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Investment Values Of Lodging Property

Part II

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Part II

Proof of Value for Selected Models

In an earlier article the authors introduced two models that demonstrated the effects of taxes and tender criteria on a property's estimated value. Here's the proof of value for those models.

by Jan A. deRoos and Stephen Rushmore

In an earlier, companion article on modeling the effects of income taxes and alternate lender criteria on investment values, we presented two valuation models for lodging properties that can be used to estimate the value of a hotel or motel on an after-tax basis.' The models allow one to study the effects of two

'Jan A. deRoos and Stephen Rushmore, "Investment Values of Lodging Property: Modeling the Effects of Income Taxes and Alternative Lender Criteria," *Cornell Hotel and Restaurant Administration Quarterly, Vol.* 36, No, 6 (December 1995), pp. 62-69.

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Exhibit 1
Values for all calculations

Our proof uses these numerical values:

M	75%
n	10 years
r	varies
NOIR	4,031,000
SE	3%
R	11.5%
i	10.25%
m	30 years
t1	39%
t2	28%
L1	39 years
L2	7 years
B	60%
Br	30%
F	20%
Fr	70%

The net operating incomes and reserves for replacement are as follows:

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

Note: Some of 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.

distinct lender underwriting criteria: **(1)** the loan-to-value ratio (i.e., value-based lending) and **(2)** the alternative debt-service-coverage ratio (i.e., cash-flow-based lending). In that earlier report the models are presented and solved algebraically; an example is presented showing the difference between before-tax and after-tax equity yield rates, while holding value constant; and the effects of the two underwriting criteria are demonstrated.

In this part of the analysis we provide a proof of value. The proof is necessary to verify the accuracy of the model and to demonstrate the ability of the model to produce robust results across a wide range of parameters.

The proof is presented using the input values from our previous article, reproduced here as Exhibit 1. The proof is limited to Model 1 and Model 2 and is structured as a net-present-value (NPV) problem, solving for value given the other input values. If the answer we derived in the first article is correct, then the NPV of the equity cash flows developed here will be equal to that answer.

Base Case, Model 1 (before-tax analysis)

Inputs: loan-to-value ratio is 75 percent;before-tax equity yield is 21.0 percent.

The value is proven by discounting the cash flows to the mortgage and equity components at their required rate of return. If the sum of the annual debt service plus ending mortgage balance discounted at the mortgage interest rate equals the initial mortgage balance; and if the sum of the annual equity dividends plus equity residual discounted at the equity yield rate equals the amount of equity capital invested, then $24,041,000 is the correct value using the algebraic model.

Using the assumed financial structure set forth for this scenario, the value can be allocated between the debt and equity as follows:

Mortgage component

(75 percent) $18.031.000

Equity component

(25 percent) 6,010.000

Total $24,041,000

The annual debt service is calculated by multiplying the mortgage component by the mortgage constant, as follows:

Mortgage component $18.031,000

Mortgage constant

(10.25 percent. 30 years) .108297

Annual debt service $ 1,953,000

The cash flow to equity is calculated by deducting the debt service from the projected net operating income as shown in Exhibit 2.

The reversion value is calculated by capitalizing the eleventh year net operating income at 11.5 percent, as follows:

Reversion value

($4,031,000/.115) $35,052.000

less

Brokerage and legal fees

(3 percent) 1.052,000

Mortgage balance 16,344.000

Equity residual $17.656.000

Exhibit 3 demonstrates that the lender will receive a 10.25-percent rate of return.

Exhibit 4 demonstrates that the equity investor will receive a 21-percent rate of return on the equity invested (equity yield).

Since the two components of capital (debt and equity) are receiving their desired rate of return, the value of $24,041,000 has been proved.

Case Two, Model 1 (before-tax analysis)

Inputs: no debt; unleveraged total property yield is 14.1 percent.

The value is proven if the sum of the annual total cash flows plus the

reversion value discounted at the total property yield equals the value of the hotel ($24,041,000).

The reversion value at the end of the tench year is calculated as follows:

Reversion value

($4,031,000/.115) $35,052,000

less

Brokerage and legal fees

(3 percent) 1.052,000

Reversion $34,000,000

Exhibit 5 shows that discounting the annual cash flow at a discount rate of 14.1 percent (total property yield) produces the $24,041,000 valuation.

