Solutions to Questions - Chapter 12
Financial Leverage and Financing Alternatives

Question 12-1

What is financial leverage? Why is a one-year measure of return on investment inadequate in determining whether positive or negative financial leverage exists?

Financial leverage is defined as benefits that may result to an investor by borrowing money at a rate of interest that is lower than the expected rate of return on total funds invested in a property.

To determine whether leverage is positive (favorable) or negative (unfavorable), the investor needs to determine whether the IRR (calculated over the entire holding period) is greater than the cost of borrowed funds. A first-year measure of return such as the overall capitalization rate can not be used because it does not explicitly consider the benefits that accrue to the investor over time from changes in income and value that do not affect the cost of debt.

Question 12-2

What is the break-even mortgage interest rate (BEIR) in the context of financial leverage? Would you ever expect an investor to pay a break-even interest rate when financing a property? Why or why not?

The BEIR is the maximum interest rate that could be paid on the debt before the leverage becomes unfavorable. It represents the interest rate where the leverage is neutral (neither favorable nor unfavorable).

The BEIR remains constant regardless of the amount borrowed (e.g. 60, 70, or 80 percent of the property value). An equity investor probably would not pay a break-even interest rate when financing a property because the investor just earns the same after-tax rate of return as a lender on the same project. Borrowing at the BEIR provides no risk premium to the investor. Normally, a risk premium is required because the equity investor bears the risk of variations in the performance of the property.

Question 12-3

What is positive and negative financial leverage? How are returns or losses magnified as the degree of leverage increases? How does leverage on a before-tax basis differ from leverage on an after-tax basis?

When the before-tax or after-tax IRR are higher with debt than without debt, we say that the investment has positive or favorable financial leverage. When returns are lower with debt than without debt, we say that the investment has negative or unfavorable financial leverage. Positive leverage occurs when the unlevered IRR is greater than the interest rate paid on the debt. Negative leverage occurs when the unlevered IRR is less than the interest rate paid on the debt. Returns and losses are magnified by the greater the amount of debt, the greater the return or loss to the equity investor.

Leverage on a before-tax basis differs from leverage on an after-tax basis because interest is tax deductible. Therefore, we must consider the after-tax cost of debt which is different than the before-tax cost of debt.

Question 12-4

In what way does leverage increase the riskiness of a loan?

Leverage increases the standard deviation of return regardless of whether it is positive or negative. This means the investment is clearly riskier when leverage is used.

Because the NOI does not change when more debt is used, increasing the amount of debt increases the debt service relative to NOI. Therefore, the debt coverage ratio (DCR) may exceed the lender's limits. With higher loan-to-value ratios and declining debt coverage ratios, risk to the lender increases. As a result, the interest rate on additional debt will also increase.

Question 12-5

What is meant by a participation loan? What does the lender participate in? Why would a lender want to make a participation loan? Why would an investor want to obtain a participation loan?

A participation loan is where in return for a lower stated interest rate on the loan, the lender participates in some way in the income or cash flow from the property. The lender's rate of return depends, in part, on the performance of the property. Participations are highly negotiable and there is no standard way of structuring them.

A lender's motivation for making a participation loan includes how risky the loan is perceived relative to a fixed interest rate loan. The lender does not participate in any losses and still receives some minimum interest rate (unless the borrower defaults). Additionally, the participation provides the lender with somewhat of a hedge

against unanticipated inflation because the NOI and resale prices for an income property often increase as a result of inflation. To some extent this protects the lender's real rate of return.

An investors motivation is that the participation may be very little or zero for one or more years. This is because the loan is often structured so that the participation is based on income or cash flow above some specified break-even point. During this time period, the borrower will be paying less than would have been paid with a straight loan. This may be quite desirable for the investor since NOI may be lower during the first couple of years of ownership, especially on a new project that is not fully rented.

Question 12-6

What is meant by a sale-leaseback? Why would a building investor want to do a sale-leaseback of the land? What is the benefit to the party that purchases the land under a sale-leaseback?

When land is already owned and is then sold to an investor with a simultaneous agreement to lease the land from the party it is sold to, this is called a sale-leaseback of the land.

One motivation for the sale-leaseback of the land is that it is a way of obtaining 100 percent financing on the land. A second benefit is that lease payments are 100 percent tax deductible. With a mortgage, only the interest is tax deductible. The investor may deduct the same depreciation charges on the building whether or not the land is owned, since land cannot be depreciated. This results in the same depreciation for a smaller equity investment. The investor may have the option of purchasing the land back at the end of the lease if it is desirable to do so.

Question 12-7

Why might an investor prefer a loan with a lower interest rate and a participation?

An investor's motivation is that the participation may be very little or zero for one or more years. This is because the loan is often structured so that the participation is based on income or cash flow above some specified break-even point. During this time period, the borrower will be paying less than would have been paid with a straight loan. This may be quite desirable for the investor since NOI may be lower during the first couple of years of ownership, especially on a new project that is not fully rented.

Question 12-8

Why might a lender prefer a loan with a lower interest rate and a participation?

A lender's motivation for making a participation loan includes how risky the loan is perceived relative to a fixed interest rate loan. The lender does not participate in any losses and still receives some minimum interest rate (unless the borrower defaults). Additionally, the participation provides the lender with somewhat of a hedge against unanticipated inflation because the NOI and resale prices for an income property often increase as a result of inflation. To some extent this protects the lender's real rate of return.

