

# Derivative Instruments

## Paris Dauphine University - Master IEF (272)

Jérôme MATHIS (LEDA)

Exercises Chapter 4

**Exercise 1** Suppose that the standard deviation of quarterly changes in the prices of a commodity is \$0.65, the standard deviation of quarterly changes in a futures price on the commodity is \$0.81, and the coefficient of correlation between the two changes is 0.8.

What is the optimal hedge ratio for a three-month contract ?

What does it mean ?

**Exercise 2 (Done)** A company has a \$20 million portfolio with a beta of 1.2. It would like to use futures contracts on the S&P 500 to hedge its risk. The index futures is currently standing at 1080, and each contract is for delivery of \$250 times the index.

a) What is the hedge that minimizes risk ?

b) What should the company do if it wants to reduce the beta of the portfolio to 0.6 ?

**Exercise 3** The standard deviation of monthly changes in the spot price of live cattle is (in cents per pound) 1.2. The standard deviation of monthly changes in the futures price of live cattle for the closest contract is 1.4. The correlation between the futures price changes and the spot price changes is 0.7. It is now October 15. A beef producer is committed to purchasing 200,000 pounds of live cattle on November 15. The producer wants to use the December live-cattle futures contracts to hedge its risk. Each contract is for the delivery of 40,000 pounds of cattle.

What strategy should the beef producer follow ?

**Exercise 4 (Done)** On July 1, an investor holds 50,000 shares of a certain stock. The market price is \$30 per share. The investor is interested in hedging against movements in the market over the next month and decides to use the September Mini S&P500 futures contract. The index is currently 1,500 and one contract is for delivery of \$50 times the index. The beta of the stock is 1.3.

What strategy should the investor follow ?

Under what circumstances will it be profitable ?

**Exercise 5** Suppose the one-year gold lease rate is 1.5% and the one-year risk-free rate is 5.0%. Both rates are compounded annually.

Calculate the maximum one-year forward price Goldman Sachs should quote for gold when the spot price is \$1,200.

**Exercise 6** The expected return on the S&P 500 is 12% and the risk-free rate is 5%.

What is the expected return on the investment with a beta of

- (a) 0.2;
- (b) 0.5; and
- (c) 1.4 ?