12-1995

Investment Values of Lodging Property: Modeling the Effects of Income Taxes and Alternative Lender Criteria

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Recommended Citation

deRoos, J. A., & Rushmore, S. (1995). Investment values of lodging property: Modeling the effects of income taxes and alternative lender criteria [Electronic version]. *Cornell Hotel and Restaurant Administration Quarterly, 36*(6), 62-69. Retrieved [insert date], from Cornell University, School of Hospitality Administration site: http://scholarship.sha.cornell.edu/articles/171/

Abstract
When taxes and lender criteria are considered, the estimated value of a hotel property can change. The effect of taxes, for instance, may well be to increase to a potential buyer's bid for a given property.

Keywords
lodging property, property price, property tax, lender criteria, modeling

Disciplines
Hospitality Administration and Management

Investment Values of Lodging Property

Modeling the Effects of Income Taxes and Alternative Lender Criteria

by Jan A. deRoos and Stephen Rushmore

When taxes and lender criteria are considered, the estimated value of a hotel property can change. The effect of taxes, for instance, may well be to increase a potential buyer's bid for a given property.

Lodging-industry valuation has traditionally relied heavily on the income approach to value, using discounted-cash-flow techniques to estimate a property's worth. One reason for that reliance is that hotels, as income-producing properties with observable operating cash flows, can furnish a history of financial performance. The historical cash flows are one of the components used to predict future cash flows, and the predicted future cash flows are data used in the income approach. For a new property with-

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out a record, the performance of similar properties is used in forecasting.

While there are several versions of the income approach in use, each typically requires projections of future income and information about equity investors' criteria and lenders' underwriting criteria. When the analysis is based on market data at the time of the valuation, the techniques surveyed in a 1992 article by Stephen Rushmore can produce an estimate of "market value."[1] If one's calculations are not drawn from market data—for example, if desired equity yield is greater than returns prevalent in the market—the valuation produced is called an investment value, not a market value. In this article, we explain tools that were developed to deal solely with investment values.

The literature to date does not incorporate the effect of income taxes or alternative lender criteria on value. Income taxes reduce and alter the timing of cash flows. Moreover, because different individuals and firms pay taxes at different rates, a property might have a distinct value for different individuals and firms, a phenomenon referred to as clientele effect. Alternative lender criteria likewise affect value by placing different constraints on the property loan. Most valuation techniques use the loan-to-value ratio as a binding constraint on the value model. Defined as the amount of the loan divided by the value of the property, the loan-to-value ratio places a cap on value by limiting the amount of leverage.[2] An alternative constraint is the debt-service-coverage ratio, which places a cap on value based on the relative size of the annual net income and the debt-service payment.[3] In an era of "cash flow" lending by financial institutions, the debt-service-coverage ratio gains importance.

This article extends the previous work on investment valuation by explicitly considering tax effects and the effects of two alternative lender criteria, the loan-to-value ratio and the debt-service-coverage ratio. The work is presented in three steps. First, we present a well-accepted valuation model that does not consider taxes or alternative lender criteria, a unique closed-form solution. Second, we consider the effects of taxes and additions to capital. Last, we incorporate an alternative lender criterion.

We carry one numerical example throughout the presentation to show the effects of income taxes and leverage and the effect of the debt-service-coverage ratio as a constraint on loan value. We generated the numerical results using a spreadsheet implementation of the models.

Valuation Model without Taxes

Our starting point is a technique called simultaneous valuation, which is based on the Ellwood formula. In use by real-estate appraisers for four decades, the formula employs a maximum loan-to-value ratio as the binding lender constraint.[4] In more recent times, Suzanne Mellen extended the formula to the hospitality industry.[5]

The simultaneous-valuation formula is defensible as an appraisal technique because it takes the familiar three-to-ten-year projections of net operating income and combines them with observable data about investor and lender criteria. In its simplest form, the technique requires three sets of parameters:

- *lender criteria*—loan-to-value ratio, mortgage interest rate, and loan term;
- *investor criteria*—equity-yield rate, holding-period length, and terminal capitalization rate; and
- *property information*—net operating incomes over the holding and reversion periods and selling expenses.

The lender and investor criteria are observable from other market transactions and from interviews of market participants, and the net incomes come from a careful projection of incomes and expenses over the holding period. The separation of debt and equity returns brings an important degree of support to the technique. In contrast, the commonly applied single overall capitalization rate does not consider the effects of leverage on value.

