

# Announcements

- Exam next Thursday, September 19th
- Sample exam uploaded to Canvas
  - Study all materials (e.g., slides, videos, homework and quizzes, cases the sample exam, etc.)
  - All is fair game

# Trading Securities

# The Process of Placing a Trade

- How do we (or our broker) find a counter-party and complete the trade?
  - Different financial assets are traded in different **types of markets**
- Do I want to buy or sell (or go **short**) the security?
- Should I borrow capital to make the purchase (buying on **margin**)?
- Should the order be contingent on a certain price?
  - Multiple **types of orders** we can place
- What will the process cost?
  - Explicit and implicit **trading costs**

# Buying on Margin

# Margin

- Borrowing money from your broker to purchase stock
  - Increases return and risk
- The amount of initial margin is the portion of the purchase price contributed by the investor

$$\text{Margin \%} = \frac{\text{Investor's Equity}}{\text{Total Value of Position}} = \frac{\text{Total Value of Position} - \text{Amount Borrowed} - \text{Costs}}{\text{Total Value of Position}}$$

# Example

- Buy 1 share of stock worth \$100 by borrowing \$20 and investing \$80 of your own capital. No fee (interest).
  - Total value: \$100
  - Debt: \$20
  - Equity: \$80

$$\text{Margin \%} = \frac{\text{Total Value of Position} - \text{Amount Borrowed} - \text{Costs}}{\text{Total Value of Position}}$$

$$\text{Margin \%} = \frac{\$100 - \$20}{\$100} = 80\%$$

# Return Amplification

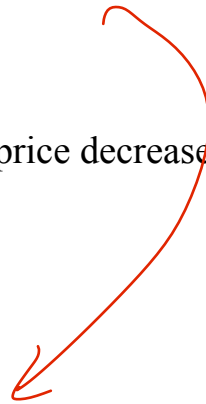
- What is your return on capital invested if the stock price increases to \$120?
  - Capital invested = \$80
  - Return on capital invested = Profit / Capital Invested
  - Profit = Equity1 – Equity0 = (\$120 – \$20) - \$80 = \$20
  - Return = \$20 / \$80 = 25% vs. 20% for the stock
- What is your return on capital invested if the stock price decreases to \$60?

$$\text{profit} = (60 - 20) - 80 = -40$$

$$\text{Return} = \frac{-40}{80} = -50\%$$

- If there are no costs:
  - Return on capital invested = [stock return / initial margin %]

20% / 80%



# Margin

- Initial margin:
  - The initial amount of capital you must have in the position
  - Fed mandates at least 50% of the shares value initially
- Maintenance margin:
  - The minimum amount of margin you must maintain (almost always less than the initial margin)
  - Fed mandates a minimum of 25%
- What happens if margin falls below maintenance?
  - **Margin call**
  - You will have to add additional capital or close out position (at least partially) to increase margin above the maintenance margin
    - In certain markets, you may have to post the *initial* margin!
  - Broker can sell off shares or close out the position if margin not met



# Stock Margin Example

- Purchase 10 shares of a stock for \$100/share

- Take position with an initial margin of 75%.
- Assume no fees

$$\frac{1000 - 750}{1000}$$

- **How much (in dollars) will you borrow from the broker?**

$$250$$

- Initial position (total value):

- = \$100/share x 10 shares = \$1,000

- Initial equity (amount invested by investor):

- = 75% x \$1,000 = \$750

- Borrowed (amount contributed by brokerage):

- = \$1000 - \$750 = \$250

# Stock Margin Example

- **At what price will you hit a 50% maintenance margin requirement?**

- Margin % = equity/market value of shares
- Equity will change when the stock price changes
- Market value of shares = price x # of shares = price x 10
- Equity = market value of shares – amount borrowed
  - = price per share x 10 shares - \$250
- Find price where margin equals the maintenance margin
  - 50% = (price x 10 - \$250)/(price x 10)
  - => price = \$50

$$\left\{ \begin{array}{l} \frac{10P - 250}{10P} = 50\% \\ P = 50 \end{array} \right.$$

# Costs

- Interest (margin fees) are calculated based on the number of days in the holding period

$$\text{Margin Interest Cost} = \text{Amount Borrowed} \times \text{Interest Rate} \times \frac{\text{Days Position Open}}{360}$$

- Typically, brokers borrow money from banks at the call money rate, charge investor an interest rate of call rate + fee
  - Call rate is usually 1% above the short-term T-bills rate
  - Banks can demand the funds be paid back immediately (hence, the "call")
- Any commissions

