FINA 395: Theory of Finance II

Sample Midterm Examination: Length: two hours

Solution

Instructions:

- Make sure that you submit the question sheet with your exam. Also, when you are asked to stop writing at the end do not continue. If you have not written your name / ID, wait till the invigilator is free to check your work and then complete the information.
- Write your name and student ID in at least one place on the question sheet. Return the question sheet with your exam.
- You are allowed to use a scientific / financial calculator. If the calculator is programmable, the memory should be cleared prior to the exam. You are not allowed to save any stored text in the calculator memory.
- There will be partial credit for some of the problems. You must show the details of your calculations / reasoning to receive such partial credit.
- Answer all questions on the answer sheet – this includes any multiple choice questions as well.
- Read the questions carefully and budget your time carefully.
- Good luck!

Section A: Multiple choice and short answers (30 points)
All questions are worth 3 points each

1. A bond issued by ABC Inc. 3 years ago has 2 years (i.e. 2 coupon payments) remaining till maturity (i.e. it was issued as a 5 year bond). The coupon rate is 8% and interest is paid once a year. If the price of the bond today is $980, the par value is $1,000 and the next interest payment is due one year from now, what is the YTM of the bond?

A) 8.80%

B) 10.5%

C) 12.3%

D) 9.14%

2. The basic output of Monte Carlo simulations depicts:

A) A distribution of possible outcomes based on our assumptions about the probability distribution of underlying variables in the model.

B) The true state of the world in the future.

C) A distribution of all possible outcomes in the future.

D) None of the above

Consider the following project cash flows for questions 3 and 4:

Year	0	1	2	3
Cash flow	-500	200	200	1700

3. The payback period is:

A) Less than 1 year

B) Between 1 and 2 years

C) Between 2 and 3 years

D) More than 3 years

4. If the discount rate is 10%, the profitability index equals (approximately) ___ :

A) 1.5

B) 2.6

C) 2.8

D) 3.2

5. Which of the following statements is correct?

a) If the IRR of a project is 0%, its NPV, using a discount rate, k, greater than 0, will be 0.

b) If the PI of a project is less than 1, its NPV should be less than 0.

c) If the NPV of a project is greater than 0, its PI will equal 0.

d) If the IRR of a project is greater than the discount rate, k, its PI will be less than 1 and its NPV will be greater than 0.

6. Your eccentric (and rich) uncle is thrilled that you are pursuing your undergraduate in business administration. For the next 40 years (starting 1 year from now; last payment 40 years from now), he will pay you $2,000 every odd year (1st, 3rd etc.) and $3,000 every even year (2nd, 4th etc.). The relevant discount rate is 5% per year. What is the present value of all the money you will receive from this source over the next 40 years (pick the closest number)?

A) $24,214

B) $29,582

C) $37,397

D) $42,688

7. Virgo Airlines will pay a $4 (annual) dividend next year (i.e. one year from now) on its common stock, which is currently selling at $100 per share. What is the market's required return on this investment if the dividend is expected to grow at 5% forever?

a) 10 percent

b) 9 percent.

c) 7 percent.

d) 5 percent.

e) 4 percent

8. The basic output of Monte Carlo simulations depicts:

A) A distribution of possible outcomes based on our assumptions about the probability distribution of underlying variables in the model.

B) The true state of the world in the future.

C) A distribution of all possible outcomes in the future.

D) None of the above

9. An annual coupon bond issued by ABC Inc. 3 years ago has 2 years (i.e. 2 coupon payments) remaining till maturity (i.e. it was issued as a 5 year bond). The coupon rate is 8% and interest is paid once a year. If the price of the bond today is $980, the par value is $1,000 and the next interest payment is due one year from now, what is the YTM of the bond?

A) 8.80%

B) 10.5%

C) 12.3%

D) 9.14%

10. Money that the firm has already spent or is committed to spend regardless of whether a project is taken is called a(n):

A) sunk cost.

B) fixed cost.

C) opportunity cost

D) none of the above.

