New Measures of Future Property Performance and Risk

Forecasting changes in a property's value from measures developed from its current lease structure.

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When pension funds and other managers of mixed-asset portfolios make asset allocation decisions, they are forced to use generalized performance information concerning real estate assets. They also have little basis for determining whether the real estate in their portfolios will perform according to their expectations.

This article describes a methodology for establishing performance expectations for multitenant commercial properties based on the character of existing leases and the credit quality of the tenant base. The technique enables the analyst to determine the proportion of total building value that is dependent on the leases in place

The Need for Better Reporting

The art of commercial real estate investment performance has been relatively static for over fifteen years. Consequently, pension funds that own real estate in closed- or open-end fund portfolios receive relatively little information about the actual assets in those portfolios.

Typically, real estate investment managers issue quarterly reports on rates of return earned (or accrued) from income, on capital appreciation, and on a combination of the two. Managers often also supply some descriptive information about the portfolio, offering information about its composition by value of property type, by geographic area, by size of individual properties, and by life cycle.

Managers rarely report the performance of specific properties and almost never provide tenant-level statistics. All too often, investment managers view property- or tenant-level data as proprietary and fear that the data will be used improperly or misconstrued, or will give ammunition to critics or competitors. Pension fund managers constantly assert a substantial desire for improved performance reporting. They complain that the reported information is inadequate to enable them to forecast future returns—either in absolute terms or relative to other asset classes. This reporting failure is increasingly important in a period in which real estate is being acquired more because it is a portfolio diversifier than because it is a generator of stellar returns.

Fortunately, it is possible to capture the salient features of properties or tenants in a way that is meaningful to asset managers, portfolio managers, and owners alike, using measures based on existing finance principles and created from readily obtainable information on properties, tenants, and leases in place. Reports using these techniques perform as follows:

- ❏ They measure tenant quality related to default risk, contribution to income, and the value of current leasehold interests;
- ❏ They determine the proportion to total property (or portfolio) value that is associated with *existing* leases as contrasted with value associated with anticipated *future* income streams; and

- They forecast changes in property value over time based on the relationship of current leases to market rents.

The notion that a substantial portion of the value of commercial real estate is embedded in the value of its existing leases is widely understood. With few exceptions, real estate investment managers, acquisition specialists, and appraisers base property income forecasts on (1) existing leases, and (2) anticipated future lease conditions. Analysis of current and future leases follows discounted cash flow techniques developed over the past twenty years.

Without getting into the details of how property values are determined by conventional appraisal techniques, suffice it to say that rigor does not characterize the process of selecting the important assumptions of the analyses. Brief descriptions of the two techniques that utilize modern finance principles follow.

The Debt-Equity Model: The RAM Approach

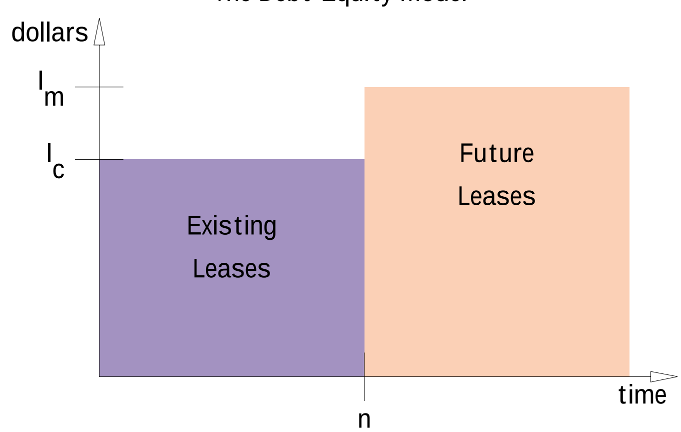
Real Asset Management, Inc. (RAM) has developed a view of commercial real estate as a hybrid asset, part debt and part equity.[1] RAM argues that if commercial real estate is viewed as a combination of debt (leases that are obligations of corporations and are thus analogous to corporate debt) and of equity (ownership in a productive "factory" for creating future leases), then the techniques of debt and equity analysis might also be applied to the two components.

