

Introduction to Derivatives



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Overview



What are Derivatives?

This isn't Calc 1

A derivative is a financial contract whose value depends on some underlying asset.

Yes, while it is a broad definition, keep this idea in mind as we proceed through this crash course.

The Purposes



Hedger

- Uses Risk management to compensate for unforeseen events
- Locks in profits or cash flows for the future
- Mitigates forex risk, interest-rate risk, commodity hedge, etc.



Speculator

- Multiplies returns by taking on more risk
- Speculates and occasionally takes a gamble
- Uses educated guesses about direction of the market or price of underlying

The Dangers of Speculative Trading

Don't be like Nick Leeson

- Leeson single handedly bankrupted Barings Bank through a series of poor trades, the losses of which he hid
- Eventually made the ultimate mistake of straddling the Singapore and Tokyo stock exchanges the night before the Kobe earthquake
 - A straddle is essentially a bet that the market will not move significantly
- Caused a total loss of \$1.4 billion, and ended up in prison

You can take this in one of two ways: be weary of holding short term positions overnight (you can get wrecked by overnight news), or just don't partake in short-term speculative trading



Barings Bank, formerly the world's second oldest merchant bank, collapsed in 1995 after losing over \$1 billion.

Some Specialties

One can control more of an asset without investing more, i.e. leverage

One can profit off of different scenarios (not just the value of the asset increasing)

Allows two parties to find more favorable interest rates or manage risk

Customizable products based on risk tolerance and chance of profitability

Hedging vs. Diversification

Hedging

Strategy of taking up an offsetting position to protect one from unexpected market moves, thereby mitigating risk

Diversification

Strategy of spreading your chips to limit risk in each investment

Common Derivatives

1

Options

Contracts that gives the *right, but not the obligation*, to buy or sell an asset

2

Futures

Contract to buy or sell an asset on a future date at a specified price (occurring in a regulated exchange)

3

Forwards

Contract between any two parties to exchange an asset on a future date at a specified price

4

Swaps

Contract that allows two parties to swap cash flows on or before a specified date (interest rates and currencies)

Others

Swaptions, Options on Futures, Warrants, Convertible Bonds, CDO, CDS, headaches

Key Differentiators

Lock

- Include swaps, futures, and forwards
- Obligates agreeing parties to follow through on contract

Option

- Vanilla options, binary options, etc.
- Provides the participant the right, but **not the obligation**, to follow through on the contract

OTC and Exchange-Traded Derivatives

1 Exchange Traded

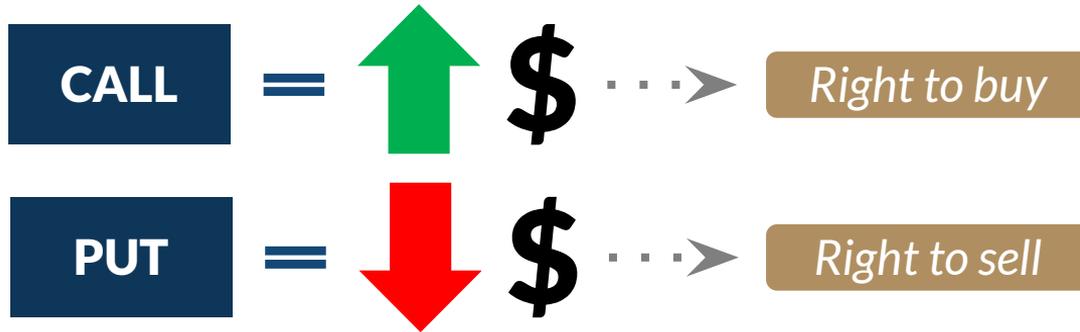
- Traded on exchanges specially dedicated to derivatives
- Contracts are standardized and highly regulated
- Examples include the CME Group, Eurex, and the Korea Exchange

2 Over-the-Counter

- No exchange or middle man is involved in the transaction
- Less regulated than a conventional exchange
- Often involved private deals between large institutions
- Much larger market than those on regulated exchanges

1

Options: No Strings Attached



Moneyness	Result
In-the-money	Gain
At-the-money	Break Even
Out-of-the-money	Loss

Strike Price

Describes the price at which the option will exercise at.

