Problem Set 4

ECON 40364: Monetary Theory and Policy
Prof. Sims
Spring 2022

Instructions: Please answer all questions to the best of your ability. You may consult with other members of the class, but each student is expected to turn in his or her own assignment. This problem set is due in class on Tuesday, March 29, 2022.

1. **Yield Curves:** Please go to the following website to access historical daily yields on US government debt of different maturities. You should be collecting data on "Daily Treasury Par Yield Curve Rates." Please use Microsoft Excel for all calculations which follow.

    (a) Create a table showing the yields on Treasury securities with maturities of 1, 2, 3, 5, 7, 10, and 20 year maturities on the following specific dates:
        i. December 31, 1993
        ii. April 20, 1995
        iii. December 27, 2000
        iv. April 23, 2004
        v. May 7, 2007
        vi. January 3, 2014
        vii. March 3, 2020

    (b) Create a plot of the yield curve for each of these dates. What does the yield curve "normally" look like? What are a couple of dates where the yield curve looks "different"? What was happening around those "different dates"? What about March 2020?

    (c) For each of the given dates, use data on the 1, 2, and 3 year maturity yields to infer market expectations of one year interest rates 1 and 2 years ahead (i.e. back out the one year "forward rates" for each date). In which years was the market expecting rates to decline versus increase? Is your answer consistent with your plots of the yield curves?

2. **Quantitative Easing and Long-Term Rates:** Use the same daily Treasury yield curve data as from the previous problem. During and after the Great Recession, the Fed initiated three rounds of quantitative easing (QE). Some relevant dates are:

    • QE1 announced: November 25, 2008
    • QE1 expanded: March 16, 2009
    • QE2 announced: November 3, 2010
    • QE3 announced: September 13, 2012

    For each of these announcement dates, download data on the 10-year Treasury yield (i) the day before the announcement, (ii) the day of the announcement, and (iii) for each of the two days after the announcement. Create a plot showing the time series of the 10-year Treasury yields immediately around these announcements for each of the four dates. This is not formal causal analysis, but from your picture, do you think QE worked? What is the *difference* in the 10-Year Treasury yield two days after the announcement relative to the day before the announcement for each of these episodes? Did QE appear to become more or less effective over time? What might possible account for any changes in its effectiveness over time? Elaborate.

3. **The Gordon Growth Model:** Suppose that there is a stock which currently pays a dividend of 1 ($D_t = 1$). It is expected that dividends will grow into the future at a constant rate of $g = 0.02$ and will do so forever (i.e. $D_{t+h} = (1+g)^h D_t$ for $h \geq 0$. The discount rate for equity is constant $\kappa^e = 0.05$.

   (a) Imposing a no-bubble condition, solve for the price of the stock in period t.

   (b) What is the expected price of the stock in $t+1$? What is the expected return? Decompose the expected return into dividend and capital gain.

   (c) For the general case (i.e. use symbols, not actual numbers), derive an expression for the dividend component of the expected return (as a function of κ^e and g) and the capital gain component of the expected return (as a function of κ^e and g). As g gets bigger, which term – dividends or capital gains – drives a bigger component of the total expected return?

4. **Bubbles:** Suppose that you have a stock that currently pays a dividend of $D_t = 1$. Future dividends are discounted at a constant rate of $\kappa^e = 0.07$, and dividends are expected to grow at a constant rate forever of $g = 0.02$. The current price of the stock is $P_t = 25$.

   (a) What is the magnitude of the bubble term for this stock?

   (b) Given your answer on (a), what would you expect the price of the stock to be in $t+1$?

   (c) Given your answers on (a)-(b), what is your expected return from holding this stock from t to $t+1$?

   (d) Suppose that the bubble bursts in period $t+1$. What is your realized return (not your expected return) from holding this stock from t to $t+1$?