# Derivative Instruments
# Paris Dauphine University - Master IEF (272)

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Exercises Chapter 1

**Exercise 1** *An investor enters into a short forward contract to sell* $100,000$ *British pounds for US dollars at an exchange rate of* $1.4000$ *US dollars per pound.*

*How much does the investor gain or lose if the exchange rate at the end of the contract is :*

***(a)*** $1.3900$ *? ;*

***(b)*** $1.4200$ *?*

**Exercise 2** *A trader enters into a short cotton futures contract when the futures price is* $50$ *cents per pound. The contract is for the delivery of* $50,000$ *pounds.*

*How much does the trader gain or lose if the cotton price at the end of the contract is :*

***(a)*** $48.20$ *cents per pound ? ;*

***(b)*** $51.30$ *cents per pound ?*

**Exercise 3** *Suppose that you write a put contract with a strike price of* $\$40$ *and an expiration date in three months. The current stock price is* $\$41$ *and the contract is on* $100$ *shares.*

***(a)*** *What have you committed yourself to ?*

***(b)*** *How much could you gain or lose if the price of the stock is* $\$30$ *(resp.* $\$20$*) ?*

***(c)*** *What is the maximal possible loss ?*

**Exercise 4** *You would like to speculate on a rise in the price of a certain stock. The current stock price is* $\$29$*, and a three-month call with a strike of* $\$30$ *costs* $\$2.90$*. You have* $\$5,800$ *to invest.*

***(a)*** *Identify two alternative strategies, one involving an investment in the stock and the other involving investment in the option.*

***(b)*** *What are the gains and losses from each if the share price goes up to* $\$40$ *(resp. falls to* $\$25$*) ?*

***(c)*** *Conclude.*

**Exercise 5 (Done)** *Suppose that a March call option to buy a share for* $\$50$ *costs* $\$2.50$ *and is held until March. Draw a diagram showing how the profit on a long position in the option depends on the stock price at the maturity of the option.*

**Exercise 6 (Done)** *Suppose that a June put option to sell a share for* $\$60$ *costs* $\$4$ *and is held until June. Draw a diagram showing how the profit from a short position in the option depends on the stock price at the maturity of the option.*

**Exercise 7** *A US company expects to have to pay 1 million Canadian dollars in six months. Explain how the exchange rate risk can be hedged using* ***(a)*** *a forward contract ;* ***(b)*** *an option.*

**Exercise 8** *"Options and futures are zero-sum games." What do you think is meant by this statement ?*

**Exercise 9** *Consider the following portfolio : a long forward contract on an asset and a long European put option on the asset with the same maturity as the forward contract and a strike price that is equal to* $20€$ *which correspond to the forward price of the asset at the time the portfolio is set up. Draw a diagram showing how the payoff of this portfolio depends of the asset at maturity.*

**Exercise 10** *On July 1, a US-company enters into a forward contract to buy 10 million Japanese yen on next year January 1. On September 1, it enters into a forward contract to sell 10 million Japanese yen on next year January 1. Describe the payoff from this strategy.*

**Exercise 11** *In the 1980s, Bankers Trust developed index currency option notes (ICONs). These are bonds in which the amount received by the holder at maturity varies with a foreign exchange rate. One example was its trade with the Long Term Credit Bank of Japan. The ICON specified that if the yen-U.S. dollar exchange rate,* $S_T$*, is greater than* $169$ *yen per dollar at maturity (in 1995), the holder of the bond receives* $\$1,000$*. If it is less than 169 yen per dollar, the amount received by the holder of the bond is*

$$1,000 - \max\left(0; 1,000\left(\frac{169}{S_T} - 1\right)\right)$$

*When the exchange rate is below* $84.5$*, nothing is received by the holder at maturity.*

*Show that this ICON is a combination of a regular bond that pays* $\$1,000$ *and two options.*