Premium

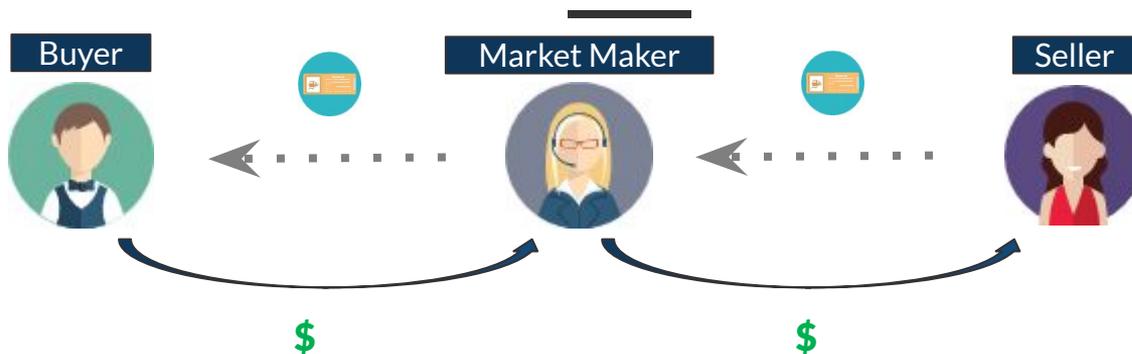
Price paid for the contract itself.

Expiration Date

Date at which contract expires, and can no longer be used after.

Intrinsic Value: Value of the option if exercised immediately; ITM option must be worth its intrinsic value!

Mechanics of an Option



Volume	Number of contracts that have been exchanged in the day
Open Interest	Number of contracts held by market participants which have not been closed out, expired, or exercised

Example of Mechanics¹

Day	Trade/EOD Price	Daily Change	Cumulative Change	Margin Account balance
0	\$1250/ounce	-	-	\$6000 ²
1	1241	-\$900	-\$900	5100
2	1238	-300	-1200	4800
3	1231	-700	-1900	4100
4	1255	+2400	+500	\$6500

²One contract concerns 100 ounces and costs \$6000

Key Points:

- Futures are regulated and traded on an exchange
- Generally used for commodities such as crude oil, gold, etc.

Different from Options because...

More Leverage...More Risk

You're obligated in the end!

Initial margin instead of premium

Long and Short (Not Calls/Puts)

Can lose more than initial cost

Forwards are very similar to futures in terms of mechanics. The differences are below:

Forwards

- Not standardized on an exchange and can occur privately between two parties
- Agreed for settlement either in the form of delivery or cash settlement
- Involves more credit risk as it is easier for one of the parties to not fulfill their side of the agreement
- Generally one settlement date between two parties

Futures

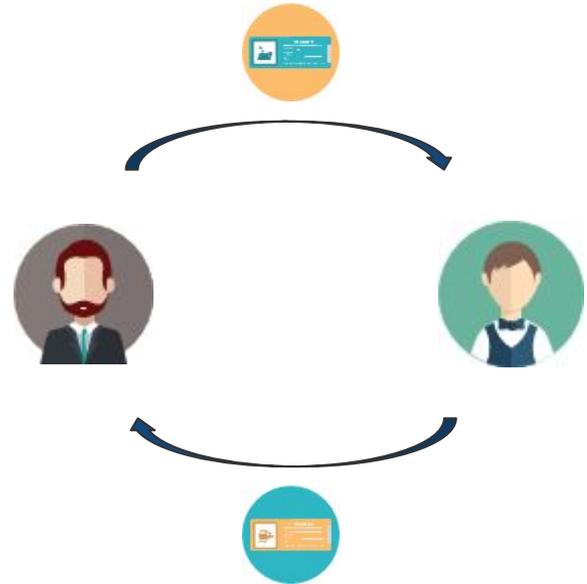
- Traded on exchanges such as the Chicago Mercantile Exchange (CME), the Minneapolis Grain Exchange (MGEX), and Euronext.
- Settled at the end of every day and traded for the value of the contract
- Different delivery dates, similar to options and no credit risk since there is full regulation

