
Question 5: Derivatives and Portfolio Management**(33 points)**

Consider futures and European options on the stock market index (SMI) of a given country. The stock index is currently at 1'000, and 3-month futures as well as 3-month options on this Index with strike prices of 900, 1'000 and 1'100 are trading at exactly their theoretical price. There are no dividends, and trading costs and margin costs can be ignored.

- a) You write 2 calls with strike prices of 1'000 and purchase 2 calls, one with a strike price of 900 and the other with a strike price of 1,100.

- a1) In total, will you pay or receive the premium on this trade? Explain your answer with reference to the chart below that shows the relation between call premiums and strike prices. (5 points)



- a2) Draw a graph that illustrates the payoff at expiration for this position. (5 points)
- a3) What kind of expectation of the stock market performance (in terms of returns and volatility) and preference for profit and loss, would a portfolio manager have when taking this position? (4 points)
- b) Assume that a trader has just bought the strategy described in a) and that he wants to use futures to implement dynamic hedging.
- b1) Explain whether this trader needs to sell or buy futures or not trade at all at the current point in time. (4 points)
- b2) Discuss whether and/or how the answer to b1) would change if the SMI index rises gradually from 1,000 to 1,200. Explain what adjustments would be needed in the futures position at different values of SMI between 1000 to 1200. (4 points)
- c) You want to use puts to obtain the same payoff at expiration as in a). Describe the put option trading you would do, including strike prices. (6 points)

- d) Briefly discuss how portfolio managers should determine whether to hedge their portfolios by using either futures contracts or option contracts. (5 points)