Algebraically, the value of a property is the sum of the present values of existing leases and future leases:

$$\text{Value of property} = \text{P.V. of existing leases} + \text{P.V. of future leases}$$

Exhibit 1 is a visual representation of the debt-equity model that shows that a property's total value (the total shaded area) comprises the value of existing leases at current rents at the level I_c for a term remaining of n years plus the value of future leases at some market rent, I_m, deferred n years but extending into perpetuity.

Exhibit 1
The Debt-Equity Model



1 David G. Booth, Daniel M. Cashdan, Jr., and Richard A. Graff, "Real Estate: A Hybrid of Debt and Equity," *Real Estate Review* 19 (Spring 1989): 54-58; Richard A. Graff and Daniel M. Cashdan, Jr., "Some New Ideas in Real Estate Finance," *Journal of Applied Corporate Finance* 3 (Spring 1990): 77-89; and Richard A. Graff, "The Impact of Tax Issues on Real Estate Debt and Equity Separation," *Real Estate Review* 20 (Fall 1990): 50-58.

Leases may be valued by bond valuation techniques that have been in use for decades.[2] Only three variables are needed to value leases treated as bonds: the pattern of net rents, the credit quality of the tenant, and the risk premium corresponding to the credit quality. This model asserts that the present value of a lease is simply the present value of the stream of net rents at the appropriate discount rate. The appropriate discount rate is calculated by assuming a premium over the risk-free rate (Treasury rate) at a point in time equal to the "duration" of the lease.

Duration

Duration is a term-of-art in bond analysis. It is a time period (often specified in months) that is considered more descriptive of a bond than is maturity. It is obtained by weighting the month in which each cash flow is produced by the debt instrument by the flow's percentage contribution to the present value (price) of the instrument. Unlike maturity, which simply tells the analyst the time lapse until the instrument's last payment, duration is a time measure that varies with the shape of the income stream.[3]

Even though duration varies with the pattern of cash flows and the rate at which the flows are discounted, for most lease calculations a very good approximation to the duration in years results from dividing the lease term in months by 25. Thus, the duration of a sixty-month lease is approximately 2.4 years.

Calculating Risk Premium

A tenant's credit quality may be difficult to determine if the tenant does not have publicly traded debt. Unfortunately, most tenants in commercial properties do not have rated debt.[4] However, if credit quality is interpreted to mean the likelihood that the tenant will fulfill its lease obligations, an asset manager familiar with the tenants in a property could give them ratings relative to one another. Exhibit 2 uses a five-point letter scale of A through E, in which A represents the highest quality tenant. Exhibit 2 also assumes that the asset manager is aware that credit quality is a measure of the risk of loss or default on lease obligations, and can express that risk in percentage terms.

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2 The "dynamic capitalization" model proposed by Gordon Blackadar of Metropolitan Life Insurance Company utilizes actuarial techniques and terminology in its view that property values comprise the sum of the individual lease values. Unlike the traditional discounted cash flow technique used by appraisers and other analysts, in which ten or more years of cash flow are projected and the resulting stream is discounted at a single rate, the dynamic capitalization technique discounts each lease separately and then sums the present values to arrive at the current valuation. The RAM debt-equity model is more in the spirit of Blackadar's dynamic capitalization.

3 An excellent description of the value of implications of duration appears in Charles H. Wurtzebach and Neil G. Waller, "Duration: A Powerful New Tool for Managing Interest Rate Risk," *Real Estate Review* 15 (Summer 1985): 65-69. See also Livingston G. Douglas, *Yield Curve Analysis: The Fundamentals of Risk and Return* (New York: New York Institute of Finance, 1988), or Gerald O. Bierwag, *Duration Analysis: Managing Interest Rate Risk* (Cambridge, Mass.: Ballinger Publishing Co., 1987). Several research pieces by Salomon Brothers have addressed duration in the real estate context, but have focused entirely on duration of the mortgage debt aspect of real estate and have overlooked the possibility of employing the same techniques to either the lease or the residual components.

4 KMV (Kealhofer, McQuown, Vasicek) of San Francisco produces a monthly assessment of the credit quality of more than 5,000 domestic firms that have publicly traded debt. The ratings are described along three measures: distance from default (DFD), implicit debenture rating (IDR), and expected default frequency (EDF). The results are reported in the KMV publication *The Credit Monitor*.