# Charles Schwab Margin Rates

Debit Balance	Margin Rate	Effective Rate
\$0-\$24,999.99	Base Rate + 1.825%	9.325%
\$25,000-\$49,999.99	Base Rate + 1.325%	8.825%
\$50,000-\$99,999.99	Base Rate + 0.375%	7.875%
\$100,000-\$249,999.99	Base Rate + 0.325%	7.825%
\$250,000-\$499,999.99*	Base Rate + 0.075%	7.575%

\*For balance tiers \$500K and above, call **877-752-9749** for more information about our latest rate offers.

**Base Rate = 7.50%.**

Schwab's base rate was last changed on 6/15/2018 and is **subject to change without notice.**

As of September 2018

# Margin Example With Fees

- Buy 500 shares at \$200/share
- Initial margin: 80%
- Margin fee rate (aka margin interest rate) is 12%
- What will be the dollar amount of fees after one month (30 days)?
  - Stock:
    - \$100,000
  - Initial equity:
    - $= 80\% \times \$100,000 = \$80,000$
  - Initial debt (borrowed from brokerage):
    - $= \$100,000 - \$80,000 = \$20,000$
  - Fees  $= \$20,000 \times 12\% \times (30 \text{ days} / 360 \text{ days}) = \$200$

# Margin Example

- Stock price falls to \$50 in one month, will there be a margin call? Maintenance margin: 40%

- Value of stock:

25000

$$\frac{50 \times 500 - 20,000 - 200}{50 \times 500} = 300$$

- Debt:

20200

- Equity:

4800

- Margin%:

19.2%

$$\frac{4800}{25000} = \frac{24}{125} = 19.2\%$$

# Margin Example Continued

- How far can the stock price fall in one month before a margin call?

- Margin % = (Equity)/Total Value

$$\frac{500X - 20000 - 200}{500X} = 40\%$$

- Equity =

$$300X = 20200$$

- Price =

$$X = 67.3$$

- How does the return on margin capital compare to the stock's return?

# The Process of Placing a Trade

- How do we (or our broker) find a counter-party and complete the trade?
  - Different financial assets are traded in different **types of markets**
- Do I want to buy or sell (or go **short**) the security?
- Should I borrow capital to make the purchase (buying on **margin**)?
- Should the order be contingent on a certain price?
  - Multiple **types of orders** we can place
- What will the process cost?
  - Explicit and implicit **trading costs**



# Short Sales

# Activist Short Sellers

## Short-Seller's Latest Hong Kong Stock Target Plunges 91 Percent

---

by Kana Nishizawa   Lisa Pham  
✈ lisapham

---

July 28, 2016 — 4:03 AM EDT *Updated on* July 28, 2016 — 4:49 AM EDT

---



Tech Pro Technology Development Ltd. shares tumbled as much as 91 percent in Hong Kong after activist short-seller Glaucus Research Group questioned the company's accounting.



# Short Sales

- **Purpose:** to profit from security price decline
- **Mechanics:**
  - “Sell high” (hopefully)
    - Borrow shares from your broker
    - Sell the shares and deposit proceeds and margin in an account
  - “Buy low” (hopefully)
    - Close out: buy the number of shares borrowed and return them to the broker

# Short Sales

- **Brokers require you to deposit money into a brokerage account in case the trade moves against you (margin)**

$$\text{Margin \%} = \frac{\text{Assets} - \text{Liabilities}}{\text{Current Value of Shares}}$$

- At initiation, the margin % will be equal to capital invested / value of shares

Assets	Liabilities
(1) Proceeds from sale (# shares x initial price) + (2) Capital Invested (margin capital) -(3) Commission on sales and purchases	(1) Current Value of Shares (# shares x current price) + (2) Hard-to-borrow fees (amount borrowed x annual interest rate x [days position is open / 360]) + (3) Dividend paid (Dividend/share x # shares)

# Scottrade Short Margin Requirements

Short Stock - Stock Price:  
\$14.30 and Up

50% of Market Value

35% of Market  
Value

Short Stock – Stock Price:  
\$5.00 - \$14.29

50% of Market Value

\$5 Per Share

Short Stock – Stock Price:  
\$0.01 - \$4.99

*You cannot initially  
short a position below  
\$5.00 per share.*

Greater of 100% of  
the market value or  
\$2.50 per share

# Short Sale Example

- If you short 100 shares of AAPL today at \$117, how much capital must you invest initially?
- Your initial margin is 80% and maintenance margin is 50% (of the value of the short position)
- No hard-to-borrow fee, commission or dividends paid