Question 12-9

How do you think participations affect the riskiness of a loan?

There is clearly some uncertainty associated with the receipt of a participation since it depends on the performance of the property. The lender does not participate in any losses and still receives some minimum interest rate (unless the borrower defaults). Additionally, the participation provides the lender with somewhat of a hedge against unanticipated inflation because the NOI and resale prices for an income property often increase as a result of inflation. To some extent this protects the lender's real rate of return.

Question 12-10

What is the motivation for a sale-leaseback of the land?

One motivation for the sale-and-leaseback of the land is that it is a way of obtaining 100 percent financing on the land. A second benefit is that lease payments are 100 percent tax deductible. With a mortgage, only the interest is tax deductible. The investor may deduct the same depreciation charges on the building whether or not the land is owned, since land cannot be depreciated. This results in the same depreciation for a smaller equity investment. The investor may have the option of purchasing the land back at the end of the lease if it is desirable to do so.

Question 12-11

What criteria should be used to choose between two financing alternatives?

Assuming the two financing alternatives are for roughly the same amount of funds (so financial risk due to leverage is the same), the alternative with the lowest effective interest cost should be chosen. This alternative should also result in the highest IRR on equity.

Question 12-12

What is the traditional cash equivalency approach to determine how below-market rate loans affect value?

Cash equivalency was introduced in Chapter 9 where it was demonstrated that a buyer would be willing to pay more for a property with a below market interest rate loan. In that chapter, the present value of interest savings was used to indicate the additional amount which might be paid for a property. This same approach could be used to determine the additional amount that might be paid for income producing properties as analyzed in this chapter.

Question 12-13

How can the effect of below-market rate loans on value be determined using investor criteria?

Note: This question is not explicitly covered in the chapter. It requires students to think about how concepts from earlier chapters dealing with valuation and cash equivalency might be applied to evaluate a below-market rate loan on income property.

Evaluating a below-market rate loan is like comparing two financing alternatives where one is at the market rate and one has a below-market rate. All else being equal, the below market interest rate loan should result in a higher IRR_E for the property than would result with a market rate loan. The investor might therefore be willing to pay more for the property, as long as the IRR_E is at least as much as it would be with the market interest rate loan.

Solutions to Problems - Chapter 12
Financial Leverage and Financing Alternatives

INTRODUCTION

The problems in this chapter are designed to reinforce the students' understanding of alternative methods of structuring debt financing and how financing can affect the cash flows and the leverage of the real estate project. The conditions necessary for positive financing leverage and how the use financial leverage affects risk are also discussed.

The third problem extends problem 5 in chapter 10 which involved calculation of the expected return and standard deviation for an investment. In this chapter financing is added to the problem. Instructors should emphasize that the risk (measured b the standard deviation) will *always* increase with leverage. However, whether the expected return increases depends on whether leverage is favorable or unfavorable.

Problem 12-1
(REFER TO TEMPLATE 12_1.XLS)

(a) 70% LOAN (70% and 10% are the original variables contained in the template. It must be changed for any other answer.)

ASSUMPTIONS:

			Tax Considerations:		
Asking Price	$2,000,000		**Building Value**	$1,600,000	
NOI year 1	$190,000		**Depreciation**	27.5 years	
Growth-NOI	3.00%		**Tax rate**	36.00%	
Loan-to-Value	70.00%				
Loan Interest	10.00%				
Loan term	25 years				
Payments per year	12				
Appreciation rate	3.00%				
Holding Period	5 years				
Selling costs	0.00% of sale price				

Equity	600,000		
Loan	1,400,000		
Annual Loan Payment	152,662		
Mortgage Balance	1,318,293	year	5

SUMMARY LOAN INFORMATION:

End of Year	1	2	3	4	5
Payment	152,662	152,662	152,662	152,662	152,662
Mortgage Balance	1,386,742	1,372,095	1,355,914	1,338,039	1,318,293
Interest	139,403	138,015	136,481	134,787	132,915
Principal	13,258	14,647	16,181	17,875	19,747

Year	1	2	3	4	5
NOI	190,000	195,700	201,571	207,618	213,847
Debt Service	152,662	152,662	152,662	152,662	152,662
Before-tax Cash Flow	37,338	43,038	48,909	54,956	61,185
NOI	190,000	195,700	201,571	207,618	213,847
Less: Interest	139,403	138,015	136,481	134,787	132,915
Depreciation	58,182	58,182	58,182	58,182	58,182
Taxable Income	(7,585)	(497)	6,908	14,649	22,750
Tax (Savings)	(2,731)	(179)	2,487	5,274	8,190
After-tax Cash Flow	40,069	43,217	46,422	49,683	52,995

Cash flow from sale in year	5
Sales Price	2,318,548
Sales costs	0
Mortgage Balance	1,318,293
Before-tax cash flow	1,000,255
Original Cost Basis	2,000,000
Accumulated Depreciation	290,909
Adjusted Basis	1,709,091
Capital Gain	609,457
Tax from Sale	219,405
After-tax cash flow from sale	780,851

EQUITY

Year	0	1	2	3	4	5
BTCF	(600,000)	37,338	43,038	48,909	54,956	1,061,440
BTIRR on Equity	**17.32%**					

Year	0	1	2	3	4	5
ATCF	(600,000)	40,069	43,217	46,422	49,683	833,846
ATIRR on Equity	**12.33%**					

(a) 80% LOAN (Change 70 to 80% and 10 to 11%. All other variables are constant.)