The simultaneous-valuation technique is accurate because it properly handles the variations in net incomes that come from most analysts' estimates, as opposed to a band-of-investment technique, which properly considers only net incomes that are constant or have constant growth. Particularly useful because of its flexibility, simultaneous valuation can produce a market value when all the parameters are based on market data, and it can produce an investment value when some of the parameters are based on data unique to an individual investor or firm.

We begin the theoretical development by reconsidering the simultaneous-valuation formula, presented here as model 1 (in

[1] These are summarized in: Stephen Rushmore, "Seven Current Hotel-Valuation Techniques," *Cornell Hotel and Restaurant Administration Quarterly*, Vol. 31, No. 4 (August 1992), pp. 49–56.

[2] A typical loan-to-value ratio in hotel lending is 70 percent; that is, the loan is no more than 70 percent of the value of the hotel.

[3] The debt-service-coverage ratio is defined as the annual net operating income divided by the annual mortgage payment. A typical value is 1.4; that is, the net operating income must be at least1.4 times the mortgage payment.

[4] L.W. Ellwood, *Ellwood Tables for Real Estate Appraising and Financing*, 1959.

[5] Suzanne R. Mellen, "Simultaneous Valuation: A New Capitalization Technique for Hotel and Other Income Properties," *Appraisal Journal*, Vol. 51 (April 1983), pp. 165–189.

Exhibit 1
Model 1 and model 1 solution

Model 1

$$V = M \bullet V + \left(\sum_{j=1}^{n} \frac{NOI_j}{(1+r)^j} \right) - \frac{\left(1 - \frac{1}{(1+r)^n}\right) f \bullet M \bullet V}{r} + \frac{\frac{NOIR\,(1-SE)}{R} - \left(1 - \frac{(1+i)^n - 1}{(1+i)^m - 1}\right) MV}{(1+r)^n}$$

Model 1 solution

$$V = \frac{\left((1+i)^m - 1\right) \left[- \left(\sum_{j=1}^{n} \frac{NOI_j}{(1+r)^j} \right) (1+r)^n R + (SE-1) NOIR \right] r}{-\left[r(1+r)^n(1+i)^m + r(1+r)^n + r\left((1+r)^n(1+i)^m - i(1+r)^n(1+i)^m + r(1+i)^n - r(1+r)^n - r(1+i)^m + i(1+i)^m\right) M \right] R}$$

Exhibit 1).[6] The model consists of four terms. They are, in order,

- the mortgage amount,
- the present value of the net operating incomes during the holding period,
- the present value of the mortgage payments made during the holding period, and
- the present value of the reversion.

The parameters used in model 1 are:

M loan-to-value ratio (expressed as a decimal),
V value of the property in dollars,
n holding period (years), as indexed by *j*,
NOI set of net operating incomes (dollars), after all expenses except debt service, over the holding period,
r equity yield (expressed as a decimal),
f debt-service or mortgage constant $\dfrac{i(1+i)^m}{(1+i)^m - 1}$,
NOIR net income (dollars) used for the reversion calculation, usually specified as the *NOI* in year $n+1$,
SE selling expenses (expressed as a decimal),
R terminal capitalization rate (expressed as a decimal), also known as the going-out capitalization rate,
i loan interest rate (expressed as a decimal), and
m loan term (years).

Since the terms on the right side of model 1 contain the value we are solving for on the left side, the formula must be solved algebraically to bring all the *V*s to the left side. The resulting solution equation is also shown in Exhibit 1.

Solving the equation using the values from our numerical example (Exhibit 2) produces a value of $24,040,738. By comparison, the value presented in the article from which our numerical example was taken was $24,097,000.[7] The difference is due to our use of annual debt-service payments instead of the monthly debt-service payments assumed in the earlier article.

[6] Rushmore, pp. 52–55.

[7] Rushmore, p. 55.