# Short Sale Example

- (1) How much capital must you invest initially?

$$\text{Margin \%} = \frac{\text{Proceeds from Sale} + \text{Capital Invested} - \text{Current Value of Shares}}{\text{Current Value of Shares}}$$

$$80\% = \frac{100 \times \$117 + \text{Capital Invested} - 100 \times \$117}{100 \times \$117} = \frac{\text{Capital Invested}}{100 \times \$117}$$

$$\text{Capital Invested} = 80\% \times \$11,700 = \$9,360$$

- (2) What is your total assets after initiating the short sale?
  - You will have  $\$11,700 + \$9,360 = \$21,060$  in your account
- (3) What is your total liabilities?
  - You owe 100 shares x price per share



# Short Sale Example

- How *high* can the price go before you get a margin call (maintenance margin is 50%)?

$$\text{Margin \%} = \frac{\text{Proceeds from Sale} + \text{Capital Invested} - \text{Current Value of Shares}}{\text{Current Value of Shares}}$$

$$50\% = \frac{100 \times \$117 + \$9,360 - 100 \times \textit{Price}}{100 \times \textit{Price}}$$

$$50 \times \textit{Price} = \$21,060 - 100 \times \textit{Price}$$

$$\textit{Price} = \$140.40$$

# Short Sale Example

- You project that MSFT is overvalued. You believe the stock should be worth \$40/share. It is currently trading at a price of \$50/share.
- You would like to invest \$1,000 of your own capital in shorting MSFT, while shorting as many shares as possible.
- The initial margin requirement at your brokerage is 50% and the maintenance is 25%
- The hard-to-borrow fee is 6%
- You open your position and hold it for 60 days. At that time the stock is worth \$40/share.
- During the 60 days, the stock paid a dividend of \$0.50/share.
- What is your return on invested capital?

$$36\%$$

$$1000$$

# Solution

- How much MSFT (in dollars) can you short?

$$5\% = \frac{1000}{x} \Rightarrow x = 2000$$

- How many shares can you short?

$$\frac{2000}{50} = 40$$

- At the end of 60 days, what is your profit?

- Assets: Invested Capital = 1000

$$\text{Proceeds} = 2000$$

- Liabilities: Current Value of Shares = 1600

- Ending equity: hard to borrow fee =  $2000\% \times 6\% \times \frac{60}{360} = 20$

$$\downarrow \text{dividend} = 40 \text{ shares} \times 0.5 = 20$$

- Profit  $1000 + 2000 - (1600 + 20 + 20) = 1360$

$$\downarrow 1360 - 1000 = 360$$

- What is your return?

$$\rightarrow \frac{360}{1000} = 36\%$$

# Is Shorting a Good Strategy?

- In general, it's a bad bet
  - Stocks tend to go up
  - Short positions tend to go down

**How Jim Chanos Uses Cynicism, Chutzpah — and a Secret Twitter Account — to Take on Markets (and Elon Musk)**

- Jim Chanos is probably the most successful short seller of all time
  - 44 percent return in the financial crisis
  - Brought down Enron
  - His short portfolio earned -0.7% per year between 1985-2017!
  - He combines his short portfolio (90%) with a long portfolio (10%)
    - The combination has earned 28% per year
- Short positions can be combined with a long position in another highly correlated asset
  - Called pairs trading
  - Example: short Ford and buy GM
  - Hedges a lot of the risk in the short Ford position
  - If the auto industry does well, Ford and GM both go up.
  - The long does well, the short does poorly.

# The Process of Placing a Trade

- How do we (or our broker) find a counter-party and complete the trade?
  - Different financial assets are traded in different **types of markets**
- Do I want to buy or sell (or go **short**) the security?
- Should I borrow capital to make the purchase (buying on **margin**)?
- Should the order be contingent on a certain price?
  - Multiple **types of orders** we can place
- What will the process cost?
  - Explicit and implicit **trading costs**

# Types of Orders

# Types of Orders

- Market orders
  - Executed as soon as possible at the current market price
- Price-contingent orders
  - Limit orders (limit buy or limit sell)
  - Stop orders (stop-loss or stop-buy)

	Price below the limit	Price above the limit
Buy	Limit-Buy	Stop-Buy
Sell	Stop-Loss	Limit-Sell

**For a stop order:** once the trigger price is hit, it becomes a market order

**For a limit order:**  
Trade is completed at the limit price or better

What kind of trade would you make if you bought a security at \$20 and want to sell if it reaches \$30?



