

Economics 104 Homework (assignment 6)

Using the Bond Value Calculator to Calculate Bond Values

In this homework assignment you will be using a **Treasury Bond Pricing Master** workbook to evaluate the relationship between bond prices and their market yields.

This homework requires that you have

- (1) read *Chapter 7 The Market for U.S Treasury Securities*;
- (2) read *Chapter 8 Bond and Note Valuation and Related Interest Rate Formulas* and understand equations **20** and **23** from that document (otherwise this is a waste of time).
- (3) have downloaded and reviewed the *Excel* file **Bond Pricing Homework (bphw.xls)**

You may want to save the original and use a copy of the model so that you can easily go back to default values.

The model should look something like this copy below, except that the date will be different and therefore the values slightly different (because of shorter time to maturity). Note: The model uses the Start Date rather than the Today date, so that value has to be updated.

This is pricing for an actual bond (the **CUSIP #**, not shown, is the identity number of that specific U.S. Treasury Bond) which was sold in May 2009 and matures on May 15, 2039. The bond has a coupon of yield of 4.25%.

The ASK YIELD shown is not current - it is the ASK YIELD for the date that this example was created. Our first task will be to update the ASK YIELD.

First, though, look at the entries, especially those in yellow, and make sure you understand them. If necessary, go back and review the material presented in **Chapter 8**.

If you don't understand what you are doing here, this is a waste of time and at some date in the future you may crash global bond markets by using a model that you don't understand.

Before doing this homework, which won't take too long, record or print out the default values for your bond for comparison.

Step 1 - Bringing the current bond value up to date and comparing it to the original.

As stated above, the coupon rate for this bond is not current. We need to fix that.

1. Go to the investing tab then bonds on that tab at <http://finance.yahoo.com> and find the bond screener (link on left side). Once inside the screener select **Treasury** with maturity range of 20 years to 30 years. On the page that appears, find the bond above.
2. Also make a note of the **Coupon Yield** of the February 15, 2039.
3. In the model bring the **Start Date** current with today's date (the model allows you to override the start date for the kind of sensitivity analysis used in the next session).

Treasury Bond Formula	
Version 1.1 May 24, 2010	
Today:	10/20/2011
Bond or CUSIP#:	15 May 2039
Maturity Date:	5/15/2039
Start Date:	10/20/2011
Coupon Rate:	0.04250
Current Ask Yield (YTM):	0.04480
Remaining Time in Years:	27.5863
Remaining # of Coupons:	56
Semi-annual Coupon:	2.125
PV Coupons:	67.429
PV Redemption:	28.922
Bond Value:	96.351
less Accrued Interest:	1.758
Final Value:	94.593

Equivalent to Formula 23 in bond handout.

You may have to hit <F9> to recalculate values.

4. Now put in the *YTM*(%) shown on *Yahoo* into your *Current Ask Yield* (the terms are equivalent) - make sure you do *not* confuse this with the data for Current Yield.
5. Run your calculation. The price for the *Bond Value* (not *Final Value*, which takes into account *Accrued Interest* and is not shown on the bond quote) should be nearly identical to the price shown for the bond on the yahoo page (it will vary by a dime or so due to rounding errors because they are using the price to solve for the yield rather than using the yield to solve for price).
6. Relative to *Par*, this bond is trading at a *premium* or a *discount*. **Do you understand why (the answer is not about math, it is about competitive markets)?**

Step 2 - Pricing in an inflation scenario.

The purpose of this exercise is to show what will happen to long-term bond values if an inflationary episode pushes up nominal bond yields. This is a very important lesson because currently bond rates are at record lows but we may have a substantial inflation in a few years. Let's see what would happen.

1. Let's roll the date forward three years, so put the start date to today's date in 2013. That should automatically drop the remaining time in years by two years. Before you override the *Current Ask Yield* look at the *Bond Value*. It will be different, but not by much.
2. Now let us assume that the inflation rate is 4% and the real return of this bond is 2% higher, so override the *Current Ask Yield* and replace it with **6%**, which is above the *Coupon Rate*. Therefore we expect this to be at *discount*.
3. Wow! That is quite a capital loss, isn't it. That would be a bad loss for even a stock. Stare at it for awhile and let the lesson sink it.
4. In the last bad inflationary episode that we had in the United States in the late 70s and early 80s, prices rose at double-digit rates and interest rates on U.S. Treasury Bonds of this maturity rose to 14%!! Well you know where we are going with this - plug in the 14% and recalculate. (Use the same 2013 date).
5. I hope you are shocked! That number is correct even though it looks impossible. Keep in mind that the bond that you are reviewing was issued at one of the lowest rates ever for a 30-year bond, which will exaggerate this swing. But you also saw a Feb 2039 with an even lower yield.

EXAM Question: What is the fundamental portfolio management lesson that is taught by this homework? If you think that a double-digit inflation is emerging, how would you adjust your portfolio (remember, you may be invested in mutual funds with bond holdings)?