ASSUMPTIONS:

Asking Price	$2,000,000	**Tax Considerations:**	
NOI year 1	$190,000	**Building Value**	$1,600,000
Growth-NOI	3.00%	**Depreciation**	27.5 years
Loan-to-Value	80.00%	**Tax rate***	36.00%*
Loan Interest	11.00%		
Loan term	25 years	*To be applied to all items of income, capital gains and recapture of depreciation.	
Payments per year	12		
Appreciation rate	3.00%		
Holding Period	5 years		
Selling costs	0.00% of sale price		

		400,000				
Equity		400,000				
Loan		1,600,000				
Annual Loan Payment		188,182				
Mortgage Balance		1,519,278	year	5		

SUMMARY LOAN INFORMATION:

End of Year	1	2	3	4	5
Payment	188,182	188,182	188,182	188,182	188,182
Mortgage Balance	1,587,185	1,572,887	1,556,934	1,539,136	1,519,278
Interest	175,367	173,884	172,229	170,383	168,324
Principal	12,815	14,298	15,953	17,799	19,858

Year	1	2	3	4	5
NOI	190,000	195,700	201,571	207,618	213,847
Debt Service	188,182	188,182	188,182	188,182	188,182
Before-tax Cash Flow	1,818	7,518	13,389	19,436	25,665

	1	2	3	4	5
NOI	190,000	195,700	201,571	207,618	213,847
Less: Interest	175,367	173,884	172,229	170,383	168,324
Depreciation	58,182	58,182	58,182	58,182	58,182
Taxable Income	(43,548)	(36,366)	(28,840)	(20,947)	(12,659)
Tax (Savings)	(15,677)	(13,092)	(10,382)	(7,541)	(4,557)
After-tax Cash Flow	17,496	20,610	23,772	26,977	30,222

Cash flow from sale in year	5	
Sales Price		2,318,548
Sales costs		0
Mortgage Balance		1,519,278
Before-tax cash flow		799,270
Original Cost Basis	2,000,000	
Accumulated Depreciation	290,909	
Adjusted Basis	1,709,091	
Capital Gain	609,457	
Tax from Sale		219,405
After-tax cash flow from sale		579,866

EQUITY

Year	0	1	2	3	4	5
BTCF	(400,000)	1,818	7,518	13,389	19,436	824,935
BTIRR on Equity	**17.12%**					

Year	0	1	2	3	4	5
ATCF	(400,000)	17,496	20,610	23,772	26,977	610,088
ATIRR on Equity	**12.74%**					

(b) BEIR

(To calculate the Break Even Interest Rate (BEIR), the ATIRR must first be calculated as if there were no financing.)

NO LOAN (Change 80 to 0%. All other variables are constant.)

ASSUMPTIONS:

Asking Price	$2,000,000	Tax Considerations:	
NOI year 1	$190,000	Building Value	$1,600,000
Growth-NOI	3.00%	Depreciation	27.5 years
Loan-to-Value	0.00%	Tax rate	36.00%
Loan Interest	11.00%		
Loan term	25 years	*To be applied to all items of income, capital gains and recapture of depreciation.	
Payments per year	12		
Appreciation rate	3.00%		
Holding Period	5 years		
Selling costs	0.00% of sale price		

Equity	2,000,000		
Loan	0		
Annual Loan Payment	0		
Mortgage Balance	0	year	5

SUMMARY LOAN INFORMATION:

End of Year	1	2	3	4	5
Payment	0	0	0	0	0
Mortgage Balance	0	0	0	0	0
Interest	0	0	0	0	0
Principal	0	0	0	0	0

Year	1	2	3	4	5
NOI	190,000	195,700	201,571	207,618	213,847
Debt Service	0	0	0	0	0
Before-tax Cash Flow	190,000	195,700	201,571	207,618	213,847
NOI	190,000	195,700	201,571	207,618	213,847
Less: Interest	0	0	0	0	0
Depreciation	58,182	58,182	58,182	58,182	58,182
Taxable Income	131,818	137,518	143,389	149,436	155,665
Tax (Savings)	47,455	49,507	51,620	53,797	56,039
After-tax Cash Flow	142,545	146,193	149,951	153,821	157,807

Cash flow from sale in year	5	
Sales Price		2,318,548
Sales costs		0
Mortgage Balance		0
Before-tax cash flow		2,318,548

Original Cost Basis	2,000,000					
Accumulated Depreciation	290,909					
Adjusted Basis	1,709,091					
Capital Gain	609,457					
Tax from Sale		219,405				
After-tax cash flow from sale		2,099,144				

EQUITY

	Year	0	1	2	3	4	5
BTCF		(2,000,000)	190,000	195,700	201,571	207,618	2,532,395
BTIRR on Equity		**12.50%**					

	Year	0	1	2	3	4	5
ATCF		(2,000,000)	142,545	146,193	149,951	153,821	2,256,951
ATIRR on Equity		**8.31%**					
Break-even Interest Rate		**12.99%**					

(c) The incremental amount of financing is $200,000. The incremental payment is $2,960 and the incremental loan balance is $200,985. Thus, $200,000 = $2,960 (MPVIFA, ?%, 5 yrs) + $200,985 (MPVIF, ?%, 5 yrs).

