



**FNCE10002 Principles of Finance**  
Semester 1, 2019

**Valuation of Debt Securities**  
Tutorial Questions for Week 3

*This tutorial is divided into two parts. The answers to the questions in Part I need to be submitted at the **beginning** of your tutorial. All answers must be **handwritten** and in **original** (photocopies/emails will not be accepted). Please follow the instructions on the Tutorial Hand-in Sheet available on the LMS via the Tutorials link. The answers to questions in Part II do not need to be submitted and will be discussed in your tutorial. Please make sure that you have worked through these questions and are prepared to discuss them if called upon by your tutor.*

*Note that questions flagged as “EXM” are past exam questions that I’ve used in this subject or subjects similar in scope to this subject, while those flagged as “TXT” are sourced from the textbook. Detailed answers to the questions in Part II will only be provided in tutorials. Brief answers may be provided via the LMS after a time lag. This policy is in place to ensure that you attend your tutorials regularly and receive timely feedback from your tutor. If you are unsure of any answer you should check with your tutor, a pit stop tutor, online tutor or me.*

**Part I: Answers to be Submitted to Your Tutor**

**A. Problems**

A1. <sup>EXM</sup> Jack and Jill Trzetrzelewska want to purchase an apartment costing \$160,000. First Australia Bank (FAB) will lend them the required funds at a fixed interest rate of 9% per annum for a 25-year period, with interest compounded on the monthly balance outstanding. The monthly payments will begin in one month’s time and all cash flows will occur at the end of each month.

- a) Calculate the monthly payments that Jack and Jill will make on their loan.
- b) Develop an amortization schedule for the loan for months 1 through 4 and get the following information from this schedule.
  - (i) The total amount owed at the end of month 4.
  - (ii) The total interest paid in month 2.
  - (iii) The total principal repaid in month 3.
- c) Suppose it is now the end of year <sup>10</sup> (that is, 120 months have elapsed since the funds were first borrowed) and Jack and Jill have decided to repay the amount outstanding in full. What amount do they now need to pay the bank? Assume that Jack and Jill have been making regular monthly payments over the past 10 years. *Show all calculations.*

d) What is the effective annual interest rate that Jack and Jill are paying on their loan?

A2. **TEXT** Answer each part separately and show all calculations.

- a) A \$100 par value bond has a coupon rate of 8% and a coupon yield of 9%. What is the bond's market price?
- b) A bond offers a coupon rate of 5%. If the face value is \$100 and the bond sells for \$125 what is the bond's coupon yield?
- c) A zero coupon bond has a \$100 face value, matures in 10 years, and currently sells for \$78.12. What is the yield to maturity on this bond? What will happen to the bond's price if the yield to maturity: (i) rises by 0.5% and (ii) falls by 0.5%? What general relation between yields and bond prices is being illustrated here?

$$78.12 = \frac{\$100}{(1+r)^{10}}$$

A3. **EXM** Whatcha Mining Ltd has recently restructured its outstanding bond issue. The bond issue has 10 years remaining to maturity and an annual coupon rate of 10%. Before the debt restructuring the coupon payments were being made on an annual basis. Under the new arrangements the firm is permitted to make **no** coupon payments during years 1 through 5. After that period, normal coupon payments will resume. At maturity, the face value of \$1,000 per bond plus all the deferred (that is, unpaid) coupons will be paid to investors. If the required rate of return on these bonds is 15% p.a., calculate the current market price of the firm's bonds. (Hint: Use a time line to help you visualize the cash flows from this bond.) Show all calculations.

$$C = \$1000 \times 10\% = \$100$$

## Part II: Submission of Answers Not Required

### B. Multiple Choice Questions

For each question pick the *most reasonable* response based *only* on the information provided.

B1. **EXM** You have been told that the effective annual interest rate that BOA Bank is charging on its home loans is 8.33% with interest compounded daily on a 365-day basis. Based on this information, the annual percentage rate (that is, the stated interest rate) is **closest** to:

- a) 7.80%.  
b) 8.00%.  
c) 8.33%.  
d) 8.67%.

$$\left(1 + \frac{r}{365}\right)^{365} - 1 = 8.33\%$$

B2. **EXM** You are head of the Schwartz Family Endowment for the Arts. You have decided to fund an arts school in Melbourne's Federation Square precinct in perpetuity. Every five years, the endowment will give the school \$1 million. The first payment will occur five years from today. If the interest rate is 8% per annum compounded annually, the present value of your gift is **closest** to:

- a) \$680,582.  
b) \$2,130,697.  
c) \$2,500,000.  
d) \$12,500,000.

$$(1 + 8\%)^5 - 1 = 46.5$$

$$g' = (1 + g)^5 - 1 = 46.5\%$$

$$P = \frac{C}{r} = \frac{1,000,000}{g'}$$

Questions B3 – B5 are based on the following information.

Consider the following two corporate bonds with 1 and 15 years to maturity with coupons paid on an

annual basis.