Exhibit 2
Tenant Credit Quality and Risk Premiums

Credit Rating	Description	Risk Premium Over Treasuries	Default Risk
A	Highest possible rating; better than commercial credit (e.g., tenant is a government office). Virtually no default risk.	0.75%	1%
B	Best commercial credit. Very low probability of default.	0.95	4
C	Good commercial credit. Small probability of default.	1.40	8
D	Average commercial credit. Real potential for default.	1.90	14
E	No credit or little business experience. New "mom and pop" or undercapitalized startup.	2.30	22

Most tenants fall into the C to D categories of Exhibit 2. Tenants with A ratings are relatively rare. Indeed, in good times, landlords may avoid A-rated tenants who demand heavily discounted rental rates or preferential lease terms. Exhibit 2 suggests appropriate risk premiums for each of the different credit ratings. The premiums are added to Treasury yields at a time equal to the lease duration. The sum of Treasury yield and risk premium represents the discount rate appropriate for the tenant's lease.

The Treasury Yield Curve

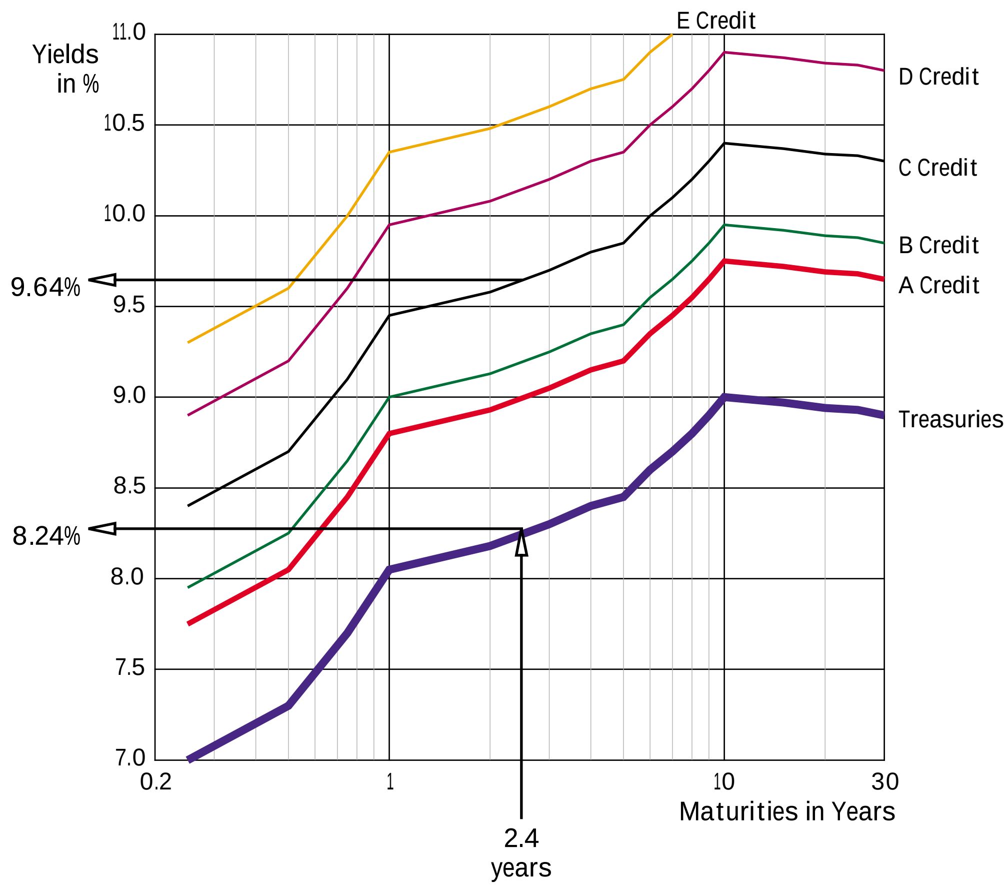
There are available in the market (risk-free) Treasury instruments of various maturities. Each instrument sells at a price that yields a different rate of return, and these rates are published daily by various financial media. A listing of these rates for instruments of varying maturity (from short-term to long-term) is called the Treasury yield curve. Exhibit 3 is based on one such curve.

Calculating the Present Value for Each Lease

Once he understands the concepts discussed above, the analyst is prepared to undertake a seven step computation of the present value of each lease in a building.

