

RE740 - Homework 2

Due: October 6

Problem 1 (EATCF practice, 15pts)

An investor is considering purchasing a property for \$1,000,000 (=original basis), holding it for two years and selling it at the end of year 2. The property's depreciable cost basis is \$800,000, and the depreciation schedule for this property is straight-line with a 27.5 years useful life. The property's Potential Gross Income is \$100,000 for all years, and the occupancy rate will be 90% over the holding period. Operating expenses are expected to be \$10,000 in both years, while capital expenditures and other income are zero throughout. The investor expects to be able to sell the property after two years for \$1,000,000 (= net sale price.) Her income tax rate is 20%, the capital gains rate is 15%, and the depreciation recapture tax rate is 20%. As for financing, she obtained approval for a 10-year fixed rate mortgage with contract rate 10% and yearly payments. The initial balance on the loan is such that the Debt Coverage Ratio is 120% (1.2) in the first year.

1. What is the loan's original balance?
2. Compute the Equity-After-Tax-Cash-Flows (EATCF) associated with this project over the first two years, both from operations and from reversion.
3. The investor requires a return of 10% from this sort of levered equity investment. Should they purchase this property at a price of \$1,000,000?

Problem 2 (GPMs, with points, 15pts)

Consider a 5-year GPM with monthly payments, an annualized contract rate of 10%, and an initial balance of \$100,000. The contract features two step-ups of equal size, after each of the first two years (in month 13 and month 25).

1. What is the loan's APR?
2. What must be the size of the step-ups for half of the principal to be paid after exactly 36 months?
3. Above what step size does the contract start featuring some negative amortization?

Problem 3 (15 pts), refinancing

Consider a 15-year FRM mortgage with initial balance \$100,000, monthly payments, full amortization and contract rate of 10%. At the end of year 5 (after 60 payments have been made), rates on 10-year mortgages are 9.5%. Refinancing carries a total fixed cost of \$1000.

1. Assuming that the borrower will have no other opportunity to refinance their mortgage, should the borrower refinance the loan?
2. When the first loan was originated, the lender offered a contract with 2 points and the same APR (10%). Had the borrower opted for that mortgage instead of a mortgage with no points, would refinancing make sense after 5 years?
3. Consider once again the loan with no points. Assume this time that the borrower has the option to refinance at any point, and that this option has value \$5000 after 5 years. How low must rates be after 5 years for refinancing at that point to have a positive NPV?

Problem 4 (15 pts), default pricing

A lender is considering issuing a 3-year FRM with yearly payments and initial balance \$100,000. The lender expects that the default hazard rate on the mortgage is 2% in each year plus $\frac{m}{40,000}\%$ where m is the size of the payment. In the event of default, the lender loses half of the loan's outstanding principal (defined as beginning balance + interest owed for the period.)

1. What contract rate must the lender set to hit an IRR target of 9% on this loan?
2. The lender now wants to hit the same IRR target, but by using a contract rate of 9% with points. How many points must it charge the borrower to hit this target? (To keep the problem simple, assume that the lender can charge points in whatever fraction she wants, she is not restricted to whole points.)

Problem 5 (20 pts), REIT analysis

For your REIT of choice:

1. Estimate your REIT's cost of equity, cost of debt, WACC and ROIC. Compare to peers.
2. Estimate your REIT's EBITDA and FFO multiples (state the definition that you are using for both) and compare to peers.
3. Estimate your REITs' implied cap rate. State all assumptions along the way.
4. Break down NOI in as many segments as you can. Estimate your REITs NAV premium.
5. If you were an analyst in charge of your REIT, what two questions would you ask right now in the course of an earnings call?

Problem 7 (10 pts)

Consider a financial economy with three securities. The (percentage terms) expected returns of securities 1, 2, and 3 are (20, 30, 13), respectively. The variance-covariance matrix of these returns is:

$$\begin{bmatrix} 198 & 200 & 145 \\ 200 & 1000 & 75 \\ 145 & 75 & 310 \end{bmatrix}.$$

Assuming that investors cannot shortsell any of these securities, use Excel to sketch the corresponding feasible set.

Problem 6 (10 pts)

Re-run the CAPM regression you ran on HW1 but augment the model to include Fama-French's two factors. Use an excess-return specification so that the intercept has a traditional alpha interpretation. Do those factors enter the regression significantly? How about alpha? What, if anything, does all this say about CAPM?

Midterm-style questions, for preparation only, no need to turn them in

1. If you want to buy a house asking \$1,000,000 and are looking for an 80% loan-to-value, how much principal will you have paid on the loan after 24 months if it is a 30-year (full amortization) FRM with an interest rate of 5.675%?
2. You wish to borrow \$200,000 for 20 years at 7% interest rate and amortize the loan by making fixed monthly payments. You also agree to make a balloon payment of \$30,000 at the end of your last month (240th month). What will be your monthly payment?
3. An investors can split his wealth across 3 assets, but cannot shortsell any of those assets. All three assets have the same expected return, namely 0.1, and the same variance, namely 0.05. The return on asset 1 has zero correlation with the returns on both asset 2 and asset 3. The returns on asset 2 and asset 3 are perfectly correlated. What is the lowest variance the investor can achieve? Show your work.
4. Consider the following probability space and random variables.

S	s_1	s_2	s_3
p	0.3	0.2	0.5
r_1	0.5	0.0	0.3

Assume that CAPM holds exactly. Assume further that the market portfolio has variance 0.01, and expected return 0.2. The risk-free rate is 0.1. What must be the covariance of r_1 with the market portfolio? Show your work.

5. An investor is considering buying a property and holding it for 3 years. She expects the property to generate a constant NOI of \$500,000 over the next 4 years. Capital expenses are expected to be 0 in the first year but 50% of NOI in year 2 and 3. Finally, the investor expects to sell the property at a NOI-cap rate of 8% at the end of year 3. The investor wants a PBTFCF return of 10% from this investment. How much is she willing to pay for the property today?