



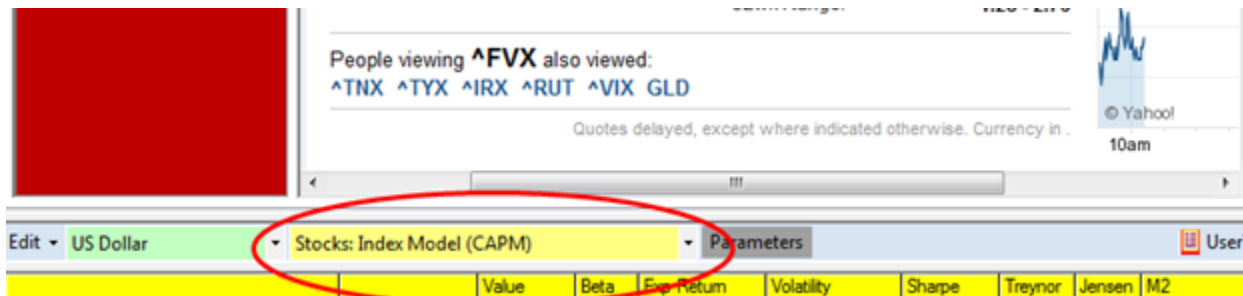
FTS Real Time Project: Managing Duration

Overview

In this exercise you will learn how Dollar Duration (\$ duration) is applied to manage the risk associated with movements in the yield curve. In the trading case, there are three Treasury Notes and Bonds that you have access to. Your objective is to design and implement a position that has approximately *zero \$ duration*. That is the \$ value of this position is predicted to remain unchanged (i.e., be hedged) against parallel shifts in the yield curve. A parallel shift in the yield curve is when the yield curve either shifts up or down across all maturities and the change in the yield to maturity for each maturity is approximately the same.

How Do I Do This?

In the bottom right hand side of the screen select **Bond Analytics** from the dropdown circled below:



An example of the Bond Analytics is provided below:

Edit		US Dollar		Bonds: Analytics				Parameters		User	
	Value	Position	YTM	Duration	Convexity	\$ Duration	\$ Convexity	Quote			
Portfolio	0.00		N/A	N/A	N/A	0.00	0.00				
CM13-WEEK TREASURY BILL	9,999.6250	0.00	0.0152	0.2466	0.0608	2,465.6610	607.9712	0.0150			
CM5-YEAR TREASURY NOTE	11,887.5000	0.00	2.0031	4.4519	21.2693	52,921.3800	252,839.1000	118.2800			
CM10-YEAR TREASURY NOTE	12,178.1300	0.00	3.3810	7.9174	72.2750	96,419.5800	880,174.5000	121.2500			
CM30-YEAR TREASURY BOND	14,321.8800	0.00	3.5908	16.7472	389.4297	239,851.4000	5,577,365.0000	143.0700			

This support screen (illustrated above) provides you with the current Value of 1 contract, the YTM (Yield to Maturity), Duration and the \$ Duration. To construct a zero duration position from the CM5-Year,

CM10-Year and CM30-Year treasury notes and bonds you need to take a position that is long the 5 and 30-year bonds and short the 10-year or vice versa.

For example if the durations respectively for the 5, 10 and 30-years are:

5-Year Duration = 4.4519, \$ Duration = 11,887.5*4.4519 = 52,921.38 per contract

10-Year Duration = 7.9174, \$ Duration = 12,178.13*7.9174 = 96,419.58 per contract

30-Year Duration = 16.7472 \$Duration = 14,321.88*16.75 = 239,851.40 per contract

Zero \$Duration position solve for x, y and z such that $x*\$ \text{Duration 5-year} + y*\$ \text{Duration 10-year} + z*\$ \text{Duration 30-year}$ approximately equals zero.

Step 1: Solving for the Correct Number of Securities and Planning for Your Trades

Suppose you want to short 1 10-Year bond then how many 5-year and 30-year bonds do you need to make \$ Duration approximately zero? You can solve for this in Excel but a useful heuristic is as follows:

Solve for x the following:

$$x*52,921.38 - 1*96,419.58 + (1-x)*239,851.40 = 0$$

In the above you have 1 equation and 1 unknown and so by rearranging you can solve for x. In general this relationship is:

$$x = (\$ \text{Duration for the 10-Year Bond} - \$ \text{Duration for the 30-Year Bond}) / (\$ \text{Duration for the 5-Year Bond} - \$ \text{Duration for the 30-Year Bond})$$

This solves for the ratio of the three securities in the following form:

X units of the 5-Year Treasury, -1 units of the 10-Year Treasury and (1-x) units of the 30-year Treasury

Alternatively you could reverse the signs to be -x, +1, and -(1-x) depending upon whether you want to go long or short the 10-year Treasury Note.

