



ACTUARY PROGRAM ASSIGNMENT COVER SHEET

THIS FORM MUST BE AT THE FRONT OF EACH ASSIGNMENT
CANDIDATES MUST KEEP A COPY OF THEIR ASSIGNMENT

Candidate to complete the following section (and update details in header and footer):

CANDIDATE NUMBER: 222XXX	COURSE: Asset Liability Management
DATE DUE: Monday 15 August 2022 at 9.00pm (Sydney Time)	

- Please ensure that your candidate number and course name is located on the header and footers of each page of the assignment.
- Save as a word document, that is, file type .docx
- By submitting your assignment, you are implicitly stating that the work is your own.
- Remember that an important aspect of being a professional actuary is to always act with integrity. Committing plagiarism by copying another person's work or not properly referencing other sources used in your assignment is a breach of the Integrity principle under the Actuaries Institute's Code of Conduct.



Part B Assignment

(Total 10 marks)

Q1 You are considering an investment in the corporate bonds issued by a company whose equity securities and corporate bonds are listed on the stock exchange **(7 marks)**

(a) Describe the sources of return to investors from the corporate bonds (2 marks)

Answer is

There are three main sources of return for a corporate bond:

- The coupon payments and principal payments as set out in the contract at onset.
- Potential capital gains if the bond price increases upon selling the corporate bonds prior to the maturity date
- Reinvestment returns from the coupon payments

The coupon payments can be fixed or indexed (E.g. to inflation) and are paid as defined in the contract.

There is no capital gains if the bond is held until maturity, but in the event that the investor wants to sell the corporate bond prior to maturity, there is a potential for capital gain if the interest rate has decreased.

Reinvestment of returns from coupons will also yield a return. The actual return or potential loss is depending on the investment made in the future and is unknown in advance. This is also a source of risk, reinvestment risk.

The bond risk premium can also be thought of as a source of return. It is essentially to compensate the bond holder for the additional credit risk and lower liquidity that the investor faces, relative to holding government bonds.

(b) Explain the two main sources of risks to the returns when investing in corporate bonds (2 marks)

Answer is

The two main sources of risks to return when investing in corporate bonds are

- Credit Risk (shortfall in agreed income and agreed capital repayments) and Interest Rate Risk (falls in price if sold before maturity due to rises in yields to maturity)



Credit risk in this situation is the risk that the company will not meet their payment commitments and fail to make payments. This implies that at that point, the corporate bond may be downgraded and/or if the company goes into administration, the value of the bond may be lost. If upon failure to make a payment, the company is still of a going-concern, then it may suffer from a credit downgrade, which will affect the value of the bonds, if sold in the market, but will not affect the actual returns if the company continues to make payments as promise after the fail payment. Alternatively, the company will no longer be able to make any future payments and the loss in capital will depend on whether the corporate bond is secured and the seniority of debt.

Interest rate risk is another major risk faced by all bonds, and not just corporate bonds. This occurs as changes in interest rate will lead to bonds being re-valued. Given the current economic climate, and the expected increases in interest by the RBA in the foreseeable future, we may see that investments in corporate bonds now may decrease in value in the future. This however, does not affect the coupon payments or principal, and only has impacts if you wish to sell the bond prior to maturity.

(c) Describe measures that can be used to quantify the risks (3 marks)

Answer is

Credit risks can be quantified via:

- Credit rating agencies: Credit rating agencies provide a rating for companies and government and attempts to estimate the probability of default in the payment of interest or principle
 - o One thing to note is that credit rating does not differentiate between the probability of default of coupon and principle. The later is more significant as the sum is larger
- Evaluation of the credit spread can also indicate the amount of credit risk that is expected. The credit spread is the additional return above risk-free return that the bond is earning.
 - o Groupings include investment grade, below investment grade, high yield, junk bond and unrated bonds.
- Other methods to quantify the risks is by looking at the past experience and repayment history of the company as well as looking at its balance sheet to see if it can sustain future payments



- Credit risk can then be quantified using this relationship: $\text{Loss} = \text{Exposure at Default (which is the bond value at the time)} \times \text{Probability of default (which can be estimated via historical data and credit ratings)} \times \text{Loss Given Default}$

Interest rate risk can be quantified via:

- Duration, modified duration and convexity measures
- All of the above measures are aimed to quantify the impacts of interest rate change on the value of the bond.
- Modified duration is the proportional first derivative of price with respect to yield and it is a measure of how sensitive the price of the corporate bond is to changes in interest rate --> The higher the modified duration, the higher the interest rate risk
- Convexity is the proportional second derivative of price with respect to yield. The convexity informs on how the duration of the corporate bond change as interest rate changes.
- By combining the two concepts, and applying the Taylor's theorem, there is a formula to quantify the changes in bond price with small changes in interest rate. Here, we can see the impacts and extent of the interest rate risk on the corporate bond.

Q2 Justify which 3 characteristics that you would pay most attention to when evaluating an investment in a corporate bond. (3 marks)

Answer is

The three items of concern are

- Credit rating
- Yield to Maturity
- Maturity

As identified in Q1, credit risk is one of the most important risk for debt securities. Credit rating will give a measure on the likelihood that the company will be able to repay coupon and principal repayments. It will inform me on the risk that I am taking based on the credit rating, and also whether the investor is being compensated fairly based on the risk (E.g. are bonds with a lower credit rating offering a higher bond risk premium).



Asset Liability Management

Semester 2 2022 Sample Assignment 2

The yield to maturity is another characteristic that should be considered when evaluating corporate bonds. The yield to maturity comprises of the required risk free yield + expected inflation + bond risk premium and is the rate of return the bond will yield if it is held to maturity. The reason why we should pay attention to YTM as it allows us to draw comparisons between different bonds and even investments in other assets. This will allow us to identify whether the bond is being traded at par, at a discount or a premium, and to see if the investment is a good opportunity.

Maturity is another important characteristic of a bond. It is effectively the term of the bond. It is an important factor as it informs us on how interest rate sensitivity of the corporate bond. It is also important to inform what corporate bonds to purchase depending on investment objectives and to match future liabilities correctly. If asset is locked into long-term bonds, whereas it is expected that there are short-term liabilities, the investor may run in to liquidity issues.

The YTM and maturity can also assist us in approximating the interest rate risk.

- Duration usually increases with maturity
- Duration is inversely related to YTM

We can use this relationship and compare the desired corporate bond with the wider market.

END OF PART B ASSIGNMENT