Empirical Methods in Finance
Homework 4

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Problem 1: Return forecasting regressions

1. Using CRSP, get monthly market returns ex and cum dividends, as well as the monthly t-bill rate, from 1963 to 2018. Create the market dividend yield by summing the dividends over the last 12 months and divide by current price (you can do this using information extracted using the ex- and cum-dividend returns). Construct excess returns by subtracting the log of the 1-month gross t-bill rate from the 1-month gross cum-dividends returns. Note: to get to gross returns you may have to add 1 to the original data series.

   From the St. Louis Fed data page (FRED; https://fred.stlouisfed.org/), get monthly data on the term and default spreads for the same sample. For the former, use the "10-Year Treasury Constant Maturity Minus Federal Funds Rate," for the latter subtract "Moody's Seasoned Aaa Corporate Bond Minus Federal Funds Rate " from "Moody's Seasoned Baa Corporate Bond Minus Federal Funds Rate."

2. Plot your data.

3. Using your three predictive variables (the lagged dividend yield, term spread, and default spread), forecast excess equity returns at the 1-month, 3-month, 12-month, 24-month, and 60-month horizons. Report your results from each of these regressions (regression coefficients, standard errors, and R^2s). The underlying data is monthly, so make sure to explain your choice of standard errors.

4. Plot the estimated expected 12-month excess return that obtains from the forecasting regressions of the 12-month excess return regression. What type of periods are

associated with high expected returns and what type of periods are associated with low expected returns. Does the patterns make sense to you? What are the economic stories you would tell to explain these patterns?

5. In the last class, we used our AR toolkit to infer expected returns at long horizons. Why do you think using, say, an AR(1)-type setting could be useful instead of simply regressing returns at different horizons on lagged predictive variables as we have done in this problem?

Problem 2: M/B ratios and the present value formula

In class, we derived a log-linear present value formula using the Campbell-Shiller return decomposition ($r_{t+1} \approx \kappa_0 + \rho \times pd_{t+1} - pd_t + \Delta d_{t+1}$). While this decomposition is very accurate, it does require a stationary pd-ratio and positive dividends. Many firms do not pay dividends, which means this formula is not always useful at the firm level.

However, Ohlson (Contemporary Accounting Research, 1995) and Vuolteenaho (Journal of Finance, 2002) derive a return decomposition that uses market-to-book ratios and return-on-equity instead of the pd-ratio and dividends (See also Lochstoer and Tetlock (forthcoming Journal of Finance)). In particular, the alternative return decomposition is:

$$r_{t+1} \approx \kappa \times mb_{t+1} - mb_t + roe_{t+1}, \tag{1}$$

where $\kappa = 0.97$ with annual data, $mb_t = \ln M_t/B_t$ and $roe_t = \ln(1 + ROE_t)$. Here, M_t is the market value of equity, B_t is the book value of equity, $ROE_t = \frac{E_t}{B_{t-1}}$ is return-on-equity where E_t is earnings. See the above papers for details. With this decomposition we have:

$$mb_t \approx E_t \sum_{j=1}^{\infty} \kappa^{j-1} roe_{t+j} - E_t \sum_{j=1}^{\infty} \kappa^{j-1} r_{t+j}. \tag{2}$$

Thus, if the market-to-book ratio is high today, either future expected return on equity is high or expected future returns are low. Vice versa if the market-to-book ratio is low today.

1. You estimate a firm's annual roe to follow the ARMA(1,1):

$$roe_{t+1} = 0.05 + 0.9\,(roe_t - 0.05) - 0.6\varepsilon_t + \varepsilon_{t+1}, \tag{3}$$

where $\sigma(\varepsilon_t) = 0.1$. Assume the current value of $mb_t = \ln M_t/B_t = 0.7$, $roe_t = \ln(1 + ROE_t)$ where $ROE_t = 0.2$, and $\varepsilon_t = 0.1$. From this information, derive the current values of the below:

$$\begin{aligned} CF_t &= E_t \sum_{j=1}^{\infty} \kappa^{j-1} roe_{t+j}, \\ DR_t &= E_t \sum_{j=1}^{\infty} \kappa^{j-1} r_{t+j}. \end{aligned}$$

2. Assume the unconditional average of mb_t is 0.2. What then is the unconditional average of CF and DR? Now, you can, as a value investor, assess if the long-run discount rate of this firm is currently higher or lower than normal.