

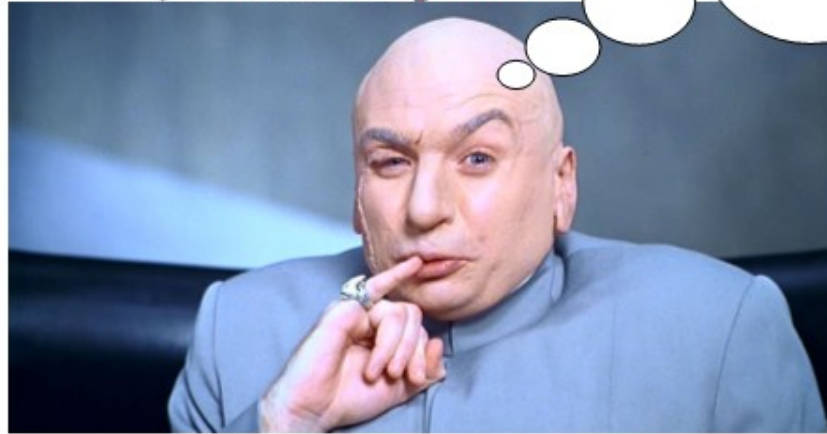
Stocks and Options and Bonds, Oh My!

A corporation has this great idea

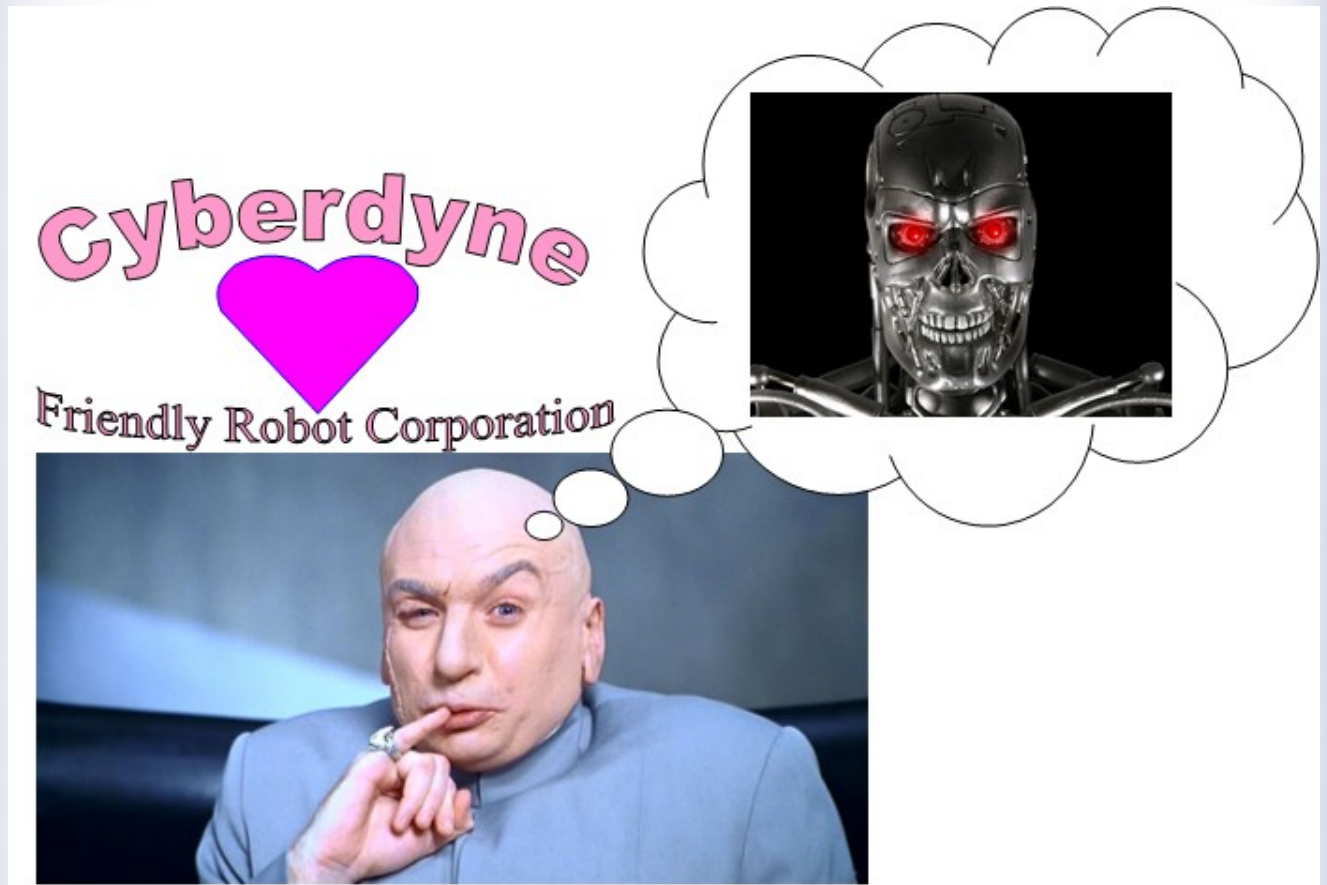
Cyberdyne



Friendly Robot Corporation



Capital is required to see it through



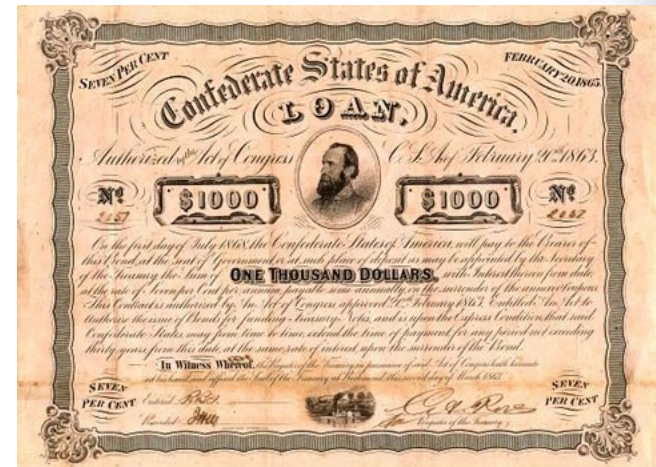
I'll let you guess how much he wants

Option 1: Borrow the money

- From a bank



- From bonds



Option 2: Issue stocks on an exchange



Some accounting jargon

- Assets (Capital)
 - What is owned
- Liabilities (Debt)
 - What is owed
- Equity
 - What is left over
- $A = L + E$
 - ALE!



The stock market



The image shows a close-up of a financial table with a magnifying glass highlighting a specific row. The table contains columns of numerical data and company names. The magnified row shows the following values: 22.11, 17, 11.10, 6.66, 317.80, 106.79, 16.30, 10.15, 77, 5.30. The company names visible in the magnified area include 'GolarLNG', 'Goodyear', and 'Google'.

6	34.70	-0.32	14.29	5.59	GolarLNG	1.3	157
91	17.85	-0.31	20.75	11.46	Banc .20	...	...
879	26.22	-0.31	18.66	11.46	Gro	2.7	1
896	37.35	-0.90	15	...	Golfe	...	...
5717	25.65	-0.05	22.11	17	Goody	2	1.6
23204	19.49	0.64	11.10	6.66	Google	...	...
2503	14.38	-0.07	317.80	106.79	GpcBi	...	...
44	31.40	-0.25	16.30	10.15	...	...	...
4	2225	26.25	77	5.30	...	...	...
2	233758	21.93	...	...	...	...	...
17	231230	77.22	...	...	...	...	...
...	227498	9.86	...	...	...	...	...
19	220218	23.33	...	...	...	...	...
4	17	24726	32.74	0.38	...	...	...
...	2	36.10	...	...	...	...	...
...	31	22.46	-0.50	...	...	...	...
1.2	20	222553	22.46	0.62	...	...	...
3.7	16	26805	20.15	0.06	...	...	...
...	2	25.46	0.06	...	...	...	...
...	11	20	0.29	...	...	...	...

What is a stock?

- A stock (a.k.a. a share) represents ownership in a company
- If there are 1,000,000 shares outstanding, and you own 1, then you own $1/1,000,000$ of the company

Benefits of owning a stock

- A share of the profits upon liquidation (rarely happens)
 - Most of the time “liquidation” comes in the form of a merger
- Dividends, should the company give any out
- Voting rights in major company decisions

Stock price

- The sum of the value of each share represents the value of the whole company.
- Not all value comes from tangible items
- P/E ratio?



\$15



\$500



Priceless

Some notable exchanges

- NASDAQ
 - \$4.39 trillion in securities
- NYSE
 - \$20.7 trillion
- TSE
 - \$2.29 trillion

Index..es? Indices?

- Reflect how the market is doing as a whole
- Dow Jones
 - 30 leading companies
 - Each company has an equal impact
- S&P 500
 - 500 leading companies
 - Company impact weighted by the company value
- NASDAQ
 - 5,500 leading companies
 - Lots of tech stocks!
- “Points” refers to the sum of the value of the companies within

Some types of investment funds

- Index
 - Throw your money in, and let the market decide!
- Mutual funds
 - Pool your money together with other investors into a fund, let a manager invest it
- Hedge funds
 - Vague term, but generally they invest in markets and “hedge” out unwanted risk
- Private Equity Firms
 - Privately owned (usually) companies that swallow up smaller companies, boost productivity, and sell at a large profit.

Bull v.s. Bear markets



Bull v.s. Bear markets

- A Bull market is a strong market
 - Lots of jobs
 - Low inflation
 - Lots of investment
- A Bear market is the opposite
 - Few jobs
 - High inflation
 - Decreasing investment
- Depends on supply & demand, market sentiment, interest rates

Crashes!



October 1929 – Wall Street Crashes

- A hot economy, and little regulation led to lots of people “buying on the margin”
 - Borrow money and buy some shares, hope the price rises so that you can pay back the money and make a profit
 - \$8.5 billion in loans were made (more than the currency)
 - Speculation that prices would rise even more fuelled a bubble.
 - Buy! Buy! Buy!
- A downturn in the market caused investors to panic. This caused a snowball effect.
 - Sell! Sell! Sell!
- The market lost \$30 billion in one week
- The Dow Jones was down by 90%

Dot-com bubble

- A bubble is created when a market rises quickly in value.
 - People speculate further rises and buy in anticipation
 - Herd behavior fuels more buying leading to gross overvaluing
- Dot-com's followed a business plan of maximizing market share before making a profit
- "Get large or get lost"
- Most of these companies could never realize a serious profit, so their stocks were over priced

Dot-com bubble

- After the March 10, 2000 weekend, the bubble burst
- One possible cause was that several multi-billion dollar sell orders from major corporations were coincidentally processed simultaneously on Monday, March 13

Are crashes all bad?

- Well, depends on your perspective
- If you foresee a decline in a stock, you can short it. That is, bet that a stock will go down.
- This is made possible with a put option (see next slide)
- Basically get someone to agree to buy the stock at today's price, let the price fall, buy it cheaply, and sell it at today's price.

Options

Theoretical option price = $pN(d_1) - se^{-rt}N(d_2)$

$$\text{where } d_1 = \frac{\ln\left(\frac{p}{s}\right) + \left(r + \frac{v^2}{2}\right)t}{v\sqrt{t}}$$

$$d_2 = d_1 - v\sqrt{t}$$

The variables are:

p = stock price

s = striking price

t = time remaining until expiration, expressed as a percent of a year

r = current risk-free interest rate

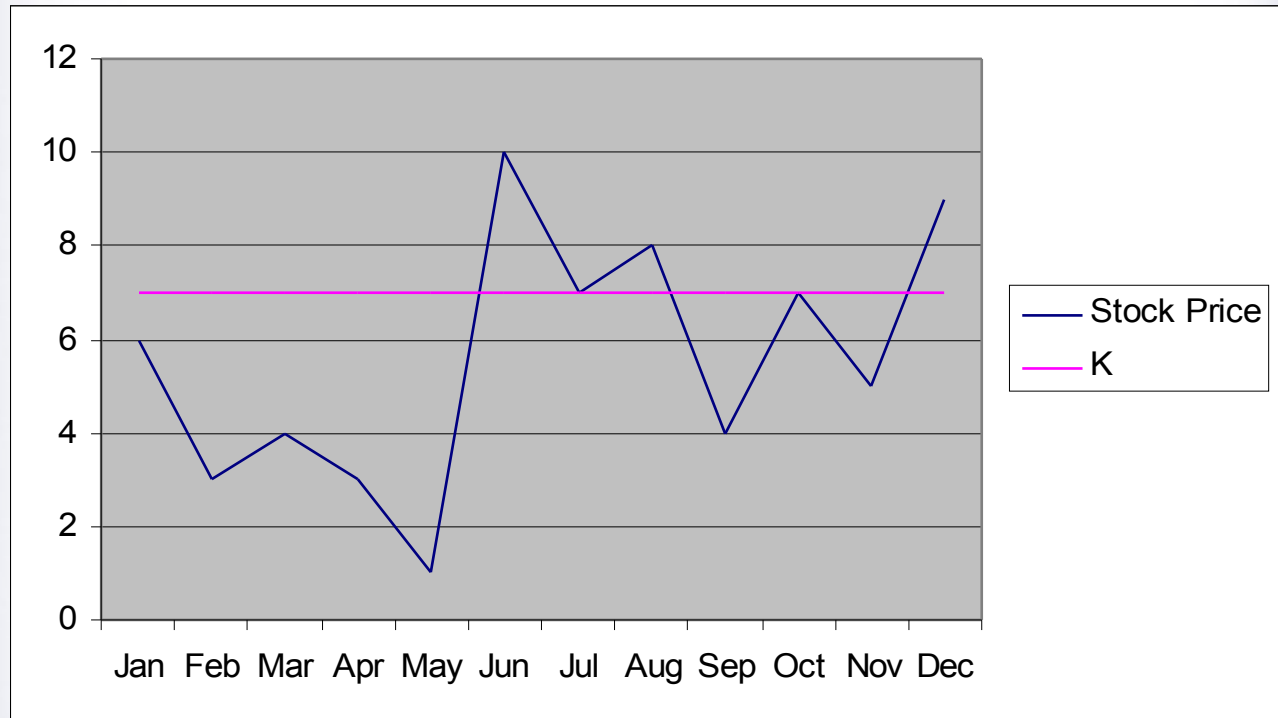
v = volatility measured by annual standard deviation

\ln = natural logarithm

$N(x)$ = cumulative normal density function

It's Friday evening! Stop showing me math!

- Options are a right to buy or sell
 - Call = right to buy
 - Put = right to sell
- For a call option:
 - Strike price K
 - Duration (say 1 year)
 - Current stock price P



Employee stock options

- Given to employees as part of a contract, or as a bonus
- If the stock falls, could be worth nothing!
- Good incentive to make employees work hard? 😊
- Actually, stocks are used a lot to generate incentives in business

A little more math... concepts

- For the buyer of the option, the downside is set (the price of the option)
- The upside is limitless
- Options are a form of risk transfer
- They can be combined in complex ways to get exactly the right amount of risk you desire, Black-Scholes tells you how to do this
- This is called financial engineering
- Options are called derivatives, they derive their value from some underlying asset (a stock)

I swear this is going somewhere

- Sounds great, case closed right?
- Underlying model assumes stock varies over time according to a Gaussian distribution (see Brownian Motion)
- In real life, they have much “fatter tails” (i.e. they crash more)

Long-Term Capital Management

- In 1994 John Meriwether, head of Bond trading at Salomon formed LTCM
- Focus was on mathematical modeling of bond prices
 - Bet on prices of similar bonds to converge over time
- All star cast included Nobel Prize winners Robert Merton and Myron Scholes (of Black-Scholes fame)
- Made 40% returns in its first few years!