Using a financial calculator, the yield is 17.82%. If the incremental cost of the 80% loan is greater than the unlevered IRR of the investment, the additional financing is not justified.

(d) To answer this question it is helpful to prepare the following summary:

IRR

	No loan	70% loan	80% loan
Before	12.50%	17.32%	17.12%
After tax	8.31%	12.33%	12.74%

Loan Cost

	No loan	70% loan	80% loan	Incremental cost of loan
Before tax	n/a	10.00%	11.00%	17.82%
After tax	n/a	6.40%	7.04%	11.40%

The 70% loan clearly has financial leverage. The return increases on both a before and after-tax basis. This occurs because the unlevered return is greater than the cost of debt. I.e., the unlevered before-tax return is 12.50% and the loan cost is 10.00%. Similarly, the unlevered after-tax return is 8.31% and the after-tax cost is debt is 10% (1-.36) = 6.40%.

The 80% loan is harder to evaluate. On the surface, the leverage is positive compared to no loan on both a before and after-tax basis. E.g., on a before tax basis the unlevered return is 12.50% versus a cost of debt of 11.00%.

If we evaluate the incremental benefits of the 80% loan versus the 70% loan, it does not appear that there is much, if any, additional leverage associated with the 80% loan. Note that the before tax IRR drops slightly from 17.32% with the 70% loan to 17.12% with the 80% loan. The reason for this is evident when we examine the incremental cost of the 80% loan over the 70% loan. The incremental cost (calculated in part c) is 17.82%. This is higher than the unlevered before-tax return on the property of 12.50%. Thus there is, in effect, negative leverage on the additional funds from the 80% loan.

On an after-tax basis the IRR increases slightly to 12.74% for the 80% loan versus 12.33% for the 70% loan. But, this is a trivial increase when evaluated relative to the additional risk associated with the higher loan-to-value ratio. Thus, it appears that the investor would be better off getting the 70% loan.

Problem 12-2
(REFER TO TEMPLATE 12_2.XLS)

(a)
ASSUMPTIONS:

Asking Price	$5,000,000		Tax Considerations:	
NOI year 1	$475,000		Building Value	$4,000,000
Growth-NOI	3.00%		Depreciation	39 years
Loan-to-Value	75.00%		Tax rate	28.00%
Loan Interest	10.00%			
Loan term	25 years			
Payments per year	12		*To be applied to all items of income, capital gains and recapture of depreciation.	
Equity Participation	40.00% of BTCF			
Equity Participation	0.00% of sales gain			
Appreciation rate	3.71%			
Holding Period	5 years			
Selling costs	0.00% of sale price			

Equity	1,250,000	
Loan	3,750,000	
Annual Loan Payment	408,915	
Mortgage Balance	3,531,141	year 5

SUMMARY LOAN INFORMATION:

End of Year	1	2	3	4	5
Payment	408,915	408,915	408,915	408,915	408,915
Mortgage Balance	3,714,486	3,675,254	3,631,913	3,584,034	3,531,141
Interest	373,402	369,683	365,575	361,036	356,023
Principal	35,514	39,233	43,341	47,879	52,893

Year	1	2	3	4	5
NOI	475,000	489,250	503,928	519,045	534,617
Debt Service	408,915	408,915	408,915	408,915	408,915
Before-tax Cash Flow	66,085	80,335	95,012	110,130	125,701
Equity Participation	26,434	32,134	38,005	44,052	50,281
Cash Flow after Participation	39,651	48,201	57,007	66,078	75,421

NOI	475,000	489,250	503,928	519,045	534,617
Less: Interest	373,402	369,683	365,575	361,036	356,023
Depreciation	102,564	102,564	102,564	102,564	102,564
Participation	26,434	32,134	38,005	44,052	50,281
Taxable Income	(27,400)	(15,131)	(2,216)	11,393	25,749
Tax (Savings)	(7,672)	(4,237)	(621)	3,190	7,210
ATCF after Participation	47,323	52,437	57,628	62,888	68,211

Cash flow from sale in year	5	
Sales Price		6,000,000
Sales costs		0
Mortgage Balance		3,531,141
Before-tax cash flow		2,468,859
Participation in Gain		0
BTCF after Participation		2,468,859

Sales Price	6000000	
Sales Costs	0	
Participation	0	

Original Cost Basis	5,000,000	
Accumulated Depreciation	512,821	
Adjusted Basis	4,487,179	

Capital Gain	1,512,821	
Tax from Sale		423,590

After-tax cash flow from sale		2,045,269

EQUITY

Year	0	1	2	3	4	5
BTCF after Participation	(1,250,000)	39,651	48,201	57,007	66,078	2,544,279
BTIRR on Equity	**17.98%**					

Year	0	1	2	3	4	5
ATCF	(1,250,000)	47,323	52,437	57,628	62,888	2,113,480
ATIRR on Equity	**14.11%**					

(b) BEIR (To calculate the Break Even Interest Rate (BEIR), the ATIRR must first be calculated as if there were no financing.)

NO LOAN (Change 75 to 0% and remove the participation by changing 40 to 0%. All other variables are constant.)

