Solution to Questions - Chapter 10
Valuation of Income Properties: Appraisal and the Market for Capital

Question 10-1

What is the economic rationale for the cost approach? Under what conditions would the cost approach tend to give the best value estimate?

The rationale for using the cost approach to valuing (appraising) properties is that any informed buyer of real estate would not pay more for a property than what it would cost to buy the land and build the structure.

The cost approach is most reliable where the structure is relatively new and depreciation does not present serious complications.

Question 10-2

What is the economic rationale for the sales comparison approach? What information is necessary to use this approach? What does it mean for a property to be comparable?

The rationale for the market approach (otherwise known as the sales comparison approach), lies in the principle that an informed investor would never pay more for a property than what other investors have recently paid for comparable properties.

The sales comparison approach to valuation is based on data provided from recent sales of properties highly comparable to the property being appraised.

For a property to be comparable, the sale must be an "arm's-length" transaction or a sale between unrelated individuals. Sales should represent normal market transactions with no unusual circumstances, such as foreclosure, sales involving public entities, and so on.

Question 10-3

What is a capitalization rate? What are the different ways of arriving at an overall rate to use for an appraisal?

An overall rate or overall capitalization rate is the rate on the overall property (debt and equity).

One way of arriving at an overall rate is to use the band of investment approach. This is based on taking into consideration the investment criteria of both the lender and the equity investor involved in a project. This is done by taking a weighted average of the equity dividend rate expected by the investor and the mortgage loan constant (expressed on an annual basis) required by the lender.

Two different ways of arriving at an overall rate are the direct capitalization approach and the present value method.

Question 10-4

If investors buy properties based on expected future benefits, what is the rationale for appraising a property without making any income or resale price projections?

Using the direct capitalization approach, this technique is a very simple approach to the valuation of income producing property. The rationale is based on the idea that at any given point in time, the current NOI produced by a property is related to its current market value.

A survey of other transactions including sales prices and NOI (NOI ÷ sales prices) indicates the cap rate that competitive investments have traded for. This survey provides cap rates that indicate what investors are currently paying relative to current income being produced. A parallel in equity securities markets would be earnings yield (or earnings per share ÷ price) or price earnings multiples (Price ÷ earnings per share).

Question 10-5

What is the relationship between a discount rate and a capitalization rate?

A capitalization rate is equal to the difference between the discount rate and the expected *growth* in income. In other words, changes in income over the economic life of the property are ignored when using a capitalization rate.

Question 10-6

What is meant by a unit of comparison? Why is it important?

A unit of comparison is used in the sales comparison approach to valuation. To the extent that there are differences in size, scale, location, age, and quality of construction between the project being valued and recent sales of comparable properties, adjustments must be made to compensate for such differences. The appraiser must find an appropriate unit of comparison for a given property. Examples are price per square foot for an office building, price per cubic foot for warehouse space, price per bed for hospitals, or price per room for hotels.

Question 10-7

Why do you think appraisers usually use three different approaches when estimating value?

If perfect information was available, then theoretically the same value should result regardless of the methods chosen, be it cost, market, or income capitalization. Even with imperfect information, there should be some correspondence between the three approaches to value, which is the reason appraisal reports will typically contain estimates of value based on at least two approaches to determining value.

Question 10-8

Under what conditions should financing be explicitly considered when estimating the value of a property?

Financing should be explicitly considered when using the mortgage-equity capitalization method. With this method, the value of a property can be estimated by explicitly taking into consideration the requirements of the mortgage lender and equity investor, hence the term "mortgage-equity capitalization".

Question 10-9

What is meant by depreciation for the cost approach?

There are three categories of depreciation for the cost approach. They are very difficult to determine and, in many cases, require the judgment of appraisers who specialize in such problems. The three categories are as follows:

Physical deterioration.

Functional or structural obsolescence due to the availability of more efficient layout designs and technological changes that reduce operating costs.

External obsolescence that may result from changes outside of the property such as excessive traffic, noise, or pollution.