From Russia with love

- As their strategy became apparent, others began to mimic
- To keep up their profits, they borrowed more money to compensate for smaller returns
- Russia devalued its currency in 1998 causing a panic across markets worldwide (what was seen as a stable investment was actually very risky... subprime mortgage??)
- People bought U.S. T-Bills to avoid risk
- Spreads didn't converge! Bad news

So Long, Long Term

- In 1998, LTCM Lost \$4.6 billion in 4 months.
- Their models predicted this scenario would only occur once in the lifetime of the universe.

Wow, so markets suck?

- I only focused on crashes because in general they're more interesting.
- There are many examples of successful firms, and people (i.e. Warren Buffet, Google).
- In general, the best a person can do is to make informed decisions when investing.
- To see how Warren Buffet invests, go to <http://www.investopedia.com/articles/01/071801.asp>

Mock market!

- Each person will get 12 shares (4 each from 3 companies) and \$25
- There will be 3 rounds, each round you can buy or sell shares as you like. You can also trade shares for other shares.
 - If you're very brave, maybe try an option 😊
- Remember: The price of a share is reflected in both its current value, and possible future value (so you don't just have to trade at the current price!).
- News flashes may occur during a round indicating late breaking information.
- The top 3 traders will win prizes!

The Companies:

- 1) CSGSA – Current share price \$1
 - Tech company involved in cutting edge computational and beer-related research. Potentially worth a lot if research is successful.
- 2) Slow & Steady Motor Co. - \$4
 - Well established automobile company, inventor of the velocitator and deceleratrix pedal system.
- 3) Jenron - \$2
 - The worlds first conglomerate oil and gas securities traders and stylish fitness clothing retailers.

The Companies:

- Powerthirst - \$5
 - Creator of a herb-infused caffeine-ridden extreme energy drink.
- Volatility Inc. - \$4
 - They don't play games, they take risks.
 - So that you don't think I'm rigging it in any way, this one follows a random walk. Each round it has a 50/50 chance of going up or down by some dollar amount {\$1, \$2, or \$3}
 - Do you feel lucky?

The Companies: Summary

Company	Value
CSGSA	\$1
Slow & Composed Motor Co.	\$4
Jenron	\$2
Powerthirst Beverages	\$5
Volatility inc.	\$4

Round 1

- Begin trading!

Round 1 results:

- CSGSA announces research at Koerners a complete success
- S&S profits up 2% thanks to good old fashioned advertising
- Jenron announces oil profits are up slightly, oil tycoons are more stylish than ever.
- Powerthirst linked with the illness Acute Extremenia

Round 1 results:

Company	Value
CSGSA	\$5
Slow & Composed Motor Co.	\$5
Jenron	\$3
Powerthirst Beverages	\$4
Volatility inc.	?

Round 2

- Begin trading!

News Flash!

- Free food in the 8th floor lounge!
Work at CSGSA grinds to a halt!

Round 2 results:

- CSGSA staff pull an all nighter, work is back on track.
- Nothing new with S&S, consumers are bored
- Jenron releases their "titanic" clothing line, the irony is lost on the market and sales are good
- It turns out that Power thirst is made of Red Bull! Lawsuits are very possible!

Round 2 results:

Company	Value
CSGSA	\$6
Slow & Composed Motor Co.	\$4
Jenron	\$4
Powerthirst Beverages	\$2
Volatility inc.	?

Round 3

- Begin trading!

Round 3 results:

- CSGSA staff announces successful consumer trial of their new AI system: the “Brew Classifier”
- An audit of Slow & Steady shows that the company had been overstating profits for years and is actually bankrupt
- Jenron continues to rise, mostly because I said so
- Some people actually like Redbull, so sales have been fairly good for Powerthirst.

Round 3 results:

Company	Value
CSGSA	\$7
Slow & Composed Motor Co.	\$0
Jenron	\$5
Powerthirst Beverages	\$3
Volatility inc.	\$8

Finished!

- Tally up your results and see what your net worth is, there are prizes for the winners!