ASSUMPTIONS:

Asking Price	$5,000,000		Tax Considerations:		
NOI year 1	$475,000		Building Value	$4,000,000	
Growth-NOI	3.00%		Depreciation	39	years
Loan-to-Value	0.00%		Tax rate	28.00%	
Loan Interest	10.00%				
Loan term	25	years			
Payments per year	12				
Equity Participation	0.00%	of BTCF			
Equity Participation	0.00%	of sales gain			
Appreciation rate	3.71%				
Holding Period	5	years			
Selling costs	0.00%	of sale price			

Equity	5,000,000			
Loan	0			
Annual Loan Payment	0			
Mortgage Balance	0	year	5	

SUMMARY LOAN INFORMATION:

End of Year	1	2	3	4	5
Payment	0	0	0	0	0
Mortgage Balance	0	0	0	0	0
Interest	0	0	0	0	0
Principal	0	0	0	0	0

Year	1	2	3	4	5
NOI	475,000	489,250	503,928	519,045	534,617
Debt Service	0	0	0	0	0
Before-tax Cash Flow	475,000	489,250	503,928	519,045	534,617
Equity Participation	0	0	0	0	0
Cash Flow after Participation	475,000	489,250	503,928	519,045	534,617
NOI	475,000	489,250	503,928	519,045	534,617
Less: Interest	0	0	0	0	0
Depreciation	102,564	102,564	102,564	102,564	102,564
Participation	0	0	0	0	0
Taxable Income	372,436	386,686	401,363	416,481	432,053
Tax (Savings)	104,282	108,272	112,382	116,615	120,975
ATCF after Participation	370,718	380,978	391,546	402,431	413,642

Cash flow from sale in year	5	
Sales Price		6,000,000
Sales costs		0
Mortgage Balance		0
Before-tax cash flow		6,000,000
Participation in Gain		0
BTCF after Participation		6,000,000
Sales Price	6,000,000	
Sales Costs	0	
Participation	0	
Original Cost Basis	5,000,000	
Accumulated Depreciation	512,821	
Adjusted Basis	4,487,179	
Capital Gain	1,512,821	
Tax from Sale		423,590
After-tax cash flow from sale		5,576,410

EQUITY

	Year	0	1	2	3	4	5
BTCF after Participation		(5,000,000)	475,000	489,250	503,928	519,045	6,534,617
BTIRR on Equity		**13.10%**					
	Year	0	1	2	3	4	5
ATCF		(5,000,000)	370,718	380,978	391,546	402,431	5,990,052
ATIRR on Equity		**9.70%**					
Break-even Interest Rate		**13.47%**					

(b) continued - Projected cost of participation.

Cost of Participation

	Year	0	1	2	3	4	5
Debt service			408,915	408,915	408,915	408,915	408,915
Loan balance							3,531,141
Participation			26,434	32,134	38,005	44,052	50,281
Loan amount		-3,750,000					
Cash flows to lender		-3,750,000	435,349	441,049	446,920	452,967	3,990,337
IRR on Loan		**10.95%**					

Using a financial calculator, the IRR of the cash flows to the lender is 10.95%. This is the effective before tax cost of the loan including the participation. (Note that this was done with annual cash flows for simplicity.)

(c) Summary

IRR

	No loan	With loan
Before tax	13.10	17.98
After tax	9.70	14.11

Yes, there is favorable leverage. The IRR increases on both a before and after-tax basis.

Problem 12-3
(REFER TO TEMPLATE 12_3AB.XLS) (8% interest rate and 3% NOI and appreciation are the original variables contained in the template. It must be changed for any other answer.)

(a)

Asking Price	$1,500,000	
Rent year 1	$120,000	
Growth-NOI	3.00%	
Loan-to-Value	70.00%	
Loan Interest	8.00%	
Loan term	25	years
Appreciation rate	3.00%	
Holding Period	5	years
Selling costs	0.00%	of sale price
Required DCR	1.20	

		450,000				
Equity		450,000				
Loan		1,050,000				
Annual Loan Payment		97,249				
Mortgage Balance		968,876	year	5		

	Year	1	2	3	4	5
NOI		120,000	123,600	127,308	131,127	135,061
Debt Service		97,249	97,249	97,249	97,249	97,249
BTCF		22,751	26,351	30,059	33,878	37,812
DCR		**1.23**	**1.27**	**1.31**	**1.35**	**1.39**

Cash flow from sale in year	5
Sales Price	1,738,911
Sales costs	0
Mortgage Balance	968,876
Before-tax cash flow	770,035

BTIRR on Equity

	Year	0	1	2	3	4	5
BTCF		(450,000)	22,751	26,351	30,059	33,878	807,847
BTIRR on Equity		**16.66%**					

In this case the DCR is greater than 1.23. Thus, the first-year NOI is 23% higher than necessary to support the debt service. Based on this criteria, the loan would probably be acceptable.

(b) The maximum loan amount would be $1,067,478
> Step 1, Calculate the payment:
> > Payment = NOI Year 1 / DCR
> > $100,000 = $120,000 / 1.2
> Step 2, Calculate the loan amount:
> > PMT = $100,000
> > N = 25
> > I = 8
> Solve for the present value
> > PV = $1,067,478

(c) (Change 8 to 10% and 3 to 5%. All other variables are constant.)