Question 10-10

When may a "terminal" cap rate be lower than a "going in" cap rate? When may it be higher?

A terminal cap rate may be lower than the going in cap rate if between the present time and end of a holding period interest rates are expected to fall, risk is expected to decline, or demand is expected to increase (thereby producing higher rents and/or appreciation). A higher terminal cap rate would result if the opposite changes in the three situations stated above occurred.

Question 10-11

In general, what effect would a reduction in risk have on "going in" cap rates? What would this effect have if it occurred at the same time as an unexpected increase in demand? What would be the effect on property values?

A reduction in risk lowers cap rates because expected returns are lower. If this occurred at a time when demand increases, property values would rise significantly because of increases in rents from greater demand and lower cap rates.

Question 10-12

What are some of the potential problems with using a "going in" capitalization rate that is obtained from previous property sales transactions to value a property being offered for sale today?

Problems occur if properties being used as "comparables" have different lease terms, maturities, and credit quality of tenants. Further, if properties are older, have depreciated, have different functional design, etc. than the subject, problems can occur. In these cases cap rates must be either adjusted to reflect these differences or not used at all.

Question 10-13

When estimating the reversion value in the year of sale, why is the terminal cap rate applied to NOI for the year after the holding period?

When we sell a property the price paid by the next investor is an assessment of income for his expected period of ownership. Therefore, for the next investor, or potential buyer, the NOI for his first year of ownership will be the year *after* we sell the property. This will be the *first year* of his investment.

Question 10-14

Is a cap rate the same as an IRR? Which is generally greater? Why?

No. The cap rate is the relationship between the current NOI and present value. The IRR is the return on all future cash flows from the operation and sale of the property. Usually the IRR is greater than the cap rate.

Question 10-15

Discuss the differences between using (1) a terminal cap rate and (2) an appreciation rate in property value when estimating reversion values.

The terminal cap rate approach to estimating a reversion value is based on the assumption that in the year of sale, investors will value the property based on the new "going in" cap rate at the time. Estimates of the terminal cap rate are made by adjusting the current or going in cap rate to reflect any depreciation that is likely to occur over the holding period. A risk premium may also be added because the cap rate is being applied to NOI several years in the future which is less certain than the current NOI that a going in cap rate would be applied to.

Using a rate of appreciation to estimate the reversion value is based on the investor's expectation as to trends in property values. This could be a reflection of risk, expected cash flows, interest rates, and returns on other investments such as stocks and bonds.

Solution to Problems - Chapter 10
Valuation of Income Properties: Appraisal and the Market for Capital

INTRODUCTION

The homework problems in this chapter provide practice in application of all three of the appraisal approaches. The required solution procedure follows the examples in the text. However, the problems purposely do *not* indicate *exactly* which approach to use. Students should learn to determine which approach is appropriate given the information available, which is, of course, the way it works in practice.

Problem 10-1
Part (a)
(1) The goal is to find the present value of NOI from year 1-7 and
(2) the present value of the reversion value, or selling price, at the end of year 7.

Present Value of NOI in years 1-7 is as follows:

End of Year	NOI	PV at 12%
1	1,000,000	892,857
2	1,000,000	797,194
3	1,000,000	711,780
4	1,200,000	762,622
5	1,250,000	709,283
6	1,300,000	658,620
7	1,339,000	605,696

(3) The reversion value at the end of year 7 is determined by NOI in year (8) or 1,379,170 ÷ .09 (which is the term NAI cap rate or 12% - 3%). This produces an expected sale price of $15,324,111. However, this must be discounted at 12% for 7 years to present value or $6,931,850. We add the PV of NOI ($5,138,052) + PV of REV ($6,931,850) and get a property value of $12,069,902.

Part (b) The terminal cap rate is .09 or (12% - 3%).

Part (c) The going in cap rate is NOI_1 of $1,000,000 ÷ $12,069,902 or .082851, .083 rounded.

Part (d) The difference between the "going in" cap rate of .083 and "going out" or terminal cap rate .09 is attributable to the fact that the property will be 7 years older, and holding all else constant, will trade at a discount much like properties that are 7 years older than the subject property would trade today.

