

Final Exam – Finance for Real Estate 2023/2024

1. What strategies are available to help ensure that managers are motivated to act in the interest of the shareholders rather than their own interest? Please list two strategies. (8 points)

- The threat of a hostile takeover
- Shareholder initiatives - Ensure that underperforming managers are fired.
- Performance-based compensation

2. Consider a retailing firm with a net profit margin of 3.5%, sales of €79.2 million, total assets of €44 million, a book value of equity of €18 million and market value of equity of €22 million. (7 points)

a. What is the firm's current ROE using the DuPont Identity?

b. If, in addition, the firm increased its sales by 20% (while maintaining this higher profit margin and without changing its assets or liabilities), what would be its ROE?

a. $3.5 \times 1.8 \times 44/18 = 15.4\%$.

b. $3.5 \times (1.8 \times 1.2) \times 44/18 = 18.5\%$.

3. Consider two securities that pay risk-free cash flows over the next two years and that have the current market prices shown here:

Security	Price Today (€)	Cash Flow in One Year (€)	Cash Flow in Two Years (€)
B1	279	300	0
B2	255	0	300

Suppose a security with cash flows of €150 in one year and €300 in two years is trading for a price of €390. What arbitrage opportunity is available? (10 pt)

There is an arbitrage opportunity because the no-arbitrage price should be €394.5 (= €279 / 2 + €255). One should buy two shares of the security at €260/share and sell one share of B1 and two shares of B2. Total profit would be €9 (–€390 × 2 + €279 + €255 × 2).

4. Suppose the interest rate is 7.1% APR with monthly compounding. What is the present value of an annuity that pays €95 every six months for seven years? (10 pt)

7.1% APR with monthly compounding: $7.1\% / 12 = 0.591666667\%$ per month

$(1.005916667)^6 - 1 = 0.03603$ or 3.603% per 6 months.

Using the PV of an annuity formula with $N = 14$ payments and $C = €95$ with $r = 3.603\%$ per 6 month interval:

$$PV = €95 \times \frac{1}{0.03603} \left(1 - \frac{1}{1.03603^{14}} \right) = €1,030.32$$

5. Assume zero coupon yields on default free securities are as summarized in the following table.

Maturity (years)	1	2	3	4	5
Zero-coupon YTM	4%	4.3%	4.5%	4.7%	4.8%

- a. What is the price of a three-year, default-free security with a face value of €1000 and an annual coupon rate of 4% with coupon paid annually? (7 pt)
- b. What is the yield to maturity for this bond? (8 pt)
- a. The price of the bond is

$$P = \frac{CPN}{1 + YTM_1} + \frac{CPN}{(1 + YTM_2)^2} + \dots + \frac{CPN + FV}{(1 + YTM_N)^N}$$

$$= \frac{40}{(1 + .04)} + \frac{40}{(1 + .043)^2} + \frac{40 + 1000}{(1 + .045)^3} = 986.58.$$

- b. The yield to maturity is

$$P = \frac{CPN}{1 + YTM} + \frac{CPN}{(1 + YTM)^2} + \dots + \frac{CPN + FV}{(1 + YTM)^N}$$

$$986.58 = \frac{40}{(1 + YTM)} + \frac{40}{(1 + YTM)^2} + \frac{40 + 1000}{(1 + YTM)^3} \Rightarrow YTM = 4.488\%$$

6. A real estate investor is trying to decide between two projects:

Year-End Cash Flows (\$ thousands)				
Project	0	1	2	IRR
A	-26	15	20	21.2%
B	-77	39	51	10.6%

The investor can undertake only one project. If his cost of capital is 5%, use the incremental IRR rule to make the correct decision. (10 pt)

Timeline:

	0	1	2
A	-26	15	20
B	-77	39	51

Subtract the cash flows of project A from the cash flows of project B

	-51	24	31
--	-----	----	----

$$NPV = -\$51 + \frac{\$24}{1 + IRR} + \frac{\$31}{1 + IRR^2}$$

Using an excel spreadsheet to calculate IRR, we find $IRR = 4.97\%$

Since the incremental IRR of 4.97% is less than the cost of capital of 5%, you should take the project A.

7. Bay Properties is considering starting a commercial real estate division. It has prepared the following four-year forecast of free cash flows for this division:

	Year 1	Year 2	Year 3	Year 4
Free Cash Flow	-\$182,000	\$12,000	\$90,000	\$151,000

Assume cash flows after year 4 will grow at 5% per year, forever. If the cost of capital for this division is 11%. What is the value today of this division? (10 pt)

$$NPV = \frac{-\$182,000}{1.11} + \frac{\$12,000}{1.11^2} + \frac{\$90,000}{1.11^3} + \frac{\$151,000 + \frac{\$151,000(1.05)}{(0.11 - 0.05)}}{1.11^4}$$

$$NPV = -\$163,963.964 + \$9,739.469199 + \$65,807.22432 + \$1,840,164.976 = \$1,751,747.71$$

8. Real Estate Capital (REC) is acquired in 2012 for a purchase price of \$15.25 per share. REC has 18.5 million shares outstanding, \$45 million in cash, and no debt at the time of the acquisition.

Given a weighted average cost of capital of 11%, and assuming no future growth, what level of perpetual annual free cash flow would justify this acquisition price? (10 pt)

$$EV = 15.25 * 18.5 - 45 = \$237.1 \text{ million.}$$

$$EV = FCF / r_{wacc} \rightarrow FCF = r_{wacc} * EV = \$26.1 \text{ million.}$$

9. Consider two real estate mortgage providers, i.e. A and B. Mortgage provider A has 100 mortgages outstanding, each for \$1 million, that it expects will be repaid today. Each mortgage has a 5% probability of default, in which case the mortgage provider is not repaid anything. The chance of default is independent across all the mortgages. Mortgage provider B has only one loan of \$100 million outstanding, which it also expects will be repaid today. It also has a 5% probability of not being repaid. Explain which mortgage provider faces less risk. (10 pt)

The expected payoffs are the same, but A is less risky because the risk of default is independent across mortgages which can be diversified away in a portfolio.

10. Consider an equally weighted portfolio of stocks in which each stock has a volatility of 50%, and the correlation between each pair of stocks is 24%. (10 pt)

What is the volatility of the portfolio as the number of stocks becomes arbitrarily large?

$$\text{Avg cov} = 50\% \times 50\% \times 24\% = 6\%$$

$$\text{Limit Vol} = (0.06)^{0.5} = 0.2449 = 24.49\% \quad (\text{equation 11.12})$$