Financial Mathematics

MATH 5870/6870[1]
Fall 2021

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[1] Based on Robert L. McDonald's *Derivatives Markets*, 3rd Ed, Pearson, 2013.

Chapter 1. Introduction to Derivatives

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Transaction costs and the bid-ask spread

Definition 1.4-1 The price at which one can buy is called the offer price or ask price, and the price at which one can sell is called the bid price. The difference between the ask price and the bid price is called the bid-ask spread.

Terminology is in the perspective
of market-maker

	Ask (offer) price	Bid price
End users	Buy	Sell
Market makers	Sell	Buy

Transaction costs

Commission	bid-ask spread
Brokers Electronic trading system	Market-makers
Fixed amount per transaction or percentage of purchase price	Based on per share

Example 1.4-1 Buy and sell 100 shares of XYZ with

$$\text{bid} = \$49.75, \quad \text{offer} = \$50, \quad \text{commission} = \$15.$$

What is the transaction cost?

Solution.

1. Buy:

$$(100 \times \$50) + \$15 = \$5,015.$$

2. Sell:

$$(100 \times \$49.75) - \$15 = \$4,960.$$

3. Transaction cost:

$$\$5,015 - \$4,960 = \$55.$$

(Note that We have payed twice the commission.) □

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Ways to buy or sell

	Market order	Limited order
Pros	Filled immediately	Might not be filled
Cons	Price could be better	At a better price

1. Market order: an instruction to trade a specific quantity of the asset immediately, at the best price that is currently available.

2. Limited order: an instruction to trade a specific quantity of the asset at a specified price.

3. Others such as stop-loss order.

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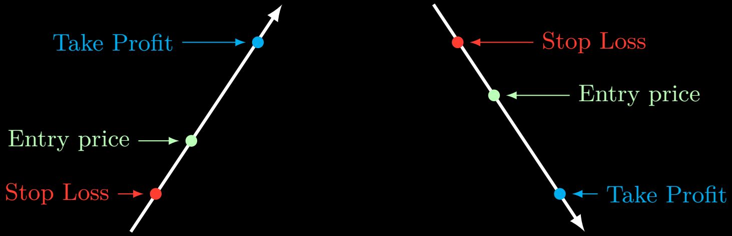
Long vs short positions

Buy when you expect the price will go up

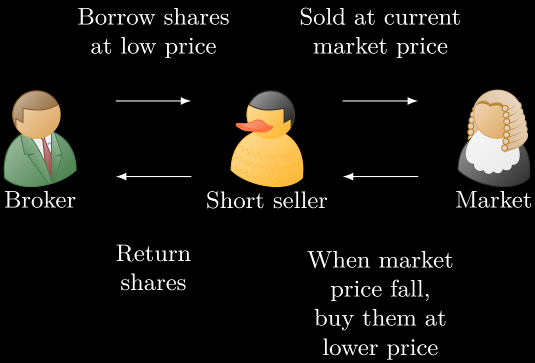
Long=Buy

Sell when you expect the price will go down

Short=Sell



Short-selling



Example 1.4-2 Short-sell IBM stock for 90 days.

	Day zero	Dividend Ex-Day	Day 90	Profit
Action	Borrow shares		Return shares	
Security	Shell shares		Purchase shares	
Cash flow	$+S_0$	$-D$	$-S_{90}$	$S_0 - D - S_{90}$

Three reasons to short-sell

1. Speculation
2. Financing
3. Hedging

Credit risk in short-selling

- The lender holding the money with an extra called Haircut.

Interest received from lender

- Scarcity decreases the interest rate.
- Repo rate in bound markets.
- Short rebate in the stock market.

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