

NBA5420 Problem Set4

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Problem 1: Are the following true or false, under the CAPM? Explain why.

A Stocks with a beta of -1 must have an expected return of zero.

B The CAPM implies that investors require a higher return to hold more volatile stocks (measured by total variance of returns).

C You can construct a portfolio with beta of 1.5 by borrowing 50 percent of your budget and investing the proceeds plus the initial amount in the market portfolio

Answer: A False, When the beta is -1, this means that this stock performs to opposite direction with the market trend, When the market has a drop trend, ie the expected return of the overall market stocks is negative, then this stock may has a positive expected return. The beta is -1 means the trend of the stock is negatively related with the market stock

B: True, if the beta is larger, it mean that the stock has higher risk, then the expected return should be higher.

C false, whether or not borrow money, the beta for the stock is fix, because the beta for one stock is directly related with the stock itself, derivated from the history data of this stock.

Problem 2:

Stock A has a beta of 0.6 and investors expect it to return 5 percent. Stock B has a beta of 1.8 and investors expect it

to return 11 percent. Use the CAPM to find the market risk premium and the expected rate of return on the market.

$$(r_A - r_f) = b_A(r_m - r_f) \quad (r_B - r_f) = b_B(r_m - r_f)$$

$$r_f = 2 \text{ percent} \quad r_m = 7 \text{ percent}$$

Problem 3: Assume that the CAPM is true. Give brief answers to the following three questions:

Sitwell, Inc., a maker of sofas with a beta of 1.25 acquires Sleepwell, Inc., a maker of mattresses with a beta of 0.5. After the acquisition, does Sitwell's beta increase, decrease or remain unchanged? Does Sitwell's expected return increase, decrease or remain unchanged?

Answer: After acquisition, the beta decreases. The beta depends on the historical data, when a high beta stock merged with a low data stock, the overall beta would decreases. It is hard to tell will the expected return increase, decrease or remain unchanged cause the CAPM can not count the alpha and idiosyncratic factor for the stock. There is some possibility that the stock of Sleepwell may beat the market with high alpha, so I can not tell the return.

The consensus forecast for the market return over the next year has just been revised upwards. Does Sitwell's beta increase, decrease or remain unchanged? Does Sitwell's expected return increase as a result, decrease or remain unchanged? The beta will remain unchanged

Answer: The expected return will increase (or may have a large probability of increase). There is some uncertainty, because we have to count the idiosyncratic factor of the stock

After repeated incidents of consumers being trapped inside while trying Sitwell sofas, a class-action suit seeking substantial punitive damages is filed against the company. After the lawsuit is announced, will Sitwell's beta increase, decrease or remain unchanged? Will Sitwell's expected return increase, decrease or remain unchanged?

Answer: The beta will remain unchanged, because it counts the market factor, the expected return will decrease, because now the idiosyncratic factor will decrease because of the class-action suit.

Problem 4:

a. *What proportion of the variation in the returns of each portfolio is systematic risk? What proportion is idiosyncratic risk?*

Answer: systematic risk = $1.1 \cdot (r_m - r_f)$: which is $b \cdot (r_m - r_f)$

idiosyncratic risk = the constant + $0.54 \cdot \text{SMB} + 0.45 \cdot \text{HML}$

b. *From the regression findings above, describe where each fund places in the Morningstar 3x3 style decomposition matrix (size/value).*

Answer: FundA is a value company because of large HML parameter, and it is a large company, because of its really small SMB

FundB is a growth company because of the small HML parameter, and it is a small company, because of its large SMB

FundC is a value company because of the large HML parameter, and it is a large medium company, because of its parameter of SMB

Problem 5:

a. *For the four funds and the market index, calculate the annualized mean excess returns, standard deviations, and Sharpe ratios.*

The Annual return mean for Fund1 is 0.150514, the annual standard deviation is 0.111786

The Annual return mean for Fund2 is 0.062517, the annual standard deviation is 0.158541.

The Annual return mean for Fund3 is 0.036641, the annual standard deviation is 0.042885

The Annual return mean for Fund4 is 0.103996, the annual standard deviation is 0.199147

The Annual return mean for Fund5 is 0.049576, the annual standard deviation is 0.325545

The sharp ratio for four funds are
for fund1 is 1.346445
for fund2 is 0.394325
for fund3 is 0.854406
for fund4 is 0.522209
for fund5 is 0.152286

b. Calculate the 1-, 3-, and 4-factor monthly alphas for each of the four fund. For part a, it's important to compound returns, so you may want calculate and report everything in log annualized excess returns. However, use monthly simple (arithmetic) returns for part b (i.e. just the returns given), since that's how Fama-French models are traditionally estimated.