Swaps represent a large number of derivatives that involve the exchange of financial products (*generally cash flows*) between two parties.

Examples include but are not limited to:

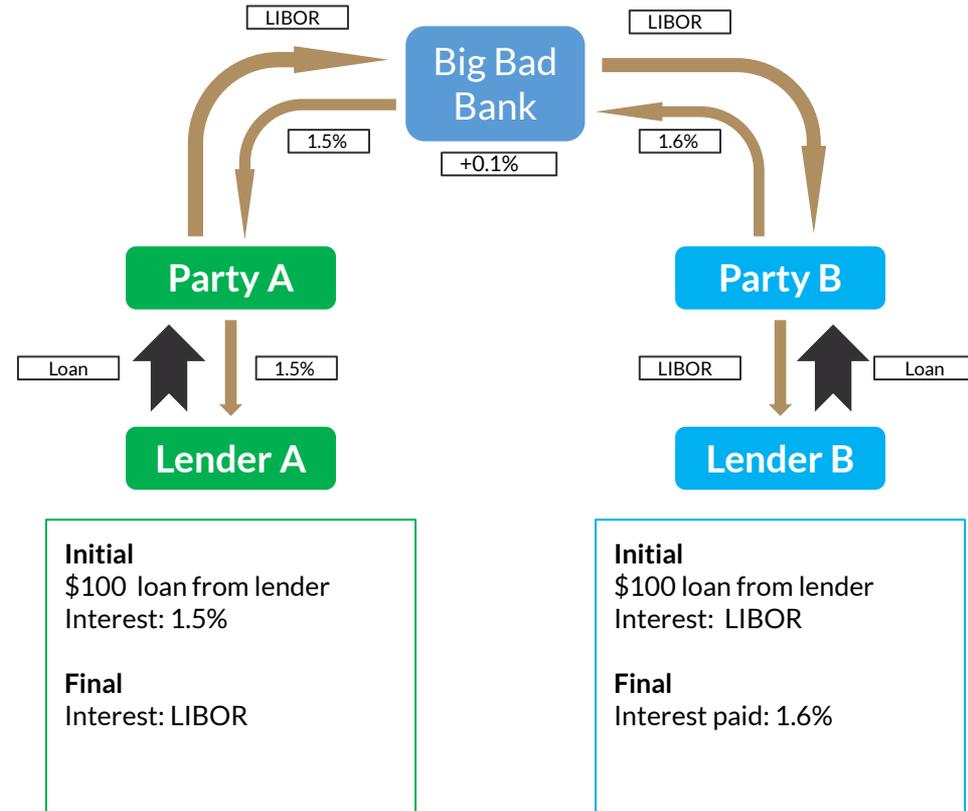
- Interest rates swaps
- Commodity swaps
- Currency swap
- Debt-equity swaps

The list goes on.



