Homework 1
MATH 476

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Exercise 1

Forward Contract Payoff

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

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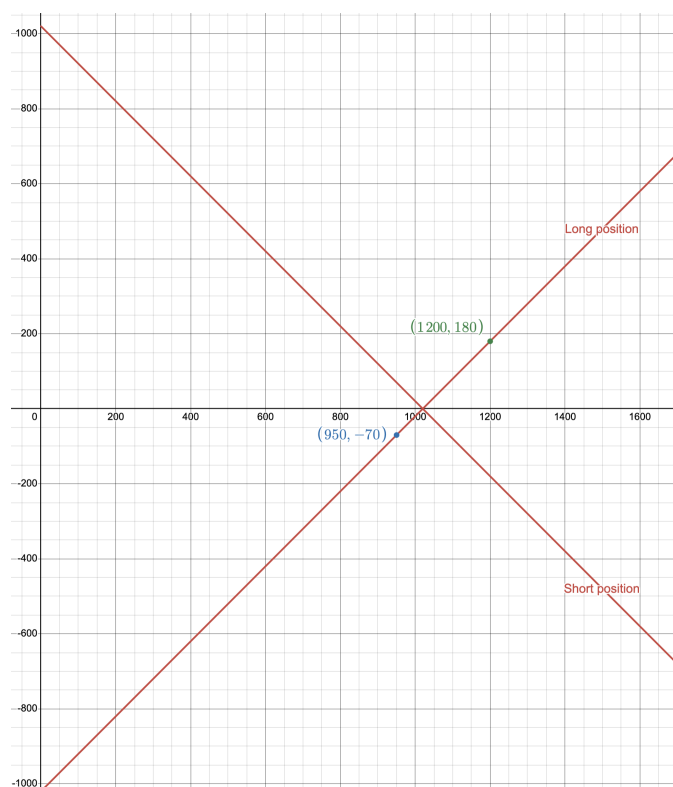
Exercise 2

Forward Contract on Stock Index
We know the current price is $1000 and the 6-month forward price is $1020.

If the price is $950 in 6 months, the long position will lose $70 (950 - 1020).

If the price is $1200 in 6 months, the long position will gain $180 (1200 - 1020).
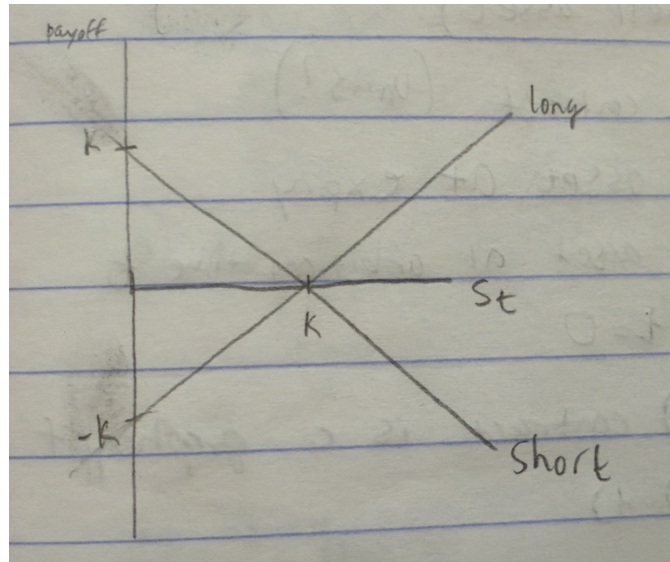The forward contract allows for a profit if the value of the asset increases after 6 months, without having to actually own the asset.
Payoff Diagram:

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.

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

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.

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

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.

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

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