxy for commercial real estate investment returns and risks?

Geltner: REIT returns are highly correlated with the corrected (unsmoothed) returns lagged a year. In other words, the REIT returns come first and then, a year or two later, come the unsmoothed commercial property market returns. Furthermore, if the overall NAREIT Index were corrected for leverage on both sides of the balance sheet (because the mortgage REITs hold debt-type instruments on the asset side as well as the liability side), then the magnitude of the rise and fall would be virtually the same for REITS and the corrected property index. The REITs, therefore, appear to be tracking the commercial property market closely but to be ahead of it in time, and on that basis, they are a good leading indicator.

Question: Is unsmoothing applied only to the capital value index? How does the methodology apply to income returns and total returns? How robust are the simulated correction factors for the Russell–NCREIF Index?

Geltner: The unsmoothing technique should be used to correct the capital component of the index. Then, to obtain a corrected total return, you must obtain or construct an index of actual operating cash flows and add those in.

The beginning value of the corrected index relative to the amount of cash flow will be unknown, but typically, you would assume that the average income return component (in other words, the average income as a fraction of property value during the entire time sample) is the same in the corrected and the uncorrected index.

As for the robustness of the simulated correction factors for the Russell–NCREIF Index, in dozens of repeated simulations, I have found that, in three-quarters of the samples, the simulated corrected returns are 90 percent or more correlated with the true returns. My worst correlation was 70–80 percent. So, the correction is probably fairly close to the true returns. It is almost certainly more accurate than the smoothed index. I recommend that sensitivity analysis be performed on the numerator and denominator.

Question: What percentage of NOI was deducted to generate distributable cash flow? What is the spread between NOI and an adjusted income?

Geltner: The average capital-

improvement expenditure is about 2 percent of property value a year, but it obviously contains some volatility. Capital-improvement expenditure is about 25 percent of NOI. Distributable cash flow roughly equals NOI minus capital-improvement expenditures.

Question: Is adding the capital expenditures to the unadjusted capital value always correct? What if money were spent but it did not increase the value of the real estate?

Geltner: Remember that the numerator of the Russell–NCREIF capital return is the appraised value of the property with the capital improvements in it. So, the appraised value should already reflect a judgment about market value and whether it has been changed by the capital expenditures. The reported, or unadjusted, Russell–NCREIF capital return subtracts the capital expenditures from this appraised value. It is a change in property value net of capital expenditures. The adjustment Mr. Salama is proposing would add those expenditures back in order to recover the appraised market value of the property, including the effect (if any) of the capital improvements. It is exactly analogous to General Motors, for example, retaining some earnings to modernize a plant instead of paying a dividend.

Question: What are Brinson Partners' current estimates of expected and required returns for real estate, and how do those figures compare with the corresponding figures for other classes?

Salama: Our firm has been using a 4.0 percent risk premium for the real estate asset class. Add to that a 3.5 percent inflation premium, a 2.0 percent real risk-free rate, and the required return is 9.5 percent. We are currently estimating an expected return of 8.5 percent, but we believe specific real estate investments are out there right now that offer greater expected returns.

The estimates for real estate compare favorably with those for other asset classes. Equity markets around the world, in our opinion, are priced in excess of their fundamental values, which gives them expected returns that fall short of their required returns. We think equity markets, based on current pricing and our cash flow expectations, will return 4–5 percent, which is unattractive compared with their 10–11 percent required returns. Because of rising world bond yields in 1994, expected returns for bonds have improved. Expected returns now available from many bond markets are near their 7–8 percent required returns. Bond markets are thus currently attractive alternatives to equities. Real estate's expected return, while greater than the returns of most equity and bond markets, remains below its required return.

Question: Do private-market investments require risk premiums to the public-REIT alternatives?

Salama: We think of real estate as a total asset class, so the numbers we use probably include REITs. REITs may have a lower premium because of liquidity, but the risk premium should be identical to that of private real estate portfolios. If all property portfolios were to go public, they would be operating in the same market. The properties would be unchanged and their economic risk would be unchanged. The only difference between private and public real estate portfolios, in terms of a risk premium, is the markets in which they trade. Adjusted for that difference, the two should theoretically share the same risk premium.

Question: Is pricing using the integrated risk premium equivalent to pricing at average cost rather than marginal cost?

Salama: If you think of the cost as the added risk, both segmented and integrated pricing assumptions are *marginal-cost* concepts. Both compute the risk added to the portfolio by the addition of the new asset. The pricing assumptions differ in the way they measure this marginal risk. Segmented pricing assumes the full risk is incurred by the purchase and prices it accordingly. Integrated pricing looks only at the new asset's contribution to existing portfolio risk and thus requires a lower premium as compensation.

Question: What adjustments do your value time series include? Also, didn't your capital-expenditure adjustment raise the appreciation index? Finally, why does your series show little immediate change from the 1986 Tax Act?

Salama: Only two adjustments were made to create the final value series—adding back capital expenditures and unsmoothing the new appreciation series. The capital-expenditure adjustment did raise the appreciation index, as it should. Remember, the new appraisal was reduced by the capital expenditure before calculating the appreciation from the old appraisal. All we are saying is that, because the capital-expenditure portion of income was not distributable, it should be considered part of appreciation.

The adjustments do not add or take anything away from the basic structure of the data; the fact that the resulting series

shows no immediate impact from the 1986 Tax Act, therefore, means that the reported data contained no discernible effect associated with the act. Appraisers evidently saw no immediate need to reduce values when the law was changed. Were they to have made even a small adjustment, the unsmoothing technique would have detected it and magnified its impact.

Question: Mr. Salama, your corrected NCREIF appreciation time series is very different from Mr. Geltner's Figure 5, which implies that appreciation started to fall in 1986. Are these two graphs comparable?

Salama: Mr. Geltner's Figure 5 and my Figure 3 show comparable information—unsmoothed appreciation indexes. There are two general methodological differences in applying the unsmoothing technique. Mr. Geltner's technique uses annual reported appreciation data as his input and develops a single-year lag relationship. My technique adjusts reported appreciation for capital expenditures *before* unsmoothing. I also identify one-quarter and four-quarter lag relationships. Thus, smoothed beginning series are different in the techniques, time frequencies are different, and the lag relationship structures are different. Both graphs show appreciation peaking in 1984, declining slowly through about 1990, and then declining rapidly.

Question: Is applying the unsmoothing techniques to design real estate appraisal indexes appropriate? Should other factors be considered?

Salama: The purpose of unsmoothing is to glean market performance information from a series based on appraisal techniques that are designed to smooth the impact of market changes. The answer to your question depends on the objective. If you want to measure appraisals, then the current index may be appropriate because it measures only the impact of appraisals and assumes that capital expenditures are added back in. If you are looking for indicators of market behavior, you can apply such techniques as unsmoothing or you can attempt to improve the appraisal process itself.