Problem 10-2
(a) The property value is $22,222,222
Solution:
Property Value = NOI Next Year / (Discount Rate - Growth Rate)
$22,222,222 = $2,000,000 / (0.13 - 0.04)

(b) If we survey recent sales, the cap rates indicated from recently sold properties that are comparable to the subject property should be 0.09, otherwise (1) market conditions have changed. If other properties have sold with cap rates lower than .09, property values have declined. If they have sold for higher cap rates, then property values have increased.
Solution:
"Going in" Cap Rate = NOI Year 1 / Property Value
.09 = $2,000,000 / $22,222,222

(c) If r = 12%, the property value would be $25,000,000
Solution:

Property Value = NOI Next Year / (Discount Rate - Growth Rate)
$20,000,000 = $2,000,000 / (0.12 - 0.04)

(d) Market cap rates should be falling and property values should be increasing.

Problem 10-3

Office is the highest and best use of this site.
The analysis for the Baker Tract is as follows:

	Office	Retail
Rent	2,400,000	2,400,000
Expenses	(960,000)	(1,200,000)
Cash Flow	1,440,000	1,200,000
Cap Rate	.10	.11
Property Value	14,400,000	10,909,090
Cost	(10,000,000)	(8,000,000)
Residual	4,400,000	2,909,090

Problem 10-4

Step 1: Calculate the NOI for the Office Building

Solution:

Rents	$6,000,000
PGI or EGI	6,000,000
less: Operating Expenses	2,400,000
NOI	$3,600,000

Step 2: Calculate the Building Value at Cost:

Solution:

300,000 sq. ft. x $100 per sq. ft. = $30,000,000

(a) Land Value would be $10,000,000.

Solution:

Property Value = NOI Next Year / (Discount Rate - Growth Rate)
$40,000,000 = $3,600,000 / (0.12 - 0.03)

Land Value = Property Value - Building Value at Cost
$10,000,000 = $40,000,000 - $30,000,000

(b) Land Value would be $15,000,000

Solution:

Property Value = NOI Next Year / (Discount Rate - Growth Rate)
$45,000,000 = $3,600,000 / (0.12 - 0.04)

Land Value = Property Value - Building Value at Cost
$15,000,000 = $45,000,000 - $30,000,000

Percentage Change in Land Value would be a 50% increase

Solution:

Percentage Change = (New Land Value - Old Land Value) / Old Land Value
0.50 = (15,000,000 - 10,000,000) / 10,000,000

(c) The Land Value would be $2,727,273

Solution:

Property Value = NOI Next Year / (Discount Rate - Growth Rate)
$32,727,273 = $3,600,000 / (0.12 - 0.01)

Land Value = Property Value - Building Value at Cost
$2,727,273 = $32,727,273 - $30,000,000

Percentage Change in Land Value would be a 72.73% decrease

Solution:

Percentage Change = (New Land Value - Old Land Value) / Old Land Value

-0.7273 = (2,727,273 - 10,000,000) / 10,000,000

(d) If the land owner is asking $12,000,000 for the land, the project would not be feasible (under the assumptions in (a)) because it is more than the estimated land value of $10,000,000.

(e) To justify a $12 million land value, something has to give:

1. Expected Return on the Investment could increase to 12.7% from 12%

   Solution:

   Property Value = Implied Land Value + Building Value at Cost

   $42,000,000 = $12,000,000 + $30,000,000

   Cap Rate (R) = NOI Year 1/ Property Value

   0.0857 = 3,600,000 / 42,000,000

   Expected Return (r) = Required Return (R) + Growth Rate

   0.1157 = 0.0857 + 0.03

2. Expected growth (g) in NOI would increase from 0.03 to 0.0343

   Solution:

   Property Value = Implied Land Value + Building Value at Cost

   $42,000,000 = $12,000,000 + $30,000,000

   Cap Rate (R) = NOI Year 1/ Property Value

   0.0857 = 3,600,000 / 42,000,000

   Expected Growth (g) = Expected Return (r) - Required Return (R)