# When 'Stop Loss' Trades Backfire on Investors

*By Mary Pilon, Karen Blumenthal and Jason Zweig*

Updated May 15, 2010 12:01 a.m. ET

Last Thursday's "flash crash" gave investors a crash course in the perils of stop-loss orders.

A stop-loss order is designed to protect investors by triggering a sale once a stock reaches a certain target. The trades are computer-activated and are based on criteria set up by the investor in advance. Many of them were triggered on May 6 as hundreds of stocks briefly plunged by 20% or more.

The problem? Because prices were falling so rapidly, the stop-loss trades couldn't be made quickly enough, and many people's shares were sold at prices far below their trigger price. Most of the stocks then rebounded quickly, making the episode all the more painful for the people who had been bounced out at the bottom.

# Limit order book for Google (Source: Data.nasdaq.com)

Limit orders are recorded in limit order book

In the limit order book, the **bids (asks)** are **buy (sell)** limit orders that haven't been executed

If you sent a market order to buy 250 shares, how much would this cost?

$$\begin{aligned} &100 \times \$589.95 \\ &+ 50 \times \$590.48 \\ &+ 100 \times \$590.49 \\ &= \$147,568 \end{aligned}$$

**NASDAQ BOOKVIEWER**

GOOG Last Match **589.95** 17:25:32.146

Current stock: **GOOG**

Today's Activity  
Orders: 79,334  
Volume: 664,367

Filter: >> Aggregate By: Price MPID

BUY ORDERS				SELL ORDERS			
TIME	MPID	SHARES	BID	ASK	SHARES	MPID	TIME
17:25:39.570	NSDQ	100	589.56	589.95	100	NSDQ	17:13:24.691
16:35:23.009	NSDQ	1	589.54	590.48	50	NSDQ	16:37:19.446
16:30:55.487	NSDQ	200	589.53	590.49	100	NSDQ	16:26:47.653
16:02:01.783	NSDQ	100	589.50	590.51	81	NSDQ	16:03:19.079
16:01:46.897	NSDQ	100	588.50	590.99	200	NSDQ	16:15:37.852
15:53:23.787	NSDQ	100	588.30	591.51	100	NSDQ	16:18:53.826
16:50:19.034	NSDQ	200	587.37	592.00	300	NSDQ	15:57:25.393
15:55:23.560	NSDQ	100	586.99	593.00	50	NSDQ	13:38:57.861
15:51:22.028	NSDQ	50	586.91	593.22	100	NSDQ	11:11:47.602
7:01:03.884	NSDQ	3	586.20	593.80	100	NSDQ	11:04:19.920
8:02:12.897	NSDQ	1	585.00	593.98	20	NSDQ	16:48:29.608
12:25:52.084	NSDQ	1	584.00	593.99	25	NSDQ	10:39:50.432
7:01:04.547	NSDQ	1	581.00	594.60	20	NSDQ	13:28:42.762
8:02:19.270	NSDQ	1	580.00	594.90	2	NSDQ	9:31:52.321
15:56:39.561	NSDQ	10	580.00	595.00	2	NSDQ	7:01:01.162

( 44 More ) ( 6 More ) [Show More](#)

As of 17:25:59.559 Powered by NASDAQ TotalView

Trades are processed when there is a mutually beneficial trade

Trades are typically processed on a price-time priority basis

If you purchased 100 shares at the current ask and immediately sell the 100 shares at the current bid, how much money will you lose?

$$100 \times (\$589.95 - \$589.56) = \$39$$

# Trading Costs

# The Process of Placing a Trade

- How do we (or our broker) find a counter-party and complete the trade?
  - Different financial assets are traded in different **types of markets**
- Do I want to buy or sell (or go **short**) the security?
- Should I borrow capital to make the purchase (buying on **margin**)?
- Should the order be contingent on a certain price?
  - Multiple **types of orders** we can place
- What will the process cost?
  - Explicit and implicit **trading costs**

# Trading Costs

- Direct cost: brokerage commission
- Indirect costs:
  - Bid-ask spreads
  - Price impact of large trades
    - Market depth: may have to move up/down the order book to find counter parties
    - Other investors will learn from the trade and update their orders
    - Strategies: break up trades into small pieces, trade on dark pools
  - Liquidity
    - The speed and cost with which you can sell/buy a security

