GESTÃO FINANCEIRA I & GESTÃO FINANCEIRA

CADERNO DE EXERCÍCIOS 5
Capítulos 11, 12 e 13
Risk and Return, Systematic Risk and the Equity Risk Premium, The Cost of Capital

(de BERK, DEMARZO e HARFORD'S "FUNDAMENTALS OF CORPORATE FINANCE")

LICENCIATURA

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Chapter 11
Risk and Return

Section "Critical Thinking"
11.1. What does the historical relation between volatility and return tell us about investors' attitude toward risk?

Typically we find an inverse relation between volatility and return, which may indicate risk aversion.

11.5. How does the relationship between the average return and the historical volatility of individual stocks differ from the relationship between the average return and the historical volatility of large, well-diversified, portfolios?

Typically the "trade-off" between risk (volatility) and return is better for portfolios than for individual stocks (portfolios have lower risk than the average of the risks of the individual stocks), arguably due to the diversification benefit – i.e., in portfolios the individual (diversifiable) risks of some individual stocks are compensated by others.

11.8. Which of the following risks of a stock are likely to be unsystematic, diversifiable risks, and which are likely to be systematic risks? Which risks will affect the risk premium that investors will demand?
a. The risk that the founder and CEO retires
b. The risk that oil prices rise, increasing production costs
c. The risk that a product design is faulty and the product must be recalled
d. The risk that the economy slows, reducing demand and the firms' products
e. The risk that your best employees will be hired away
f. The risk that the new product you expect your R&D division to produce will not materialize

Non-systematic: a, c, e, f.
Systematic: b,d,

Non-systematic risk should not affect the risk premium that well-diversified investors demand. Systematic risk affects the risk premium demanded by investors.

11.12. Why doesn't the risk premium of a stock depend on its diversifiable risk?

Because this type of risk is statistically "eliminated" from the measure of risk of a well-diversified portfolio.

Section "Problems"

11.4. Your portfolio consists of 100 shares of CSH and 50 shares of EJH, which you just bought at $20 and $30 per share, respectively.
a. What fraction of your portfolio is invested in EHJ? In CSH?

b. If CSH increases to $23 and EJH decreases to $29, what is the return on your portfolio?
c. What are the weights of investment in the two stocks after the change in price?

a. Your investment in CSH is 100 × $20 = $,2000; in EJH it is 50 × $30 = $1,500, so your total investment is $3,500. Your weights are 2,000/3,500 = 0.57 and 1,500/3,500 = 0.43.

b. There are two ways to calculate this. You can either compute the return on each stock and multiply those returns by their weights, or you can compute the total change in the value of your portfolio:

CSH: (23 – 20)/20 = 0.15 ; EJH: (29 – 30)/30 = –0.033, so the return on your portfolio is:

(0.57)(0.15) + (0.43)(–0.033) = 0.071

Or: your investment in CSH goes from $2,000 to $2,300 and in EJH goes from $1,500 to $1,450. Your portfolio has a net gain of $300 – $50 = $250. As a return, that is $250 / $3,500 = 0.071

[**NOTE**: the calculations would always yield exactly the same answer unless you round during the process]

c. After the change in price the final value of the portfolio is: 2300+1450=3750. The weight of stock CSH is 2300/3750 (no longer 0.57) and the weight of stock EJH is 1450/3750 (not 0.43 anymore).

11.7. Using the data in the following table, calculate the return from investing in Boeing stock (BA) from January 2, 2008, to January 2, 2009, and also from January 3, 2011, to January 3, 2012, assuming all dividends are reinvested in the stock immediately.

