FNCE 921
Professor Nick Roussanov
Spring 2019
Assignment #3

Due Monday April 15^{th}, *2019*

1. **Factor models**

   (a) Download the Fama-French factors and portfolios sorted by size and book-to-market from Ken French's web site:

   `http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`

   Using monthly data for the univariate size-sorted portfolios and (separately) book-to-market-sorted decile portfolios estimate alphas and betas, as well as compute the Gibbons-Ross-Shanken statistics to test the CAPM and the Fama-French 3 factor model using. Perform this test for the most recent 120 months and 25 year periods, as well as the full sample. What did you find?

   (b) Using all of the Size and Book-to-Market decile portfolios from French's website above jointly, run a Fama-MacBeth cross-sectional regression of excess returns on the Fama-French factors as well as the two characteristics: Size (average market cap) and average Book/Market (Value Weight Average of BE/ME). Do the latter have significant slope coefficients? How would you interpret them? Do the results change if you omit the SMB and HML factors from the regression?

   (c) Download (real) aggregate nondurable and services consumption from BEA or FRED (as before), at both monthly and quarterly frequencies. Using portfolio returns above as test assets, test the standard (unconditional) consumption-based CAPM, using both Fama-MacBeth cross-sectional regressions and SDF-GMM methods, report estimates of cross-sectional factor risk premia (λ's) and SDF loadings (b's) and their standard errors, as well as the relevant cross-sectional tests. Is the model rejected? What is the price of consumption risk that is implied by this cross-section of asset returns? Plot the actual mean excess returns against "predicted" expected excess returns.

   (d) In the problem above, you had to match quarterly returns over the period from time t to $t + j$, where $j = 3$ months, to quarterly consumption growth. The standard approach is to use consumption in the quarter ending at time $t + j$ divided by consumption over the previous quarter (ending at time t), although it some studies instead use consumption over the quarter *beginning* at time $t + j$ divided by consumption over the quarter ending at $t + j$. Does this make a difference to your results above?

(e) Now replace the consumption growth above with $\frac{C_{t+k}}{C_t}$, where $k = 12$ *quarters.* Can you conclude that the consumption CAPM does a better job at explaining the cross-section of equity returns?

(f) Let the price of consumption risk in question (3) be a linear function of the "value spread", measured as the difference between Value-weighted average Book/Market of "High" and "Low" portfolios, $b_t = b_0 + b_1 z_t$. Test the *unconditional* implications of this conditional CCAPM using the scaled factor approach using GMM as well as Fama-MacBeth.

(g) How would you go about testing conditional implications of the model? (note: in order to test conditional implications of the model you will need to make additional assumptions along the lines discussed in class).
Bonus: implement your approach above. Is the model rejected?

2. **Long-run consumption exposure**

To do this problem you will need the data files cashflowcusipcs2.txt and "returncusipcs2.txt". Each data set is quarterly. The first column of each file gives the date (1947.00 is 1947 Q1, 1947.25 is 1947 Q2, 1948.5 is 1948 Q3, and so on). The fifth column of cashflowcusipcs2.txt gives real quarterly consumption of nondurables and services and the second column gives its deflator. Columns 17 through 21 give quarterly (real) dividends for the 5 portfolios created by sorting on book to market values. Column 22 gives quarterly dividends for the CRSP value weighted returns (the market). Columns 39 through give the corresponding price-dividend ratio; columns 34 through 38 give quarterly price-dividend ratios for 5 portfolios book-market sorted portfolios.

Columns 2 through 6 of returncusipcs2.txt give the natural logarithms of the returns to holding these portfolios on a quarterly basis. These were created by accumulating nominal monthly returns from CRSP. To put these returns in real terms, you need to use the deflator above

For each portfolio i consider the following vector:

$$Y_t = [\log(C_t/C_{t-1}), \log(P_{it}/D_{it}), \log(R_{it})]$$

Estimate a vector autoregression:

$$Y_t = \mu + \sum_{i=1}^{4} A_i Y_{t-1} B w_t, \;\; E(w_t w_t') = I$$

Form the state-space representation:

$$Y_t = UX_t + \nu_t, X_t = GX_{t-1} + Hw_t$$

For values of τ from 1 through 40 calculate the conditional covariance between $\log(C_{t+\tau}/C_t)$ and $\log(R_{it+1})$. Plot these estimated quantities as a function of τ for each portfolio. Are there any interesting differences?

For each portfolio (5 value-sorted portfolios and the market portfolio) fit a VAR in (log) dividend growth and (log) price-dividend ratios. You can use whatever lag structure you would like. (You dont need to report these results). For each portfolio construct and plot the impulse response functions implied by the VARs. That is, think of a one standard deviation impulse to each (orthogonal) shock in the model and plot out how dividends and the price-dividend ratios respond to these shocks into the future. Also, use the approximation to returns that we discussed in class (all variables are in logs): $r_{t+1} = d_{t+1} - d_t + \chi + \kappa(p_{t+1} - p_t) - (p_t - d_t)$ to construct the impulse response functions for the returns to each portfolio. Plot these functions for each portfolio. What can you conclude about the differences in long-run consumption growth exposure of these portfolios?