



KTH Real Estate and
Construction Management

Examination

Course: Financial Economics with Real Estate Applications

Course code: AI2153

Date: January 14, 2022

Time: 14 – 18 + 0.5 hour extra time for everybody.

Examiner: Han-Suck Song

Teacher: Han-Suck Song han-suck.song@abe.kth.se, mobile 0708758206

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.
- I have not used any prohibited aids or co-operated with any one.
- During the examination I have not had any contact and/or communication (personal or otherwise, like via internet, phone, chat, etc) with living beings or artificial intelligence (including internet searches) that is not allowed during the examination.
- I have done the exam by myself in solitude.

Answers

- Write your answers to the MCQs like this (row and/or column): 1) A, 2) B, 3) C and so on.
- (If you want you can also send a your answers to han-suck.song@abe.kth.se)

Number of questions, points and grading scale

- This exam consists of 9 MCQs and essay questions.
 - Correct MCQ answer 1 point. Only one alternative can give 1 point per MCQ.
 - No, wrong or several answers per MCQ give 0 points.
 - 1 essay question that can give up to 1 point.
 - Maximum number of points: 9 + 1 = 10 points.
- 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.

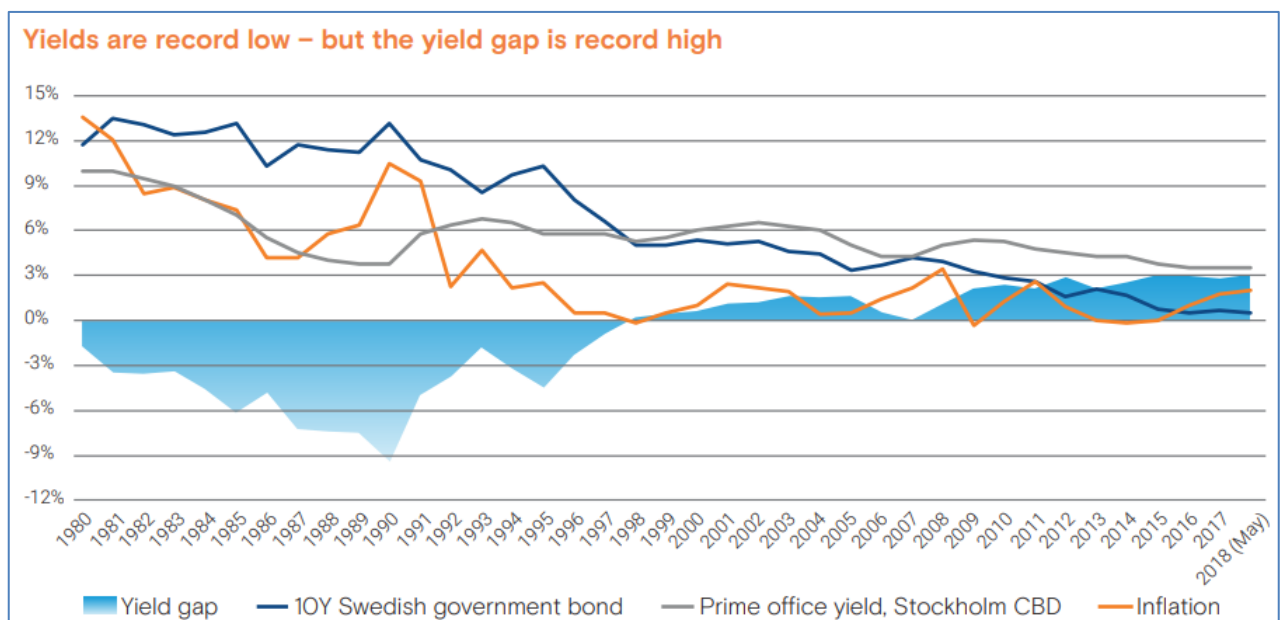
Good luck!

1) Suppose that the real 5-year government bond interest rate is -1.5% (i.e. minus 1.5%). If the nominal 5-year government bond rate is 1.5% , then the (expected) inflation rate is closest to

- A) 0.0% .
- B) 1.5% .
- C) 3.0% .
- D) -3.0% .
- E) None of the above (A, B, C, D) is close to be correct.