1. He determines the net rent (month by month) for each lease, taking care to include all scheduled rental increases and current operating expense reimbursements.
2. He calculates the total operating expenses not recovered from each tenants, and he subtracts from each tenant's net rent a proportionate amount based on its relative net rent.

Exhibit 3
Yield Curves for Tenants with Various Credit Ratings



3. He estimates the duration of the lease by dividing the remaining months in the lease term by 25.[5]
4. Using a Treasury yield curve like that of Exhibit 3 and a calculation of risk premiums like that of Exhibit 2, he creates yield curves for tenants of various credit ratings (like that of Exhibit 3).
5. He calculates the risk-free discount rate appropriate to each lease's duration. In Exhibit 3, for example, a lease with sixty months remaining would have a duration of 2.4 years. The Treasury yield curve in Exhibit 3 indicates that the estimated risk-free rate at that time is 8.24 percent. But, the rate for the lease of a tenant with a C credit, because it has a risk premium of 1.4 percent, would produce a 9.64 percent risk-adjusted discount rate.
6. For each lease, the analyst discounts the net monthly rents that he has calculated in step 2 above at the appropriate discount rate and determines its current present value.

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5 In this article, the authors chose to use the intercept of duration and the credit risk adjusted yield curve as the point at which to select the appropriate discount rate for each lease. An equally good choice would have been the average life of the lease analogous to the average life or weighted average maturity of a bond. The choice is immaterial as long as the method is consistently and logically applied. Duration uses the time until payments as the weights, while average life uses the payments as weights.

7. Finally, the analyst adds up the value of all current leasehold interests to obtain the value of existing leases.

As indicated at the beginning of this section, the value of property is the sum of the present values of existing leases and future leases. One way to calculate the present value of future leasehold interests (the pure equity value of the property) is to subtract the present value of current leases (calculated as above) from the current market value of the property.

The Differential Income Model: The Sykes/Young Approach

In 1979, Sykes and Young refined the basic income property valuation equation used the United Kingdom in ways that shed light on the major determinants of investment performance.[6] The basic model is similar to the simple perpetuity model used by many appraisers in the United States, $V=I/r$, but adds a second term that represents the difference between existing net rents and market net rents. The U.K. valuation model is:

$$V = \frac{I_c}{r} + \frac{I_m - I_c}{r(1+r)^n} \qquad \text{Equation 1}$$

where: I_c = current net income
I_m = net income at market rent
r = discount rate
n = time until lease rollover

Exhibit 4
The Differential Income Model

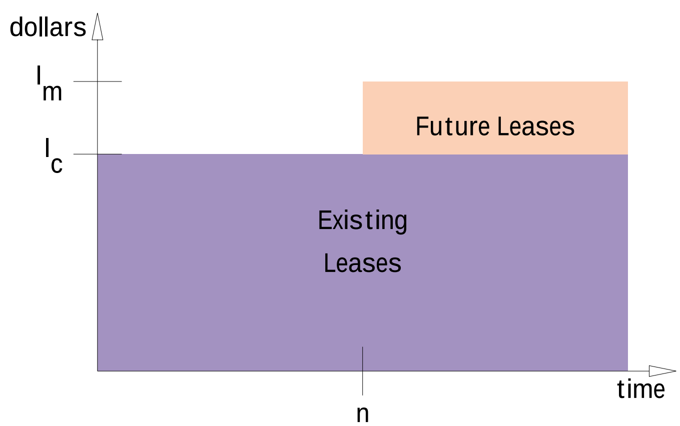

Exhibit 4 is a visual conceptualization of the differential income model. It shows that a property's total value (the crosshatched areas) is comprised of the value of existing leases given a

6 Stephen G. Sykes, "Aspects of Property Capital Growth and Its Interpretation," *The Investment Analyst* 56 (1980): 21-30; Stephen G. Sykes and Michael S. Young, "A Differential Approach to Invome Property Valuation: A New Measurement Technique," *The Appraisal Journal* 49 (April 1981): 214-233; Michael S. Young, "Measuring the Performance of Real Estate Assets and Its Managers," *Proceedings*, Seminar on the Analysis of Security Prices, Center for Research in Security Prices, University of Chicago, November 1982: 115-138.

perpetual term and current rents of I_c *plus* future leases at some market rental increment over current rents $(I_m - I_c)$ deferred n years but also extending into perpetuity. This is just a different way of slicing the value components shown in Exhibit 1. Thus, the debt-equity and the differential income models appear to be near identical transformations of one another.