E) erosion cost.

Section B: (70 points)

Answer all questions.

11. Caravan Corp. is contemplating a new widget manufacturing plant with the following details:
    1. The project will require an initial investment (in year 0) in machinery worth $100,000.
    2. The project life is three years. At the end, the machine will be sold for $10,000.
    3. The machine will be depreciated over 3 years using the straight line method.
    4. Widgets cost $15 per unit (in labor and raw material costs) in the first year and can be sold for $50 per unit. In the second and third years, widgets cost $17 but can be sold for $55.
    5. There are additional fixed costs of $10,000 during each year of operation.
    6. Due to a special government incentive, the Caravan pays no tax.
    7. The relevant discount rate is 10%.

(i) Compute the breakeven number of units assuming that the same number of units is sold each year.

Solution:

Set NPV = 0

Relevant cash flows will be:

Invest; time 0; 100,000

Salvage; year 3; 10,000

Fixed cost: -10,000 each year

Contribution margin (sales-variable costs): 35N, 38N and 38N for years 1-3 assuming N units

Solve

$$-100000+\frac{35N-10000}{1.1}+\frac{38N-10000}{1.1^2}+\frac{38N-10000+10000}{1.1^3}=0$$

rearranging yields

$$92N=117355$$

Breakeven comes out between 1278 and 1279 and so is rounded up to 1279

(ii) How much does NPV increase for one extra unit sold in each year? Assume all other figures are unaffected.

Solution:

An extra unit brings the contribution margin per unit, 35 in year 1 and 38 each year 2 and 3

$$\frac{\Delta NPV}{\Delta N} = \frac{35}{1.1} + \frac{38}{1.1^2} + \frac{38}{1.1^3} = 91.77$$

Or

Obtain the derivative

$$\frac{\partial NPV}{\partial N} = \frac{-100000 + \frac{35N - 10000}{1.1} + \frac{38N - 10000}{1.1^2} + \frac{38N - 10000 + 10000}{1.1^3}}{\partial N}$$

$$= \frac{35}{1.1} + \frac{38}{1.1^2} + \frac{38}{1.1^3} = 91.77$$

(iii) The analysts at Caravan estimate that the market demand will be between 1,400 and 1,500 units. Should the project be undertaken? Make any reasonable assumptions.

Solution:

If we make the same assumptions as in (i) (no other variables affected), then demand at 1400 – 1500 is higher than breakeven and so do the project.

……20 points

12. Mindgames Inc., a maker of video games, is considering the release of their new simulation game. If the game is a success, they expect to earn a present value of $15 million. However, if the game is a failure, they will incur a loss of $1 million (present value). There is a 50% chance of success (and so a 50% chance of failure). Alternatively, they can delay (by one year) the release and spend $2 million to undergo further beta testing. If they do so, they will improve the game and increase the probability of success to 75%. The relevant discount rate is 15%. Should Mindgames go for the beta testing?

Solution:

No test:

Expected NPV is just an expected value with 50-50 chances of 15 and -1. So you get expected positive 7 million

With test:

Expected value is Prob(success)*payoff if success + Prob (Failure) *payoff if failure

Remember to take PV into account as testing delays the project

PV=-2+(15*.75-1*.25)/1.15 = 7.565

Since payoff is higher with test – recommend testing.

……14 points

13. XYZ Inc. will pay a dividend of $4 per share tomorrow. This amounts to 100% of its earnings and is expected to remain constant forever. The market rate of return is 9%, the risk free rate is 3%, the beta of XYZ stock is 2, the standard deviation of the returns on XYZ stock is 18%, and XYZ is an all-equity firm. For simplicity, assume that dividends are declared and paid on the same day.
Recall, that the risk adjusted discount rate is calculated as risk-free rate + beta x (market rate – risk-free rate)

A) What is the price of XYZ stock now?

Solution:

Discount rate using CAPM is 15%

So price is 4+ 4/.15 = 30.67

Or calculate a price of perpetuity due: (4/.15)*1.15=30.67

B) What will be the price of XYZ stock after the dividend is paid tomorrow?

