FINA 1082 –Financial Management
Valuation of Debt Securities II
Tutorial Solutions for Lecture 3

Note that detailed answers to tutorial questions will only be provided in tutorials. The following abridged answers are intended as a guide to these detailed answers. This policy is in place to ensure that you attend your tutorial regularly and receive timely feedback from your tutor. If you are unsure of your answers you should check with your tutor, a pit stop tutor or the lecturer.

A. Multiple Choice Questions

A1.
Choice "c" is correct. Zero coupon bonds pay a return because they are bought at a discount and are redeemed at par at maturity; they just don't pay a coupon.
Choice "a" is incorrect. Zero-coupon bonds do pay a rate of return.
Choice "b" is incorrect. Zero-coupon bonds do not sell at par or at premium. They do sell at a discount.

A2.
Choice "a" is correct. Long-term bonds have more interest rate price sensitivity than short-term bonds. In other words, for a given basis point increase (or decrease) in interest rates, the price of a long-term bond will fall (or rise) more than the price of a short-term bond.

If a bond's coupon is low, it will have greater interest rate sensitivity. Therefore, for a given basis point increase (decrease) in interest rates, the price of a low-coupon bond will fall (rise) more than the price of a high-coupon bond.

A3.
Choice "a" is correct. A bond with longer maturity and lower coupon will fluctuate more with changes in interest rates.

A4.
Choice "c" is correct. Currency risk is the risk that foreign exchange rates will change.
Choice "a" is incorrect. This will result in interest rate risk, not currency risk.
Choice "b" is incorrect. This is inflation risk, not currency risk.

A5.
Choice "c" is correct. You could compute the price of a 4 year bond yielding 6.5%, but be prepared to answer a question where you cannot compute a numeric answer. The yield of 6.5% is more than the coupon: the bond must sell a discount. Time has passed pulling the price toward par (i.e. upward). The yield-to-maturity has decreased, so the price has risen. Therefore, the price has to be more than 95.84 (but less than 100.00).
Choice "a" is incorrect. The yield has fallen so price must have risen above 95.84. The amortization of original discount also pulls value toward par.
Choice "b" is incorrect. The yield has fallen so price must have risen above 95.84. The amortization of original discount also pulls value toward par.

A6.
Choice "b" is correct. Par value bond: Coupon rate = current yield = yield-to-maturity
Choice "a" is incorrect. Discount bond: coupon rate $<$ current yield $<$ yield-to-maturity

Choice “c” is incorrect. Premium bond: coupon rate > current yield > yield-to-maturity

A7.
Choice “c” is correct. All other things being equal, longer maturity bonds have greater duration than shorter maturity bonds, and lower coupon bonds have greater duration than higher coupon bonds. Greater duration means greater bond price volatility when interest rates change. Bond “c” has the combination of the longer maturity and lower coupon.

A8.
Choice ‘c’ is correct. All other things being equal, bonds with higher coupons and shorter maturities have shorter durations than bonds with lower coupons and longer maturities. Lower durations exhibit less price risk. Bond “c” has the combination of higher coupon and shorter maturity.

Choice “a” is incorrect. Since bond “c” has a higher coupon, bond “c” will have lower duration.
Choice “b” is incorrect. Since bond “c” has a higher coupon and a shorter maturity than bond “b”, bond “c” will have lower duration.
Choice “d” is incorrect. Since bond “c” has shorter maturity than bond “c” will have lower duration.

A9.
Choice “c” is correct. It is accurate that the difference in durations is small between two bonds maturing in more than 15 years. This is because the present value of principal is less important for bonds with long maturities.

Choice “a” is incorrect. Duration shortens as yields rise, because at higher discount rates, the present values of further-out cash flows become less significant. Therefore, a greater proportion of the bond’s value will be attributed to earlier cash flows, which shortens the duration.
Choice “b” is incorrect. When coupons are higher, they become more significant relative to the value of principal to be received at maturity. This shortens duration.
Choice “d” is incorrect. This is accurate only for zero-coupon bonds.

