

Finance I

2nd Midterm Exam

June 11, 2012

Instructions

- Test Duration: 120 minutes.
- Use legible handwriting. Illegible answers will not be graded.
- Please exhibit all your calculations and round off the results to two decimal places.
- Read the questions carefully.
- No questions are allowed during the exam.

Formulae

Volatility of a portfolio with N stocks

$$\sigma_p^2 = \sum_{i=1}^N \sum_{j=1}^N x_i x_j \sigma_{ij}$$

Minimum variance portfolio with N=2

$$x_1^{MVP} = \frac{\sigma_2^2 - \sigma_{12}}{\sigma_1^2 + \sigma_2^2 - 2\sigma_{12}}, \quad x_2^{MVP} = 1 - x_1^{MVP}$$

Capital Market Line

$$E[r_{CML}] = r_f + \left(\frac{E[r_M] - r_f}{\sigma_M} \right) \sigma_{CML}$$

CAPM

$$E[r_i] = r_f + \beta_i (E[r_M] - r_f)$$

Price of an European Call (Black&Scholes)

$$C = S \times N(d_1) - PV(K) \times N(d_2) \quad d_1 = \frac{\ln\left(\frac{S}{PV(K)}\right) + \frac{\sigma\sqrt{T}}{2}}{\sigma\sqrt{T}}, \quad d_2 = d_1 - \sigma\sqrt{T}$$

Section I (50 minutes) – Portfolio Theory

Consider the three assets given in the following table

Asset	Expected return	Volatility
Treasury Bills	0.02	0.00
Corporate Bonds	0.04	0.10
Stocks	0.10	0.40

a) If you had to combine Treasury Bills with only one of the risky assets (i.e., either Corporate Bonds or Stocks), which one would you pick?

b) Consider a portfolio that invests 50% in Treasury Bills, 30% in Corporate Bonds, and 20% in Stocks.

i) Compute the expected return and volatility of the portfolio, assuming that the correlation coefficient between the two risky assets is 0.1.

ii) If you were to choose between this portfolio and any of the portfolios in a), which one would you pick?

c) Plot the expected return as function of the portfolio volatility. Using your graph, locate:

- The three assets listed in the above table
- The portfolio in question b)
- The market portfolio (you do not need to compute the exact coordinates)
- The efficient frontier (you do not need to compute the exact expression)

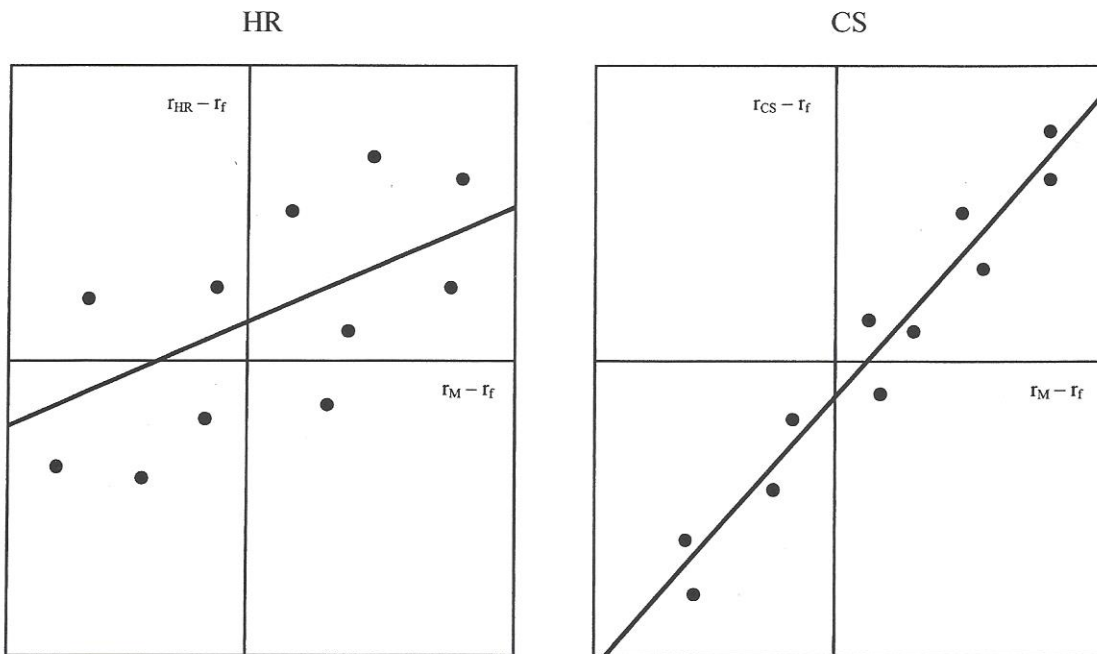
One influential financial analyst notes that the correlation between the returns of Corporate Bonds and Stocks changes over time. During normal times, this correlation is 0. However, in times of financial turbulence (or crisis), this correlation is 1.

d) Explain intuitively how the change in the correlation coefficient affects the performance of investors' portfolios. Use graphic analysis if appropriate.

e) Obtain the expression of the efficient frontier that investors face during crisis times.

Section II (30 minutes) – CAPM

Consider the two following regression lines for stocks HR and CS in the following figures.



Answer the following questions, explaining briefly your answers.

- a) Which stock has higher estimated alpha (α)?
- b) Which stock has a higher estimated beta (β)?
- c) Which stock has higher firm-specific risk?
- d) Suppose that the CAPM holds. Which stock is riskier?
- e) Suppose you form a portfolio by holding a long position in HR and a short position in CS. Characterize this portfolio in terms of its alpha and beta.

Section III (40 minutes) – Financial Options

Consider the following option strategy:

- Buy a one-year call option on VHT, with exercise price of €10, and
- Sell a one-year put option on VHT, with exercise price of €10.

- a) Plot the value of this combination as a function of the stock price on the exercise date.
- b) The current price of VHT is €10. During the next year, the stock price can either go up by 20% or go down by 20%. The one-year risk-free interest rate is 5%. Using the Binomial Model, calculate the price of the portfolio that combines the two above options.
- c) Show that Put-Call Parity holds. When would the net cost of acquiring the above portfolio of options be zero?
- d) Explain briefly the objective of the above option strategy.