

# Homework 1

## MATH 476

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April 8, 2025

### Exercise 1

#### Forward Contract Payoff

1. The payoff from a long position (buying the asset) in a forward contract is  $S_T - K$ .
2. The payoff from a short position (selling the asset) in a forward contract is  $K - S_T$ .

### Exercise 2

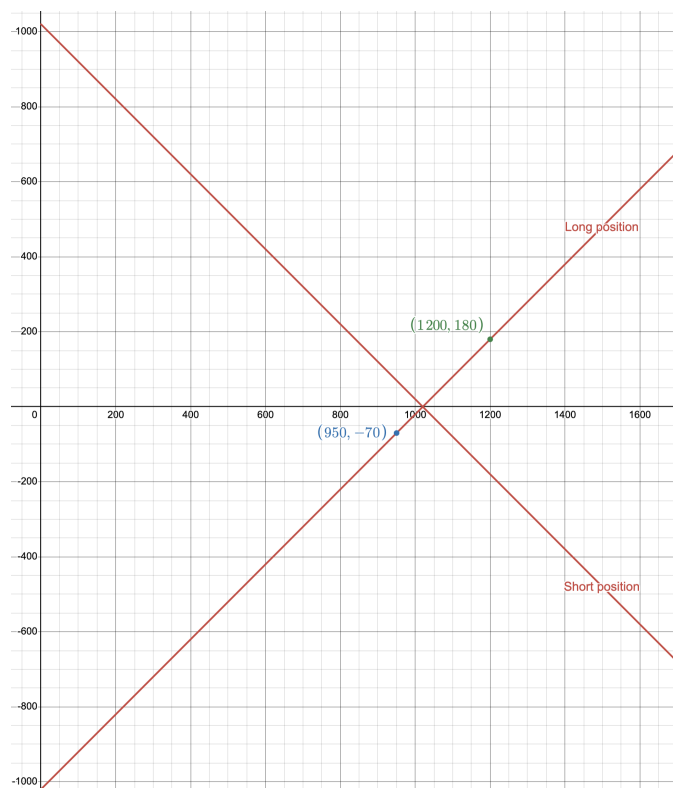
#### Forward Contract on Stock Index

We know the current price is \$1000 and the 6-month forward price is \$1020.

1. If the price is \$950 in 6 months, the long position will lose \$70 ( $950 - 1020$ ).
2. If the price is \$1200 in 6 months, the long position will gain \$180 ( $1200 - 1020$ ).

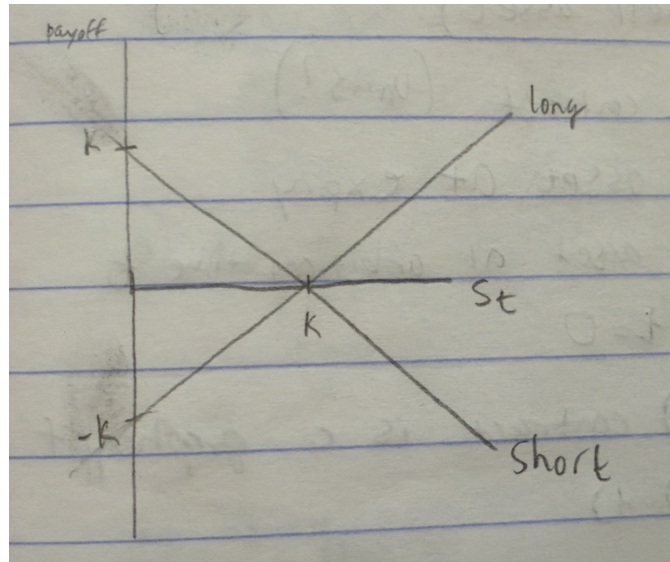
The forward contract allows for a profit if the value of the asset increases after 6 months, without having to actually own the asset.

Payoff Diagram:



## Exercise 3

### Payoff Diagrams for Forward Contract



## Exercise 4

### Forward Contract on Foreign Exchange

The bank agrees to a 6-month forward contract to purchase 1 million GBP in 6 months.

1. If the spot price is 1.3000 in 6 months, the bank will make  $(1.3000 - 1.2230) \cdot 1000000 = \$77000$ .
2. If the spot price is 1.2000 in 6 months, the bank will lose  $(1.2000 - 1.2230) \cdot 1000000 = \$23000$ .

## Exercise 5

### Forward Contract on Foreign Exchange

An investor enters into a short forward contract to sell 100,000 GBP for USD at 1.3000 USD per pound.

1. If the spot price is 1.2900 at the end of the contract, the short position gains  $(1.3000 - 1.2900) \cdot 100000 = \$1000$ .
2. If the spot price is 1.3200 at the end of the contract, the short position loses  $(1.3000 - 1.3200) \cdot 100000 = \$2000$ .

## Exercise 6

### Forward Contract on Foreign Exchange

A trader enters into a short forward contract to sell 100 million yen at \$0.0090 per yen.

1. If the spot price is 0.0084 at the end of the contract, the short position gains  $(0.0090 - 0.0084) \cdot 100000000 = \$60000$ .
2. If the spot price is 0.0101 at the end of the contract, the short position loses  $(0.0090 - 0.0101) \cdot 100000000 = \$110000$ .