Case Three, Model 2 (after-tax analysis)

Inputs: loan-to-value ratio is 75 percent; after-tax equity yield is 17.5 percent.

The value is proven if the sum of the annual after-tax cash flows to equity (equity dividends) plus the after-tax equity residual discounted acihe after-tax equity yield rate equals the amount of equity capital invested.

The assumed financial structure set forth for this scenario is the same as the base case (Model 1, on the previous page), allocated between debt and equity as follows (and as shown earlier):

Mortgage component

(75 percent) $18,031,000

Equity component

(25 percent) 6,010,000

Total $24,041,000

Calculating the annual debt service is the same as for the base case

and is repeated here:

Mortgage component $18.031,000

Mortgage constant

(10.25 percent, 30 years) .108297

Annual debt service $ 1,953,000

Using annual debt service of $1,953,000, and assuming one annual mortgage payment, the amortization table shown in Exhibit 6

Exhibit 2

Calculation of cash flow to equity (base case; in $OOOs)

Year	1	2	3	4	5	6	7	8	9	10 11
Net income	2.1	2.42	2.72	2.8	3.0	3.15	3.3	3.4	3.65	3.839
Debt service	1,9	1,95	1,95	1,9	1,9	1,95	1,9	1,9	1,95	1,953
Cash flow to equity	159	470	775	912	1,055	1,205	1,363	1,529	1.703	1.886

Exhibit 3

Mortgage-component yield (IRR s 10.25%)

Year	Total annual debt service	Present value (PV) of $1 Discounted 9 10.25% cash flow	
1	1,953	x 0.907031	1,771
2	1,953	x 0.822706	1,606
3	1,953	x 0.746219	1,457
4	1.953	x 0.676644	1,322
5	1.953	x 0.613918	1,199
6	1,953	x 0.556843	1,087
7	1,953	x 0.505074	986
8	1,953	x 0.458117	895
9	1,953	x 0.415527	811
10	18,297"	x 0.376896	6,896
Value of mortgage component			18,031
		•10th year debt service	1.953
plus outstanding mortgage balance of			16,344
Numbers are 000s of dollars			18,297

Exhibit 4

Equity-component yield (IRR = 21%)

Year	Net Income to Equity	Present value (PV)of $1 9 21%	Discounte cash flow
1	159 x	0.826446	132
2	470 x	0.683013	321
3	775 x	0.564474	438
4	912 x	0.466507	426
5	1,055 x	0.385543	407
6	1,205 x	0.318631	384
7	1,363 x	0.263331	359
8	1.529 x	0.217629	333
9	1,703 x •	0.179859 =	306
10	19,542' x	0.148644 =	2,905
Value of equity component			6,010
•10th year net income of			1.886
	plus net sale proceeds to equity of		17,656
Numbers are OOOs of dollars			19,542

Exhibit 5
Total property yield (IRR = 14.06%)

Year	Net income before debt service		Present value (PV) of $1 @ 14.06%		Discounted cash flow
1	2,112	×	0.876705	=	1,852
2	2,423	×	0.768611	=	1,862
3	2,728	×	0.673845	=	1,838
4	2,865	×	0.590763	=	1,693
5	3,008	×	0.517925	=	1,558
6	3,158	×	0.454067	=	1,434
7	3,316	×	0.398083	=	1,320
8	3,482	×	0.349001	=	1,215
9	3,656	×	0.305971	=	1,119
10	37,839*	×	0.268246	=	10,150
Total property value					24,041
			*10th year net income before debt service of		3,839
			plus sale proceeds of		34,000
Numbers are 000s of dollars					37,839

In years where the taxable income is negative, the tax liability is positive, thus assuming that the tax benefit can be used to offset a tax liability from another investment.

shows the debt service, annual interest, mortgage balance at the beginning and end of each year, and the amount of amortization.

To determine the taxable income, the amount of the annual depreciation must be quantified. Using the acquisition price of $24,041,000, the following table shows the allocation of the basis among the three components: building (60 percent); furniture, fixtures, and equipment (FF&E, 20 percent); and land (20 percent).

Improvements:	
Building	$14,425,000
FF&E	4,808,000
Land:	4,808,000
Total	$24,041,000

The straight-line depreciation method will be used, with the building component being depreciated in 39 years and the FF&E component being depreciated in seven years.

