

37011 Financial Markets Instruments**Whiteboard Tutorial 2**

1. Suppose a bond is paying an annual coupon of 5%, with a maturity of six years, and the market price of the bond is 105.00 (based on a face value of 100). If you assume that continuously compounded yields in the market are the same for all maturities, what continuously compounded yield is consistent with this bond price? What would be the market price of an otherwise identical bond which pays its coupons quarterly instead of annually?
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

For each of the seven maturities, determine the discount factor (i.e., zero coupon bond price) which is consistent with these market prices. What would be the market price of a bond with face value 100 and an annual coupon of 8%, maturing in seven years?

3. Market prices for bonds are typically quoted without *accrued interest*. However, when bonds are traded, the buyer also has to pay the seller this interest accrued since the last coupon date, equal to the fraction of the next coupon corresponding to the fraction of time between the last and next coupon date that has already elapsed. Suppose a bond with face value 100 pays a *per annum* coupon of 5% every 15 June and every 15 December. On 15 August, what is the accrued interest assuming a 30/360 daycount convention (and ignoring the effect of weekends and public holidays)?
4. When we want to value a bond (or any future cashflow) in the case of non-constant interest rates, where the payment dates do not all coincide with dates for which we have discount factors, we need to *interpolate* the term structure of interest rates. For example, we might consider a bond with face value 100 and a *semi-annual* coupon of 6%, maturing in seven years and want to value that bond in a manner consistent with the market prices in Question 2 above. Please do this by using *loglinear* interpolation of zero coupon bond prices, i.e., if we know $B(t, T_i)$ and $B(t, T_{i+1})$, then for $T_i \leq \tau \leq T_{i+1}$,

$$\ln B(t, \tau) = \ln B(t, T_i) + \frac{\tau - T_i}{T_{i+1} - T_i} (\ln B(t, T_{i+1}) - \ln B(t, T_i)) \quad (1)$$

5. Re-do Question 2 assuming that the market prices are for bonds paying quarterly (instead of annual) coupons.
6. Assume today is February 26, 2024. Consider an existing bond which was originally issued with a time to maturity of ten years and an annual coupon of 4.5%. The bond will mature on 22 April 2024. Based on a face value of 100, assuming an ACT/ACT daycount convention, what is the quoted market price of the bond that is consistent with your answer to Question 5? What is the accrued interest?
7. Assume that the current term structure of interest rates is as you've determined in Question 5. Consider a two-year loan of \$1 million, to be repaid in equal monthly instalments over two years (i.e., at the end of each month for 24 months, the borrower pays an equal dollar amount, such that no money is owed after 24 months). What is the monthly repayment amount? Assume that each month equals 1/12 of a year.
8. Adjust your answer to the previous question, such that instead of paying interest equal to the market rate, the borrower pays 50 bp above the market rate with continuous compounding. Here, bp denotes *basis point*, which is market terminology for one hundredth of one percent.
9. Suppose you have a credit card debt of \$10,000. Interest on your current credit card account accrues at 17% per annum, compounded monthly. You see an offer to switch to another credit card provider, who offers an interest-free period of six months on transferred balances, after which interest accrues at 22% per annum, compounded monthly. Suppose that you will only be able to make monthly interest payments (not debt repayments) on your credit card debt for the next 24 months, but after 24 months you'll have the money to repay the debt in full. Suppose further that if you decide to switch, you will not be able to switch again. Assuming that the current term structure of interest rates is as you've determined in Question 5, based solely on the time value of money, is it worthwhile to switch?
10. Adjust the offer to switch in the previous question such that you would be indifferent between switching and not switching, based solely on the time value of money. (Your choice as to which part of the offer you vary.)