HOMEWORK 1

Problem Set

1. Solve for the price of a Treasury bond with a coupon rate of 10 percent and a maturity date of 25 years. The yield on the bond is 2 percent.

2. What would be the most you would be willing to pay for a share of preferred stock paying a semiannual coupon of $6.25. Assume that the discount rate is 7 percent.

3. You have sold an apartment house you owned by accepting $1,000,000 down and monthly payments of $14,000 per month for 10 years. Your plans are to place the entire down payment and all payments as they are received into a money market fund earning 4 percent compounded monthly. How large will your accumulated sum be when the mortgage is paid off?

4. You are considering purchasing a share of common stock in an airline. The dividends on this common stock have been growing at a 3 percent rate for the past 20 years, and you expect this to continue indefinitely. Dividends are expected to be $10 per share at the end of the year ahead, and you think 12 percent is the appropriate rate of return on this stock. How much would you be willing to pay for this stock?

5. What is the present value of a stream of cash flows expected to grow at a 10 percent rate per year for 5 years and then remain constant thereafter until the final payment in 30 years. The payment the end of the first year is $1,000 and the discount rate is 3.50 percent.

6. What is the value of an annuity that starts in year 21 and goes until year 45. The annuity is $10,000 per year and the discount rate is 3 percent.

7. A 6% 20-year AA rated corporate bond is priced at $893.22. What is the yield to maturity on the bond?

Arbitrage Case 1

RCOS Partners LLC is fixed income hedge fund located in Newport Beach, California with $1.43 billion of assets under management. The fund has grown rapidly since it was founded in 2005, primarily because of its disciplined focus on identifying relative value trading opportunities in highly liquid Treasury and Agency mortgage markets. This approach was very successful for the firm during the 2008-2010 financial crisis period, and much of the growth in the fund's asset has come from public pension plans attracted by the recent alpha performance of the fund.

These clients, however, are increasingly concerned about the size of their portfolio allocations to fixed income, given market fears about rising interest rates as the Federal Reserve ends its quantitative easing programs and tightens monetary policy. Furthermore, improving economic conditions in the US raise the possibility of higher inflation in the intermediate horizon, which, in turn, could put upward pressure on interest rates.

RCOS Partners would like you to help them make the case to their clients that there are still attractive relative value opportunities in the Treasury markets that can be pursued without having to take significant directional risk. If RCOS Partners can identify profitable arbitrage opportunities that involve taking offsetting long/short positions, rather than more-conventional long positions, RCOS Partners will not only be able to retain existing clients, but may be able to attract clients with similar concerns about rising interest rates away from competing managers following long-only strategies.

Current market prices for Treasury zero-coupon and coupon bonds are provided in the accompanying spreadsheet. Examine the prices and identify any potential relative value or arbitrage opportunities. Describe exactly how you would implement trading strategies to profit from any opportunities you identify. Estimate the potential profit you could earn from each trading strategy.

Arbitrage Case 2

Several of RCOS Partners' clients have also raised concerns about the implicit leverage in some of the relative value trading strategies the fund has entered into. In particular, several of RCOS Partners' competitors have recently made statements in the financial press disparaging long/short strategies as being inherently riskier than long-only strategies, especially during bond market selloffs when rates increase. These clients have heard these claims and now want more assurance that RCOS Partners isn't just levering up tail risks that could later result in huge losses.

RCOS Partners wants you to evaluate the investment performance of a trading strategy designed to exploit mispricing in the Treasury STRIPS market. In particular, as the Federal Reserve has ended its quantitative easing program of buying long-maturity Treasury bonds, bond dealers have had to absorb more of the flow of longer-maturity Treasuries at auction. To accomodate this, dealers have been aggressively selling investories of principal STRIPS. At the same time, Asian sovereign wealth funds have been buying coupon STRIPS as a hedge against recurring negative Japanese economic shocks and the resulting weakening in the Yen. As a result, there have been frequent distortions in the relative pricing of principal and coupon STRIPS over the past year.

The accompanying spreadsheet provides the time series of prices for the November 2024 coupon and principal STRIPS during the past twelve months. Assume that the fund allocates \$5 of capital to the long/short STRIPS stratgy at the beginning of the year. Implement the strategy using a \$100 long/short position in the appropriate STRIPS. Compute the value of the portfolio each day by marking the portfolio to market with the given prices. Compute the daily returns for the strategy and plot the distribution of returns. Evaluate the performance of the strategy in terms of its realized returns, return volatility, and overall annualized Sharpe ratio. What can you say about the tail risk of the strategy (the potential for large negative returns)?