You can convert these numbers into integers by multiplying through some scaling constant such as:

$$100*x, -100, 100*(1-x)$$

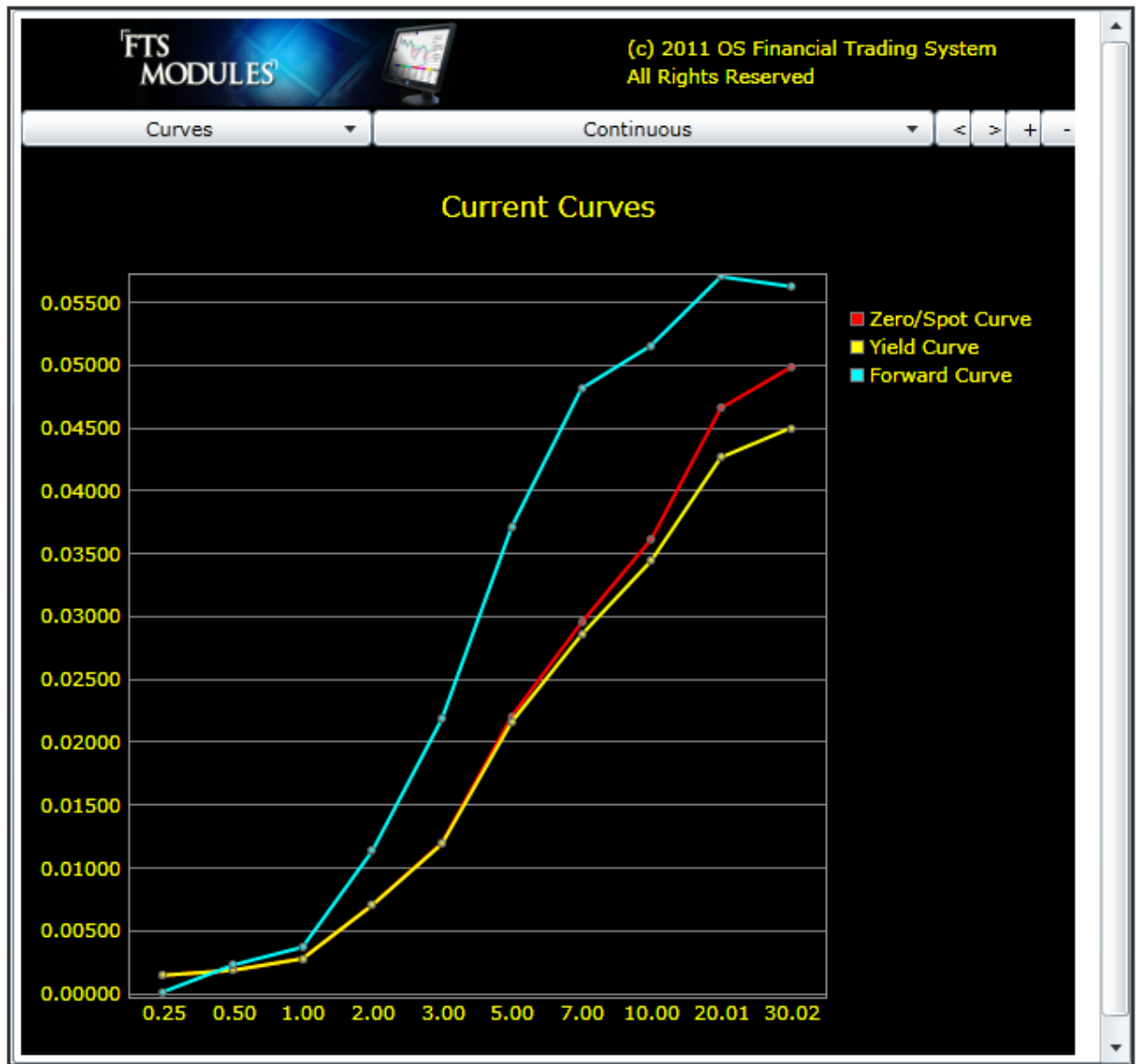
Where the constant depends on how much money you have available (see the note below).