Historical Stock and Dividend data for Boeing

Date	Price	Dividend	Date	Price	Dividend
01/02/08	86.62		01/03/11	66.40	
02/06/08	79.91	0.40	02/09/11	72.63	0.42
05/07/08	84.55	0.40	05/11/11	79.08	0.42
08/06/08	65.40	0.40	08/10/11	57.41	0.42
11/05/08	49.55	0.40	11/08/11	66.65	0.42
01/02/09	45.25		01/03/12	74.22	

Date	Price	Dividend	Realized Return	Date	Price	Dividend	Realized Return
01/02/08	86,62			01/03/11	66,4		
02/06/08	79,91	0,4	-0,072846918	02/09/11	72,63	0,42	0,100150602
05/07/08	84,55	0,4	0,063070955	05/11/11	79,08	0,42	0,094589013
08/06/08	65,4	0,4	-0,221762271	08/10/11	57,41	0,42	-0,268715225
11/05/08	49,55	0,4	-0,236238532	11/08/11	66,65	0,42	0,168263369
01/02/09	45,25		-0,086781029	01/03/12	74,22		0,113578395
	Holding-Period Return		-0,464994004		Holding-Period Return		0,145648294

11.8 The last four years of returns for a stock are as follows:

1	2	3	4
-7%	23%	18%	6%

a. **What is the average annual return?**
b. **What is the variance of the stock's returns?**
c. **What is the standard deviation of the stock's returns?**
d. **What is the geometric average return over the 4-year period?**

    a. Average annual return $= (-7\% + 23\% + 18\% + 6\%)/4 = 10\%$

    b. Variance of returns $= \dfrac{\left(-7\%-10\%\right)^2 + \left(23\%-10\%\right)^2 + \left(18\%-10\%\right)^2 + \left(6\%-10\%\right)^2}{4-1}$

    $= 179.33333$

    c. Standard deviation of returns $= \sqrt{\text{variance}} = \sqrt{179.3333} = 13.39\%$

The average annual return is 10%. The variance of return is 179.33. The standard deviation of returns is 13.39%

    d. The geometric average is

CAGR $((1-0.07)(1+0,23)(1+0,18)(1+0,06))^{\wedge}(1/4)-1=$ 0,09369.

Chapter 12
Systematic Risk and the Equity Risk Premium

Section "Critical Thinking"

12.3. **Why isn't the total risk of a portfolio simply equal to the weighted average of the risks of the securities in the portfolio?**
Because of what we call the diversification benefit: a correlation coefficient between a pair of assets inferior to one, it is sufficient for a portfolio with these two assets to have a total standard deviation inferior to the weighted average of the standard deviations of the individual stocks.

12.4. **What does beta measure? How do we use beta?**

Beta measures the systematic risk component of an asset. We use it in the CAPM to estimate the equilibrium risk premium and return for a financial investment.

Section "Problems"

12.1. You buy 200 shares of Tidepool Co. for $55 each and 400 shares of Madfish, Inc., for $25 each. What are the weights in your portfolio?

Calculate each investment's weight as the amount invested in it as a proportion of the total amount invested.

Tide pool: 200 × $55 = $11,000

Mad fish: 400 × $25 = $10,000

Weight on Tide pool = $11,000/($11,000 + $10,000) = 52.38%

Weight on Mad fish = $10,000/($11,000 + $10,000) = 47.62%

You cannot tell the weights just by the number of shares; what matters is the total "dollar" amounts invested in each stock.

12.3. Your mother is considering how to invest part of her retirement savings. She has decided to put $200,000 into three stocks: 50% of the money in Goldfinger (currently $25/share), 25% of the money in Moosehead (currently $80/share), and the remainder in Venture Associates (currently $2/share). If Goldfinger stock goes up to $30/share, Moosehead stock drops to $60/share, and Venture Associates stock rises to $3 dollars per share,
a. what is the new value of the portfolio?
b. what return did the portfolio earn?
c. If you don't buy or sell shares after the price change, what are your new portfolio weights?