Exhibit 2
Values for model 1

Our example uses these numerical values:

M	75%
n	10 years
r	21%
NOIR	4,031,000
SE	3%
R	11.5%
i	10.25%
m	30 years

The net operating incomes used in our example are as follows:

Year	Net operating income
1	2,112,000
2	2,423,000
3	2,728,000
4	2,865,000
5	3,008,000
6	3,158,000
7	3,316,000
8	3,482,000
9	3,656,000
10	3,839,000

Note: These values are taken from: Stephen Rushmore, "Seven Current Hotel-Valuation Techniques," *Cornell Hotel and Restaurant Administration Quarterly,* Vol. 31, No. 4 (August 1992), pp. 49–56.

Valuation Model with Taxes and Additions to Capital

We now add income taxes, capital-gains taxes, and additions to capital to model 1. Doing so adds complexity to the model, as the tax effects of the interest deduction and depreciation need to be considered. In addition, most owners of lodging properties have a program of ongoing capital improvements to the property, which is affected by income taxes.

The reserve for replacement should be added to the basis of the property, and the additions should be depreciated according to their useful lives. In addition, taxes must be paid on the reserve for replacement, as it is not considered an expense item for tax purposes. The

Exhibit 3
Model 2

$$V = M \bullet V + \left(\sum_{j=1}^{n} \frac{NOI_j(1-t1)}{(1+r)^j}\right) - \frac{\left(1-\frac{1}{(1+r)^n}\right) f \bullet M \bullet V}{r} + \left(\sum_{j=1}^{n} \frac{t \bullet 1 \bullet i\,(1+P_j) M \bullet V}{(1+r)^j}\right) + \frac{\left(1-\frac{1}{(1+r)^n}\right) t1 \bullet V \bullet B}{r \bullet L1} + \left(\sum_{j=1}^{n} \frac{Br \bullet RFR_j \bullet t1 \left(1-\frac{1}{(1+r)^{n-j}}\right)}{L1 \bullet r(1+r)^j}\right)$$

$$+ \frac{\left(1-\frac{1}{(1+r)^{L2}}\right) t1 \bullet V \bullet F}{r \bullet L2} + \left[\left(\sum_{j=1}^{n-L2} \frac{Fr \bullet RFR_j \bullet t1 \left(1-\frac{1}{(1+r)^{L2}}\right)}{L2 \bullet r(1+r)^j}\right) + \left(\sum_{j=n-L2+1}^{n} \frac{Fr \bullet RFR_j \bullet t1 \left(1-\frac{1}{(1+r)^{n-j}}\right)}{L2r(1+r)^j}\right)\right] + \left(\sum_{j=1}^{n} \frac{RFR_j \bullet t1}{(1+r)^j}\right) +$$

$$\frac{\left\{\frac{NOIR\,(1-SE)}{R} - \left(1-\frac{(1+i)^n-1}{(1+i)^m-1}\right)MV - \left[\frac{NOIR\,(1-SE)}{R} - V + \frac{n \bullet V \bullet B}{L1} + V \bullet F - \left(\sum_{j=1}^{n} RFR_j\right) + \left(\sum_{j=1}^{n} \frac{Br \bullet RFR_j (n-j)}{L1}\right) + \left(\sum_{j=1}^{n-L2} Fr \bullet RFR_j\right) + \left(\sum_{j=n-L2+1}^{n} \frac{Fr \bullet RFR_j (n-j)}{L2}\right)\right] t2 \right\}}{(1+r)^n}$$

depreciation calculations consider the lives of two different types of assets, real property and personal property. The life of the building for depreciation purposes is much longer than the life of the furniture, fixtures, and equipment.

The resulting formula for the value of a property is model 2 (Exhibit 3), which contains the following 10 terms.

- the mortgage amount,
- the present value of the after-tax operating cash flows during the holding period,
- the present value of the mortgage payments made during the holding period,
- the present value of the mortgage-interest tax deduction during the holding period,
- the present value of the depreciation tax shelter on the initial allocation to the building during the holding period,
- the present value of the depreciation tax shelter on the additions to the building during the holding period,
- the present value of the depreciation tax shelter on the initial allocation to furniture, fixtures, and equipment,
- the present value of the depreciation tax shelter on additions to furniture, fixtures, and equipment that are totally and partially depreciated within the holding period,
- the present value of the tax on the reserve for replacement, and
- the present value of the reversion, net of capital-gains taxes.

New parameters in this model are:

- $t1$ ordinary income tax rate (expressed as a decimal),
- $t2$ capital-gains tax rate (expressed as a decimal),
- P_j proportion of the mortgage paid off in the j^{th} year, defined as:[8] $\frac{(1+i)^{j-1}-1}{(1+i)^m-1}$,
- RFR set of cash flows that will be spent on improving the property over time, that is, the reserve for replacement in dollars (RFR_j is the amount spent in the j^{th} year),
- $L1$ depreciable life of the building (years),
- $L2$ depreciable life of the furniture, fixtures, and equipment (years),

[8] This definition gives the proportion paid off at the beginning of the year. It is used because the mortgage-interest deduction is based on this value rather than the ending balance.

Exhibit 4
Values for model 2

Model 2 uses these numerical values from model 1 (Exhibit 2):

M	75%
n	10 years
r	varies
$NOIR$	4,031,000
SE	3%
R	11.5%
i	10.25%
m	30 years

We have added the following values for model 2 (Exhibit 3):

$t1$	39%
$t2$	28%
B	60%
$L1$	39 years
$L2$	7 years
Br	30%
F	20%
Fr	70%

The net operating incomes are from Model 1. We have added the following reserves for replacement:

Year	Net operating income	Reserve for replacement
1	2,112,000	320,000
2	2,423,000	344,000
3	2,728,000	370,230
4	2,865,000	397,740
5	3,008,000	417,630
6	3,158,000	438,510
7	3,316,000	460,440
8	3,482,000	483,460
9	3,656,000	507,630
10	3,839,000	533,010

Exhibit 5
Changes in equity yields

Scenario	*Type of equity yield*	*Yield (%)*
Before-tax model		
(*A*) 75% loan-to-value ratio	Before-tax	21.0
(*B*) No debt	Unleveraged before-tax	14.1
After-tax model		
(*C*) 75% loan-to-value ratio	After-tax	17.5
(*D*) 90% loan-to-value ratio	After-tax	27.0

Note: Value is held constant at $24,040,738.

B proportion of total value attributable to the building for depreciation purposes (expressed as a decimal),
Br proportion of *RFR* spent on improvements to the building for depreciation purposes (expressed as a decimal),
F proportion of total value attributable to furniture, fixtures, and equipment for depreciation purposes (expressed as a decimal), and
Fr proportion of *RFR* spent on replacement of furniture, fixtures, and equipment for depreciation purposes (expressed as a decimal).

Because of the widespread use of a ten-year holding period and a general acceptance that the average life of furniture, fixtures, and equipment is seven years, we present only the model in which the holding period (*n*) is greater than the life of the furniture, fixtures, and equipment (*L2*).

Another model is needed for the case when *n* is less than *L2*. The reason for treating the two cases distinctly is that no closed-form solution exists for the general case that would handle both holding periods.

Assumptions contained in model 2 are that the reserve for replacement is split between additions to the building and additions to furniture, fixtures, and equipment in the same proportion each year, straight-line depreciation is used, the reserve for replacement is considered spent the instant it is received, and the reserve for replacement is received at the end of each projection year. The closed-form solution to model 2 is not presented here, owing to its formidable appearance. A spreadsheet implementation of model 2 provides the tools necessary to solve the model and to gain insight into the components of value.

A Numerical Example

To show the effects of taxes and the reserve for replacement on the valuation model, we hold value and all the remaining input parameters constant while permitting the equity yield rate to change. That allows us to compare before-tax and after-tax equity yields. The base case is model 1, using a 75 percent loan-to-value ratio and a 21.0 percent equity yield rate. Those assumptions used to solve model 1 produce a value of $24,040,738, as previously stated. We present results for the following scenarios:

(*A*) model 1, using a 75 percent loan-to-value ratio (base case);
(*B*) model 1, with no debt;
(*C*) model 2, using a 75 percent loan-to-value ratio; and
(*D*) model 2, using a 90 percent loan-to-value ratio.

The difference between scenarios *A* and *B* (see Exhibit 5) illustrates the impact that debt financing can have on equity yields. It is a good illustration of the beneficial effects of leverage. The difference between scenarios *A* and *C* shows how the equity yield changes under the impact of income and capital-gains taxes. That difference leads to our first conclusion.

Finance theory tells us that the after-tax return on an investment should be equal to the before-tax return times one minus the tax rate:[9]

before-tax return x (1 – tax rate) = after-tax return

That is, if the tax rate is 39 percent, investors should be equally content with $1.00 of before-tax income or $0.61 of after-tax income.

