



KTH Real Estate and
Construction Management

Examination

Course: Financial Economics with Real Estate Applications

Course code: AI2153

Date: April 6, 2021

Time: 8 – 12 + 2.5 hours extra time for everybody (canvas upload link closes at 14.30).

Examiner: Han-Suck Song

Teachers: Han-Suck Song

Allowed aid

- Take-home examination without monitoring, that can be revised with an oral examination if necessary.
- Open textbook/open note/online material exam: that is, all material and software, such as textbook, online notes, Excel, R, Python, are allowed.
- Naturally, according to standard student code of conduct, you agree to the following text:

I assure that:

- I will go through with the exam according to the examiner's instructions.
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- I have done the exam by myself in solitude.

Answer sheet to the MCQs

- Write your answers to the MCQs in the answer sheet that you have downloaded. Save often!
- Upload your MCQ answer sheet in Canvas -> Assignments.
- (If you want you can also send a your answers to han-suck.song@abe.kth.se)

Number of Multiple-choice questions, points and grading scale

- This exam consists of 7 MCQs.
- Maximum number of points is 7.
 - ☐ Correct answer gives 1 point.
 - ☐ No or wrong answer gives 0 points.
 - ☐ Only one alternative can give 1 point per MCQ.
 - ☐ You will get 0 points if you choose more than one answer per MCQ.
- Grading scale (preliminary): percentage needed of maximum points:
 - A: 90%
 - B: 80%
 - C: 70%
 - D: 60%
 - E: 50%
 - Fx: 45%. Student has an opportunity to hand in an assignment to get grade E.
 - F: Failed.

Good luck!

1) Suppose that the net present value (NPV) of a real estate investment, when you use a 12 % discount rate, is very negative. Then the internal rate of return (IRR) of this investment must be _____.
A) negative.
B) equal to the discount rate.
C) higher than the discount rate.
D) lower than the discount rate.
E) None of the above (A, B, C, D) is correct.

2) Suppose that your real estate company at the end of 2019 purchased a property for \$250 000 000. At the end of 2020, your real estate company sold the property for \$218 000 000 after obtaining net cash flows (NOI) of \$13 750 000 at the end of 2020. Suppose the inflation during 2020 was 1.25%. The nominal total return was _____.
A) 20.99 %.
B) -7.30 %.
C) -8.37 %.
D) -8.55 %.
E) None of the above (A, B, C, D) is correct. Instead it should be _____.

3) You are analyzing drivers of cap rates for a stabilized property using the formulas presented in the report “What Really Drives Cap Rates?” by Dr. Peter Linneman. You assume that the real long-term risk-free rate should be 0.50 %, the economy-wide inflation rate 1.50 %, the operating risk premium of the property 2.50 %, and that the nominal cash-flow growth rate is 2.30 %. The cap rate for the property you analyze is 3.25 %. Based on these numbers, the liquidity premium for the property is _____.
A) 2.55 %
B) 1.05 %
C) -0.55 %
D) 4.05 %
E) None of the above (A, B, C, D) is correct. Instead it should be _____.

4) A property can be purchased for 350 000 000 today. A real estate analyst is analyzing the expected IRR and risk, measured as the standard deviation, of the real estate investment by projecting five different scenarios as follows:

Severe recession: NOI will be 15 000 000 the first year, and then decrease 4 percent per year until year ten. The property will sell for 240 000 000 in year ten. The probability for this scenario is 20 percent.

Moderate recession: NOI will be 15 000 000 the first year, and then decrease 2 percent per year until year ten. The property will sell for 270 000 000 in year ten. The probability for this scenario is 25 percent.

Baseline forecast: NOI will be level 15 000 000 per year for the next ten years. The property will sell for 350 000 000 in year ten. The probability for this scenario is 30 percent.

Moderate expansion: NOI will be 15 000 000 the first year, and then increase by 2 percent per year until year ten. The property will sell for 410 000 000 in year ten. The probability for this scenario is 20 percent.

Strong boom expansion: NOI will be 15 000 000 the first year, and then increase 4 percent per year until year ten. The property will sell for 450 000 000 in year ten. The probability for this scenario is 5 percent.