a. Let n_i be the number of shares in stock i, then

$$n_G = \frac{200,000 \times 0.5}{25} = 4,000$$

$$n_M = \frac{200,000 \times 0.25}{80} = 625$$

$$n_V = \frac{200,000 \times 0.25}{2} = 25,000$$

The new value of the portfolio is

$$p = 30n_G + 60n_M + 3nv$$
$$= \$232,500$$

b. $\text{Return} = \frac{232,500}{200,000} - 1$
$$= 16.25\%$$

c. The portfolio weights are the fraction of value invested in each stock

$$\text{GoldFinger: } \frac{n_G \times 30}{232,500} = 51.61\%$$

$$\text{Moosehead: } \frac{n_M \times 60}{232,500} = 16.13\%$$

$$\text{Venture: } \frac{n_V \times 3}{232,500} = 32.26\%$$

a. The new value of the portfolio is $232,500.

b. The return on the portfolio was 16.25%.

c. If you do not buy or sell shares after the price change, your new portfolio weights are GoldFinger 51.61%, Moosehead 16.13%, and Venture 32.26%.

12.8. **Using the date in the following table, estimate the average return and volatility for each stock.**

	Realized Returns	
Year	Stock A	Stock B
2008	-10%	21%
2009	20%	30%
2010	5%	7%
2011	-5%	-3%
2012	2%	-8%
2013	9%	25%

$$\overline{R}_A = \frac{-10 + 20 + 5 - 5 + 2 + 9}{6}$$

$$= 3.5\%$$

$$\overline{R}_B = \frac{21 + 30 + 7 - 3 - 8 + 25}{6}$$

$$= 12\%$$

$$\text{Variance of } A = \frac{1}{5}\begin{bmatrix}(-0.1 - 0.035)^2 + (0.2 - 0.035)^2 + \\ (0.05 - 0.035)^2 + (-0.05 - 0.035)^2 + \\ (0.02 - 0.035)^2 + (0.09 - 0.035)^2 \end{bmatrix}$$

$$= 0.01123$$

$$\text{Volatility of } A = SD(R_A) = \sqrt{\text{Variance of } A} = \sqrt{.01123} = 10.60\%$$

$$\text{Variance of } B = \frac{1}{5}\begin{bmatrix}(0.21 - 0.12)^2 + (0.3 - 0.12)^2 + \\ (0.07 - 0.12)^2 + (-0.03 - 0.12)^2 + \\ (-0.08 - 0.12)^2 + (0.25 - 0.12)^2 \end{bmatrix}$$

$$= 0.02448$$

$$\text{Volatility of } B = SD(R_B) = \sqrt{\text{Variance of } B} = \sqrt{.02448} = 15.65\%$$

The return on Stock A is 3.5% with a volatility of 10.60%. The return on Stock B is 12% with a volatility of 15.65%.

12.9. **Using your estimates from Problem 8 and the fact that the correlation of A and B is 0.48, calculate the volatility (standard deviation) of a portfolio that is 70% invested in stock A and 30% invested in B.**

$$\sigma = \sqrt{(0.7)^2(0.1060)^2 + (0.3)^2(0.1565)^2 + 2(0.7)(0.3)(0.1060)(0.1565)(0.48)}$$

$$= 0.1051$$

$$= 10.51\%$$

The volatility of a portfolio of 70% invested in Stock A and 30% in Stock B is 10.51%.

12.14. Suppose Johnson & Johnson and the Walgreen Company have the expected returns and volatilities shown below, with a correlation of 22%.

	E(R)	SD(R)
Johnson & Johnson	7%	16%
Walgreen Company	10%	20%

For a portfolio that is equally invested in Johnson & Johnson's and Walgreen's stock, calculate,
a. the expected return.
b. the volatility (standard deviation).

a. In this case, the portfolio weights are $x_j = x_w = 0.50$. From Eq. (12.3),

$$E[R_P] = x_j E[R_j] + x_w E[R_w]$$
$$= 0.50(7\%) + 0.50(10\%)$$
$$= 8.5\%$$

b. We can take the square root of the portfolio variance equation (Eq. 12.4), to get the standard deviation.

$$SD(R_P) = \sqrt{x_j^2 SD(R_j)^2 + x_w^2 SD(R_w)^2 + 2x_j x_w \mathrm{Corr}(R_j, R_w)SD(R_j)SD(R_w)}$$
$$= \sqrt{0.50^2(0.16^2) + 0.50^2(0.20)^2 + 2(0.50)(0.50)(0.22)(0.16)(0.20)}$$
$$= 14.1\%$$

The portfolio would have an expected return of 8.5% and a standard deviation of return of 14.1%. The relatively low correlation coefficient helps reduce the risk of the portfolio.

