

RE 310 – Principles of Real Estate

How Do You Invest in Real Estate?

Practice Homework Problems – Solutions

Dr. Stanley D. Longhofer

- 1) A class B commercial office building has 25,000 square feet gross leasable area. Of this, 20,000 square feet is currently leased for \$10 per square foot (psf), while the remaining 5,000 is leased at \$9.50 psf. On average, commercial office buildings of this class in this area are experiencing a 15% vacancy rate. Each of the leases are gross leases, and the operating expense ratio for this property has been running at around 40% for the last several years.

You are considering purchasing this building for \$1.4 million. Acme Life has indicated that it will provide 75% loan-to-value (LTV) ratio financing at 7.5% interest with a 20-year term. Annual debt service on this loan will be \$101,505.

- a) Construct the pro forma operating statement for this shopping center. What is the net operating income and cap rate for this property?

Potential gross income calculations:

<u>Square footage</u>	<u>Rent per square foot</u>	<u>Total annual rent</u>
20,000	\$ 10.00	\$ 200,000
5,000	9.90	<u>47,500</u>
Total		\$ 247,500

NOI calculations:

Potential gross income	\$ 247,500
– Vacancy & collection allowance (15%)	<u>37,125</u>
Effective gross income	210,375
– Operating expenses (40%)	<u>84,150</u>
Net operating Income	\$ 126,225

The cap rate is therefore $r = \$126,225 / \$1,400,000 = 0.0902 \approx 9\%$.

- b) If office buildings like this are current selling at a 8.5% cap rate, is this property a good buy? Explain.

Assuming this office building is truly comparable with others in the market, it would appear this property is a good buy. It implies that an investor can earn a 9% return on a \$1.4 million investment in this property, compared to an 8.5% return on similar properties.

- c) Under these assumptions, how much should you be willing to pay for this property and still earn an 8.5% return?

$$V = NOI / r = \$126,225 / 0.085 = \$1,485,000.$$

- d) Why might the cap rate you calculated in part (a) be a misleading indicator of the property's true worth?

If the net operating income for the building is expected to change significantly in the future (either because of changing rent rates, vacancies, or operating expenses), then the cap rate will not provide an accurate measure of the rate of return on this investment.

For example, if building's current leases will expire soon and are expected to be renewed at lower rates, then the NOI the property will generate in the future will decline. In this case, the current cap rate may overstate the true quality of this investment, and a \$1.4 million purchase price may be appropriate.

Additionally, the cap rate ignores the riskiness of an investment. If this property's cash flows are expected to be less stable than is typical for similar office properties, then the higher cap rate (lower price) may simply reflect the higher risk of the investment.

- e) Calculate the cash-on-cash return for this property. Does this exhibit positive or negative leverage? Explain.

$$\begin{aligned}
 EDR &= \frac{NOI - ADS}{\text{Purchase Price} - \text{Loan Amount}} \\
 &= \frac{\$126,225 - \$101,505}{\$1,400,000 - \$1,400,000 \times 0.75} \\
 &= \frac{\$24,720}{\$350,000} \\
 &= 0.0706 \\
 &\approx 7.1\%
 \end{aligned}$$

This property exhibits negative leverage, because the mortgage constant ($MC = ADS / \text{Loan Amount} = \$101,505 / \$1,050,000 = 9.67\%$) is greater than the cap rate of 9%.

This means that added leverage acts to lower the rate of return earned by equity investors.

- f) Calculate the break-even ratio.

$$BER = \frac{OE + ADS}{EGI} = \frac{\$84,150 + \$101,505}{\$210,375} = 0.8825 = 88.25\% .$$

- g) Calculate the debt coverage ratio.

$$DCR = \frac{NOI}{ADS} = \frac{\$126,225}{\$101,505} = 1.24 .$$

- 2) You are considering investing in a strip shopping center sitting on a 1.5 acre site. The gross leasable area of the center is 15,000 square feet. Of this, 7,000 square feet is currently leased for \$12 per square foot (psf), 5,000 is leased at \$12.50 psf, and the remaining 3,000 square feet is leased at \$15.00 psf. Each of these leases are net leases, with the tenants paying utilities and some common area maintenance charges. Last year, operating expenses for the center totaled \$90,000, while the average vacancy rate for similar retail space in the area is 15%.