Sykes and Young observed that changes in a building's value can be brought about by changes in market rental value or by changes in capitalization rate, and that the relationships between value and these variables could be quantified by two "sensitivity coefficients."

They called "sensitivity with respect to market rental value changes" S_i, and measured it by the following equation:

$$S_i = \frac{I_m}{Vr(1+r)^n} \qquad \text{Equation 2}$$

They called "sensitivity with respect to capitalization rate changes" S_r, identified by the following equation:

$$S_r = -1 - \frac{n}{(1+r)}\left[r - \frac{I_c}{V}\right] \qquad \text{Equation 3}$$

The sensitivity coefficients are unitless numbers (i.e., ratios or elasticities) that compare the relative change in capital value to the relative change in market rental income and to the relative change in capitalization rate. (The derivations of Equations 2 and 3 and subsequent Equation 4 are the result of partial differentiation of Equation 1. The mathematics are somewhat involved, and this article does not attempt to show their derivation.[7])

Real estate practitioners understand that the speed with which the value of real estate responds to changes in market rents, for example, is based on the degree of "under-rentedness" and the time until lease rollover. Intuition says that properties with short-term leases will experience increases or decreases in value from changes in market rents more quickly than properties with long-term leases. Intuition, however, does not provide a quantitative measure of the change. The sensitivity coefficients express the response precisely.

Property values may change even if there are no changes in market rents or capitalization rates. It is clear that values will change merely from the passage of time, as the existing leases approach lease rollover. Sykes and Young define this phenomenon as the intrinsic growth of a property's value, and they offer the following mathematical definition of K, the intrinsic growth:

$$K = \log(1+r)\left[1 - \frac{I_c}{rV}\right] \qquad \text{Equation 4}$$

Thus, a complete explanation of the total change in a property's value (property value growth, P_g) can be found by summing its three components.

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[7] Interested readers can find the appropriate calculations in the Appendix to "Measuring the Performance of Real Estate Managers," *Proceedings*, Seminar on the Analysis of Security Prices, Center for Research in Security Prices, University of Chicago, November 1982: 115-138.

- The rate of change in rental value, that is, the change in market rent times the sensitivity with respect to changes in market rental value ($I_g \times S_i$);
- The rate of change in capitalization rate, that is, the change in capitalization rate times the sensitivity with respect to changes in capitalization rates ($R_g \times S_r$); and
- The growth due to the approach of the lease rollover date, that is ,the intrinsic growth (K).

Put in the form of an equation, the property value change is:

$$P_g = I_g \times S_i + R_g \times S_r + K \qquad \text{Equation 5}$$

Testing the Models Against an Institutional Portfolio

The validity and usefulness of the two models were tested using detailed property and tenant-specific data obtained from a portfolio of eight properties managed by a major institutional real estate advisor on behalf of a group of domestic pension investors. The properties include four community shopping centers having a total of 95 tenants and an aggregate market value of about $51 million, and four industrial properties with 105 tenants and an aggregate market value of about 54 million.

Tenant Credit Quality and Default Risk

Each of the models requires that the analyst measure the credit quality of leases in a particular property. Once the individual lease credits have been incorporated into a property's valuation, several different measures of risk emerge. Each measure has its particular usefulness and can be used as either an absolute or a comparative measure. Of the four measures below, two were discussed previously:

- *An implicit credit rating*, expressed as a letter score, which represents the weighted average of the credit ratings for each tenant in the property.
- *An estimated default risk*, expressed as a percentage estimate of the likelihood of a default. This is the average of the default risk percentage associated with each tenant, weighted by the present value of each lease.
- *The actual lease yield*, the risk-adjusted discount rate for the existing leases, is computed as the weighted average by value of the risk-adjusted discount rates applied to each lease. For any particular lease duration, a higher lease yield should indicate a lower quality, higher risk collection of leases.
- *The market lease yield*, what the risk-adjusted discount rate for the property would be if all tenants had leases with a term of years typical of the market, is considered a better estimate of property yield over the longer term than the actual lease yield, because the latter is calculated from actual unexpired terms of the existing leases, which are likely to be shorter than market rent terms.

