KTH Real Estate and
Construction Management

Examination
Course: Financial Economics with Real Estate Applications
Course code: AI2153

Date: January 15, 2021
Time: 14 – 18 + 2.5 hours extra time for everybody (canvas upload link closes at 20.30).
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 exminer's instructions.
- I have not used any prohibited aids or co-operated with any one.
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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 **9** MCQs.
- Maximum number of points is **9**.
  - ❑ 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 an investment is very positive. Then the internal rate of return (IRR) of this investment must be_____

A) zero %.
B) equal to the discount rate.
C) higher than the discount rate.
D) lower than the discount rate.

2) A property can be purchased for 20 000 000 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 1 000 000 the first year, and then decrease 4 percent per year until year five. The property will sell for 16 000 000 in year five. The probability for this scenario is 15 percent.

Moderate recession: NOI will be 1 000 000 the first year, and then decrease 2 percent per year until year five. The property will sell for 18 000 000 in year five. The probability for this scenario is 25 percent.

Baseline forecast: NOI will be level 1 000 000 per year for the next five years. The property will sell for 20 000 000 in year five. The probability for this scenario is 35 percent.

Moderate expansion: NOI will be 1 000 000 the first year, and then increase by 2 percent per year until year five. The property will sell for 22 000 000 in year five. The probability for this scenario is 20 percent.

Strong boom expansion: NOI will be 1 000 000 the first year, and then increase 4 percent per year until year five. The property will sell for 24 000 000 in year five. The probability for this scenario is 5 percent.

A) The expected IRR is 4.405% and the standard deviation is 2.232%.
B) The expected IRR is 4.405% and the standard deviation is 3.188%.
C) The expected IRR is 4.405% and the standard deviation is 2.852%.
D) The expected IRR is 0% and the standard deviation is 0.050%.
E) None of the above (A, B, C, D) is close to be correct.

3) A property can be purchased for 23 000 000 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 1 000 000 the first year, and then decrease by 5.00 percent per year until year five. The property will sell for 18 000 000 in year five. The probability for this scenario is 20 percent.

Moderate recession: NOI will be 1 000 000 the first year, and then decrease by 2.50 percent per year until year five. The probability for this scenario is 25 percent.

Baseline forecast: NOI will be level 1 000 000 per year for the next five years. The property will sell for 23 000 000 in year five. The probability for this scenario is 25 percent.

Moderate expansion: NOI will be 1 000 000 the first year, and then increase by 3.00 percent per year until year five. The probability for this scenario is 15 percent.

Strong boom expansion: NOI will be 1 000 000 the first year, and then increase by 5.00 percent per year until year five. The property will sell for 30 000 000 in year five. The probability for this scenario is 15 percent.

If you want the expected IRR for this real estate investment to be 4.15 %, then the property must sell

A) for 20 700 00 in the moderate recession scenario, and for 25 000 000 in the moderate expansion scenario.
B) for 20 000 000 in the moderate recession scenario, and for 28 400 000 in the moderate expansion scenario.
C) for 22 300 000 in the moderate recession scenario, and for 27 700 000 in the moderate expansion scenario.
D) for 19 000 000 in the moderate recession scenario, and for 26 600 000 in the moderate expansion scenario.
E) None of the above (A, B, C, D) is close to be correct.

4) The NOI for your income property is expected to be $250 000 for the first year. Financing will be based on a 1.3 DCR applied to the first year NOI, will have a 5.5 percent interest rate, and will be amortized over 30 years with monthly payments. This is a CPM (FPM), constant or fixed payment mortgage. The NOI will increase 2 percent per year after the first year. You expect to hold the property for five years. The resale price is estimated by applying a 5 percent terminal capitalization rate to the sixth-year NOI. You require a 10 percent rate of return on equity (equity yield rate) for your property.

What is the present value of the equity interest in the property?

A) 666 035
B) 2 683 371
C) 2 526 780
D) 2 061 006
E) None of the above (A, B, C, D) is close to be correct.

5) If 1-year interest rates (proxy for short-term interest rates) for the next five years are expected to be 0.2, 0.3, 0.5, 1, and 2 percent, and the 5-year term premium is 0.5 percent, than the 5-year bond rate will be
A) 1.3 percent.
B) 0.8 percent.
C) 1.5 percent.
D) 0.9 percent.
E) None of the above (A, B, C, D) is close to be correct.

**** MCQs 6 -8 are based on the following text***
A borrower has been analyzing different adjustable rate mortgage (ARM) alternatives for the purchase of a property. The borrower anticipates owning the property for five years. The lender first offers a $500 000, 30-year fully amortizing ARM with the following terms:
Initial interest rate = 4 percent
Index = 1-year Treasuries
Payments reset each year
Margin = 1 percent
Interest rate cap = None
Payment cap = None
Negative amortization = Not allowed
Discount points = 1 percent

Based on estimated forward rates, the index to which the ARM is tied is forecasted as follows: Beginning of year (BOY) 2 = 4.5 percent; (BOY) 3 = 5 percent; (BOY) 4 = 5.5 percent; (BOY) 5 =6 percent. (For a given loan interest rate, this is a constant payment mortgage).

6) What will be the monthly payments during the second year?
A) 2 387.
B) 2 827.
C) 1 243.
D) 3 128.
E) None of the above (A, B, C, D) is close to be correct.

7) What is the loan balance end of year 5?
A) 495 000.
B) 503 241.
C) 470 514.
D) 463 896.
E) None of the above (A, B, C, D) is close to be correct.

8) What is the yield to the lender (ENAR) on this mortgage, based on monthly cash flows?
A) 5.94 %.
B) 5.72 %.
C) 6.25 %.
D) 5.65 %.
E) None of the above (A, B, C, D) is close to be correct.

9) A property is expected to have *NOI* of $200 000 the first year. The *NOI* is expected to increase by 3 percent per year thereafter. The appraised value of the property is currently $2 million and the lender is willing to make a $1 800 000 participation loan with a contract interest rate of 5 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 60 percent of the *NOI* in excess of $200,000 each year until the loan is repaid. The lender also will receive 40 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) 9.95 %.
B) 12.75 %.
C) 13.25 %.
D) 10.50 %.
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)		
1	C		
2	A		
3	B		
4	D		
5	A		
6	B		
7	D		
8	A		
9	7.09%		

Upload your MCQ answer sheet in Canvas -> Assignments.