The asking price for this property is \$661,500. You have determined that 70% loan-to-value (LTV) ratio financing is available at 8.5% interest with a 20-year term. Annual debt service on this loan will be \$48,222.

- a) Construct the pro forma operating statement for this shopping center. What is the net operating income and cap rate for this property?

Potential gross income calculations:

Square footage	Rent per square foot	Total annual rent
7,000	\$ 12.00	\$ 84,000
5,000	12.50	62,500
3,000	15.00	<u>45,000</u>
Total		\$ 191,500

NOI calculations:

Potential gross income	\$ 191,500
– Vacancy & collection allowance (15%)	<u>28,725</u>
Effective gross income	162,775
– Operating expenses	<u>90,000</u>
Net operating Income	\$ 72,775

The cap rate is therefore $r = \$72,775 / \$661,500 = 0.11$ or 11%.

- b) If shopping centers like this are current selling at a 13% cap rate, is this property a good buy? Explain.

Assuming this shopping center is truly comparable with others in the market, it would appear this property is *not* a good buy. At an 11% cap rate, the asking price on this property is too high for an investor to earn a competitive rate of return.

- c) Under these assumptions, how much should you be willing to pay for this property and still earn a 13% return?

$$V = NOI / r = \$72,775 / 0.13 = \$559,808 \text{ or approximately } \$600,000.$$

- d) Why might the cap rate you calculated in part (a) be a misleading indicator of the property's true worth?

If the net operating income for the shopping center is expected to change significantly in the future (either because of changing rent rates, vacancies, or operating expenses), then the cap rate will not provide an accurate measure of the rate of return on this investment. Thus, if NOI for this property is expected to grow faster than average, it may still be a good investment despite its low cap rate.

Additionally, the cap rate ignores the riskiness of an investment. If this property's cash flows are expected to be more stable than is typical for shopping center properties, then the lower cap rate (higher price) may simply reflect the lower risk of the investment. Thus, even though the overall rate of return is lower, it might still be a worthwhile investment.

- e) Calculate the equity dividend rate for this property. Does this exhibit positive or negative leverage? Explain.

$$\begin{aligned} EDR &= \frac{NOI - ADS}{\text{Purchase Price} - \text{Loan Amount}} \\ &= \frac{\$72,775 - \$48,222}{\$661,500 - \$661,500 \times 0.70} \\ &= \frac{\$24,553}{\$198,450} \\ &= 0.1237 \\ &\approx 12.4\% \end{aligned}$$

This property exhibits positive leverage, because the mortgage constant ($MC = ADS / \text{Loan Amount} = \$48,222 / \$463,050 = 10.4\%$) is less than the cap rate of 11%.

This means that added leverage acts to raise the rate of return earned by equity investors.

- f) Calculate the operating expense ratio.

$$OER = \frac{OE}{EGI} = \frac{\$90,000}{\$162,775} = 0.5529 \approx 55\% .$$

- g) Calculate the break-even ratio.

$$BER = \frac{OE + ADS}{EGI} = \frac{\$90,000 + \$48,222}{\$162,775} = 0.8492 \approx 85\% .$$

- h) Calculate the debt coverage ratio.

$$DCR = \frac{NOI}{ADS} = \frac{\$72,775}{\$48,222} = 1.51 \approx 1.5 .$$

- 3) You are considering investing in a warehouse that sits on a 2 acre site. The total gross building area of the warehouse is 75,000 square feet. The gross leasable area is 70,000 square feet. Currently, the entire space it is leased to one tenant at \$6 per square foot (psf), gross, with one year left on the lease. Total operating expenses, taxes, and reserves on this property are expected to be \$150,000 per year. The asking price for this property is \$2.5 million.

Other information that may be useful includes the fact that similar warehouse space in the area is renting for \$10 psf, gross, with an average vacancy rate of 10%.

- a) Construct the pro forma operating statement for this space based on its current situation. What is the net operating income and cap rate for this property?