The reserve for replacement needs to be factored into the depreciation calculations. It is assumed that each year's reserve for replacement will be spent in a lump sum on the last of each year and will increase the basis in the following year. Thirty percent of the reserve for replacement will be spent on building components (39-year assets) and 70 percent on the acquisition of FF&E (seven-year assets). The depreciation of reserve-for-replacement expenditures in a year will commence the following year. Exhibit 7 shows the calculation of the depreciation for the building and FF&E components.

The basis for the building is calculated each year by deducting ' the annual depreciation from the beginning-of-the-year basis and then adding the building component of the reserve for replacement. The basis for the FF&E is calculated each year by deducting the annual depreciation from the beginning-of-the-year basis and then adding the

Exhibit 5
Total property yield (IRR = 14.06%)

Year	Net income before debt service		Present value (PV) of $1 @ 14.06%		Discounted cash flow
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Total property value					24,041
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The reserve for replacement needs to be factored into the depreciation calculations. It is assumed that each year's reserve for replacement will be spent in a lump sum on the last of each year and will increase the basis in the following year. Thirty percent of the reserve for replacement will be spent on building components (39-year assets) and 70 percent on the acquisition of FF&E (seven-year assets). The depreciation of reserve-for-replacement expenditures in a year will commence the following year. Exhibit 7 shows the calculation of (he depreciation for the building and FF&E components.

The basis for the building is calculated each year by deducting the annual depreciation from the beginning-of-the-year basis and then adding the building component of the reserve for replacement. The basis for the FF&E is calculated each year by deducting the annual depreciation from the beginning-of-the-year basis and then adding the

Exhibit 6 *Amortization table, base case three ($000s)*

Year 1	Year 2	Year 3	Year 4	Year5	Year6	Year 7	Years	Year 9	Year 10
Interest payment 1,848	1,837	1,826	1,813	1.798	1,782	1,765	1,746	1,725	1,701
Principal payment 105	115	127	140	154	170	188	207	228	252
Annual debt service 1,953	1,953	1,953	1,953	1,953	1,953	1,953	1,953	1,953	1,953
Beginning mortgage balance 18,031	17,926	17,811	17,684	17,544	17,390	17,220	17,032	16,825	16.597
less Principal payment 105	115	127	140	154	170	188	207	228	252
Ending mortgage balance 17,926	17,811	17,684	17,544	17,390	17,220	17,032	16,825	16,597	16,345

Exhibit 7 ***Depreciation for the building and FF&E components ($000s)***

Year 1		2	3	4	5	6	7	8	9	10
Total reserve (or replacement	320	344	370	398	418	439	460	483	508	523
Building basis, beginning o(year	14,425	14,15	13,882	13,61	13,35	13.10	12,851	12,602	12.35	12.113
Initial building depreciation	370	370	370	370	370	370	370	370	370	370
		2	2	2	2	2	2	2	2	2
			3	3	3	3	3	3	3	3
				3	3	3	3	3	3	3
					3	3	3	3	3	3
Reserve for replacement, building	i					3	3	3	3	3
							3	3	3	3
								4	4	4
									4	4
"										4
Less Total building depreciation	370	372	375	378	381	384	387	391	395	399
Add: Reserve for replacement, building	96	103	111	119	125	132	138	145	152	160
Building basis, end of year	14,151	13,882	13,618	13,359	13,104	12,851	12,602	12,356	12,113	11.875
FF&E basis, beginning of year	4,808	4,345	3,867	3,373	2,861	2,323	1,757	1,165	1,218	1,293
Initial FF&E depreciation	687	687	687	687	687	687	687			
		32	32	32	32	32	32	32		
			34	34	34	34	34	34	34	
				37	37	37	37	37	37	37
					40	40	40	40	40	40
Reserve for replacement, FF&E	i					42	42	42	42	42
							44	44	44	44
								46	46	46
									48	48
										51
Less Total depreciation	687	719	753	790	830	872	916	275	291	308
Add Reserve for replacement, FF&E	224	241	259	278	292	307	322	338	355	373
FF&E basis, end of year	4,345	3,867	3,373	2,861	2,323	1,757	1,165	1,218	1,293	1,35i

The basis for the building is calculated each year by deducting the annual depreciation from the beginning-of-the-year basis and then adding the building component of the reserve for replacement. The basis for the FF&E is calculated each year by deducting the annual depreciation from the beginning-of-the-year basis and then adding the FF&E component of the reserve for replacement.

