Quantitative Finance – 1st year/Eco-Finance-Management, 1st sem., Exam 1   06.06.2017, 12:00

1st Part   (70 marks)   Total Time: 2h

1st Part: 70 Marks. Do not detach any sheet. All answers shall be given in the space available. All True/False questions have equal marking. During the test there won't be any comments or questions given. Write your name and number on every sheet. No mobile phones or any *wifi* devices are allowed at any time.

Name:____**Number:**_________

In the following group of questions, every right answer has 2.5 marks each, wrong answers have –2.5 each (2.5 penalty mark). *Each group of questions will have a mark between* ***0*** *(minimum) and* ***10*** *(maximum)]*

Write True (**T**) or False (**F**), *with an* ***X*** *in the appropriate entry*.

1. Consider Simple and Compound Interest calculation:

	T	**F**
The effective monthly interest rate is always proportional to the annual nominal rate with monthly accumulation irrespective of the interest regime.		
Simple Interest accumulation is mostly used in short term operations.		
For a fixed annual interest rate, money invested at Compound Interest grows faster in time than money invested at Simple Interest when time is less than 1 year.		
The notation $i_A^{(m)}$ is taken to mean that interest has a compounding period of $1/m$ years.		

2. Consider discount and ordinary annuities:

	T	**F**
Simple Discount simply means that interest is paid in advance.		
The notation $a_{\overline{n}|}$ stands for an ordinary annuity with n equal payments for a fixed interest rate.		
A monthly payment Pension is an example of a non-contingent annuity.		
An annuity is a series of periodic payments not necessarily constant.		

3. Consider deferred annuities, perpetuities, variable payment annuities and debts:

	T	**F**
The value $s_{\overline{n}|} = a_{\overline{n}|}(1+i)^n$ means that the present value of a unit payment annuity is accumulated at the maturity.		
A perpetuity is an infinite period annuity that results as $n \to \infty$.		
In loan repayment, in the amortization methods learned with fixed interest rate, interest is always non-increasing in time.		
In a "constant payment loan" both interest and principal payments are decreasing along time.		

4. Consider bonds, leasing and shares:

	T	**F**
For a given bond, the time to maturity and the yield rate will both affect the value of the bond.		
A bond coupon is a guaranteed interest payment.		
The leasing operation is not a loan but a rent contract.		
The redemption value at the maturity date is typically the face value of the bond.		

In the next group of questions, tick √ or write X in the box next to the answer you consider to be correct (<u>only one is</u>). In each group, a correct answer has <u>5 marks</u> and a wrong answer gets <u>-1.25</u> marks (penalty 1.25).

5. Consider compound interest. Calculate the annual nominal rate, compounded twice a year, equivalent to a quarterly effective interest rate of 1%.

a) 2.01% ☐; **b)** 4.00% ☐; **c)** 4.02% ☐; **d)** 2.00% ☐.

6. Consider compound interest and quarterly effective interest rate of 2%, and the following options:

i. Receive €10,200 in a year from now, and the same value within two years, exactly;
ii. Receive €10,000 within nine months from now, and the same value within eleven months, exactly.

Choose the best option:

a) Choose (i) ☐; **b)** Choose (ii) ☐; **c)** Indifferent ☐; **d)** Not enough information ☐.

7. Consider simple interest and monthly interest rate of 0.5%. Marcelo has to pay 300, 600 e 900 euros within 3, 6 and 12 months, respectively. After six months from start he has not made any payment. At that time what is Marcelo's complete debt?

a) ☐ €1,777.99; **b)** €1,752.62 ☐ **c)** €1,778.29 ☐; **d)** None of the others ☐.

8. A laptop computer has a selling price of €1,500. António has been given the option to pay the computer in six biannual installments of €267.79 each, being the first within six months. Considering a semi-annual interest rate of 2%, advise António the best option:

a) Pay €1,500 ☐; **b)** Pay the annuity ☐; **c)** Indifferent ☐; **d)** Not enough information ☐;

9. Consider the following information about the amortization schedule of a given loan:

Period	Debt at beginning of the period	Interest	Payment	Principal Paid	Accumulative Amortization	Debt at end of the period
k	€99,932.90	€666.22	€733.77	€67.55	€134.65	€99,865.35
k+1	€99,865.35	€665.77	€733.77	€68.00	€202.65	€99,797.35

The type of the Amortization Method used is of:

a) Constant-payment ☐; **b)** Constant-principal loan ☐; **c)** Not enough information ☐; **d)** None of the others ☐;

10. A certain perpetual bond has a par value of €100 and coupon rate of 5.0%. Bondholders require a return of 4.0%. What is the value of the bond?

a) €200 ☐; **b)** €100 ☐; **c)** **€125** ☐; **d)** None of the previous ☐;

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2nd Part (130 marks)

In this group write your calculations in the space below the question and write the final answer in the box provided. Do not forget to present all formulae and intermediate calculations needed.

1. (45 marks)

Mr. Red is buying a new car and requires a loan of €12,000 to pay for it. A car dealer offers two alternatives on the loan:

i. Monthly payments for three years, starting one month after purchase, with an annual interest of 12% compounded montly, or

ii. monthly payments for four years, also starting one month after purchase, with annual interest 15% compounded montly.

Denote by P_1 and P_2 the monthly payments of options (i) and (ii), respectively.

a) Calculate P_1.

R:

b) Calculate P_2.

R:

c) Help Mr. Red to decide. Explain short but clearly your option.

d) Compute the first four lines of the following amortization table:

Period	Debt at beginning of the period	Interest	Payment	Amortization	Accumulative Amortization	Debt at end of the period
1	12,000					
2						
3						
4						

2. (40 marks)

A friend of Mr. Red financed his car through a leasing contract with the following conditions:

- Purchase value: €20,000;
- Term of the contract: 4 years;
- Quarterly effective rate of 3.0%, the first payment done three months after the contract date;
- A down payment of 10% over the purchase value;
- A residual value equal to 10% of the car value, at the last periodic payment;
- Payments are constant and done at the end of every quarter.

Mr. Red's friend does not intend to exercise the option to buy.

a) Compute the payments that are associated with the leasing contract.

R:

b) How much is the cost of the operation for Mr. Red's friend at the contract date?

R:

c) Compute the amount of the debt at the end of the second year.

R:

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3. (45 marks)

RedMood Corporation issued a bond loan under the following terms:

• Date of issue: 01/01/*n*.

• Nominal Value: €5.00.

• N.º of bonds issued: 40,000.

• Issue value at par;

• Loan term: 3 years.

• Semi-annual coupon rate: 4.0%.

• Payment of semi-annual interest. The first payment will occur one semester after issuance.

• Mode of Redemption (at premium): Repayments semi-annually of equal number of bonds, starting 6 months after the issuance date;

Redemption premium: €0.25 per bond during the first two repayments and €0.50 per bond after that.

a) Compute the total value of the bond loan.

R:

b) Fill out the bond amortization table (Euros).

Semester	Debt at beginning of the period	Interest	No. of bonds repaid	Amortization	Premium	Total Payment
0						
1						
2						
3						
4						
5						
6						

c) Mr. Red has 200 bonds. Just after the redemption in the fourth semester, and the semi-annual yield rate is expected to be 5.0%. Compute the value of Mr. Red's bonds in the fourth semester.

R: