MAS362/MAS462/MAS6051 Financial Mathematics
Problem Sheet 5

1. Consider the following two portfolios with present value £200:

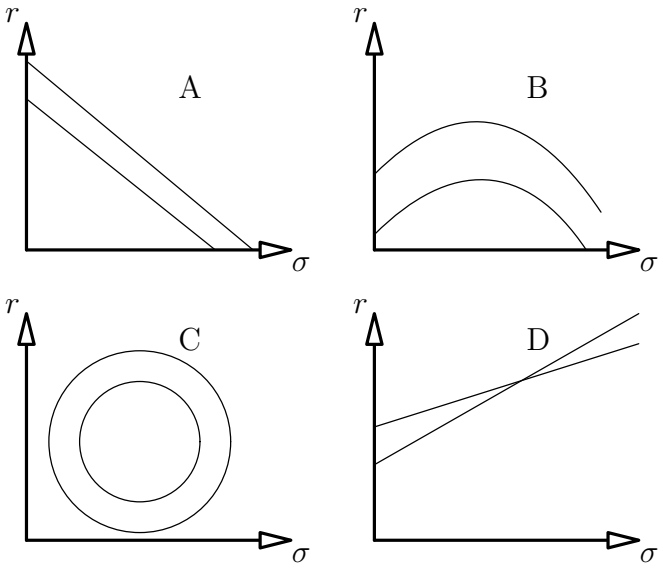
   Portfolio C Is worth £240 with probability 3/4 and £300 with probability 1/4.

   Portfolio D Is worth £200 with probability 3/4 and £520 with probability 1/4

   (a) Calculate the expected returns and standard deviation of returns for these two portfolios.

   (b) Draw sets of indifference curves for two investors, one who would prefer C to D and one who would prefer D to C.

2. Which of the following cannot be set of indifference curves for an investor? Explain your answers.



3. You want to invest £1000 so that on average you double your investment in a year. Given that the risk-free interest rate is 5% and that the market portfolio has an annual expected return of 20% and standard deviation of return 10%, how much risk would you have to assume in order to achieve your goal? Describe your investment in detail.

4. You are given the following data on three stocks and the market portfolio:

	Expected return	Correlation with market portfolio	Standard deviation of return
Stock 1	?	0.9	20%
Stock 2	9%	?	18%
Stock 3	7%	0.7	?
Market portfolio	10%	1	15%

The risk-free interest rate is 5%. Give the equation of the capital market line and fill in the missing entries in the table.

5. Consider a market with risk-free interest rate 5% and two risky investments A and B. We are given the following data:

Investment	Expected return	Standard deviation of return
A	10%	10%
B	15%	20%

We are also told that the correlation between the returns of A and B is $\rho = 0.5$. We assume that the CAPM holds.

   (a) Use the fact that the market portfolio is the unique portfolio which maximises

$$\frac{r_P - r_B}{\sigma_P},$$

   as P ranges over all portfolios consisting entirely of risky investments, to find the market portfolio in the market described above.

   (b) You are a fund manager and are asked to invest £10,000,000 in a portfolio consisting of investments A and B together with the risk free investment. The portfolio should have an expected return of 12% and the lowest possible standard deviation of returns. Describe the portfolio.

6. Assume that the market portfolio has an expected return of 12% and that the risk-free return in 4%. What is the expected return of an investment whose β coefficient is -0.5? Why would anyone choose to invest in this asset rather than in a risk-free investment.