Exhibit 6 *Amortization table, base case three ($000s)*

Interest payment	Year1	Year 2	Year3	Year 4	Year 5	Year 6	Year 7	Years	Year 9	Year 10
Principal payment	1,848	1.837	1,826	1,813	1.798	1.782	1,765	1,746	1,725	1,701
Annual debt service	105	115	127	140	154	170	188	207	228	252
Beginning	1,953	1,953	1,953	1,953	1,953	1,953	1,953	1,953	1,953	1,953
mortgage balance *less*	18,031	17,926	17,811	17,684	17,544	17,390	17,220	17,032	16,825	16,597
Principal payment	105	115	127	140	154	170	188	207	228	252
Ending mortgage balance	17,926	17,811	17,684	17,544	17,390	17,220	17,032	16,825	16,597	16,345

Exhibit 7 *Depreciation for the building and FF&E components ($OOOs)*

Year	1	2	3	4	5	6	7	8	9	10
Total reserve for replacement	320	344	370	398	418	439	460	483	508	523
Building basis, beginning of year	14,425	14,15	13.88	13.61	13,35	13.10	12,85	12,602	12,356	12.113
Initial building depreciation	370	370	370	370	370	370	370	370	370	370
		2	2	2	2	2	2	2	2	2
			3	3	3	3	3	3	3	3
				3	3	3	3	3	3	3
					3	3	3	3	3	3
Reserve for replacement, building						3	3	3	3	3
							3	3	3	3
								4	4	4
									4	4
										4
Less: Total building depreciation	370	372	375	378	381	384	387	391	395	399
Add: Reserve for replacement, building	96	103	111	119	125	132	138	145	152	160
Building basis, end of year	14,151	13,882	13,618	13,359	13,104	12.851	12,602	12.356	12,113	11,875
FF&E basis, beginning of year	4.808	4,345	3,867	3,373	2.861	2,323	1.757	1,165	1,218	1,293
Initial FF&E depreciation	687	687	687	687	687	687	687			
		32	32	32	32	32	32	32		
			34	34	34	34	34	34	34	
				37	37	37	37	37	37	37
					40	40	40	40	40	40
Reserve (or replacement, FF&E						42	42	42	42	42
							44	44	44	44
								46	46	46
									48	48
										51
Less: Total depreciation	687	719	753	• 790	830	872	916	275	291	308
Add: Reserve for replacement, FF&E	224	241	259	278	292	307	322	338	355	373
FF&E basis, end of year	4.345	3,867	3.373	2,861	2,323	1,757	1,165	1,218	1,293	1,358

The basis tor the building is calculated each year by deducting the annual depreciation from the beginning-of-the-year basis and then adding the building component of the reserve for replacement. The basis for the FF&E is calculated each year by deducting the annual depreciation from the beginning-of-the-year basis and then adding the FF&E, component of the reserve for replacement.

Exhibit 8 *Calculation of taxable Income ($000s)*

Net Income	Year 1	Year 2	Year 3	Year 4	Year 5	Year6	Year7	Year 8	Year 9	Year 10
Less debt service	2,112	2.423	2,728	2.865	3.008	3,158	3,316	3,482	3,656	3.839
Cash flow after	1.953	1,953	1,953	1,953	1,953	1,953	1,953	1,953	1,953	1.953
debt service	159	470	775	912	1,055	1,205	1,363	1,529	1,703	1,886
Add back:										
Amortization	105	115	127	140	154	170	188	207	228	252
Reserve for replacement	t 320	344	370	398	418	439	460	483	508	533
Total additions	425	459	497	538	572	609	648	690	736	785
Deduct:										
Depreciation for...	370	372	375	378	381	384	387	391	395	399
...building	687	719	753	790	830	872	916	275	291	308
...FF&E										
Total deductions	1,057	1.091	1,128	1.168	1.211	1.256	1.303	666	686	706
Taxable income	-473	-162	144	282	416	558	708	1.554	1,753	1,965

Exhibit 9 *Calculation of after-tax equity cash flow ($000s)*

	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year7	Year 8	Year 9	Year 10
Taxable income	-473	-162	144	282	416	558	708	1,554	1,753	1,965
Tax rate	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Tax liability	-184	-63	56	110	162	218	276	606	684	766
Cash flow before										
debt service	2,112	2.423	2,728	2.865	3.008	3,158	3,316	3,482	3.656	3.839
Less debt service	-1,953	-1,953	-1,953	-1,953	-1,953	-1,953	-1.953	-1,953	-1,953	-1.953
Tax liability	184	63	-56	-110	-162	-218	-276	-606	-684	-766
After-tax equity										
cash flow	344	533	719	802	893	988	1,087	923	1,020	1,129

FF&E component of the reserve for replacement.