   0.0343 = 0.12 - 0.0857

3. Building Costs would have to decrease by $2,000,000, or by $6.67 per sq. ft. and the investor will earn 12%.

   Solution:

   Max Building Costs = Expected Property Value - Amount Paid for Land

   $28,000,000 = $40,000,000 - $12,000,000

   $28,000,000 / 300,000 = $93.33 per square foot compared to $100 per square foot

   $100 - $93.33 = $6.67

4. Rents would have to increase from $6,000,000 to $6,300,000 or average rent per square foot from $20 to $21 and the investor would still earn 12%.

   Solution:

   Property Value = Implied Land Value + Building Value at Cost

   $42,000,000 = $12,000,000 + $30,000,000

   NOI = Property Value x Required Return (R)

   $3,780,000 = $42,000,000 x 0.09

   Rents = NOI / 0.6*

   $6,300,000 = $3,780,000 / 0.6*

   *Operating Expenses are 40% of rents (1-0.4 = 0.6) and NOI is rent less operating expenses.

Problem 10-5

(a) The present value of the property would be $588,235.

Solution:

Property Value = NOI Next Year / (Discount Rate - Growth Rate)

$588,235 = $100,000 / (0.13 + 0.04)

(b) The new development would produce NOI of $200,000 and when a cap rate of .07 is applied a value of $2,857,142 is indicated. If the cost to redevelop (demolish/rebuild/release) is $1,000,000 the property could be acquired for $588,235 and a profit of $1,268,909 or (2,815,142 - 1,000,000 - 588,235) could be earned.

Problem 10-6

(a)The estimated value of this property is $1,172,457

Solution:

End of Year	(a) NOI	(b) PV at 11%	(c) REV	(d) PVREV at 11%	(e) Total PV
1	$100,000	$90,090			
2	105,000	85,220			
3	110,000	80,431			
4	115,000	75,754			
5	120,000	71,214			
6	125,000	66,830			
7	130,000	62,616			
8	135,000	58,580			
9	140,000	54,729			
10	145,000	51,067			
11	150,000*				
PVCF		$696,532			$ 696,532
					528,277
10 resale			1,500,000	528,277	$1,224,809

*To estimate resale price.

(b) The current or "going in" cap rate (R) for this property is 0.0853

Solution:

"Going In" Cap Rate = NOI Year 1 / Total PV

0.0816 = $100,000 / $1,224,809

(c) The difference between the cap rate in (b) and the .10 terminal cap rate is caused by the fact that as properties age and depreciate over time, the production of income declines. Therefore, the expected growth in NOI from an older property should be less than that of a new property. This means that, holding all else constant, when compared to newly developed properties, a property this is 10 years old should have a higher cap rate than a new one.

(d) That economic conditions today and 10 years from now will be the same. Or, that if economic conditions change, all properties and other investments will be affected in the same way, thereby not affecting the relative performance or expected returns in a disproportionate manner.

Problem 10-7

Calculation of incurable physical depreciation:

Reproduction cost	$5,000,000
Less: curable physical depreciation	300,000
Less: curable functional obsolescence	200,000
Balance subject to depreciation	4,500,000
Incurable physical depreciation (5/50 or 10%)	450,000

Calculation of depreciated cost:	
Reproduction cost	$5,000,000
Physical depreciation:	
Curable	$300,000
Incurable (from above)	450,000
Functional obsolescence:	
Curable	200,000
Incurable*	207,063
Value of Building	3,842,937
Add land value	1,000,000
Total value estimate	$4,842,937

**$25,000 x (PVIFA, 45 yrs., 12%) = 25,000 x 8.282516 = $207,063

Problem 10-8

(a)

Comparable	Rent/unit	Price	Units	Price/unit	GRM*
#1	$550	$9,000,000	140	$64,286	117
#2	650	6,600,000	90	73,333	113

*Price/unit divided by rent/unit

Thus the GRM ranges from about 113 to 117. This implies a range in value for the subject property as follows:

Rent	x	Units	x	GRM	=	Est. value
$600	x	120	x	117	=	$8,424,000
600	x	120	x	113	=	8,136,000

Note: Because vacancy is the same for both comparables and the subject property, the vacancy can be ignored. That is, the potential gross rent multiplier can be used. If the vacancy was not the same, then using an *effective* gross rent multiplier would be preferred.