- A) The expected IRR is 4.29% and the standard deviation is 2.12 %.
- B) The expected IRR is 4.29% and the standard deviation is 6.56%.
- C) The expected IRR is 3.39% and the standard deviation is 2.12%.
- D) The expected IRR is 3.39% and the standard deviation is 0.45%.
- E) None of the above (A, B, C, D) is close to be correct. Instead it should be_____.

5) A property can be purchased for 255 000 000 today. A real estate analyst is analyzing the expected IRR of the real estate investment by projecting five different scenarios as follows:

Severe recession: NOI will be 12 000 000 the first year, and then decrease by 5.00 percent per year until year ten. The probability for this scenario is 20 percent.

Moderate recession: NOI will be 12 000 000 the first year, and then decrease by 2.50 percent per year until year ten. The property will sell for 225 000 000 in year ten. The probability for this scenario is 20 percent.

Baseline forecast: NOI will be level 12 000 000 per year for the next ten years. The property will sell for 275 000 000 in year ten. The probability for this scenario is 25 percent.

Moderate expansion: NOI will be 12 000 000 the first year, and then increase by 3.00 percent per year until year ten. The property will sell for 350 000 000 in year ten. The probability for this scenario is 20 percent.

Strong boom expansion: NOI will be 12 000 000 the first year, and then increase by 5.00 percent per year until year ten. The probability for this scenario is 15 percent.

If you want the expected IRR for this real estate investment to be 5.40 %, then the property must sell for

- A) 180 000 000 in the severe recession scenario, and for 400 000 000 in the strong boom expansion scenario.
- B) 225 000 000 in the severe recession scenario, and for 470 000 000 in the strong boom expansion scenario.
- C) 225 000 000 in the severe recession scenario, and for 490 000 000 in the strong boom expansion scenario.
- D) 120 000 000 in the severe recession scenario, and for 400 000 000 in the strong boom expansion scenario.
- E) None of the above (A, B, C, D) is close to be correct. Instead it should be_____.

6) A property is expected to have *NOI* of \$350 000 the first year. The *NOI* is expected to increase by 3 percent per year thereafter. The appraised value of the property is currently \$3 million and a lender is willing to make a \$2 200 000 participation loan with a contract interest rate of 4 percent. The loan will be amortized with monthly payments over a 25-year term. In addition to the regular mortgage payments, the lender will receive 70 percent of the *NOI* in excess of \$350,000 each year until the loan is repaid. The lender will also receive 30 percent of any increase in the value of the property. The loan includes a substantial prepayment penalty for repayment before year 5, and the balance of the loan is due in year 10. (If the property has not been sold, the participation will be based on the appraised value of the property.) Assume that the appraiser would estimate the value in year 10 by dividing the *NOI* for year 11 by a 10 percent capitalization rate. (For a given loan interest rate, this is a constant payment mortgage). What is the effective cost (to the borrower) of the participation loan assuming the loan is held for 10 years. (Note that this is also the expected return to the lender.)

- A) 4.25 %.
- B) 7.75 %.
- C) 9.25 %.
- D) 12.50 %.
- E) None of the above (A, B, C, D) is close to be correct. It should instead be_____

7) You like financial leverage and have a good contact with your bank. You believe that your future property investment can give you 8.50 % before-tax IRR on total investment. Your bank is willing to lend you money for which the effective cost of the loan (including points) is 4.50 % (i.e. this is the banks' return on debt). What must the loan-to-value ratio be if you want to enjoy 17 % before-tax IRR on equity invested?

- A) 4 %.
- B) 400 %.
- C) 50 %.
- D) 68 %.
- E) None of the above (A, B, C, D) is close to be correct. It should instead be_____.

Answer sheet to multiple choice questions (MCQs) AI2153

BETYG: A

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MCQ number	Your answers (A/B/C/D/E)	Write here if your answer is E and correct answer is requested: Instead it should be _____
1	D	
2	B	
3	B	
4	C	
5	E	195 000 000 / 440 000 000
6	E	7,36 %
7	E	57,63 %

Upload your MCQ answer sheet in Canvas -> Assignments.