Question 1.

You have just formed your portfolio by buying one share of Apple, which costs $150/share and a share of Microsoft, which costs $250/share. Over the next one year, you think the economy will be either good or bad with probability of 0.5 each. And the future return for each stock given the economic condition is as follows.

|  |  |  |
| --- | --- | --- |
|  | Apple | Microsoft |
| Economy is Good  (probability = 0.5) | 0.04 | 0.10 |
| Economy is Bad (probability = 0.5) | -0.02 | -0.06 |

(a) Find the expected return for the Apple stock and the Microsoft stock.

For Apple, the expected return is 0.04\*0.5 + (-0.02)\*0.5 = 0.01

For Microsoft, the expected return is 0.10\*0.5 + (-0.06)\*0.5 = 0.02

(b) Find the standard deviation of the future return for the Apple stock and the Microsoft stock.

For Apple, variance = (0.04-0.01)2\*0.5 + (-0.02-0.01)2\*0.5 = 0.0009

Std = 0.03

For Microsoft, variance = (0.10-0.02)2\*0.5 + (-0.06-0.02)2\*0.5 = 0.0064

Std = 0.08

(c) Find the expected return of your portfolio

The weight on Apple is 150/(150+250) = 0.375 and the weight on Microsoft is 250/(150+250) = 0.625

The expected return of the portfolio is 0.375\*0.01 + 0.625\*0.02 = 0.01625

(d) Find the correlation between these two stock returns.

|  |  |  |
| --- | --- | --- |
|  | Apple  RApple – E[RApple] | Microsoft  RMicrosoft – E[RMicrosoft] |
| Economy is Good  (probability = 0.5) | 0.04 – 0.01 | 0.10 – 0.02 |
| Economy is Bad (probability = 0.5) | -0.02 – 0.01 | -0.06 – 0.02 |

Cov(RApple, RMicrosoft) = (0.04 – 0.01)\*( 0.10 – 0.02)\*0.5 + (-0.02 – 0.01)\*( -0.06 – 0.02)\*0.5 = 0.0024

Corr(RApple, RMicrosoft) = 0.0024/0.03/0.08 = 1

(e) Find the standard deviation of your portfolio return.

Variance of portfolio =

= 0.375\*0.375\*0.03\*0.03 + 0.625\*0.625\*0.08\*0.08+2\*0.375\*0.625\*1\*0.03\*0.08

= 0.003752

Standard deviation of portfolio = 0.003752 = 0.06125

(f) Find the Shape ratio of your portfolio return when the risk-free rate is 1%.

=(0.01625-0.01)/ 0.06125 = 0.102

Question 2.

The following table indicates yearly returns for different asset classes in the past 10 years. Estimate the beta for the Nike stock, using Analysis Took Pak (Regression) in Excel.

|  |  |  |
| --- | --- | --- |
| Nike  Return | Market Return | Risk Free Rate |
| 0.1 | 0.08 | 0.02 |
| -0.1 | -0.076 | 0.02 |
| 0.15 | 0.1 | 0.02 |
| 0.025 | 0.04 | 0.02 |
| 0.02 | 0.01 | 0.02 |
| -0.12 | -0.1 | 0.02 |
| 0.2 | 0.015 | 0.02 |
| -0.03 | -0.02 | 0.02 |
| -0.3 | -0.2 | 0.02 |
| 0.12 | 0.09 | 0.02 |

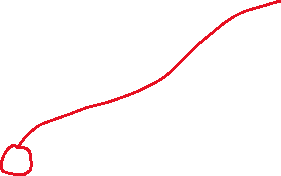
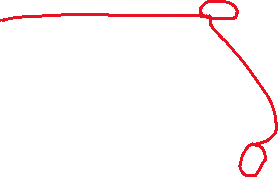
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Nike  Return | Market Return | Risk Free Rate | Excess Return for Nike | Excess Return for Market |
| 0.1 | 0.08 | 0.02 | 0.08 | 0.06 |
| -0.1 | -0.076 | 0.02 | -0.12 | -0.096 |
| 0.15 | 0.1 | 0.02 | 0.13 | 0.08 |
| 0.025 | 0.04 | 0.02 | 0.005 | 0.02 |
| 0.02 | 0.01 | 0.02 | 0 | -0.01 |
| -0.12 | -0.1 | 0.02 | -0.14 | -0.12 |
| 0.2 | 0.015 | 0.02 | 0.18 | -0.005 |
| -0.03 | -0.02 | 0.02 | -0.05 | -0.04 |
| -0.3 | -0.2 | 0.02 | -0.32 | -0.22 |
| 0.12 | 0.09 | 0.02 | 0.1 | 0.07 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | *Coefficients* | *Standard Error* | *t Stat* | *P-value* |
| Intercept | 0.024143 | 0.020732 | 1.164555 | 0.277749 |
| X Variable 1 | 1.442273 | 0.219706 | 6.564556 | 0.000176 |