Because the rental income is provided for in this problem, use of a rent multiplier (either gross or effective gross) is the preferred solution. However, an alternative approach to the problem would be to estimate value based on using only the price per unit. That is, the price per unit ranges from $64,286 to $73,333. This implies a range in price for the 120 unit subject property from $7,714,320 to $8,799,960.

(b) Other information that might be considered includes differences between the subject property and the comparable properties in expense ratios, financing, expected trends in rents and property values, and risk.

Problem 10-9

(a) Loan payment (PMT) = NOI / DCR = $150,000 / 1.2 = $125,000
Loan amount (using a financial calculator):
PMT = $125,000, i = 10/12%, n = 20x12, FV = 0

Solve for PV
PV = $1,079,423

Solve for loan balance after 5 years using financial calculator:
PMT = $125,000, i = 10/12%, n = 5x12, PV = $1,079,423

Solve for FV
FV = $969,348

Project NOI

Year	NOI	PMT	Cash flow to equity
1	$150,000	$125,000	$25,000
2	154,500	125,000	29,500
3	159,135	125,000	34,135
4	163,909	125,000	38,909
5	168,826	125,000	43,825
6	173,891		

Resale = 173,891 / .09 =	$1,932,123
Loan balance =	969,348
Cash flow from sale	$ 962,775

Year	Cash flow to equity
1	$25,000
2	29,500
3	34,135
4	38,909
5	43,825 + $ 962,775

PV of Cash flow to equity at 12% = $666,035

(b)	Total value	= PV of cash flow to equity + loan amount
	Total value	= $666,035 + $1,079,423
	Total value	= $1,745,458

(c)	Cap rate	= NOI / Value
		= $150,000 / $1,745,458 = 8.59%

Problem 10-10
(a)

Comparable #1	
Rent (350,000 s.f. x $3.90)	$1,365,000
Vacancy and expenses (50%)	682,500
NOI	$682,500
Price	$9,400,000
Overall rate (682,500 / 9,400,000)	7.26%

Comparable #2	
Rent (300,000 s.f. x $4.10)	$1,230,000
Vacancy and expenses (50%)	615,000
NOI	615,000
Price	$7,900,000
Overall rate (615,000 / 7,900,000)	7.79%

Comparables 1 and 2 imply an overall rate of about 7.53%.

Application to the subject:

Rent (320,000 s.f. x $4.00)			$1,280,000
Vacancy and expenses (50%)			640,000
NOI			$640,000
Price	=	NOI / Overall rate	
	=	640,000 / 0.0753	
	=	$8,499,336	

(b)
Examples of additional information that would be desirable about the comparable properties and the subject property include the trend in NOI, property values, financing, and risk.

Problem 10-11

Refer to table below, the highest land value is now $1,714,286 with a highest and best use of warehouse. The higher growth rate for warehouse was enough to change the highest and best use.

	(a)	(b)	(c)	(a/c = d)	(e)	(d) - (e)
Use	***Year 1 NOI***	***(r-g)***	***R***	***Implied Property Value***	***Building Costs***	***Implied Land Value***
Office	$500,000.00	.13-.03	0.10	$5,000,000	$ 4,000,000.00	1,000,000
Retail	$600,000.00	.12-.04	0.08	$7,500,000	$ 6,000,000.00	1,500,000
Apartment	$400,000.00	.12-.03	0.09	$4,444,444	$ 3,000,000.00	1,444,444
Warehouse	$400,000.00	.10-.03	0.07	$5,714,286	$ 4,000,000.00	1,714,286

Problem 10-12

(a)
Rose garden has a better quality and location then other comparables. It offers all the amenities offered by other apartments and has more parking space. In sum, Rose garden should have lower going-in cap rate then all other comparables.