# Bid-Ask Spreads

- Ask price: price at which an investor can buy a share
- Bid price: price at which an investor can sell a share
- Ask  $>$  Bid. Difference is the bid-ask spread.
  - How dealers, specialists make money

# Innovations in Trading

# Computer Trading

- **Algorithmic trading:** computers make the trading decision according to an algorithm
  - Makes up more than half of trading volume
- High Frequency Trading - rapid algo trading
- Strategies:
  - Exploit short-term trends, new information
  - Pairs trading
  - Stock price vs. futures price
  - Feel out bid-ask, profit on spread before prices move
  - Price discrepancies across markets



# Computer Trading

- Speed matters
- Arms race for the fastest speeds
  - Co-locating near exchanges

## **Satellite Startup LeoSat Secures Customer for High-Speed Trading**

Venture aims to transit data from New York to Tokyo within less than 130 milliseconds

# Downsides to computer trading

- Computers make mistakes. Like using old news stories as trading signals...

TECH

## UAL Story Blame Is Placed on Computer

Events Remain Murky, But Automated Search, Trades Played Roles

By SHIRA OVIDE and JESSICA E. VASCELLARO

Updated Sept. 10, 2008 12:01 a.m. ET

As [Tribune Co.](#) and [Google Inc.](#) pointed fingers at each other over the glitch that cratered [UAL Corp.](#)'s stock Monday, blame spread to the computers that robotically troll the Web for news stories and execute stock trades automatically.

- HFT not obligated to make markets
  - Abandon market during turbulent periods
  - Flash Crash: May 6, 2010

# Other Innovations/Changes

- **Dark pools**

- Private trading systems in which participants can trade large blocks of shares without “showing their hand”
  - There is no visible order book
  - Mainly used by institutional investors

- New exchange (IEX) plans to place **speed bumps** on trades to limit the advantage of HFT over slower traders

- 38 mile coil of fiber optic cable adds a 350 microsecond delay

- **Exchange consolidation:**

- NYSE:

- Merged with Archipelago ECN in 2006, acquired American Stock Exchange in 2008

- NASDAQ:

- Acquired Instinet in 2005, Boston Stock Exchange in 2007

- International:

- Germany's Deutsche Börse tried to merge with the NYSE Euronext in 2011/12
    - London Stock Exchange tried to merge with Deutsche Börse (vetoed by EU 3/2017)

# Another AI startup wants to replace hedge funds

Mark Bergen

Dear, Wall Street: Silicon Valley is increasingly coming for you.

A machine intelligence system, dubbed Emma AI, is starting a fund that hopes to outsmart the humans and computers that make a living trading stocks. It's part of a wave of tech startups aiming advanced machine learning at financial markets.

Automation is **not new** to Wall Street. But Shaunak Khire, Emma's creator, claims his system differs from current finance computing — high-frequency trading and "quant" data science — because its system of neural nets takes into account a more complex set of factors affecting stocks, like management changes or monetary policy in Europe, that other programs miss.

"This is not algorithmic trading," he said. "This is literally replication of an analyst."

# Summary

- Different types of markets, orders and trades
- Markets constantly evolving with regulation, technology, rest of the economy
- Short sales and buying on margin

# For next class

- Finish equity valuation assignment and upload materials to Canvas
- Name your team – this makes for easier identification

Bonus Questions if Time Permits

# Margin Example With Fees

- Buy 1,000 shares at \$30/share
- Initial margin: 50%
- Margin fee rate (aka margin interest rate) is 8%
- What is your return on capital invested if the stock price increases by 1% to \$30.30?



# Margin Example Continued

- $\text{Return} = \text{Profit} / \text{Investment} = (\text{Ending Equity} - \text{Starting Equity}) / \text{Investment}$
- Purchase 1,000 shares x \$30 = \$30,000 in shares on 50% margin
  - $\text{Margin \%} = \text{Equity} / \text{Value of shares}$
  - Equity = \$15,000
  - Borrow \$15,000
- $\text{Ending Equity} = 1,000 \text{ shares} \times \$30.30 - (\$15,000 \times (1 + 8\% \times (45/360))) = \$15,150$
- $\text{Profit} = \$15,150 - \$15,000 = \$150$
- $\text{Return} = \$150 / \$15,000 = 1\%$
- W/o interest the return would have been 2%, but interest costs decreased return