King Saud University

College of Science

Department of Mathematics

Final Examination

Actuarial Coroprate Finance ACTU 262

Trimester 3- 26/11/1444 H – 15/6/2023 G

Duration: 3 Hours

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Name:
Student Number:
Section:

Note*: *The exam consists of 9 pages

Exercise	Mark
Exercise 1 (MCQ)	**10**
Exercise 2	**5**
Exercise 3	**5**
Exercise 4	**5**
Exercise 5	**5**
Exercise 6	**5**
Exercise 7	**5**
Total	**40**

Exercise 1: (MCQ)

1) You plan to invest an equal amount of $2,000 in an equity fund every year-end beginning this year. The expected annual return on the fund is 15 percent. He plans to invest for 20 years. How much could he expect to have at the end of 20 years?

a) $237,620
b) $176,424
c) $204,887
d) $178,424

2) If investors require a 10 percent real rate of return and the inflation rate is 8 percent, what must be the approximate nominal rate?

a) 19%
b) 18%
c) 18.8 %
d) 19.8%

3) What is the approximate present value of an ordinary annuity (beginning one year from now) of a stream of 12 annual payments of $87,000 if you use a discount rate of 6%?

a) $773,154.04
b) $747,278.92
c) $729,394.95
d) $718,974.58

4) You ran a little short on your spring break vacation, so you put $10,000 on your credit card. You can afford only the minimum payment of $250 per month. The interest rate on the credit card is 2 percent per month. How long (in month) will you need to pay off the $10,000?

a) 78
b) 79
c) 80
d) 81

5) With continuous compounding at 10 percent for 30 years, the future value of an initial investment of $2,000 is closest to:

a) 34,898
b) 40,171
c) 164,500
d) 328,282

6) Global Corp. borrows $7 million at a rate of 5.00% to finance a new plant. They will fully repay the loan with annual payments in 3 years. How much will they pay in total over the 3 years to repay the loan in full?

a) 923,899
b) 4,200,000
c) 5,105,126
d) 7,711,380

7) Which of the following are examples of a primary market transaction?

a) A company issues new common stock.
b) A company issues new bonds.
c) An investor asks his broker to purchase 1,000 shares of Microsoft common stock.
d) All of the statements above are correct.
e) Statements A and B are correct.

8) Assume that you wish to purchase a bond with a 30-year maturity, an annual coupon rate of 10 percent, a face value of $1,000, and semi-annual interest payments. If you require a 9 percent nominal yield to maturity on this investment, what is the maximum price you should be willing to pay for the bond?

a) $ 905.35
b) $ 1,102.74
c) $ 1,103.19
d) $ 1,106.76
e) $ 1,149.63

9) What is the major difference between a stock and a bond?

a) A bond is ownership in a company, but a stock is a loan.
b) A bond can always be resold for its face value, but a stock cannot.
c) A stock is ownership in a company, but a bond is a loan.
d) A stock can always be resold for its face value, but a bond cannot.

10) Investors believe that a certain stock will pay $4 dividend next year. The market price of the stock is $66.67, and investors expect 12% return on the stock. What long-run growth rate in dividend is consistent with the current price of the stock?

a) 5%
b) 6%
c) 7%
d) 8%

Exercise 2 [5]:

a) The present value of the following cash flow stream is $6,550 when discounted at 10 percent annually. What is the value of the missing cash flow?

Year	Cash Flow
1	1,700
2	2,100
3	?
4	2,800

b) Find the Future value for the same cash flow at an annual interest rate 10%.

Answer

a)

6550=1700/(1.10)^{-1) +2100/(1.10)^2 + X/(1.10)^3 +2800/(1.10)^4

Then X= 1805.60

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b) Fv= PV(1+i)^4 = 6,550 (1.10)^4 =$9589.855

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Exercise 3 [5]:

You are planning to save for retirement over the next 30 years. To do this, you will invest $700 a month in a stock account and $300 a month in a bond account. The return of the stock account is expected to be 11 percent, and the bond account will pay 6 percent. When you retire, you will combine your money into an account with a 9 percent return.