Bond	Coupon Rate	Time to Maturity	Price per \$100 Face Value
A	8.0%	1 year	\$93.910
B	12.0%	15 years	\$82.460

 $P < FV$ 

d B3. EXM The yield to maturity of the 1-year bond is closest to:

- a) 6.5%.  
b) 8.0%.  
c) 12.0%.  
d) 15.0%.

$$\frac{8.0}{100} \left( 1 - \frac{1}{(1+r)^1} \right) = 93.910$$

coupon payment \$8  
principal \$100

$$\frac{100+8}{93.9} - 1$$

c B4. EXM The yield to maturity of the 15-year bond is closest to:

- a) 10.0%.  
b) 12.0%.  
c) 15.0%.  
d) 16.0%.

coupon payment \$12  
principal \$100

$$\frac{12}{100} \left( 1 - \frac{1}{(1+r)^{15}} \right) + \frac{100}{(1+r)^{15}} = 82.46$$

d B5. EXM If interest rates on all maturities increase by one percent what will happen to the price of these bonds?

1%  $r \uparrow$   $P \downarrow$

- a) The price of the shorter and longer maturity bonds will rise by the same percentage.  
b) The price of the shorter and longer maturity bonds will fall by the same percentage.  
c) The price of the shorter maturity bond will rise by a lower percentage than the rise in price of the longer maturity bond.  
d) The price of the shorter maturity bond will fall by a lower percentage than the fall in price of the longer maturity bond.

### C. Problems and Case Studies

C1. EXM Anne Investa is offered one of the following alternative cash flows:

Alternative 1: \$9,700 now.

Alternative 2: \$1,850 per year for the next 8 years.  $PV_2 = \frac{1850}{0.1} \left( 1 - \frac{1}{(1+0.1)^8} \right) = \$9702.6$  ✓

Alternative 3: \$150 per month for the next 8 years.  $\rightarrow$  Alternative 3

Alternative 4: \$21,000 at the end of 8 years.

$$PV_4 = \frac{21000}{(1+0.1)^8} = \$9467.45$$

$$PV_{\text{annual}} = \frac{150}{0.1} \left( 1 - \frac{1}{(1+0.1)^8} \right) = \$1022$$

$$PV_3 = \frac{1022}{0.1} \left( 1 - \frac{1}{(1+0.1)^8} \right) = \$5860$$

Assume end-of-the-period cash flows and an interest rate of 10% p.a. compounded monthly.

Which alternative should Anne choose and why?  $EAR = \left( 1 + \frac{r}{m} \right)^m - 1 = \left( 1 + \frac{0.1}{12} \right)^{12} - 1 = 10.471\%$

C2. Refer to the case study "Microsoft's Jumbo Issue" covered in class which was related to Microsoft's \$2.25 billion notes issue that paid a coupon of 3.95% and was due on Aug 8, 2056.

a) What is the price of the issue if the coupons are paid semi-annually and the yield to maturity is 4.5%?

$$PV = \left[ \frac{3.95 \times 2}{4.5} \left( 1 - \frac{1}{(1+4.5\%)^{40}} \right) + \frac{100}{(1+4.5\%)^{40}} \right] / 100 \times \$2.25 \text{ b} = \$3.658 \text{ billion}$$

b) What is the price of the issue if the coupons are paid semi-annually and the yield to maturity is 3.5%?

$$PV = \left[ \frac{3.95 \times 2}{3.5} \left( 1 - \frac{1}{(1+3.5\%)^{40}} \right) + \frac{100}{(1+3.5\%)^{40}} \right] / 100 \times \$2.25 \text{ b} = \$4.364 \text{ billion}$$

c) Compare the prices in parts (a) and (b) to the prices we calculated in the case study and comment on the differences, if any.

if  $YTM \uparrow$   $PV \downarrow$ .  
if compound frequency  $\uparrow$ ,  $PV \uparrow$

- d) Now assume that the coupons are paid on an annual basis, as in the case study. If market interest rates do not change, what is the note's price at the end of 2018 if the yield to maturity is 4.5% and 3.5% respectively? Show all calculations.

rd

(a) coupon payment semi-annually = \$1.975

yield to maturity semi-annually =  $\frac{4.5\%}{2}$

$$PV = \frac{1.975}{(\frac{4.5\%}{2})} \cdot \left(1 - \frac{1}{(1 + \frac{4.5\%}{2})^{80}}\right) + \frac{100}{(1 + \frac{4.5\%}{2})^{80}} = \$86.846.$$

(b). coupon ... 1.975  
ytm  $\frac{3.5\%}{2}$

(c)  $C = 3.95$

$r = 4.5\% / 3.5\%$

$n = 40 - 2$

$$PV = \frac{3.95}{0.045} \left(1 - \frac{1}{1.045^{38}}\right)$$

Amortization

payment	interest	principal	remaining balance
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