The principle can be applied to rates of return as well as dollar amounts. Assuming a tax rate of 35 percent, the after-tax equity yield should be 65 percent of the before-tax equity yield.[10] But in our numerical example the after-tax equity yield is 17.5 percent—83 percent of the before-tax yield of 21 percent.

The conclusion is that the tax code dampens the effect of income taxes, to the benefit of taxpaying investors. The dampening is due to two factors: the tax deductibility of interest and the tax shields from depreciation.

That finding provides a new tool for investors. A scenario *A* investor who wants a 21 percent before-tax equity yield would be willing to bid $24,040,738 for the property. A scenario *C* investor could offer more than $24,040,738 and achieve an after-tax equity yield greater than one minus the tax rate times the before-tax yield. Such an investor who is, for example, content with a

[9] See, for example: James C. Van Horne, *Fundamentals of Financial Management,* 7th edition (Englewood Cliffs, NJ: Prentice-Hall, 1989), pp. 442–444.

[10] Because the tax rate is 39 percent on ordinary income and 28 percent on capital-gains income, a weighted average-tax-rate calculation is necessary for accuracy. The weights depend on the proportion of the value subject to each tax rate. It is easy to see that the weighted rate would be between 39 percent and 28 percent. We are using 35 percent for expository purposes.

Exhibit 6
Partitioned values under the four scenarios

Component of value	Scenario *A*	*B*	*C*	*D*
Mortgage amount	$18,030,553	$0	$18,030,553	$21,636,564
Operating cash flows	11,301,973	14,920,249	7,885,847	5,604,779
Mortgage payments	(7,916,272)	0	(8,930,618)	(7,893,300)
Mortgage-interest deduction	0	0	3,218,155	2,856,979
Initial building depreciation deduction	0	0	659,708	485,901
Reserve for replacement building depreciation deduction	0	0	16,566	10,067
Initial furniture, fixtures, and equipment depreciation deduction	0	0	1,035,430	806,809
Reserve for replacement furniture, fixtures, and equipment depreciation deduction	0	0	207,273	127,131
Tax on reserve for replacement	0	0	(708,990)	(505,958)
Reversion	2,624,484	9,120,489	2,626,814	911,766
Total	*$24,040,738*	*$24,040,738*	*$24,040,738*	*$24,040,738*

Note: For ease of comparison, we have used the present value of all components.

15 percent after-tax equity yield could outbid the scenario *A* investor (up to $25,889,770) while still achieving (or surpassing) his or her overall investment objectives. The added accuracy that results from the explicit consideration of taxes in the valuation model allows investors confidently to raise their bid. Ironically, this example indicates that investors subject to taxes may have an advantage over investors who are tax-exempt.

The difference between scenarios *C* and *D* is due solely to the increase in leverage. As the loan-to-value ratio approaches 100 percent, equity yield approaches infinity, as long as the unleveraged equity yield is greater than the mortgage-interest rate. Because of that problem—a weakness of models based on the loan-to-value ratio—lenders use the debt-service-coverage ratio as an additional constraint on loan underwriting.

Partitioning the Value Estimate

One way to use the models developed is to partition the value solution into its component parts. That is done in Exhibit 6, which lists all 10 components of value for the four scenarios presented in Exhibit 5. The differences among the scenarios are an interesting study, as we have held the value constant at $24,040,738.

Comparing scenarios *A* and *C* is especially interesting, as they have the same loan-to-value ratio and thus the same value for debt. In both cases the net equity position is $6,010,185 ($24,404,738 minus $18,030,553), but the two scenarios vary considerably in the effects of tax deductions on value. The tax deductions under scenario *C*—amounting to $5,137,132—are offset by a large reduction in the value of the operating cash flows, an increase in the value of mortgage payments (due to lower equity yield), and the taxes paid on the reserve for replacement. The difference in the reversion value between *A* and *C* is trivial. The essence of the difference between scenarios *A* and *C* is a shifting of value from operating cash flows to tax deductions.

An examination of the differences between scenarios *C* and *D* shows the effects of leverage, while

By considering taxes in the valuation model, some investors will raise their bid—in fact, in some cases investors subject to taxes may have an advantage over investors who are tax-exempt.

