

Solutions to Problem Set 5

1.

$$(1 + y_7)^7(1 + f) = (1 + y_8)^8$$

$$\therefore 1.02^7(1 + f) = 1.03^8$$

Solving this gives the annual forward rate, $2f$, equal to 20.56%.

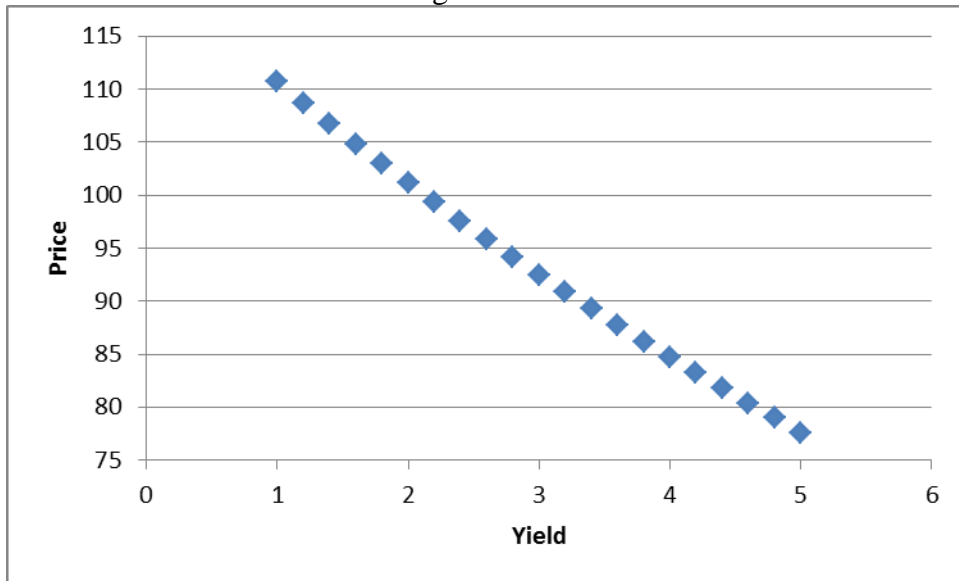
2.(a) The price was \$98.39 and the yield was 2.306 percent.

(b) Duration is 9.05 years.

Modified duration is 8.95 years.

Convexity is 94.18.

(c) The calculations were done in Excel using the PRICE function. Here is the answer:



3. The price is \$80, and so the yield to maturity is $\frac{1.5}{80} = 1.875\%$ per 6 months. The duration of

this security is $\frac{1 + 0.01875}{0.01875} = 54\frac{1}{3}$ 6 month periods, which is 27.167 years.

4. (a) Because short-term rates are expected to rise, and because the risk of capital loss on a short term security is less than on a long-term security. So long-term securities are cheaper and have higher interest rates.

(b) The average three-month interest rate is 4.8 percent; the average ten-year interest rate is 6.63 percent. So the average spread was 1.83 percent. At present, the yield curve is steeper than average, but not by much.

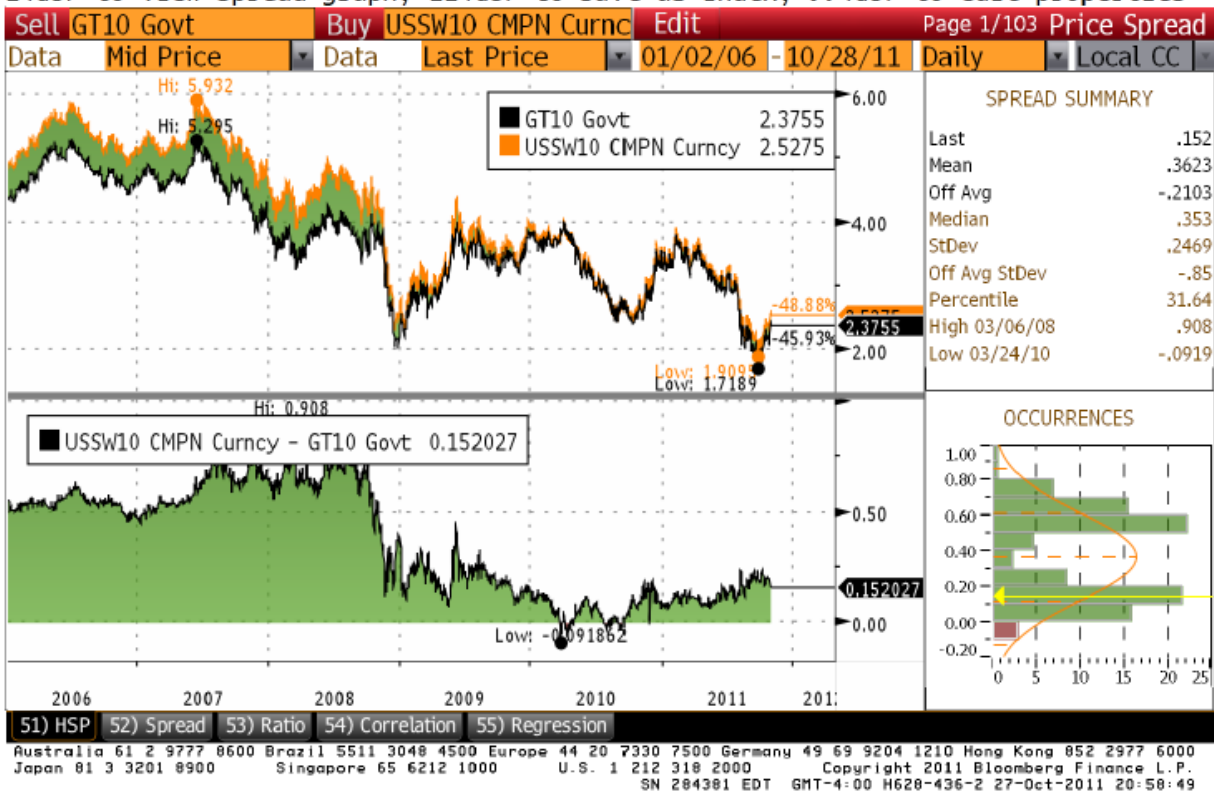
5. (a) The present value is \$5,439.

(b) The duration of the liability is 9 years. Let x be the weight on the one-year STRIP. Then, to match duration, we must have $x+30(1-x)=9$ and so $x=21/29$. So the portfolio will invest \$3,939 in one-year STRIPs and \$1,500 in thirty-year STRIPs.

6. (a) \$20,000 per year.

(b) Let the probability be x . We have that $0.02 = (1 - 0.4) * x$ and so $x = 0.0333$.

7.



The spread is normally positive (swap rate above Treasuries). Treasuries have lower yield because of their liquidity and tax advantages. But the spread flipped sign in 2010. Perhaps this was because of the increased supply of Treasury securities (even after taking account of Fed purchases, which were mostly at the shorter end). Or it could be because financial institutions are issuing more fixed rate bonds, as an alternative way to resolve the maturity mismatch of their assets and liabilities. That reduces the demand to pay fixed, while the demand to receive fixed remains as strong as ever.