

Economics of Finance

Tutorial 8

1. Consider the following two stocks: stock 1 has expected return  $e_1 = 3$  and standard deviation  $s_1 = 3$ ; stock 2 has expected return  $e_2 = 7$  and standard deviation  $s_2 = 6$ . Assume that the correlation between the returns on the two stocks is 0.25, i.e., the correlation coefficient  $r_{12} = 0.25$ .

- (i) Write down an equation for the expected return ( $e_p$ ) and the variance ( $v_p$ ) of the return on the portfolio as a function of  $x$  only, where  $x$  is the proportion of invested wealth in stock 2.
- (ii) Find the minimum variance portfolio. What is the expected return and variance of this portfolio?
- (iii) Is Stock 1 on the efficient (portion of) frontier?
- (iv) Assume that the risk-free asset is now available and the risk-free rate is 2. What is the market portfolio? Compute its Sharpe ratio. Derive the capital market line?
- (v) Draw the security market line. What is  $\beta$  for stock 2? What is stock 2's idiosyncratic risk in terms of standard deviation?

2. Consider the multifactor model (arbitrage pricing theory, APT) with only two factors. The risk premiums on the factor 1 and factor 2 portfolios are 5% and 6% respectively. Stock A has a beta of 1.2 on factor 1, and a beta of 0.7 on factor 2. The expected return on stock A is 17%.

*Statistical arbitrage* is a strategy which exploits mispricing of expected returns, but it is different from the *pure arbitrage* strategy which covers all risks. Statistical arbitrage involves risks as there is no guaranty that each particular realized returns are similar to expected returns. Most of trading strategies are some variants of statistical arbitrage, but as such they are not risk-free.

- (i) If no statistical arbitrage opportunities exist, what is the risk-free rate of return?
- (ii) What an investor would do to take advantage of a statistical arbitrage opportunity?
- (iii) Recall strategies involving trading dual-listed shares (the last question of Assignment 1). Do these provide statistical or pure arbitrage opportunities?