**37011 Financial Markets Instruments**

# Whiteboard Tutorial 3

1. Suppose an investor buys a 90-day Australian bank bill with face value \$100,000 and yield 5.5%. After 30 days the investor decides to close out the position when the bill is trading at 5.48%. What is the holding period yield realised by the investor?

2. Suppose you have the following set of coupon bonds, each paying its coupon annually, with a face value of 100:

| Maturity in years | Coupon | Market price |
|---|---|---|
| 1 | 6.50 | 101.8137 |
| 2 | 3.25 | 97.7066 |
| 3 | 4.80 | 101.2414 |
| 4 | 1.50 | 89.9751 |
| 5 | 5.00 | 103.4012 |
| 6 | 4.00 | 99.0074 |
| 7 | 2.00 | 87.2087 |

   Compute the yield to maturity for each of these bonds.

3. Suppose that a 6% Treasury Bond matures on 15 September 2019. What is the price of the bond per \$100 face value if its yield is 4.5% and the settlement date is 6 March 2017? What if the bond is to be settled on 13 March 2017, with the same yield as above?

4. What is the continuously compounded HPY for the bond in the previous AOFM example if the bond is purchased on 6 March 2017 and then sold on 7 March 2017? Consider two cases:

   (a) Assume that the quoted yield is 4.45% on both days.

   (b) Assume that the quoted yield is 4.45% on 6 March 2017 and 4.4% on 7 March 2017.

5. If the bond in Question 3 above is held until maturity, then what is the continuously compounded HPY assuming that all the coupons can be reinvested at 4.52%, with semi-annual compounding?

6. Suppose a 5% semi-annual US Treasury Bond is trading at the quoted price of

$$\$98\text{-}19 = \$\ 98\tfrac{19}{32}.$$

   If the bond matures on 15 July 2025 and the settlement date is 7 March 2022, what is the cash price for the bond?

7. Let $r_1 > 0$ be the 1-year, risk-free, simple interest rate and $r_2 > 0$ be the 1-year, risk-free, semi-annually compounded rate. Construct an explicit no-arbitrage argument to show that

$$r_2 = 2(\sqrt{1 + r_1} - 1)$$

(Assume that both rates are available and that in both cases borrowing and lending rates are the same.)

8. The file `AustralianGovernmentBonds.xlsx` on Canvas gives Australian Government Bond prices as of 1 March 2024. The official term sheets giving the relevant details about the bonds are available at `https://www.aofm.gov.au/securities/treasury-bonds`.[1]

   (a) Calculate the corresponding Australian Government Bond yields.

   (b) Using loglinear interpolation where necessary, determine the term structure of zero coupon bond prices consistent with these Australian Government Bond prices.

   (c) If a new Australian Government Bond were issued on 1 March 2024, maturing 28 February 2044 and paying a coupon of 4% per annum semi-annually in arrears, paid on 1 March and 1 September each year commencing on 1 September 2024, what would be the price consistent with the term structure of zero coupon bond prices that you determined? What would be the Australian Government Bond yield?

   (d) Suppose you bought the bond with ISIN AU000XCLWAP3 on 1 March 2024, and sold it on 1 May 2024, by which time Australian Government Bond yield on this bond had increased by 20 bp. What is your holding period return?

[1] Note that these bonds use the "following, unadjusted" business day convention, meaning that "for any Payment Date that falls on a day that is not a Business Day, that any payment due on such Payment Date will be postponed to the next day that is a Business Day, but that the day(s) of such postponement shall not be considered when calculating the actual number of days in the relevant Interest Period for the purpose of calculating the relevant Interest Payment Amount due." The Python `datetime` package is useful here, see `https://docs.python.org/3/library/datetime.html`, as well as the `holidays` package, see `https://pypi.org/project/holidays/`.