PGI (70,000 × \$6.00)	\$420,000
– V&C (0%)	<u>0</u>
EGI	420,000
– OE	<u>150,000</u>
NOI	\$270,000

The cap rate for this property is $\$270,000 / \$2,500,000 = 0.108 = 10.8\%$.

- b) If you require a 12% return on your investment, is this property a good buy? Explain.

The cap rate may be thought of as the annual rate of return earned on the property investment. Because this property's cap rate is only 10.8%, and lower than your required return, this would not appear to be a good investment.

- c) Under these assumptions, how much should you be willing to pay for this property and still earn your 12% return?

To have a 12% cap rate, this property would need to be purchased for $\$270,000 / 0.12 = \$2,250,000$, or \$250,000 less than the current asking price.

- d) Why might the cap rate you calculated in part (a) be a misleading indicator of the property's true worth?

The NOI in part (a) was calculated at the current lease and vacancy rates. However, market rates are \$4 psf higher, and the current lease is set to expire in 1 year. It is therefore more appropriate to calculate the cap rate based on the income this property will likely earn when the property is released in a year.

- e) Construct a new pro forma for the property using inputs that more accurately reflect the true earning potential for the property. Under these new assumptions, is the property a good investment using your same 12% required rate of return? Explain.

PGI ($70,000 \times \$10.00$)	\$700,000
– V&C (10%)	<u>70,000</u>
EGI	630,000
– OE	<u>150,000</u>
NOI	\$480,000

Under these new assumptions, the cap rate for this property is $\$480,000 / \$2,500,000 = 0.192 = 19.2\%$. Thus, it looks like the \$2.5 million asking price for this property makes it a steal. (Just to be safe, I'd want to make sure there's not a reason the property is rented so far below market.)

- 4) The Silver Fox apartment complex is up for sale with an asking price of \$4.5 million dollars. It contains 150 units, 50 of which rent for \$750 per month and the rest of which rent for \$600 per month. Lately, there has been a great deal of overbuilding in the apartment market, and consequently current vacancy rates are around 15%. The operating expense ratio for this property is 45%.
- a) Construct the pro forma statement for this property and calculate its cap rate. If apartment complexes are currently selling at a 10% cap rate, does this apartment appear to be overpriced, underpriced, or about right?

PGI ($50 \times \$750 \times 12 + 100 \times \600×12)	\$1,170,000
– V&C (15%)	<u>175,500</u>
EGI	994,500
– OE (45%)	<u>447,525</u>
NOI	\$546,975

The cap rate for this property is $\$546,975 / \$4,500,000 = 0.122 = 12.2\%$. Based on the fact that similar apartment complexes are selling for a 10% cap rate, it looks like this property is underpriced. Once again, however, you need to make sure that there are not other circumstances that make the calculated cap rate unreliable.

- b) You decide to purchase this property, and can obtain a loan for 80% of the purchase price with annual debt service of \$366,668. Using this information, calculate the following for this property:
- The mortgage constant;

The loan amount will be $0.80 \times \$4,500,000 = \$3,600,000$. Thus, the mortgage constant is $K = \$366,668 / \$3,600,000 = 0.1019$.

- The equity dividend rate;

$$EDR = (\$546,975 - \$366,668) / (\$4,500,000 - \$3,600,000) = 0.200 = 20.0\%.$$

- The breakeven ratio;

$$BER = (\$447,525 + \$366,668) / \$994,500 = 0.819 = 81.9\%.$$

- The debt coverage ratio.

$$DCR = \$546,975 / \$366,668 = 1.49.$$

- c) If the lender requires a debt coverage ratio of 1.2 in order to approve the loan, will this property qualify?

Yes, because the *DCR* of 1.49 exceeds this minimum requirement.

- 5) An apartment complex has 50 units. Thirty of these units rent for \$500 per month and there rest rent for \$600 per month. The allowance for vacancy and bad debts is 10%. Operating expenses are 35% of effective gross income. You may acquire this property for \$1.5 million.

Financing will consist of a 75% LTV loan with a 20-year term, monthly payments, and an interest rate of 9.5%.

- a) Construct the annual pro forma operating statement for this property and calculate the net operating income it generates.