Each of these measures is shown in Exhibit 5 for the eight properties of the test portfolio.

Implicit credit rating is perhaps the most easily communicated measure of the relative quality of a property's tenancy; the letter rankings of implicit credit rating are more easily assimilated than the numerical rankings of the other three measures.

Exhibit 5
Measures of Tenant Credit Quality and Default Risk

Property	Implicit Credit Rating	Estimated Default Risk	Actual Lease Yield	Market Lease Yield
Retail				
Property E	C+	6.43%	9.59%	9.49%
Property G	C	7.96	9.70	9.72
Property W	C	9.00	9.57	9.88
Property Y	C–	9.44	9.72	10.03
subtotals		8.26%	9.67%	9.79%
Industrial				
Property K	C–	10.47%	9.68%	9.80%
Property V	D	14.41	9.80	10.05
Property L	D+	11.18	9.47	9.88
Property Z	C	8.45	9.47	9.63
subtotals		10.45%	9.61%	9.80%
Portfolio totals		9.45%	9.64%	9.80%

Proportion of Total Property Value Associated with Existing Leases

The debt-equity model was used to calculate the proportion of each property's value associated with the lease portfolio in place. These are indicated in Exhibit 6.

Exhibit 6
Proportion of Property Value of Existing Lease Portfolios

Property	Lease Portfolio Value	Residual Equity Value	Total Property Value
Retail			
Property E	33.6%	66.4%	100.0%
Property G	29.4	70.6	100.0
Property W	26.4	73.6	100.0
Property Y	21.9	78.1	100.0
subtotals	27.7%	72.3%	
Industrial			
Property K	17.1%	82.9%	100.0%
Property V	9.9	90.1	100.0
Property L	10.9	89.1	100.0
Property Z	17.6	82.4	100.0
subtotals	15.3%	84.7%	
Portfolio totals	21.3%	78.7%	

The lease portfolio represents a much greater proportion of the retail properties than of the industrial properties, but this may just be an accident of the particular properties in the sample. A test of a wider variety of properties probably would show less dramatic differences among property types.

In all these properties, the value of the current leases is significantly less than half of the total property value. For the industrial properties, current leases account for less than 20 percent of total value. These ratios reflect the advisor's short-term leasing strategy and the coincident short average period to rollover of the existing leases. (See Exhibit 7.) Similar calculations on properties that have long-term leases in place have produced ratios of lease portfolio value to total property value of more than 50 percent.

The ratio of lease portfolio value to total property value is a powerful indicator of how property performance is likely to respond to changing market conditions.

The fact that properties, and indeed entire portfolios, can be described by the fraction of the total value embedded in existing leases suggests that this is an important distinguishing characteristic of properties and portfolios. Investors who seek properties or portfolios with strong inflation-hedging characteristics, for example, should prefer that this ratio be relatively low. On the other hand, an asset manager who expects market rents to remain low or to decline for several years probably should seek properties in which the contribution of the existing lease portfolio to total value is relatively high.

Lease Durations vs. "Time Until Rollover" as a Measure of Future Market Exposure

Exhibit 7 summarizes lease durations, years to rollover, and the weighted average property duration of the test portfolio. The weighted average property duration is obtained by multiplying lease duration by the fraction of total value attributable to the existing leases and adding this product to the product of the average years to rollover and the fraction of value attributable to the residual. Thus, weighted average property duration combines the durations of the existing leases with the durations of the spaces encumbered by those leases (i.e., the individual space residuals). Residuals can be thought of as zero-coupon equity interests that have a duration exactly equal to their terms, which are the average years to rollover.

As a measure of a property's exposure to rollover risk, lease duration is superior to the more conventional measure of average number of years until rollover because duration incorporates the time value of the lease payments into its calculation. This, two properties having a similar average number of years to rollover, but differing markedly in lease duration, would have different exposure to rollover with the property having the shortest duration being the least exposed and least risky.

Other things being equal, properties with shorter lease durations would be less subject to changes in value because of changes in interest rates.

Summarizing the above, lease duration is a measure of a lease's sensitivity to value change due to changes in interest rates. By analogy, the weighted average property duration is a measure of a property's sensitivity to capital value change due to changes in interest rates. It will be shown below that the relative ranking of properties according to weighted average duration closely parallels a similar ranking of sensitivity of capital value to changes in capitalization rates derived from the differential income model.

