Bond Math 2 Questions 10/7/11

1. Why would an investor prefer to purchase a bond at a premium or discount vs. at par?
   A premium bond will provide greater price stability (less volatility) as interest rates change while a discount bond provides additional call protection versus a par or premium bond as it will take a greater drop in interest rates for an issuer to find calling the bonds to be economical.
2. How is the market yield determined? Is it the average market yield across all fixed income products or specific products?
   The market yield is determined by the supply and demand of bonds of all kinds. The US Treasury yield curve is widely considered the base against which other bond yields are determined. The US Treasury yield curve is considered the “risk free” rate of return since the U.S. government can always just print money to repay its debt and all other U.S. bonds are considered to have some repayment risk.
3. For slide #13, could you discuss in terms of the issuer?
   An issuer might be interested in issuing zero coupon bonds or CABs if it allows for lower interest rate bonds to be issued so that the overall interest cost of the bond issue is lower. For example, a normal level debt service structure would have the issuer sell a series of current interest bonds which when added together result in level annual debt service payments. As an alternative, the issuer might issue the longest maturities as zero coupon bonds. Since there is no interest to be paid on those bonds until maturity the issuer would be able to issue more bonds in the early maturities in order to still have overall level debt service. In effect the issuer has been able to “carve out” a section of debt service in the early years by not having to pay current interest on the longer maturities and filled up that “carve out” with more bonds maturing earlier and, presumably, at lower interest rates.
4. On page 13, why is the price 125? For example 5/.05 = 100 and 5/.04 = 125
   The price of a bond is not calculated by dividing the coupon by the yield. It is calculated by discounting all the future payments to be received on the bond to today at the market yield for that bond. This present value of all the future payments determines the price of the bond.
5. Why do investors care if their bonds are called? What is the risk to them? Lower interest rates?
   Yes, the risk is lower interest rates. If you have a bond that has a 10% coupon and interest rates have dropped to 5% your bond has a good chance of being called. You will then get your investment back but you will have to reinvest the money in a market environment where yields are 5%...considerably less than the 10% rate you had before.
6. Is there a standard call spread between coupon and the yield?
   If you mean is there a standard rule of thumb for what the difference between the coupon on a bond and the current market yield has to be for your bond to be called the answer is no. Issuers have different limits for what the savings on a bond has to be in order to justify the time and expense to do a refunding. Most issuers would not do a refunding for less than 3% present value savings (comparing the savings to the size of the bond issue) and some issuers need to have 6% or more to do a refunding.

7. In a flat yield curve state, why would anyone invest in a 30yer term bond?
   If you think interest rates are going to fall in the future you might invest in a 30 year bond, even if interest rates are flat and you could get the same yield on a 2 year bond, as the value of the longer maturity bond would rise quickly in a falling interest rate environment.
8. Is there more risk with zero coupon bonds?
   Yes. There is more price risk as a zero coupon bond will fall in value quickly in a rising interest rate environment…much faster than a bond with a high coupon. Of course, in a falling interest rate environment the zero coupon bond will rise in value much faster as well. This higher volatility makes owning a zero coupon bond more risky.
9. What would the benefit be because of compounding interest to have a CAB that matures in 45 years?
   A Capital Appreciation Bond (CAB), or zero coupon bonds, that matures in 45 years would have 45 years of compounded interest so that a small investment today could yield a huge return in the future. Of course, 45 years is a long way away so you don't know what inflation (or bankruptcy or the bond being called) might do to the value of your bond between now and then.
10. Can CABs/Zero coupon bonds be called or refunded?
    Yes, depending on the terms of the bond when it was originally sold. Some bonds (zero coupon or current coupon) are sold as "non-callable" bonds so that you don't have to worry about your bond being called. Usually the call price of the bond is based on a formula that takes into account the accreted value of the bond at the time of the call.
11. Is there a lot of demand for CAB bonds?
    The demand for CABs rises and falls depending on other things going on in the market. At times in the past there has been great demand and issuers have issued quite a few zero coupon bonds and, at other times, not so much.
12. Is there more risk with zero coupon bonds and therefore would they have a higher risk premium?
    There is often a higher yield on zero coupon bonds due to their higher price volatility.
13. Would CABs be more prevalent in periods of higher interest rates vs. current low interest rates?
    I might be wrong, but, I am not aware of the demand for CABs changing based on the overall level of interest rates.
14. Can you tell us the difference between XIRR, IRR, and MIRR?
    IRR: The internal rate of return of a series of cash flows. The interest rate that, when used to discount future cash flows to the present, equals the current value of the cash flows. For a bond this means that the price of the bond today is equal to the present value of the future cash flows to be received from the bond when the rate used to discount those future cash flows is the IRR (yield on the bond).

    XIRR: While the IRR requires that the cash flows each occur at regular intervals (e.g., monthly or semi-annually), the XIRR allows the cash flows to occur at odd intervals. In order to calculate the IRR for these non-uniform cash flow periods you have to add a schedule of payment dates to the calculation. The arguments for the XIRR formula are: XIRR(values, dates, guess) so that you have to list the values (like in the IRR formula) but you also have to add a list of dates for when those values occur.

    MIRR: The "Modified IRR". I have never used this formula in my bond calculations but it is used in calculating the return on investments where you want to incorporate the idea of reinvesting cash flows received at a given earnings rate in the future. The arguments for the MIRR formula are: MIRR(values, finance_rate, reinvestment_rate) where the "finance_rate" is the rate at which you are borrowing money and the "reinvestment_rate" is the rate at which you can reinvest the money you receive in the future. The MIRR appears to be more applicable when evaluating the rate of return in project finance.

15. Could you explain the "guess" portion of the equation of the IRR? What effect does it have on the entire calculation? Where would you come up with that number?
    Since the IRR calculation is an "iterative" calculation the "guess" gives Excel a place to start its calculations. By "iterative" I mean that the way the IRR formula works is it starts with a "guess" of what the rate of return might be, calculates the present value of the cash flows based on that guess, sees how close the result is to being correct, and then comes up with a new guess that might be closer to start the process over again. IRR calculations are inherently iterative. A good starting place for the "guess" is the coupon on the bond (for a current interest bond).
16. How do you change the interest in the debt service payments table if the interest is paid semi-annually?
    The semi-annual interest is simply ½ of the annual rate of interest so you can put together a debt service payments schedule on an annual basis (just using the annual coupon rate) or you can have a more precise table for what the actual payments would be on a municipal bond by creating a table with semi-annual payments and using the coupon rate divided by two to determine the semi-annual interest payments to be made.
17. Shouldn't we be calculating semi-annual compounding, i.e., use the XIRR function?
    You don't have to use the XIRR formula to calculate cash flows with semi-annual compounding as long as all of the payments occur at equal intervals. However, if the payment dates are not at regular intervals you should use the XIRR formula.
18. In the payment calc example, do you assume semiannual interest payments? Is it immaterial?
    The PMT calculation comes up with the total annual payment required to pay off the loan in the assumed time period (in our example, 30 years). In the case of a municipal bond that annual payment would consist of two interest payment during the year and a principal payment at the end of the year but that would not change the calculation. The PMT function is used to provide a "quick and dirty" estimate of what the annual cost of a loan would be.