Exhibit 7
Model 3

$$V = \frac{NOI_3}{DCR \bullet f} + \left(\sum_{j=1}^{n} \frac{NOI_j}{(1+r)^j} \right) - \frac{\left(1 - \frac{1}{(1+r)^n}\right) NOI_3}{r \bullet DCR} + \frac{\frac{NOIR\,(1-SE)}{R} - \frac{\left(1 - \frac{(1+i)^n - 1}{(1+i)^m - 1}\right) NOI_3}{DCR \bullet f}}{(1+r)^n}$$

Exhibit 8
Changes in value using changes in parameters of debt-service-coverage ratio

Net operating income	Debt-service-coverage ratio	Value
Third-year	1.3	$24,614,509
Third-year	1.4	24,024,612
First-year	1.3	22,749,673
First-year	1.4	22,292,978

scenario *B* shows the effects of using an all-equity model.

Proof of Value

One of the important checks in any valuation exercise is to perform a proof of value to verify that the value determined by the analysis is correct. The proof is generally performed by using all the input parameters except the equity yield to model the cash flows to equity. If the value estimate is correct, the internal rate of return on the equity cash flows should be equal to the equity-yield rate.

We performed a proof of value on the $24,040,738 value obtained in Exhibit 5 under scenario *C*. The proof verified that the value calculation was correct, as the desired equality between the equity yield and the internal rate of return to the equity cash flows was obtained, with a value of 17.50964 percent.[11]

Debt-Service-Coverage Ratio

The debt-service-coverage ratio is a lender criterion that imposes a constraint on value different from that of the loan-to-value ratio. Instead of establishing a maximum loan amount to constrain value, the debt-service-coverage ratio requires that the annual net operating income "cover" the debt-service payments by a specific ratio. Many lenders employ both ratios and will lend funds based on the constraint that results in the smallest loan.

In determining the debt-service-coverage ratio, one has to decide which net operating income to use. Since the net operating income typically increases over time, the most conservative lenders base the loan on a debt-service-coverage ratio using the first year's (or smallest) net-operating-income figures.

Other lenders use a "stabilized net operating income," especially when lending on new properties, which take time to reach a stable occupancy rate. The stabilized net operating income is the net operating income in the year in which the project produces a cash flow that supports an overall market capitalization rate—typically the second, third, or fourth year of operation.

In this paper we use the third-year net operating income when determining the debt-service-coverage ratio. Note that any year's net operating income can be used in the formula.

We start by presenting the case in which income taxes are not considered. Model 3 (Exhibit 7), like model 1, produces a before-tax value for a property. The formula has been changed to account for the substitution of debt-service-coverage ratio for the loan-to-value ratio. All other parameters are the same. Model 3 has the same four terms as model 1.

Model 3 produces a value of $24,614,509 using a debt-service-coverage ratio of 1.3 on the third-year net operating income, compared to the value of $24,040,738 in model 1. Three additional calculations of value, presented in Exhibit 8, allow a glimpse of how the model responds to changes in the debt-service-coverage ratio and the income that is used as the basis for the loan.

With a debt-service-coverage ratio of 1.3 and the third-year net operating income, model 3 produces a value greater than model 1. On the other hand, when the debt-service-coverage ratio is 1.4 times the third-year net operating income, the model 3 value is slightly less than model 1's result. Applying coverage ratios to the first year's net operating income lowers the values by about $850,000.

Model 4 (Exhibit 9) incorporates the effects of income taxes and the reserve for replacement as well as the debt-service-coverage ratio. It differs from model 2 only in the changes necessary to substitute

[11] The entire proof of value, which will be published in the February 1996 *Cornell Quarterly*, is also available from the authors.