A separate taxable-income calculation is necessary because the IRS definition of taxable income is different from annual cash flow.

The following items' are allowable (IRS) deductions:

- All normal operating expenses,
- Interest on mortgages, and
- Depreciation (a non-cash expense).

The following cash expenditures are not allowable deductions:

- Reserve for replacement, and
- Amortization of mortgages.

The taxable-income calculation starts off with the 10-year projection of income and expense. The projection includes the reserve for replacement, which is not an allowable deduction. From the projection of income and expense, the assumed debt service (interest and amortization) is deducted. The interest component of the debt service is an allowable deduction but the amortization is not. The result of deduct-

ing the reserve for replacement and debt service from the projection of income and expense is commonly called "cash flow after debt service."

Taxable income is calculated by adding back the amortization and reserve for replacement and deducting the depreciation on the building and FF&E. The details are shown in Exhibit 8.

Once the taxable income is calculated, the tax liability can be determined by multiplying the taxable income by the assumed tax rate (39 percent). The after-tax equity cash flow takes the cash flow after debt service and deducts the tax liability (see Exhibit 9). These calculations result in the quantification of the annual after-tax equity cash flow for the 10-year projection period.

Note that in years where the taxable income is negative, the tax liability is positive, thus assuming that the tax benefit can be used to offset a tax liability from another investment.

The valuation model assumes the sale of the subject property at the end of the tenth year. The resulting equity residual and tax consequences need to be determined. This is called the after-tax equity residual.

The after-tax equity residual is calculated by capitalizing the eleventh-year's net income by the terminal capitalization rate to obtain the reversion value. The before-tax equity residual from the sale of the property is determined by deducting the ending mortgage balance and sales expenses (broker and legal fees) from the reversion value.

As indicated earlier (and repeated here) the reversionary value is calculated by capitalizing the eleventh year net operating income at 11.5 percent, as follows:

Reversion value
($4.031,000/.115) $35,052,000
less:
Brokerage and legal fees
(3 percent) 1,052,000 Mortgage balance 16,344.000
Equity residual $17,656.000

The tax consequences must then be determined to obtain the after tax equity residual. The capital gain is the difference between the reversion value and the property's tax basis at the end of the tenth year. The capital-gains tax liability is found by multiplying the capital gain by the assumed tax rate (28 percent). The after-tax equity residual is the equity residual minus the capital-gains tax.

The following table illustrates the calculation of the tax consequences of the subject property's sale and the resulting after-tax equity residual:

Net sale price $34,000,000
Less basis:
Building $11,875,000
FF&E 1,358,000
Land 4,808,000
Total basis 18.041,000
Capital gain $ 15.959,000 Capital gains tax rate 0.28
Capital gains tax $4.469,000

Before-tax equity residual $17,656,000
less: capital gains tax 4.469.000
After-tax equity residual $13,187,000

The proof is completed by discounting the annual after-tax cash flows for the ten-year projection period plus the after-tax equity residual at the assumed after-tax equity yield rate of 17.51 percent to see if the results equate to the original equity investment of $6,010.000. Exhibit 10 shows the discounting process and proof. **CQ**

Exhibit 10 *Equity-component yield (IRR = 17.51%)*

Year	Net income Before debt service	Present value (PV)of $1 *9* 17.51%	Discounted Cash flow
1	344 x	0.850994	293
2	533 x	0.724191	386
3	719 x	0.616282	443
4	802 x	0.524452	420
6	683 x	0.446306	308;
6	988 x	0.378804	37^
7	1,087 x	0.323211	351
8	923 x	0.275050	254
9	1,020 x	0.234066	239
10	14,316" x	0.199189	2.851
Value of equity component			6.010
		"10th year after-tax cash flow of:	1,129
		plus after-tax equity residual of:	13,187
Numbers are 000s of dollars			14,316