12.25. Suppose the risk-free return is 5% and the market portfolio has an expected return of 15% and a standard deviation of 22%. Johnson & Johnson Corporation stock has a beta of 0.98. What is its expected return?

$$\text{Expected Return} = 5\% + 0.98\ (0.15 - 0.05) = 14.8\%$$

12.29. Suppose Intel stock has a beta of 1.8, whereas Boeing stock has a beta of 1.2. If the risk-free interest rate is 5% and the expected return of the market portfolio is 15%, according to the CAPM,
a. what is the expected return of Intel stock?
b. what is the expected return of Boeing stock?
c. what is the beta of a portfolio that consist of 70% Intel stock and 30% Boeing stock?
d. what is the expected return of a portfolio that consists of 70% Intel stock and 30% Boeing stock (show both ways to solve this)?

Compute the expected returns of Intel and Boeing as well as the portfolio beta. Then compute the expected return of the portfolio.

a. Intel's Expected Return = 5% + 1.8 (0.15 – 0.05) =23%

b. Boeing's Expected Return = 5% + 1.2 (0.15 – 0.05) =17%

c. Portfolio Beta = (70%)(1.8) + (30%)(1.2) =1.62

d. Portfolio's Expected Return = 5% + 1.62 (0.15 – 0.05) = 21.2%

or Portfolio's Expected Return = (70%)(23%) + (30%)(17%) = 21.2%

Chapter 13
The Cost of Capital

13.1. MV Corporation has debt with a market value of $100 million, common equity with a book value of $100 million, and preferred stock worth $20 million outstanding. Its common equity trades at $50 per share, and the firm has 6 million shares outstanding. What weights should MV Corporation use in its WACC?

Compute the weights for the WACC.

Value of debt: $100 million

Value of preferred stock: $20 million

Market value of common equity: $50 per share × 6 million shares = $300 million

Total market value of firm: $100 + 20 + 300 = $420 million

Weights for WACC calculation:

$$\text{Debt } \frac{100}{420} = 23.81\%$$

$$\text{Preferred Stock } \frac{20}{420} = 4.76\%$$

$$\text{Common Equity } \frac{300}{420} = 71.43\%$$

The total market value of the firm is $420 million. Debt is 23.81% of the total value, preferred stock is 4.76%, and common equity is 71.43%.

13.13. CoffeeCarts has a cost of equity of 18%, has an effective cost of debt after tax of 7%, and is financed 60% with equity and 40% with debt. What is this firm's WACC?

$$\text{WACC} = (40\%)(7\%) + (60\%)(18\%) = 13.6\%$$

13.14. AllCity Inc., is financed 40% with debt, 10% with preferred stock, and 50% with common stock. Its pretax cost of debt is 6%, its preferred stock pays an annual dividend of $2.50 and is priced at $30. It has an equity beta of 1.1. Assume the risk-free rate is 2%, the market risk premium is 7%, and AllCity's tax rate is 35%. What is its after-tax WACC?

Its after-tax costs of debt is $(0.06)(1 – 0.35)$

Its cost of preferred equity is $2.50/30 = 0.0833$

Its cost of common equity is $0.02 + 1.1(0.07) = 0.097$

Applying the WACC formula we have: WACC = $(0.50)(0.097) + (0.10)(0.0833) + (0.40)(1 – 0.35)(0.06) = 0.07243$.