Note: Don't forget in the real world when you sell a security short you do not get access to all of the proceeds from the short sale because the short sales creates an initial margin account that must be maintained over the time you remain short. The FTS Real Time Client software does this automatically for you and so your available funds from a short sale is only 50% of the total proceeds.

Step 2: Take a position in each of the three Treasury securities (Notes and Bonds).

Step 3: By clicking on any of the Treasury securities take a screen shot of the current yield curve:

You can go to www.bondtutor.com and here you can get access to current yield curve information.



From the above dropdown you can get finer information on each of the series 5-, 10- and 30-years. If you hold the cursor over a little dot (i.e., mouseover) then you can read of the numbers.

Furthermore by clicking on Treasury Yield Curve you gain access to the most recent 30-day behavior for these series and so you can complete the project from this information – again a mouse over the dot on any graph provides you with numerical information.



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Home

Treasury Yield Curve

Inflation Expectations

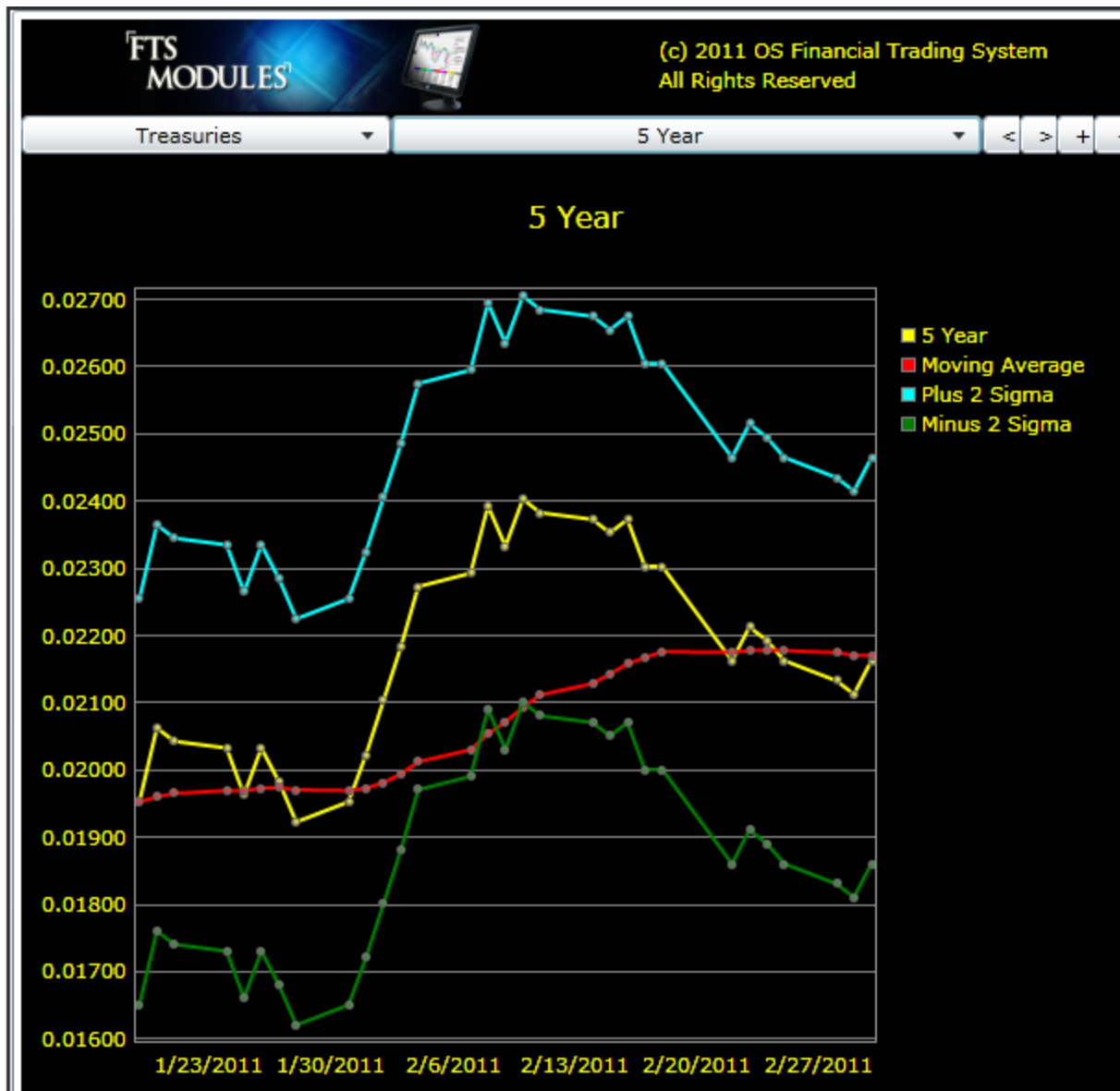
TIPS (Real Rates)