2) In the Cornerstone report *Lecture 3, Nov 9 -Cap-rates-and-RE-Cycles.pdf* you can find some interesting formulas. One formula is the “cap rate spread”:

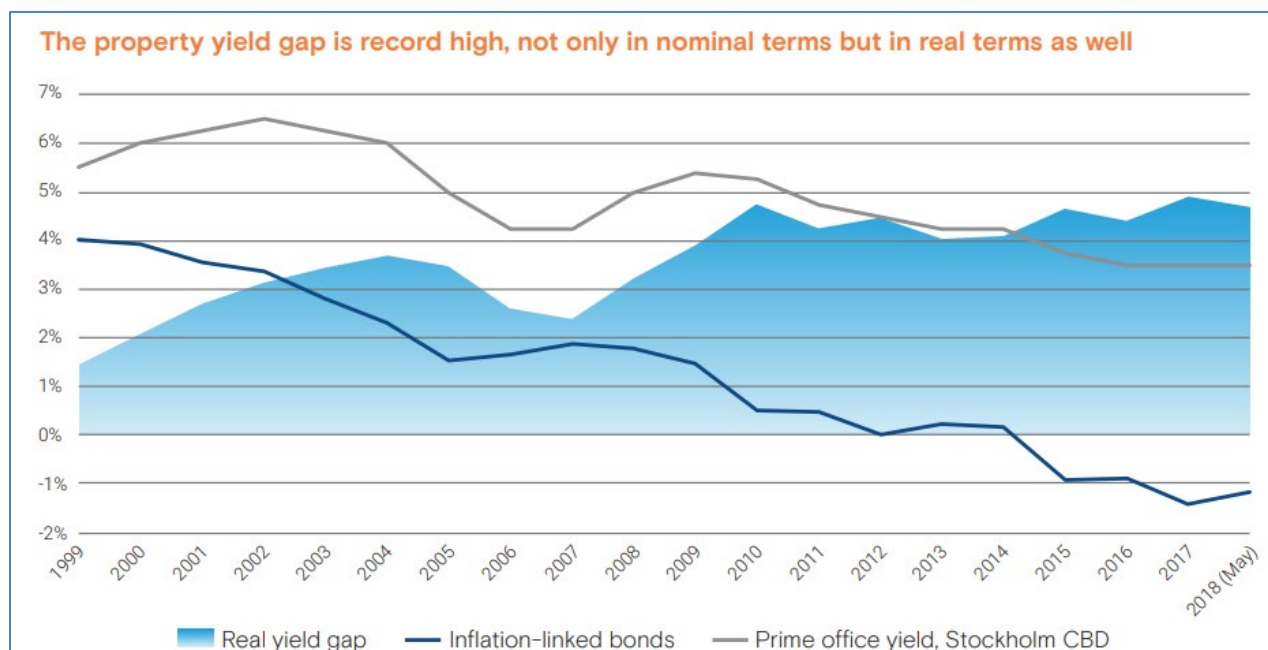
$$(\text{cap rate} - k_{RF}) \approx (RP - g)$$



Which of following statements is not correct (i.e. is false)?

- A) The left-hand side of the formula “cap rate spread” is the formula that is used to calculate the “yield gap” in the diagram.
- B) Although the Nordanö report writes that the yield gap is a measure of the risk premium for property, the Cornerstone report states that it is too simplistic to call the spread between cap rates and treasury yields a risk premium because the cap rate spread is equal to the risk premium plus the property income growth expectations.
- C) The yield gap in the diagram is negative when the 10-year nominal government bond interest rate is higher than the Stockholm CBD prime office yield.
- D) Both the yield gap and the cap rate spreads are positively related to the risk premium.

3) In the Nordanö report Lecture 3, Nov 9 - *Nordanö - 2018-1_property-the-holy-grail-of-investments.pdf*, you can find following diagram:



Which of following statements is not correct (i.e. is false)?

A) The real yield gap is equal to the nominal government bond interest rate + (expected) inflation rate minus the Stockholm CBD price office yield.

B) Nordanö argues that although Stockholm CBD office yields are record low (year 2018), investors still find office property investments attractive since the real yield gap has widened.

C) Inflation-linked bonds reflect the size of the real interest rate.

D) The real interest rate has fallen from about 4% in 1999 to below zero about 15 years later.

4) In the Cornerstone report *Lecture 3, Nov 9 -Cap-rates-and-RE-Cycles.pdf* you can find some interesting formulas. Suppose that the first year NOI for your private favorite property investment is USD 900 000.

