## Introduction to Financial Mathematics - 20912

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## Exercise Sheet 2

1. Find the stock price S(T) on the exercise date in three months for a European put option with the strike price £30 to produce the profit of £4 if the option is bought for £2, financed by a loan at the interest rate of 10%. Ans: £23.95

**2.** Find the expected gain (or loss) for a holder of a European call option with E = 94 to be exercised in six months if the stock price S(T) on the exercise date is  $\pounds 90$  with probability  $\frac{1}{4}$ ,  $\pounds 96$  with probability  $\frac{1}{4}$ ,  $\pounds 98$  with probability  $\frac{1}{2}$ , given that the option is bought for  $\pounds 10$ , financed by a loan at the interest rate of 10%. Ans:  $-\pounds 8.01$ 

**3.** Draw the payoff diagrams for each of the following portfolios:

(a) Short one share, long two calls with strike price E (this combination is called a **straddle**);

(b) Long two puts and one call, all with strike price E (a strip);

(c) Long one put and two calls, all with strike price E (a strap);

(d) Long one call with strike price  $E_1$  and one put with strike price  $E_2$ . Compare three cases  $E_1 > E_2$  (known as a **strangle**),  $E_1 = E_2$  and  $E_1 < E_2$ .

4. Explain what view about the financial market is reflected in **strip** and **strap** (what is the benefit to hold such portfolios?)

5. Butterfly Spread. Find a portfolio consisting of European calls with three strike prices, 10, 20 and 30, all with same expiration time T, whose payoff is described in the graph below. (Hint: try from left to right).



What is the benefit to hold *Butterfly Spread*?

**6.** Find a portfolio consisting of European call options with different strike prices and the same expiry date, whose payoff is described below.

