Solutions to Final Exam

ECON 337901 - Financial Economics   Peter Ireland
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1. Estimating CAPM Betas

In the monthly data, the variance of the market return over the five-year period from 2016 through 2020 is $\sigma_M^2 = 22.16$. The table below shows the covariance σ_{jM} between each individual stock return and the market return and the CAPM beta, which can be calculated as σ_{jM}/σ_M^2. Since the formula for the CAPM beta is the same as the formula for the estimated slope coefficient in a regression of the return of each individual stock return on a constant and the market return, the beta can also be computed from running that regression with a statistics or econometrics software package.

Estimated CAPM Betas

Stock	σ_{jM}	β_j
Apple	26.04	1.18
Ford	26.67	1.20
Google	19.99	0.90
Kellogg	11.97	0.54
US Steel	54.57	2.46
Walmart	8.21	0.37

2. CAPM Betas and Expected Returns

The table below uses the settings $E(\tilde{r}_M) = 8.80$ and $r_f = 1.59$, based on averages of annual data from 2000 through 2020, together with the CAPM formula

$$E(\tilde{r}_j) = r_f + \beta_j[E(\tilde{r}_M) - r_f]$$

and the betas estimated earlier, to compute the expected return $E(\tilde{r}_i)$ on each of the six individual stocks.

Estimated Expected Returns

Stock	σ_{jM}	β_j	$E(\tilde{r}_j)$
Apple	26.04	1.18	10.06
Ford	26.67	1.20	10.27
Google	19.99	0.90	8.10
Kellogg	11.97	0.54	5.48
US Steel	54.57	2.46	19.35
Walmart	8.21	0.37	4.26

Notice that, according to the CAPM, shares in companies like US Steel, that are heavily exposed to the business cycle, have high expected returns. Investors must receive these high expected returns to compensate for the aggregate risk they take on when buying these shares. Companies like Kellogg and Walmart, in businesses that are more insulated from recessions, offer lower expected returns. Investors are willing to hold these shares, despite their low expected returns, to avoid aggregate risk. Interestingly, despite being in very different industries, Apple Computer and Ford Motor Company turn out to have similar betas. According to the CAPM, therefore, they also have very similar expected returns.

3. Value Stocks and the CAPM

A regression of the return on the HML portfolio on a constant and the difference between the market return and the risk-free rate yields

$$\tilde{r}_{HML,t} \quad = \quad \underset{(1.72)}{3.47} \quad + \quad \underset{(0.08)}{0.06}(\tilde{r}_{M,t} - r_{f,t}) \quad + \quad e_t$$

where standard errors appear in parentheses underneath the estimated intercept and slope coefficients.

The slope coefficient is small and statistically insignificant, confirming that differences in CAPM betas do not play a big role in explaining why value stocks have provided higher average returns than growth stocks.

Instead, the intercept is large, implying that after accounting for the small difference in CAPM betas, value stocks have provided annual returns that are nearly 3.5 percent higher than growth stocks on average. Moreover, the t-statistic of $3.47/1.72 = 2.02$ exceeds the critical value of 1.99 needed to reject the null hypothesis that the intercept equals zero at the 95 percent confidence level.

These results show that there is still fairly strong statistical evidence that value investing strategies provide expected returns higher than those predicted by the CAPM.