Solution:

Ex dividend day effect implies a drop of 4 ie 26.67

Or we get a classical perpetuity: 4/0.15=26.67

C) On the day after the dividend is paid, XYZ announces that it has found a valuable investment opportunity such that it can invest 20% of its earnings in each of the subsequent years and earn a return of 30% on each such investment in perpetuity. What would be the stock price of XYZ after this announcement (assuming efficient markets)?

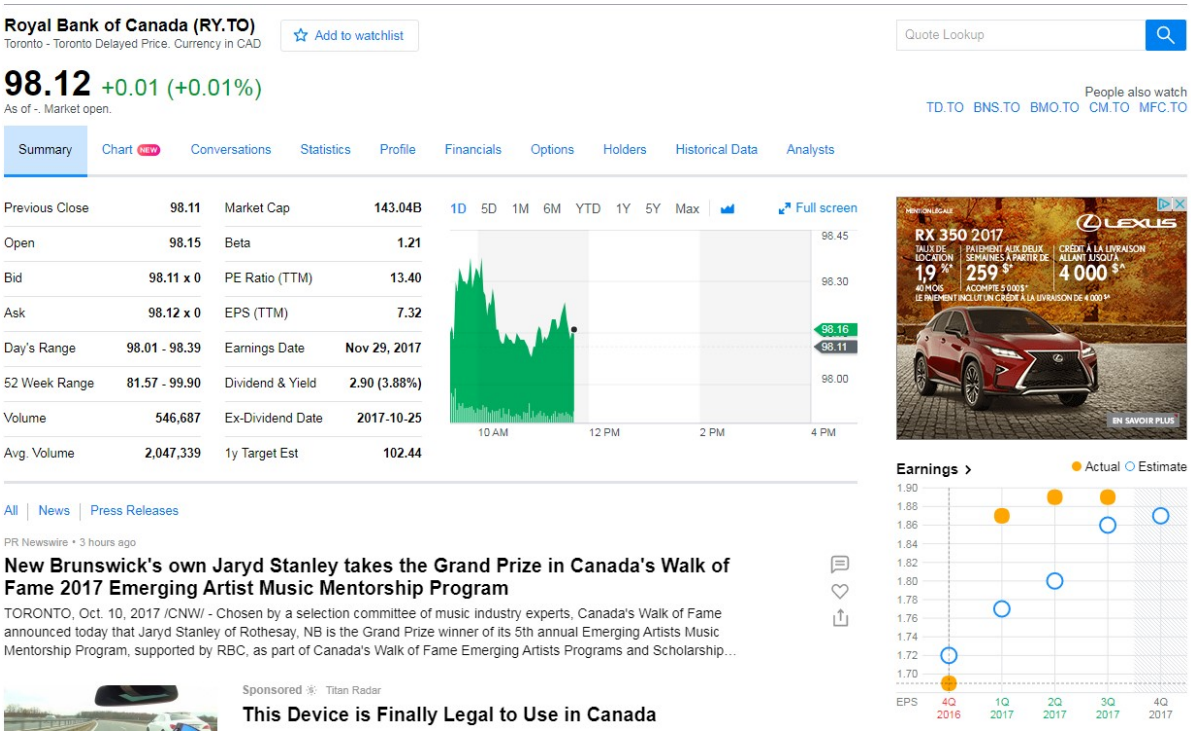
Solution:

New dividend = 3.2; growth = ROE*retention = 6%

So price = 3.2/(15% - 6%) = 35.56

16 points

14. Consider the following information regarding the earnings announcement surprise in the second quarter of 2017 of the Royal Bank of Canada (RBC):



The earning for the 2nd quarter were announced on May 25th, 2017 (the value of the earnings per share is given by the yellow filled circle in the graph above; the previously forecasted value for the EPS of that quarter is given by the blue circle). Around the announcement you observe the following returns for RBC stocks and the Toronto Stock Exchange market index (denoted by TSX).