The estimated beta is 1.44.

Question 3.

The expected return on the market portfolio is 5% per year, and the risk-free return is 3% per year. Company ABC’s stock has a beta of 1.5, and the company is expected to pay a constant dividend of $6/share every year, starting from a year from today. While the current stock price you observe in the stock market is $110 per share, you want to find the intrinsic value of the stock price, using the Capital Asset Pricing Model (CAPM).



(a) What should be the required rate of return on this stock based on CAPM?

Required rate of return on this stock = 0.03 + 1.5\*(0.05-0.03) = 0.06

(b) What should be the intrinsic value of the stock?

The type of cashflow is perpetuity.

Hence, the stock price today should be 6/0.06 = $100/share

One Note about short-selling:

Your intrinsic value = 100 < market valuation = 110. You believe that the stock price will eventually come down to $100. You can make money by short-selling this asset.

In other words, today you borrow one stock from a brokerage company, promising that you will give back this stock one year later (at a small commission fee). Suppose this commission fee is $1. The meaning of shorting the asset is that you sell this stock at the current price of $110, and keep the cash in your pocket. One year later, if your evaluation is correct, the price of the stock will come down to $100, and you will pay $100 out of your pocket to buy the stock. Because you promised that you will return the stock with the commission fee of $1, you give back the stock and pay the brokerage company $1. Hence, you end up with $9 in the end. (=110-100-1)

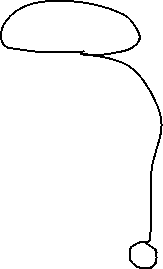
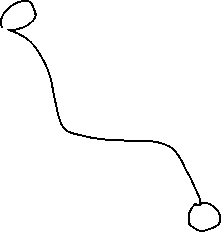
Question 4.

Company XYZ’s stock has a correlation of 0.25 with the market portfolio and this stock has a standard deviation of 10%. The market portfolio has an expected return of 2% and standard deviation of 1%. The risk-free rate is 1%. Find the expected return on this stock.

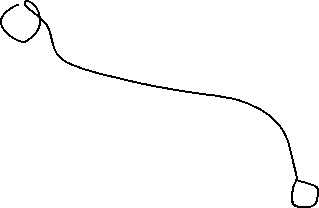


(A) 2.3% per year

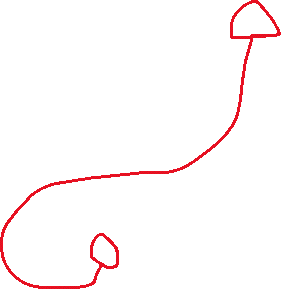
(B) 3.5% per year



(C) 5.6% per year



(D) 7.7% per year



E[RXYZ] = 0.01 + 2.5\*(0.02-0.01) = 0.035



Question 5.

In your portfolio, you have put $300 into Amazon stocks and $200 into Nike stocks. The expected return on Amazon stocks is 5% and the expected return on Nike stocks is 9%. Also, the expected return on the market portfolio is 11% and the risk-free rate is 1%. What is the beta of your portfolio? (Hint: Find the expected return of your portfolio first, and then apply this expected return to the Security Market Line.)



(A) 0.23

(B) 0.34

(C) 0.45

(D) 0.56

E[RAmazon] = 0.05 = 0.01 + \*(0.11-0.01)

Hence, = 0.4



E[RNike] = 0.09 = 0.01 + \*(0.11-0.01)

Hence, = 0.8



The portfolio’s beta is a weighted average of betas of individual stocks (weighted by relative investment size)

Actually, you could have used a different approach:

E

Then, = 0.066 = 0.01 + \*(0.11-0.01)