ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

MGT-482 Principles of Finance
Assignment 4

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1 Exercice 1

a) We compute the Sharpe ratio of the portfolio:

$$\begin{aligned} SharpeRatio &= \frac{E[R_p] - r_f}{SD(R_p)} \\ &= \frac{12-4}{10} \\ &= 0.8 \end{aligned} \tag{1}$$

b) We compute the CML by using the efficient portfolio and the risk-free rate:

$$\begin{aligned} y &= r_f + \frac{E[R] - r_f}{SD(R)} \cdot x \\ &= 4 + \frac{15-4}{12} \cdot x \\ &= \frac{11}{12}x + 4 \end{aligned} \tag{2}$$

c) We compute the maximum expected return by substituting 10% for x in (b) equation:

$$y = \frac{11}{12} \cdot 10 + 4 = 13.17\% \tag{3}$$

Hence the maximum expected return in $ is:

$$150000\$ \cdot 0.13167 = 19750\$$$

2 Exercice 2

The expected return and the standard deviation can be expressed as follows when investing a fraction x of the portfolio:

$$\begin{aligned} E[R_x] &= (1-x)r_f + xE[R_M] \\ &= 9x + 3 \end{aligned} \tag{5}$$

$$\begin{aligned} SD[R_x] &= xSD[R_M] \\ &= 10x \end{aligned} \tag{6}$$

a) If $\mathrm{E}[\mathrm{R}_x] = 16\%$:

$$x = \frac{13}{9} \tag{7}$$

$$SD[R_x] = \frac{130}{9} = 14.4\% \tag{8}$$

Thus the amount of the investment is:

$$20000 \cdot \frac{13}{9} = 28889\$ \tag{9}$$

Hence the portfolio is borrowing 8,889$ and investing 28,889$

b) If $\mathrm{SD}[\mathrm{R}_x] = 50\%$:

$$x = 5 \tag{10}$$

$$E[R_x] = 48\% \tag{11}$$

Thus the amount of the investment is:

$$20000 \cdot 5 = 100000\$ \tag{12}$$

Hence the portfolio is borrowing 80,000$ and invest 100,000$

3 Exercice 3

a) Efficient portfolios are composed of the tangency portfolio and the risk free rate both have 50% more invested in stock B which mean that the tangency portfolio is composed of 40% in asset A and 60 % in asset B

b) Manager 2 won't have to change. Manager 1 will need to change something. The change will depend on his objectives. If he simply stops borrowing from the risk free he will hold everything in the tangency portfolio. 3200$ in asset A and 4800$ in asset B would be a possibility.

4 Exercice 4

We have invested 27500$ in U.S treasury bills.
After 1 year we have:

$$275000 \cdot 1.04 = 28600\$ \tag{13}$$

As we have short the stock we need to pay back

$$7500 \cdot \frac{75.5 + 2}{64} = 9082.03\$ \tag{14}$$

The return is thus

$$R = \frac{28600 - 9082.03 - 20000}{20000} = -2.41\% \tag{15}$$

5 Exercice 5

a)
$\mathrm{E}_A = 9.17\%$
$E_B = 8.21\%$
$E_C = 4.75\%$
b) 7.8%
c) 0.56
d)
e)

6 Exercice 6

We compute Tesla Inc.'s beta:

$$\begin{aligned} \beta &= \frac{SD[R_T] \cdot Corr(R_T, R_M)}{SD[R_M]} \\ &= \frac{17 \cdot 0.14}{3} \\ &= 0.79 \end{aligned} \tag{16}$$

Then we compute the expected return:

$$E[R_T] = r_f + \beta(E[R_M] - r_f) = 9.14\% \tag{17}$$

7 Exercice 7

$r_f = 2\%$
a)

$$E[R_M] = \frac{E[R_B] - r_f}{\beta_B} + r_f = 10\% \tag{18}$$

$$E[R_A] = \beta_A(E[R_M] - r_f) + r_f = 13.2\% \tag{19}$$

$$\beta_C = \frac{E[R_C] - r_f}{E[R_M] - r_f} = 1.625 \tag{20}$$

b) 1 obviously

c) The martket portfolio is composed of 7.2% in stock A 23.19% in stock C and 69.56% in stock B