Exhibit 9
Model 4

$$V = \frac{NOI_3}{DCR \bullet f} + \left(\sum_{j=1}^{n} \frac{NOI_j(1-t1)}{(1+r)^j} \right) - \frac{\left(1 - \frac{1}{(1+r)^n}\right) NOI_3}{r \bullet DCR} + \left(\sum_{j=1}^{n} \frac{t1 \bullet i(1+P_j) NOI_3}{DCR \bullet f(1+r)^j} \right) + \frac{\left(1 - \frac{1}{(1+r)^n}\right) t1 \bullet V \bullet B}{r \bullet L1} + \left(\sum_{j=1}^{n} \frac{Br \bullet RFR_j \bullet t1 \left(1 - \frac{1}{(1+r)^{n-j}}\right)}{L1 \bullet r(1+r)^j} \right)$$

$$+ \frac{\left(1 - \frac{1}{(1+r)^{L2}}\right) t1 \bullet V \bullet F}{r^{L2}} + \left[\left(\sum_{j=1}^{n-L2} \frac{Fr \bullet RFR_j \bullet t1 \left(1 - \frac{1}{(1+r)^{L2}}\right)}{L2 \bullet r(1+r)^j} \right) + \left(\sum_{j=n-L2+1}^{n} \frac{Fr \bullet RFR_j \bullet t1 \left(1 - \frac{1}{(1+r)^{n-j}}\right)}{L2 \bullet r(1+r)^j} \right) \right] + \left(\sum_{j=1}^{n} \frac{RFR_j \bullet t1}{(1+r)^j} \right) +$$

$$\frac{\left\{ \frac{NOIR(1-SE)}{R} - \frac{\left(1 - \frac{(1+i)^n - 1}{(1+i)^m - 1}\right) NOI_3}{DCR \bullet f} - \left[\frac{NOIR(1-SE)}{R} - V + \frac{n \bullet V \bullet B}{L1} + V \bullet F - \left(\sum_{j=1}^{n} RFR_j \right) + \left(\sum_{j=1}^{n} \frac{Br \bullet RFR_j (n-j)}{L1} \right) + \left(\sum_{j=1}^{n-L2} Fr \bullet RFR_j \right) + \left(\sum_{j=n-L2+1}^{n} \frac{Fr \bullet RFR_j (n-j)}{L2} \right) \right] t2 \right\}}{(1+r)^n}$$

debt-service-coverage ratio for loan-to-value ratio. Model 4 contains the same 10 terms as model 2. Comparing the results of models 2 and 4, we see that the debt-service-coverage ratio used in model 4 must be between 1.3 and 1.4 to achieve the value obtained by model 2 (see Exhibit 10). Thus a 75 percent loan-to-value ratio is reasonable in this instance, as lenders are currently using debt-service-coverage ratios in the range of 1.3 to 1.4.

Many lenders use both criteria to underwrite lending. For instance, a group of lenders interviewed for the *Crittenden Hotel/Motel Real Estate News* stated that loans must meet both a 75 percent loan-to-value ratio and a 1.1 debt-service-coverage ratio.[12] Using the parameters above, the binding constraint would be the loan-to-value ratio of 75 percent, as a loan based on a debt-service-coverage ratio of 1.3 would result in a loan-to-value ratio greater than 75 percent. With lenders relying on both criteria to underwrite loans, the prudent investor would calculate values based on both constraints before making an offer on a property.

Exhibit 10
Comparison of models 2 and 4

Scenario	Value
Model 2, 75% loan-to-value ratio, taxes	$24,040,738
Model 4, third-year net operating income, 1.3 debt-service-coverage ratio	24,798,064
Model 4, third-year net operating income, 1.4 debt-service-coverage ratio	24,019,454

Tax Consequences

We have shown that valuation models that explicitly account for tax effects produce after-tax equity yields that are better than expected. That is owing to the dampening effect of the tax deductibility of interest and depreciation expenses. Since the tax code affects each investor in a different way, such matters should affect their willingness to pay for a given set of cash flows.

The tools presented in this article can be used to assist investors in the following ways:

- An investor can determine the maximum bid to offer (or if one is selling a property, the maximum likely bid) on both an after-tax and before-tax basis.
- An investor can compare the after-tax equity yield from a hotel-property investment with the before-tax equity yield.
- An investor can evaluate potential investments on an after-tax basis instead of relying on the approximations inherent in a before-tax approach.
- An investor can determine how a change in tax regimes can affect investment value.
- An investor can determine the effects of alternative lender criteria and use that information to achieve the best financing for a lodging investment.
- An investor can partition value into its component parts to examine the effects of different scenarios.

It is clear that income taxes, the reserve for replacement, and alternative lender criteria should affect the maximum bid one is willing to make for a lodging property. **CQ**

[12] "Lenders Launch Floating-Rate Conduit," *Crittenden Hotel/Motel Real Estate News,* September 19,1994, p. 1.