MATH2090 – Mathematics of Finance

Assignment 8

Name:

MUN Number:

Due Date: Friday, 10 November

1. Consider a 20 year, par-valued, \$1,000 face value, callable bond with semi-annual coupons of 1.8%; the bond is redeemable at any time in the 18th, 19th or 20th years.

   (a) Find the price which will guarantee the investor a yield rate of at least

   (ii) 2.0% semi-annually;

   (ii) 1.4% semi-annually.

   (b) If the bond is redeemed at the end of the 18th year find the *duration* for the investment for each of the two yield rates in (a) above.

2. Consider a par-value bond with a 3.8% coupon, convertible quarterly (i.e. every 3 months), face value of \$1,000 with a ten year maturity and an effective annual yield rate of 2.4%.

   (a) What is the price of this bond as a standard coupon bond?

   (b) What is the price of the bond as a split bond, packaged with the coupons paid as a lump sum on maturity?

3. In our simplified market model we have two assets, $S(t)$ and $B(t)$, a stock and a bond, and two possible times $t = 0, 1$. Suppose the bond has a price of $B(0) = 100$ dollars, and redeemable value of $B(1) = 110$ dollars and that the stock price today is $S(0) = 80$ dollars.
   Next, suppose I own a portfolio with 60 shares and 30 bonds, and that the possible share prices at $t = 1$ are,

$$S(1) = \begin{cases} 100, & \text{with probability } 0.8; \\ 60, & \text{with probability } 0.2. \end{cases}$$

   (a) What is the initial value $V(0)$ of the portfolio? What are the possible values at $t = 1$?

   (b) Calculate the possible yields (or returns), i_V, of the portfolio.

   (c) What is the *expected return* on the portfolio?