A10.
Choice “b” is correct.

$$\frac{\Delta P}{P_0} = -D\Delta r + C(\Delta r)^2$$

The 2nd term is the percentage change due to convexity.

$$C \times (\Delta r)^2 = 60 \times 0.015^2 = 0.0135 = 1.35\%$$

Choice “a” is incorrect. This choice incorrectly uses convexity of 48 (80% of 60) rather than 60.
Choice “c” is incorrect. This choice incorrectly uses Δr of 0.02 rather than 0.015.
Choice “d” is incorrect. This choice incorrectly uses Δr of 0.035 rather than 0.015.

A11.
Choice “b” is correct. When a bond contains embedded options, its price risk must be modeled using effective duration because cash flows of the bonds may change when interest rates change.

Choice "a" is incorrect. Modified convexity ignores the effect of any embedded options on a bond's cash flows.
Question "c" is incorrect. Modified duration ignores the effect of any embedded options on a bond's cash flows.
Question "d" is incorrect. Macaulay duration ignores the effect of any embedded options on a bond's cash flows.

A12.
Choice "a" is correct. 75 basis points = 0.75%

$$\%\Delta P = -D(\Delta r) = (-3.65)\times(-0.0075) = 0.0274 = 2.74\%$$

Choice "b" is incorrect. This choice incorrectly states the price to be negative, and uses duration of 3.376 (92.5% of 3.65).
Choice "c" is incorrect. This choice incorrectly assumes duration carries a minus sign.
Choice "d" is incorrect. This choice incorrectly uses duration of 3.376 992.5% of 3.65).

A13.
Choice "b" is correct.
The formula for effective duration is:

$$D_E = \frac{P_- - P_+}{2P_0\Delta r} = \frac{1{,}027-975}{2\times 1{,}000\times 0.002} = 13.0$$

Choice "a" is incorrect. This choice incorrectly ignores the 2 in the denominator and uses Δr of 0.02.
Choice "c" is incorrect. This choice incorrectly uses P_+ of $1,000.
Choice "d" is incorrect. This choice incorrectly uses Δr of 0.004.

A14.
Choice "b" is correct.

$$\frac{\Delta P}{P_0} = -D_E\Delta r = -4.5\ (0.004) = -0.0180 = -1.80\%$$

The new price of the bond is the original price minus 1.8% of the original price.
102.5-(102.5 × 1.80%) = 102.5 – 1.845 = 100.66

Choice "a" is incorrect. This choice incorrectly computes the price change to be +1.8%, based on $100 as the existing price.
Choice "c" is incorrect. This choice incorrectly uses $100 as the existing price in the computation, and subtracts 1.8% of $100.
Choice "d" is incorrect. This choice incorrectly computes the price change to be + 1.8% rather than – 1.8%.

A15.
Choice "c" is correct. Percentage price change formula:
% change in price = $- D_E\Delta r + C_E\Delta r^2$ = -4.68 (-.0065) + 16.35 $(-0.065)^2$ .0304 + 0.007 = **3.11%**

Choice "a" is incorrect. This choice fails to calculate price change using negative sign for duration.

Choice “b” is incorrect. This choice incorrectly uses 16.35 as duration and 4.68 as convexity, rather than the reverse.
Choice “d” is incorrect. This choice incorrectly uses Δr of +0.0065 rather than -0.0065.

A16.
Choice “a” is correct. This statement is accurate. Duration and convexity are a decreasing function of the bond’s yield.
Choice “b” is incorrect. For option-free bonds, the price-yield relationship is negative; that is, price and yield move in opposite directions.
Choice “c” is incorrect. All option-free bonds exhibit positive convexity.
Choice “d” is incorrect. The upside price movement will be greater than the downside price movement on a percentage basis.

A17.
Choice “b” is correct. When the options are out of the money, modified convexity and effective convexity will be the same.
Choice “a” is incorrect. Effective convexity must be used when embedded options are in or near the money.
Choice “c” is incorrect. Modified convexity ignores the effect of embedded options, while effective convexity takes them into account.
Choice “d” is incorrect. Effective convexity must be used when embedded options are in or near the money.