(b)
Going in cap rate = NOI/ Value
= 1645000/27000000
=0.0609

This cap rate is less than the cap rates of the other comparable apartments.

(c)
Value of the Rose garden apartment after 5 years = NOI in year 6/ cap rate
= 1645000*(1.03)^5 /(0.0609+.005)
= 28,937,873

Hence the return on the investment can be calculated by using the IRR function in excel or by solving following equation:

27,000,000 = 1,645,000/(1+r)^1
+1,645,000*1.03/(1+r)^2+1,645,000*1.03^2/(1+r)^3+1,645,000*1.03^3/(1+r)^4+1,645,000*1.03^4/(1+r)^5+28,937,873.33/(1+r)^5

Return = 7.67%. This is below the required rate of 8%. Therefore, the asking price is too high to achieve 8%.

Problem 10-13

(a)

The price of the apartment can be calculated by solving the following equation

PV= 200,000/(1.1)^1 +210,000/(1.1)^2+ 220,000/(1.1)^3+ 230,000/(1.1)^4+ 240,000/(1.1)^5+ PV*1.03^5 /(1.1)^5

This produces:

PV= PVNOI + PVREV or

PV= 826,775 + $[PV(1.03)^5 \times (1/1 + .10)^5]$

PV= 826,775 + PV(1.159274 x .620921)

PV= 826,775 + PV(.7198181)

.280182PV= 826,775

PV= 2,950,849

The price will be = $2,950,850

(b)

The price of the apartment in year 5 = $2,950,850*1.03^5 = $3,420,843

(c)

Value at end of year 5 can be estimated even when present value is not known. This is done in part (a) by expressing future value in terms of present value as done in solution (a) of this question or by expressing present value in terms of future value.

(d) Land Value = Property Value – Building Cost = $2,950,850 - $2,300,000

= $650,850

Problem 10-14

(a) The loan increases to $403,673 from $336,394 and the value increases to $504,531from $501,960.

(b) We would expect the lender to normally charge a higher interest rate for a greater loan amount. The equity investor is also likely to require a higher return on equity due to the additional risk. With a DCR of only 1.0 any drop in NOI will result in negative cash flow for the investor.

Problem 10-15

(a) Warehouse is now the highest and best use with a land value of $2,214,286 as shown below:

	(a)	(b)	(c)	(a/c = d)	(e)	(d) - (e)
Use	***Year 1 NOI***	***(r-g)***	***R***	***Implied Property Value***	***Building Costs***	***Implied Land Value***
Office	$500,000.00	.13-.03	0.10	$ 5,000,000.00	$ 3,500,000.00	1,500,000
Retail	$600,000.00	.12-.04	0.08	7,500,000	$ 6,500,000.00	1,000,000
Apartment	$400,000.00	.12-.02	0.10	4,000,000	$ 2,500,000.00	1,500,000
Warehouse	$400,000.00	.10-.03	0.07	5,714,286	$ 3,500,000.00	2,214,286

(b) Warehouse is still the highest and best use of the site with a land value of $2,214,286 as shown below:

	(a)	(b)	(c)	(a/c = d)	(e)	(d) - (e)
Use	***Year 1 NOI***	***(r-g)***	***R***	***Implied Property Value***	***Building Costs***	***Implied Land Value***
Office	$500,000.00	.13-.04	0.09	$ 5,555,555.56	$ 3,500,000.00	2,055,556

Retail	$600,000.00	.12-.04	0.08	7,500,000	$	6,500,000.00	1,000,000
Apartment	$400,000.00	.12-.02	0.10	4,000,000	$	2,500,000.00	1,500,000
Warehouse	$400,000.00	.10-.03	0.07	5,714,286	$	3,500,000.00	2,214,286

Problem 10-16

The value increases to $12,368,216 from $10,573,934 due to the lower required return and the higher resale price resulting from the lower terminal capitalization rate. (Answers may differ slightly due to rounding.