Exhibit 7
Lease Duration and Years to Rollover

Property	Lease Duration (years)	Average Years to Rollover	Weighted Average Property Duration (years)
Retail			
Property E	3.77	7.25	6.08
Property G	3.60	8.60	7.13
Property W	2.66	4.68	4.15
Property Y	2.33	5.85	5.08
subtotals	3.18	7.18	6.05
Industrial			
Property K	1.33	2.21	2.06
Property V	1.22	1.56	1.53
Property L	1.07	1.46	11.42
Property Z	1.56	2.41	2.26
subtotals	1.33	2.05	1.94
Portfolio totals	2.23	4.54	3.94

Sensitivity Coefficients as Predictors of Future Performance

The differential income model asserts that the speed with which a property's value moves in response to changes in market rents is represented by its sensitivity coefficient with respect to market rent, S_i. Exhibit 8 indicates that S_i may vary greatly among properties of the same type and between different property types. For the eight properties studied, S_i ranged between 0.597 and 0.896. The range of S_i for retail properties was somewhat greater (0.597 to 0.739) than the range of S_i for industrial properties (0.8000 to 0.896), and the differences between the two property types was pronounced.

The most direct application of the Sykes/Young measures is forecasting property value growth utilizing Equation 5, $P_g = I_g \times S_i + R_g \times S_r + K$. The analysts were able to identify market rent growth rates for each property from appraisal data. These appear in Exhibit 9 as I_g. However, the analysts have no indication of the direction or magnitude of changes in capitalization rates; they therefore assume that R_g is zero, thereby eliminating the second term of Equation 5 and reducing it to:

$$P_g = I_g \times S_i + K$$

All the elements of this equation are available in Exhibits 8 and 9. It is therefore possible to forecast the property value change (P_g) for each property and for the total test portfolio, as is done in the last column of Exhibit 9.

Exhibit 8
Sensitivity of Values to Changes in Market Rent and Cap Rates

Property	S_i Sensitivity to Market Rent	S_r Sensitivity to Cap Rate	K Value Growth Due to Time
Retail			
Property E	0.597	-1.116	1.40%
Property G	0.604	-1.191	2.61
Property W	0.689	-1.096	1.35
Property Y	0.739	-1.088	1.50
subtotals	0.648	-1.142	1.99%
Industrial			
Property K	0.821	-1.008	0.18%
Property V	0.894	-1.009	0.38
Property L	0.896	-0.999	-0.15
Property Z	0.800	-1.018	0.21
subtotals	0.837	-1.009	0.16%
Portfolio totals	0.746	-1.073	1.05%

Exhibit 9
Computation of Property Value Growth

Property	I_g Market Rent Growth Rate	S_i Sensitivity to Market Rent	K Value Growth Due to Time	P_g Total Property Value Growth
Retail				
Property E	5.0%	0.597	1.40%	4.3%
Property G	5.0	0.604	2.61	5.63
Property W	5.0	0.689	1.35	4.80
Property Y	5.0	0.739	1.50	5.20
subtotal				5.23%
Industrial				
Property K	5.0%	0.821	0.18%	4.29%
Property V	6.0	0.894	0.38	5.74
Property L	6.0	0.896	-0.15	5.23
Property Z	6.0	0.800	0.21	5.01
subtotal				4.80%
Portfolio total				5.01%

Implications for Real Estate Investors

The approach outlined in this article allows the analyst to measure significant differences in the risk and performance characteristics of individual properties or portfolios that are largely invisible or only hinted at by conventional analytical techniques. The use of these measures creates the opportunity for strategic investment planning and management based on individual property or portfolio characteristics rather than on generic property type or geographic performances.

Summary

The debt-equity model and the differential income model shed light on the risk characteristics of commercial real estate inherent in a property's underlying lease structure. By application of individual lease risk assessment based on a tenant's relative credit rating and a risk-premium over Treasuries, it is possible to make a property's riskiness explicit. The models also reveal that commercial properties differ in proportions of their total value that consist of bond like (lease) components and equity like (equity residual) components. This characteristic may be more important in determining a property's sensitivity to changes in interest rates or market rents than conventional measures such as property type or geographic location.