

Solutions to Final Exam

ECON 337901 - Financial Economics
Boston College, Department of Economics

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Spring 2026

Due Monday, May 11, 12noon

1. Estimating CAPM Betas

In the monthly data, the variance of the market return over the five-year period from 2021 through 2025 is $\sigma_M^2 = 19.82$. 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
Advanced Micro Devices	37.86	1.91
Kraft Heinz	0.40	0.02
Netflix	34.74	1.75
Nucor	36.37	1.84
AT&T	6.63	0.33
Exxon-Mobil	6.59	0.33

2. CAPM Betas and Expected Returns

The table below uses the settings $E(\tilde{r}_M) = 10$ and $r_f = 3$,

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

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	$E(\tilde{r}_j)$
Advanced Micro Devices	37.86	1.91	16.38
Kraft Heinz	0.40	0.02	3.14
Netflix	34.74	1.75	15.27
Nucor	36.37	1.84	15.85
AT&T	6.63	0.33	5.34
Exxon-Mobil	6.59	0.33	5.33

Notice that, according to the CAPM, shares in companies like Advanced Micro Devices, Netflix, and Nucor 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 AT&T, Exxon-Mobil, and especially Kraft Heinz, 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, each of these two groups of stocks includes companies in very different industries with potentially very different growth prospects. But, according to the CAPM, these differences don't matter: stocks with similar betas will always have similar expected returns.

3. Momentum and the CAPM

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

$$\tilde{r}_{WML,t} = \underset{(1.72)}{9.41} - \underset{(0.08)}{0.10}(\tilde{r}_{M,t} - r_{f,t}) + e_t$$

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

The slope coefficient is negative, indicating that the portfolio of winning stocks actually has a CAPM beta that is slightly lower than that of the portfolio of losing stocks. The slope coefficient, however, is small and statistically insignificant, meaning that it is impossible to reject the null hypothesis of equal betas across winners and losers.

More importantly, the intercept is large and highly significant. Its value indicates that after taking into account the difference in CAPM betas, the portfolio of winners has provided annual returns that are more than 9.4 percentage points higher than the returns from the portfolio of losers. Moreover, the t -statistic of $9.41/1.72 = 5.49$ exceeds by far 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 the success of the momentum strategy does not reflect differences in betas and is, to the contrary, inconsistent with the CAPM's implications.