Case 1: The real 5-year government bond interest rate is -0.5% (i.e. minus 0.5%). The (expected) inflation rate is 4.5%. The risk premium (RP) is 3.5%. Property income growth expectations (g) is 2.5%.

Case 2: The real 5-year government bond interest rate is -1.5% (i.e. minus 1.5%). The (expected) inflation rate is 4.5%. The risk premium (RP) is 3.5%. Property income growth expectations (g) is 2.5%.

You compute the value of your property using the “direct capitalization” method of real estate valuation. Which of following statements is correct (i.e. is true)?

A) The property value in case 1 is 20% higher than the property value in case 2.

B) The property value in case 1 is 25% higher than the property value in case 2.

C) The property value in case 2 is 20% higher than the property value in case 1.

D) The property value in case 2 is 25% higher than the property value in case 1.

E) None of the above (A, B, C, D) is close to be correct.

5) A property can be purchased for 15 000 000 today. A real estate analyst who likes risk analysis 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 900 000 the first year, and then decrease 3.5 percent per year until year six. The property will sell for 10 000 000 in year six. The probability for this scenario is 5 percent.

Moderate recession: NOI will be 900 000 the first year, and then decrease 1.5 percent per year until year six. The property will sell for 12 000 000 in year six. The probability for this scenario is 15 percent.

Baseline forecast: NOI will be level 900 000 per year for the next six years. The property will sell for 16 000 000 in year six. The probability for this scenario is 35 percent.

Moderate expansion: NOI will be 900 000 the first year, and then increase by 2.0 percent per year until year six. The property will sell for 18 000 000 in year six. The probability for this scenario is 30 percent.

Strong boom expansion: NOI will be 900 000 the first year, and then increase 3.0 percent per year until year six. The property will sell for 20 000 000 in year six. The probability for this scenario is 15 percent.

A) The expected IRR is 7.10 % and the standard deviation is 2.91 %.

B) The expected IRR is 7.10 % and the standard deviation is 0.084 %.

C) The expected IRR is 2.91 % and the standard deviation is 7.10 %.

D) The expected IRR is 0.084 % and the standard deviation is 7.10%.

E) None of the above (A, B, C, D) is close to be correct.

6) MCQ 5 continued. If the required rate of return (the discount rate) is 12 % for each of the five scenarios in MCQ 5, then the standard deviation of the NPV is _____

A) -1 545 432.

B) 12 %.

C) 2 985 884

D) 1 545 432 .

E) None of the above (A, B, C, D) is close to be correct.

7) Below is a list of annual US CPI values for urban consumers for the years 2015 – 2021. (Link to FRED: [Consumer Price Index for All Urban Consumers: All Items in U.S. City Average \(CPIAUCSL\)](#))

Year	CPI all urban consumers
2015	237
2016	240
2017	245
2018	251
2019	256
2020	259
2021	271

Using these values, the average (arithmetic mean) annual rate of inflation over this period is

- A) 14.35%.
- B) 2.27%.**
- C) 4.63%.
- D) 2.05%.
- E) None of the above (A, B, C, D) is close to be correct.

8) If 1-year interest rates (proxy for short-term interest rates) for the next five years are expected to be 0.2, 0.5, 0.8, 1, and 1.5 percent, and the 5-year term premium is 0.5 percent, then the 5-year bond rate will be

- A) 1.3%.**
- B) 0.8%.
- C) 1.5%.
- D) 2.1%.
- E) None of the above (A, B, C, D) is close to be correct.

9) The NOI for your income property is expected to be \$900 000 for the first year. Debt financing will be based on a 1.2 DCR applied to the first year NOI, will have a 4.5 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 2.5 percent per year after the first year. You expect to hold the property for five years. The resale price is estimated by applying a 4 percent terminal capitalization rate to the sixth-year NOI. You require a 12 percent rate of return on equity (equity yield rate) for your property. What is the present value of the equity interest in the property?

Note! If you choose MCQ alternative E, then you need to write the correct present value to get 1 point.

- A) 10 964 278
- B) 7 783 371
- C) Minus 560 059
- D) 11 152 667
- E) None of the above (A, B, C, D) is close to be correct. Instead it should be: **8 752 513**

10) ESSAY QUESTION!

As you know, there exist many property sectors (with subsectors), see for instance REIT Sectors | Nareit (<https://www.reit.com/what-reit/reit-sectors>) .

Suppose you must choose only one sector to invest in (for some years). Which sector would you choose and why?