Asking Price	$1,500,000	
Rent year 1	$120,000	
Growth-NOI	5.00%	
Loan-to-Value	70.00%	
Loan Interest	10.00%	
Loan term	25	years
Appreciation rate	5.00%	
Holding Period	5	years
Selling costs	0.00%	of sale price
Required DCR	1.20	

Equity	450,000				
Loan	1,050,000				
Annual Loan Payment	114,496				
Mortgage Balance	988,720	year	5		

	Year	1	2	3	4	5
NOI		120,000	126,000	132,300	138,915	145,861
Debt Service		114,496	114,496	114,496	114,496	114,496
BTCF		5,504	11,504	17,804	24,419	31,364
DCR		**1.05**	**1.10**	**1.16**	**1.21**	**1.27**

Cash flow from sale in year	5
Sales Price	1,914,422
Sales costs	0
Mortgage Balance	988,720
Before-tax cash flow	925,703

BTIRR on Equity

	Year	0	1	2	3	4	5
BTCF		(450,000)	5,504	11,504	17,804	24,419	957,067
BTIRR on Equity		**18.25%**					

The DCR is now much less than 1.2 and it is barely above 1.0. This does not provide a safety margin for the lender. It is not likely that this loan would be made.

Problem 12-4
(REFER TO TEMPLATE 12_4.XLS)

ASSUMPTIONS:

Purchase Price	2,500,000
NOI	200,000
Loan to Value Ratio	80.00%
Loan Interest Rate	12.00%
Payments per Year	12
Annual Payment Increase	10.00%
Required DCR	1.25
Holding Period	5 years

	Year	1	2	3	4	5
NOI		200,000	200,000	200,000	200,000	200,000
Debt Service		160,000	176,000	193,600	212,960	234,256
DCR		1.25	1.14	1.03	0.94	0.85

Month	Beginning Balance	Interest	Principal	Payment	Ending Balance	Loan to Value Ratio
0					2,000,000.00	80.00%
1	2,000,000.00	20,000.00	(6,666.67)	13,333.33	2,006,666.67	80.27%
2	2,006,666.67	20,066.67	(6,733.33)	13,333.33	2,013,400.00	80.54%
3	2,013,400.00	20,134.00	(6,800.67)	13,333.33	2,020,200.67	80.81%
4	2,020,200.67	20,202.01	(6,868.67)	13,333.33	2,027,069.34	81.08%
5	2,027,069.34	20,270.69	(6,937.36)	13,333.33	2,034,006.70	81.36%
6	2,034,006.70	20,340.07	(7,006.73)	13,333.33	2,041,013.43	81.64%
7	2,041,013.43	20,410.13	(7,076.80)	13,333.33	2,048,090.23	81.92%
8	2,048,090.23	20,480.90	(7,147.57)	13,333.33	2,055,237.80	82.21%
9	2,055,237.80	20,552.38	(7,219.04)	13,333.33	2,062,456.85	82.50%
10	2,062,456.85	20,624.57	(7,291.24)	13,333.33	2,069,748.08	82.79%
11	2,069,748.08	20,697.48	(7,364.15)	13,333.33	2,077,112.23	83.08%
12	2,077,112.23	20,771.12	(7,437.79)	13,333.33	2,084,550.02	83.38%
13	2,084,550.02	20,845.50	(6,178.83)	14,666.67	2,090,728.85	83.63%
14	2,090,728.85	20,907.29	(6,240.62)	14,666.67	2,096,969.48	83.88%
15	2,096,969.48	20,969.69	(6,303.03)	14,666.67	2,103,272.50	84.13%
16	2,103,272.50	21,032.73	(6,366.06)	14,666.67	2,109,638.56	84.39%
17	2,109,638.56	21,096.39	(6,429.72)	14,666.67	2,116,068.28	84.64%
18	2,116,068.28	21,160.68	(6,494.02)	14,666.67	2,122,562.30	84.90%
19	2,122,562.30	21,225.62	(6,558.96)	14,666.67	2,129,121.25	85.16%
20	2,129,121.25	21,291.21	(6,624.55)	14,666.67	2,135,745.80	85.43%
21	2,135,745.80	21,357.46	(6,690.79)	14,666.67	2,142,436.59	85.70%
22	2,142,436.59	21,424.37	(6,757.70)	14,666.67	2,149,194.29	85.97%
23	2,149,194.29	21,491.94	(6,825.28)	14,666.67	2,156,019.57	86.24%
24	2,156,019.57	21,560.20	(6,893.53)	14,666.67	2,162,913.10	86.52%
25	2,162,913.10	21,629.13	(5,495.80)	16,133.33	2,168,408.89	86.74%
26	2,168,408.89	21,684.09	(5,550.76)	16,133.33	2,173,959.65	86.96%
27	2,173,959.65	21,739.60	(5,606.26)	16,133.33	2,179,565.91	87.18%
28	2,179,565.91	21,795.66	(5,662.33)	16,133.33	2,185,228.24	87.41%
29	2,185,228.24	21,852.28	(5,718.95)	16,133.33	2,190,947.19	87.64%
30	2,190,947.19	21,909.47	(5,776.14)	16,133.33	2,196,723.32	87.87%
31	2,196,723.32	21,967.23	(5,833.90)	16,133.33	2,202,557.22	88.10%
32	2,202,557.22	22,025.57	(5,892.24)	16,133.33	2,208,449.46	88.34%
33	2,208,449.46	22,084.49	(5,951.16)	16,133.33	2,214,400.62	88.58%
34	2,214,400.62	22,144.01	(6,010.67)	16,133.33	2,220,411.30	88.82%
35	2,220,411.30	22,204.11	(6,070.78)	16,133.33	2,226,482.08	89.06%
36	2,226,482.08	22,264.82	(6,131.49)	16,133.33	2,232,613.56	89.30%
37	2,232,613.56	22,326.14	(4,579.47)	17,746.67	2,237,193.03	89.49%
38	2,237,193.03	22,371.93	(4,625.26)	17,746.67	2,241,818.30	89.67%
39	2,241,818.30	22,418.18	(4,671.52)	17,746.67	2,246,489.81	89.86%
40	2,246,489.81	22,464.90	(4,718.23)	17,746.67	2,251,208.05	90.05%
41	2,251,208.05	22,512.08	(4,765.41)	17,746.67	2,255,973.46	90.24%
42	2,255,973.46	22,559.73	(4,813.07)	17,746.67	2,260,786.53	90.43%
43	2,260,786.53	22,607.87	(4,861.20)	17,746.67	2,265,647.73	90.63%
44	2,265,647.73	22,656.48	(4,909.81)	17,746.67	2,270,557.54	90.82%
45	2,270,557.54	22,705.58	(4,958.91)	17,746.67	2,275,516.44	91.02%
46	2,275,516.44	22,755.16	(5,008.50)	17,746.67	2,280,524.94	91.22%
47	2,280,524.94	22,805.25	(5,058.58)	17,746.67	2,285,583.53	91.42%
48	2,285,583.53	22,855.84	(5,109.17)	17,746.67	2,290,692.69	91.63%