Original Textbook

BOND TUTOR

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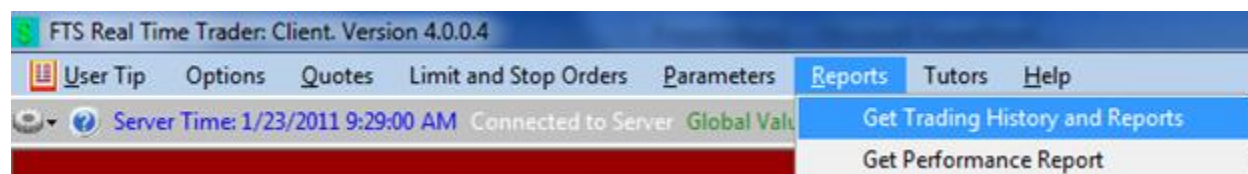
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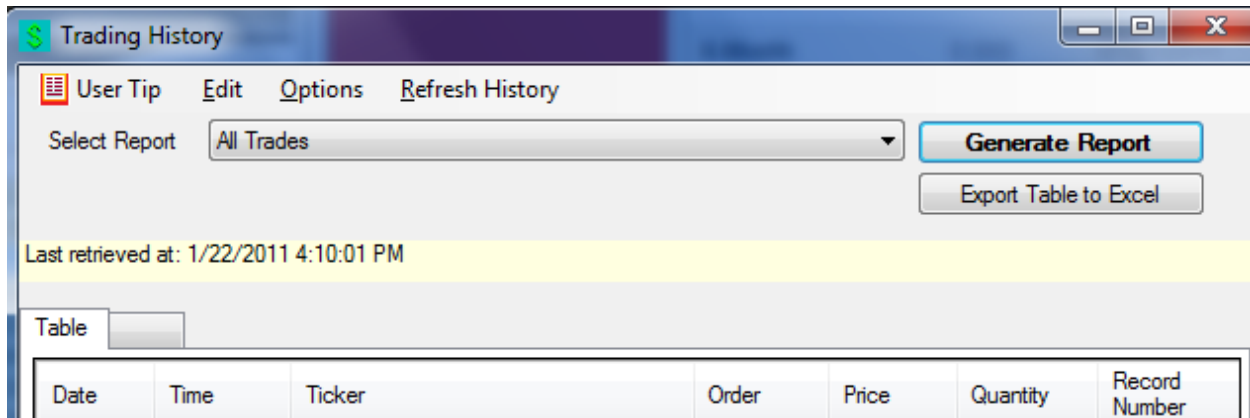
Step 4: Hold the position for at least 7-trading days and check that the US Treasury yield curve has shifted a little. (i.e., refer back to the 30-day movements in the yield as illustrated above from www.bondtutor.com and click on Treasury Yield Curve).

Step 5: Reverse your trades for the Treasury position. Also make sure that you capture the current Yield Curve information (i.e., repeat step 3 for this point in time.)

Step 6: From the Reports menu item click on Get Trading History and Reports



Then access all of your trades by selecting All Trades from the dropdown:



Either export these trades or copy and paste to Excel and isolate the Treasury trades that are relevant to this project.

Required: (Answer within two pages)

Compute the change in value for each individual Note and Bond and then compute the aggregate change in value. **The theory predicts** that if the yield curve shifts in parallel (i.e., each instrument by the same amount) then the change in the \$ value of your position is approximately zero. If the long end of the yield curve shifts by more or less than the short end of the yield curve then your \$ duration neutral position is still exposed to this risk.

Discuss the actual dollar performance of your position (i.e., did it make money, lose money or remain about the same) and contrast this performance with what is predicted from the theory using the Price information recorded in the above All Trades Screen and relating this price information to the shift in the yield curve that you have recorded from steps 3 and 5 above. Is the realized behavior of the curve and your position consistent with each other? (why or why not).