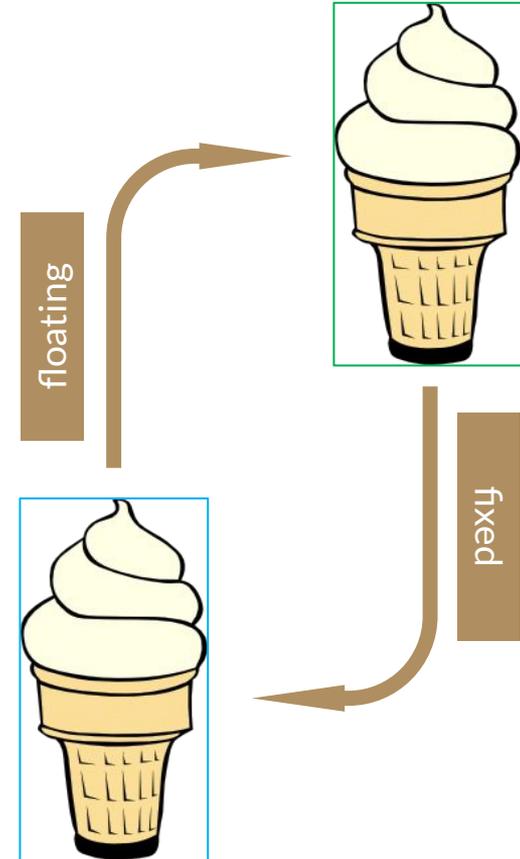
Interest Rate Swaps

- OTC Agreements between two parties to exchange interest rate-related cash flows
- Often more convenient to borrow at one rate even if a party prefers another
 - Can be later exchanged
 - Fixed for fixed
 - Fixed for floating (vice versa)
 - Float for float
- Different motivations for each swap
- Bank serves as intermediary



Vanilla Swaps

- Fixed-for-floating or vice versa are known as **vanilla swaps**
- Floating rates are based on LIBOR
 - Stands for London Inter-Bank Offered Rate, Not Little Investment Bankers of Rutgers
 - “Risk-free” lending rate between banks
- Market makers are investment and commercial banks
- Cornerstone of risk management but can be used to speculate
- Involves credit risk and interest rate risk



Other Swaps

Currency Swaps

- Agreement between two parties for the exchange of either principal or the interest rates on the principal
- Latter is akin to an interest rate swap, while former is simply an exchange of a sum of currency

Commodity Swaps

- Agreement between two parties where a floating (market) price for some commodity is traded for a fixed price
- Very common with oil, natural gas, metals, grains, and livestock
- Market dominated by large financial institutions

Options on Futures

Definition

The right to enter into a futures contract at a specified price by a certain date

Call Futures Option: Right to enter into a long future (bullish)

Put Futures Option: Right to enter into a short future (bearish)



Generally traded on commodities: corn, cotton, oil, soybean, etc.

Facts

Normally closed out before delivery

May be cheaper, more liquid, and more convenient

Exercise results in contract position and cash settlement

Long and Short (Not Calls/Puts)

Credit Derivatives

- Include credit default swaps, credit spread options, and credit spread forwards
- Credit risk includes default, credit spread, and downgrade risk
- Can be forwards, swaps or options that involve credit risk



Discussion: Did credit derivatives worsen the Global Financial Crisis nearly a decade ago?¹

There are many products that are designed to mitigate or transfer credit risk. These products also helped facilitate the Great Recession in the late 2000s.

¹Discussion derived from

<https://www.sciencedirect.com/science/article/pii/S1877042813052233> needs proper cite

Implied Volatility and the VIX

- CBOE Volatility Index (VIX) provides the implied volatility of the S&P 500 Index (SPX) 30-day options
- The VIX represents investor sentiment, so if people are buying options way out of or in the money, they expect big moves and therefore high volatility
- High VIX correlates with steep market drops, sudden and unpredictable movements, and people losing money
 - It can be very profitable to trade during times of high uncertainty
- Implied volatility is implied by the options prices in the market, these volatilities can be calculated using options models (the math for which I'm not going to discuss here)
- Historical volatility involves past prices; implied volatility involves future prices

Implied Volatility and the VIX



Implied Volatility and the VIX



And Finally Finally, Remember This?

A derivative is a financial contract whose value depends on some underlying asset.

Think about this in relation to all of the different derivatives we went over today.