49	2,290,692.69	22,906.93	(3,385.59)	19,521.33	2,294,078.29	91.76%
50	2,294,078.29	22,940.78	(3,419.45)	19,521.33	2,297,497.74	91.90%
51	2,297,497.74	22,974.98	(3,453.64)	19,521.33	2,300,951.38	92.04%
52	2,300,951.38	23,009.51	(3,488.18)	19,521.33	2,304,439.56	92.18%
53	2,304,439.56	23,044.40	(3,523.06)	19,521.33	2,307,962.62	92.32%
54	2,307,962.62	23,079.63	(3,558.29)	19,521.33	2,311,520.92	92.46%
55	2,311,520.92	23,115.21	(3,593.88)	19,521.33	2,315,114.79	92.60%
56	2,315,114.79	23,151.15	(3,629.81)	19,521.33	2,318,744.61	92.75%
57	2,318,744.61	23,187.45	(3,666.11)	19,521.33	2,322,410.72	92.90%
58	2,322,410.72	23,224.11	(3,702.77)	19,521.33	2,326,113.49	93.04%
59	2,326,113.49	23,261.13	(3,739.80)	19,521.33	2,329,853.30	93.19%
60	2,329,853.30	23,298.53	(3,777.20)	19,521.33	2,333,630.50	93.35%

(a)
BALLOON PAYMENT AT END OF YEAR 5 = $2,333,630.50

(b)
LOAN-TO-VALUE RATIO AT END OF YEAR 5 = 93.35%

Problem 12-5
(a)
Payment at 8%, 30 years using a financial calculator is $7,337.65 per month. Note, calculated *as if* the loan had an interest rate of 8%.

(b)
Interest accrues at 10%. On $1,000,000 this is $100,000 per year or $8,333.33 per month.   In this case, payments do not cover the interest, although the loan would not be amortized in 30 years. For this reason the future value of the loan will be greater that the initial loan amount, even though monthly payments are made.   We can find the loan balance after one year using a financial calculator as follows:

        PV = -1,000,000
        i   = 10% / 12 = .8333%
        pmt = 7,337.65 (from part a)
        n = 12 (to get balance after 12 months)
        Solve for FV
        FV = $1,012,511.38

(c)
Using the same approach as above we can get the balance after 5 years.

        PV = -1,000,000
        i   = 10% / 12 = .8333%
        pmt = 7,337.65 (from part a)
        n = 60 (to get balance after 60 months)
        Solve for FV
        FV = $1,077,103.13

(d)
To amortize the loan over the remaining 10 years, we can use a financial calculator as follows:

        PV = -$1,077,103.13
        i   = 10% / 12 = .8333%
        n = 120 (120 months remaining loan term)
        FV = 0 (to amortize the loan)
        Solve for pmt
        pmt = $14,234

Problem 12-6

Purchase price	$1,000,000	Loan amount	$900,000
		Interest rate	8.00%
Initial NOI	$100,000	Loan term	20
Growth in NOI	3.00%	Monthly payment	$7,527.96
Base for participation	$100,000	Annual payment	$90,335.53
Participation % of NOI	50.00%		
Terminal cap rate	10.00%		
Participation in price increase	50.00%		
Resale price	$1,343,916		
Purchase price	$1,000,000		
Increase in value	$343,916		
Participation in sale	$171,958		
Loan balance at resale	$620,466		