Calculate the inputs as follows:

$$\text{Potential gross income} = 30 \times \$500 + 20 \times \$600 = \$27,000 \text{ per month or } \$324,000 \text{ per year.}$$

$$\text{Vacancy and collection allowance} = 0.10 \times \$324,000 = \$32,400.$$

$$\text{Effective gross income} = \$324,000 - \$32,400 = \$291,600.$$

$$\text{Operating expenses} = 0.35 \times \$291,600 = \$102,060.$$

The pro forma operating statement is therefore

PGI	\$324,000
- V&C	<u>32,400</u>
EGI	291,600
- OE	<u>102,060</u>
NOI	189,540

- b) Calculate the cap rate, the equity dividend rate, the breakeven ratio, and the debt-coverage ratio for this property.

Based on a 75% loan-to-value ratio, your equity investment in this property will be $0.25 \times \$1,500,000 = \$375,000$, while you will borrow $0.75 \times \$1,500,000 = \$1,125,000$.

To calculate the monthly payment on the loan, input $N = 20 \times 12 = 240$, $I = 9.5 / 12 = 0.792\%$, $PV = \$1,125,000$, $FV = 0$, and solve for $PMT = \$10,486$. The annual debt service is therefore $12 \times \$10,486 = \$125,832$.

Using this information we can calculate:

$$\text{Cap rate} = \text{NOI} / \text{acquisition cost} = \$189,540 / \$1,500,000 = 0.126 = 12.6\%.$$

$$\text{EDR} = (\text{NOI} - \text{ADS}) / \text{equity investment} = (\$189,540 - \$125,832) / \$375,000 = 0.170 = 17.0\%.$$

$$\text{BER} = (\text{OE} + \text{ADS}) / \text{EGI} = (\$102,060 + \$125,832) / \$291,600 = 0.782 = 78.2\%.$$

$$\text{DCR} = \text{NOI} / \text{ADS} = \$189,540 / \$125,832 = 1.51.$$

- 6) You can purchase an office building for \$1.5 million today. Relevant data include: potential gross income = \$340,000; vacancy and collection allowance = 15%; operating expenses = 45% of effective gross income.

What is the NOI for this property? What is the cap rate?

$$\text{PGI} = \$340,000.$$

$$\text{V\&C} = 0.15 \times \$340,000 = \$51,000.$$

$$\text{EGI} = \$289,000.$$

$$\text{OE} = 0.45 \times \$289,000 = \$130,050.$$

$$\text{NOI} = \$289,000 - \$130,050 = \$158,950.$$

$$\text{Cap rate} = \$158,950 / \$1,500,000 = 0.106 = 10.6\%$$

- 7) You are considering the purchase of a quadruplex apartment for \$200,000. Each of the four units is expected to rent for \$800 per month. Expected vacancy allowance is 12.5%, and operating expenses are expected to be 40% of effective gross income.
- a) What is the expected NOI and cap rate for this property?

$$\text{PGI} = 4 \times \$800 \times 12 = \$38,400.$$

$$\text{V\&C} = 0.125 \times \$38,400 = \$4,800.$$

$$\text{EGI} = \$38,400 - \$4,800 = \$33,600.$$

$$\text{OE} = 0.40 \times \$33,600 = \$13,440.$$

$$\text{NOI} = \$20,160.$$

$$\text{Cap rate} = \$20,160 / \$200,000 = 0.101 = 10.1\%$$

b) Suppose Biggie Bank will lend you \$140,000 to purchase this property. The loan will have a 30-year term, monthly payments, and an 8% interest rate.

- What is the annual debt service required on this loan?

Input $N = 360$, $I = 8 / 12 = 0.667$, $PV = \$140,000$, $FV = 0$, and solve for $PMT = \$1,027.27$.

$$ADS = \$1,027 \times 12 = \$12,324.$$

- What is the equity dividend rate on this property?

$$EDR = (\$20,160 - \$12,324) / (\$200,000 - \$140,000) = 0.131 = 13.1\%.$$

- What is the debt coverage ratio?

$$DCR = \$20,160 / \$12,324 = 1.64.$$

- What is the breakeven ratio?

$$BER = (\$13,440 + \$12,324) / \$33,600 = 0.767 = 76.7\%.$$