How much can you withdraw each month from your account assuming a 25-year withdrawal period?

Answer : We need to determine the future value of the two (stock and annuities

FV for stock=700×[(1+0.1112)^360−1)/0.1112=$1,963.163.816
By using financial calculator
N=360,1/Y=11/12, PMT=0, CPT for FV=$1,963.163.816
FV for bond=300×[(1+0.612)360−1)/0.0612=$301,354.5127
By using financial calculator
N=360,1/Y=6/12, PMT=0, CPT for FV=$301,354.5127
The expected value for retirement accounts in 30 years is
=$1,963.163.816+ $301,354.5127=$2,264,518.329
Now , we need to determine the monthly withdrawal amount using the present value annuity equation and solving for C:

$$PV = C\frac{1-(1+0.0912)^{-300}}{0.0912} = 2{,}264{,}518.329$$

Which by calculator gives $C = \$19{,}003.75547$
N=300. 1/Y=9/12 . PV==$2,264,518.329, CPT, PMT=$19,003.75547
You would be able to withdraw $19,003.75547 each month for the next 25 years

Exercise 4 [5]:

A) What is inflation rate?

B) Al Marai company Provided a gallon of milk cost $5 in 2004 and $5.60 in 2014, what is the inflation rate between 2004 and 2014?

C) suppose you want to withdraw money each year for the next three years, and you want each withdrawal to have $25,000 worth of purchasing power as measured in current dollars. If the inflation rate is 4 percent per year, what is the present value of these cash flows if the appropriate nominal discount rate is 10?

Answer

A)

The inflation rate is the measure of the increase or rate of increase in the general price of selected goods and services over a determined period of time.

1

B) 5.60 minus 5 equals .60. Divide .60 by 5. The results are .12. Multiply by 100. The inflation rate on a gallon of milk between 2004 and 2014 was 12%.

1

C)

The withdrawals each year will thus be:

$$C_1 = \$25{,}000(1.04) = \$26{,}000$$
$$C_2 = \$25{,}000(1.04)^2 = \$27{,}040$$
$$C_3 = \$25{,}000(1.04)^3 = \$28{,}121.60$$

2

What is the present value of these cash flows if the appropriate nominal discount rate is 10 percent? This is a standard calculation, and the answer is:

$$PV = \$26{,}000/1.10 + \$27{,}040/1.10^2 + \$28{,}121.60/1.10^3 = \$67{,}111.65$$

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Notice that we discounted the nominal cash flows at a nominal rate.

Exercise 5 [5]:

Suppose a seven-year, $1000 bond with an 8% coupon rate and semiannual coupons is trading with a yield to maturity of 6.75%.

a) Is this bond currently trading at a discount, at par, or at a premium? Explain.
b) If the yield to maturity of the bond rises to 7% (APR with semiannual compounding), what price will the bond trade for?

Answer

a. Because the yield to maturity is less than the coupon rate, the bond is trading at a premium.

b. $$\frac{40}{(1+0.035)}+\frac{40}{(1+0.035)^2}+\cdots+\frac{40+1000}{(1+0.035)^{14}}=\$1,054.60$$

	NPER	Rate	PV	PMT	FV	Excel Formula
Given	14	3.50%		40	1,000	
Solve for PV			(1,054.60)			=PV(0.035,14,40,1000)

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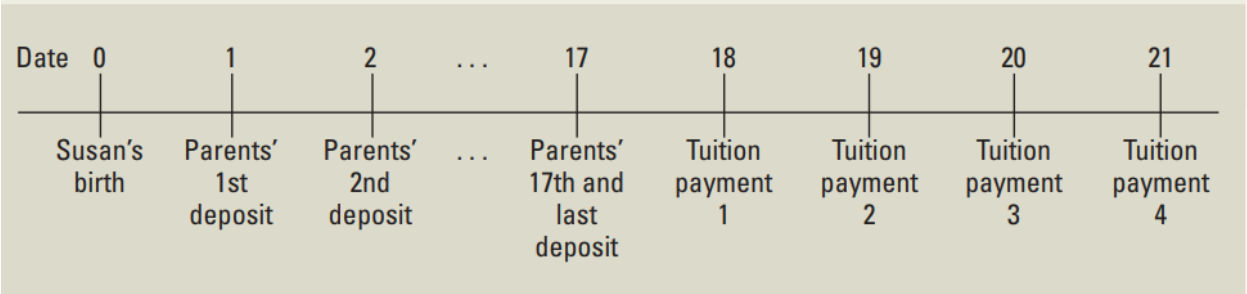
Exercise 6 [5]:

Harold and Helen Nash are saving for the college education of them new-born daughter, Susan. The Nashis estimate that college expenses will run $30,000 per year when their daughter reaches college in 18 years. The annual discount rate over the next few decades will be 14 percent.

How much money must they deposit in the bank each year so that their daughter will be completely supported through 4 years of college?

Answer

To simplify the calculations, we assume that Susan is born today. Her parents will make the first of her four annual tuition payments on her 18th birthday. They will make equal bank deposits on each of her first 17 birthdays, but no deposit at date 0. This is illustrated as



Mr. and Ms. Nash will be making deposits to the bank over the next 17 years. They will be withdrawing $30,000 per year over the following four years. We can be sure they will be able to withdraw fully $30,000 per year if the present value of the deposits is equal to the present value of the four $30,000 withdrawals. This calculation requires three steps. The first two determine the present value of the withdrawals. The final step determines yearly deposits that will have a present value equal to that of the withdrawals.

1. We calculate the present value of the four years at college using the annuity formula

$$\$30{,}000 \times \left[\frac{1 - \frac{1}{(1.14)^4}}{.14}\right] = \$30{,}000 \times \text{PVIFA}_{14\%,4}$$
$$= \$30{,}000 \times 2.9137 = \$87{,}411$$

We assume that Susan enters college on her 18th birthday. Given our discussion in Trick 1, $87,411 represents the present value at date 17. Where PVIFA14%,4 is Pv for annuity at 14% and t=4

2. We calculate the present value of the college education at date 0 as
$87,411/ (1.14)^17 = $9,422.91

3. Assuming that Helen and Harold Nash make deposits to the bank at the end of each of the 17 years, we calculate the annual deposit that will yield a present value of all deposits of $9,422.91. This is calculated as C x (Pv for annuity at 4%, and T=17) = $9,422.91

Where (Pv for annuity at 4%, and T=17)= $ 6.3729 ,

So C = $9,422.91 /6.3729 = $1,478.59

Thus, deposits of $1,478.59 made at the end of each of the first 17 years and invested at 14 percent will provide enough money to make tuition payments of $30,000 over the following four years.

Exercise 7 [5]:

A company is planning on increasing its annual dividend by 15% a year for the next 4 years and then decreasing the growth rate to 3.5% per year. The company just paid its annual dividend in the amount of $0.20 per share. We suppose that the required rate of return is 15.5%.

a) What is the current value of one share of this stock?
b) What is the value of one share of this stock 3 years from now?

Answer

- D0 = $0.20
- D1 = $0.20 x (1 + 15%) = $0.23
- D2 = $0.23 x (1 + 15%) = $0.26
- D3 = $0.26 x (1 + 15%)=$0.299
- D4=$0.299x(1+15%)=$0.343

The value of the Equity after the fourth year (growth rate is g=0.035)

P4=D4 x(1+g)/(r-g)=

P4=0.343x(1.035)/(0.155-0.035)

P4= $2.958

So, current Value of one share:

$P0=0.23/(1.155) +0.26/(1.155)^2+0.299 /(1.155)^3+0.343/(1.155)^4+2.958/(1.155)^4$

P0=0.1991+0.19489+0.194055+0.192737+1.6621

P0=$2.442

b- $2.442(1.155)^3+0.20(1.155)^3+0.23(1.55)^2+0.26(1.155)+0.299(1.155)^0$

P3=3.762+0.308+0.3068+0.3003+0.299

P3=4.9761