Year	NOI	Excess over base	Participation	Debt service	Lender cash flow
0					-$900,000
1	100,000	0	0	90,336	90,336
2	103,000	3,000	1,500	90,336	91,836
3	106,090	6,090	3,045	90,336	93,381
4	109,273	9,273	4,636	90,336	94,972
5	112,551	12,551	6,275	90,336	96,611
6	115,927	15,927	7,964	90,336	98,299
7	119,405	19,405	9,703	90,336	100,038
8	122,987	22,987	11,494	90,336	101,829
9	126,677	26,677	13,339	90,336	103,674
10	130,477	30,477	187,197	90,336	897,998 [*]
11	134,392				
				IRR	9.95%

*Includes participation in NOI, Resale, and loan balance

Problem 12-7

(a)

Purchase price	$1,000,000	Loan amount	$900,000
		Interest rate	9.00%
Initial NOI	$100,000	Loan term	20
Growth in NOI	3.00%	Monthly payment	$8,097.53
Base for participation	$100,000	Annual payment	$97,170.40
Participation % of NOI	50.00%		
Terminal cap rate	10.00%		
Conversion percentage	60.00%		

Resale price	$1,343,916	
Conversion value	$806,350	
Loan balance at resale	$639,233	
Lender cash flow if no default	$806,350	(lender gets higher of conversion value or loan balance)
Lender cash flow if default allowed	$806,350	(lender gets property if less than loan balance at resale)

Year	Debt service	Lender cash flow
0		-$900,000
1	97,170	97,170
2	97,170	97,170
3	97,170	97,170
4	97,170	97,170
5	97,170	97,170
6	97,170	97,170
7	97,170	97,170
8	97,170	97,170
9	97,170	97,170
10	97,170	903,520 *
	IRR	10.15%

*Includes debt service plus either loan balance, conversion value or default proceeds.

Note: In this case the lender would want to convert to ownership in the property because 60% of the resale value is greater than the loan balance.

(b)

Purchase price	$1,000,000	Loan amount	$900,000
		Interest rate	9.00%
Initial NOI	$100,000	Loan term	20
Growth in NOI	3.00%	Monthly payment	$8,097.53
Base for participation	$100,000	Annual payment	$97,170.40
Participation % of NOI	50.00%		
Terminal cap rate	10.00%		
Conversion percentage	60.00%		
Resale price	$1,000,000		
Conversion value	$600,000		
Loan balance at resale	$639,233		
Lender cash flow if no default	$639,233	(lender gets higher of conversion value or loan balance)	
Lender cash flow if default allowed	$639,233	(lender gets property if less than loan balance at resale)	

Year	Debt service	Lender cash flow
0		-$900,000
1	97,170	97,170
2	97,170	97,170
3	97,170	97,170
4	97,170	97,170
5	97,170	97,170

6	97,170	97,170
7	97,170	97,170
8	97,170	97,170
9	97,170	97,170
10	97,170	736,403 *
	IRR	8.88%

*Includes debt service plus either loan balance, conversion value or default proceeds.

Note: In this case the lender would not want to convert because the mortgage balance after 10 years is greater than 60% of the resale value. Thus, the return is essentially the same as the interest rate on the mortgage of 9%. The rounding (8.88% vs. 9.0%) is due to the fact that we assumed all the cash flows occurred at the end of each year rather than monthly.

(c)

Purchase price	$1,000,000	Loan amount	$900,000
		Interest rate	9.00%
Initial NOI	$100,000	Loan term	20
Growth in NOI	3.00%	Monthly payment	$8,097.53
Base for participation	$100,000	Annual payment	$97,170.40
Participation % of NOI	50.00%		
Terminal cap rate	10.00%		
Conversion percentage	60.00%		
Resale price	$500,000		
Conversion value	$300,000		
Loan balance at resale	$639,233		
Lender cash flow if no default	$639,233	(lender gets higher of conversion value or loan balance)	
Lender cash flow if default allowed	$500,000	(lender gets property if less than loan balance at resale)	

Year	Debt service	Lender cash flow
0		-$900,000
1	97,170	97,170
2	97,170	97,170
3	97,170	97,170
4	97,170	97,170
5	97,170	97,170
6	97,170	97,170
7	97,170	97,170
8	97,170	97,170
9	97,170	97,170
10	97,170	597,170 *
	IRR	7.68%

*Includes debt service plus either loan balance, conversion value or default proceeds.

Note: If the borrower did not default, the lender's return would be the same as part b. In this case, however, we assume that the borrower defaults and the lender gets the property and sells it for its estimated resale value of $500,000. Thus, the lender's return would be 7.68 percent as shown above.

Problem 12-8

This question is like an example in the chapter.

(a) Reinvestment Rate = 6% + 1.5%
   $YMF_{156} = [(9\% - 7.5\%)/12]$ x 20,000,000(MIFPVA, 9%, 24mos.)
       = $547,229

If the 2-year treasury rate was 8%, then the lender's reinvestment rate would be 9.5% (or 8% +1.5%), which is greater than the original interest rate (of 9%). Therefore, the lender will not charge a YMF, because the loan balance can now be reinvested at a rate greater than the original rate.

Problem 12-9

The before tax IRR on equity is now 16.86% and the after tax IRR on Equity is 12.83%. The lender's return is 11.04%.

Problem 12-10

The IRR on equity increases to 23.87% with an 80% loan from 20.98% with a 70% loan. (The loan-to-value ratio is changed in the "yield – debt financing" menu in ARGUS.)