HW:

Term Structures in BY 2004

Due by Dec 1st 2021 by 8:29am

PART I -- Objectives:

1) efficiently computing the term structure of real bonds and equities in the BY2004 economy in dynare++;
2) integrate in a main matlab file the commands required for:
    a. writing the mod file;
    b. solving the mod in dynare++;
    c. simulating the model to generate nice tables;
    d. creating nice figures.

Expected Final Output: I expect from each one of you a single matlab file called `TS_BY04_#YOUNAME#.m' able to produce the output detailed above (and below) just in one click.

STEP 1: what to compute

Download and read carefully the following paper:

http://finance.wharton.upenn.edu/~jwachter/research/LettauWachterTSEIR.pdf

They use an affine stochastic discount factor, while you will use the EZ discount rate and the consumption and dividends cash-flow in BY2004. In this step, ABSTRACT FROM INFLATION AND PROCEED WITH ONLY REAL UNITS.

- Use equations (8) and (9) to price bonds and equations (16) and (17) to price ZCEs. Pay attention to the initialization of this recursion of equations (i.e., maturity zero). I suggest you do it first for maturity 1 and 2, and then you go ahead with a generalized algorithm.
- Generate a loop in matlab that will allow you to add to the mod file as many pricing equations as you want (it's a loop on the fprintf commands). I would like to see results for a maturity ranging from 1 to 30. You do not

want to write manually 30 almost identical pricing equations, as it would inefficient and typo-prone.

- In dynare++, call the price of ZCEs with maturity N ``P_ZCE_N'', i.e., if N=10 you want the variable name to be P_ZCE_10. Use ``P_B_N" for bonds, ie, P_B_10. Use a similar convention for the returns of bonds and equities. Use log-units where appropriate, as seen in class.

STEP 2: produce nice tables and figures

- Produce a figure with 3 panels stack in a column. This figure will be similar to figure 4 in the following paper:
  http://www.econ.nyu.edu/user/ludvigsons/lmi.pdf
  Here is what we need:
  1. Panel #1. Show the risk premium for zero-coupon equities (solid line) and bonds (dashed line) with different maturities (1-30). The risk premium has to be computed for the excess returns of the following strategy: buy a zero-coupon equity/bond with maturity *n* at time *t* and sell it at time *t+1*. Note that you pay *p_t(n)* and receive *p_{t+1}(n-1),* hence the return in levels is R_{t+1}(n) = *p_{t+1}(n-1)/ p_t(n).* Use log–units where appropriate as learned in class. Annualize the premium by multiplying by 12.
  2. Panel #2. Show the volatility of the realized excess returns of the strategies listed above for all maturities considered in point 1. Annualize the vol by multiplying by sqrt(12).
  3. Panel #3. Plot the Sharpe-ratios (SR) of the strategies above. Note that SR=risk premium/vol of excess returns. Producing this panel is simple once you have the top two panels done.
- Produce a table like the one you prepared for my HW1, so that we can double check what the model is doing in terms of aggregate statistics.

PART II -- Objectives:

In dynare++, add a variable for inflation. Model inflation as Lettau-Watcher (equations (3)-(4)) and calibrate it as they do. NOTE: we have a monthly

calibration, so you need to make sure to adapt the Lettau-Watcher calibration to a monthly frequency.

1. Use equation (26) to price nominal returns. Basically, you need to work with the following EE:

$$1 = \exp(m(+1) + r(+1) - infl(+1)),$$

where it is understood that "r" is now expressed in nominal units, as the discount factor is corrected for inflation.