Dates	RBC Returns	TSX Returns
23/05/2017	0.0055	0.0012
24/05/2017	-0.0057	-0.0037
25/05/2017	0.0080	-0.0006
26/05/2017	0.0019	0.0004
27/05/2017	0.0059	0.0003

Assume you can use the beta for the Royal Bank of Canada from the snapshot, further assume you can neglect alpha (set alpha=0). Furthermore, assume that the standard deviation of the residuals in the market model is 0.0035.

a.) Do you see the expected reaction (correct sign) for the event day? Is the reaction significant?

Solution:

To measure the reaction, calculate $AR_{RBC,2017/05/25}$

$AR_{RBC,2017/05/25}$=0.0080-1.21*(-0.0006)=0.0087

The reaction to the news is positive. Looking at the graph we can see that reported earnings were above expectations, so the news were also positive. Hence, the stock price reaction had the correct sign.

Now test

H0: $E[AR_{RBC,2017/05/25}]=0$, no reaction

H1: $E[AR_{RBC,2017/05/25}]\neq 0$

$$t-stat\left(AR_{RBC,2017/05/25}\right)=\frac{0.0087}{0.0035}=2.49$$

|2.49|>1.96 (5% critical value), hence we can reject H0 at the 5% significance level. We find significant positive reaction to the news on the announcement day.

b.) Can you report significant early reaction?

Solution:

To answer this question one has to test for effects on the 23rd and 24thof May

Therefore test

H0: $E[AR_{RBC,2017/05/23}]=0$, no reaction

H1: $E[AR_{RBC,2017/05/23}]\neq 0$

$AR_{RBC,2017/05/23}$=0.0055-1.21*0.0012=0.0040

$$t-stat\left(AR_{RBC,2017/05/23}\right)=\frac{0.0040}{0.0035}=1.14$$

|1.14|<1.96 (5% critical value), hence we can not reject H0 at the 5% significance level. No evidence of the effect on the 23rd of May

And test

H0: $E[AR_{RBC,2017/05/24}]=$, no reaction

H1: $E[AR_{RBC,2017/05/24}]\neq 0$

$AR_{RBC,2017/05/24}$=-0.0057-1.21*(-0.0037)=-0.0013

$$t-stat\left(AR_{RBC,2017/05/24}\right)=\frac{-0.0013}{0.0035}=-0.37$$

|-0.37|<1.96 (5% critical value), hence we can not reject H0 at the 5% significance level. No evidence of the effect on the 24th of May.

Hence we find no evidence of the early reaction.

c.) Can you report significant late reaction?

Solution:

To answer this question one has to test for effects on the 26th and 27thof May

Therefore test

H0: $E[AR_{RBC,2017/05/26}]=0$, no reaction

H1: $E[AR_{RBC,2017/05/26}]\neq 0$

$AR_{RBC,2017/05/26}=0.0019-1.21*0.0004=0.0014$

$$t-stat\left(AR_{RBC,2017/05/26}\right)=\frac{0.0019}{0.0035}=0.54$$

$|0.54|<1.96$ (5% critical value), hence we can not reject H0 at the 5% significance level.

No evidence of the effect on the 26th of May

And test

H0: $E[AR_{RBC,2017/05/27}]=$, no reaction

H1: $E[AR_{RBC,2017/05/27}]\neq 0$

$AR_{RBC,2017/05/27}=0.0059-1.21*0.0003=0.0055$

$$t-stat\left(AR_{RBC,2017/05/27}\right)=\frac{0.0059}{0.0035}=1.69$$

$|1.69|<1.96$ (5% critical value), hence we can not reject H0 at the 5% significance level.

No evidence of the effect on the 27th of May.

Hence we find no evidence of the late reaction

d.) Do your findings support the semi-strong form of market efficiency?

Solution:

Since we find evidence of significant ARs only on the announcement day, YES, our findings support the semi-strong forme of market efficiency.

20 points