Introduction to Capital Markets and Financial Derivatives

Jan 2, 2025

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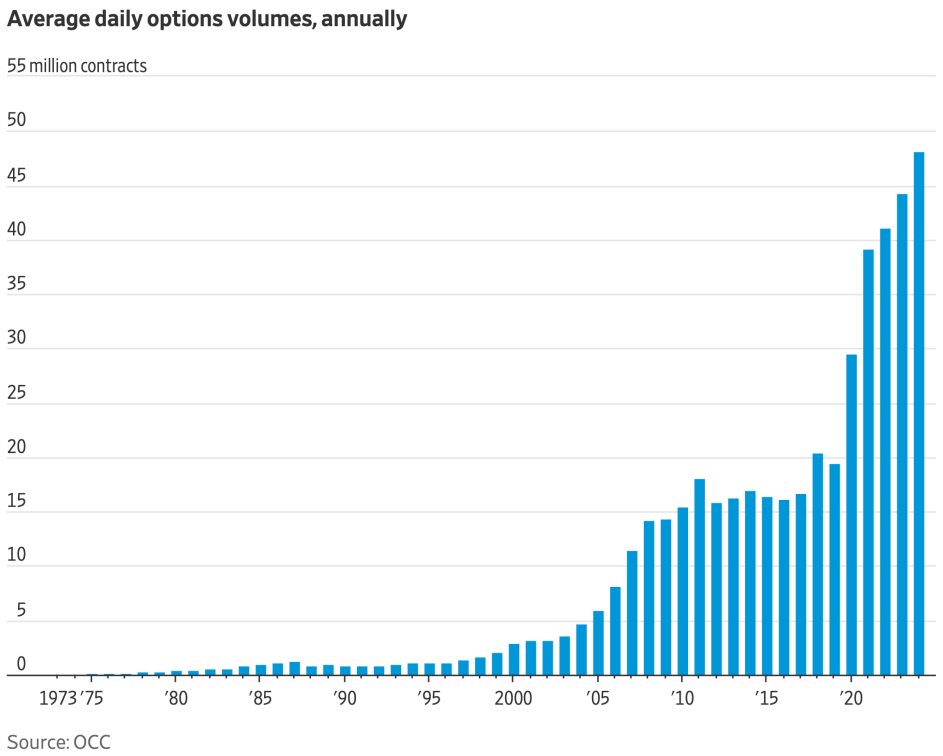
What is a Derivative?

- A derivative is an instrument whose value depends on, or is derived from, the value of another asset.
- Examples: futures, forwards, swaps, options, exotics…



A Thrill-Seeking Trade Amps Up Heading Into 2025. wsj. Dec. 28, 2024

Why Derivatives Are Important

- Derivatives play a key role in transferring risks in the economy
- The underlying assets include stocks, currencies, interest rates, commodities, debt instruments, electricity prices, insurance payouts, the weather, etc
- Many financial transactions have embedded derivatives
- The real options approach to assessing capital investment decisions has become widely accepted

How Derivatives Are Traded

- On exchanges such as the Chicago Board Options Exchange (CBOE)
- In the over-the-counter (OTC) market where traders working for banks, fund managers and corporate treasurers contact each other directly

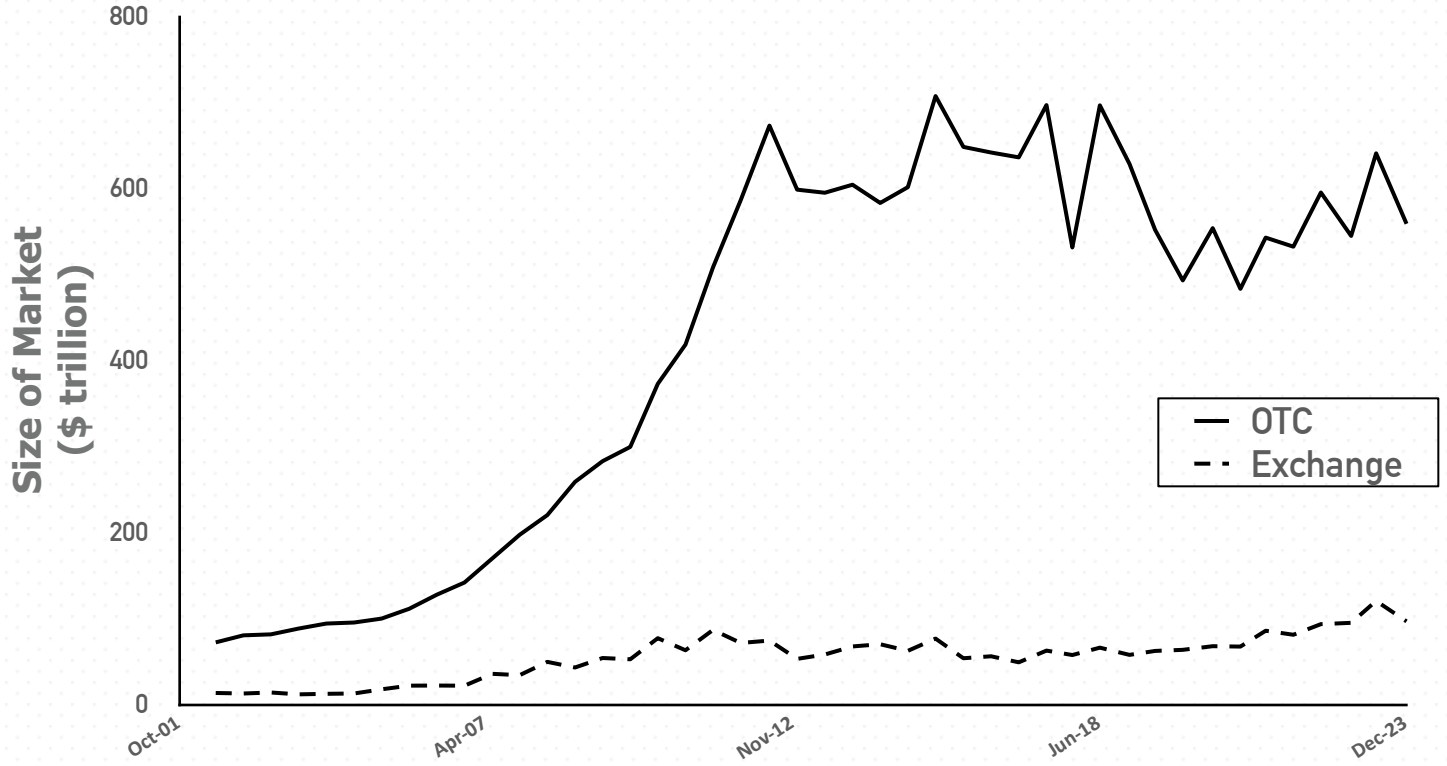
The OTC Market Prior to 2008

- Largely unregulated
- Banks acted as market makers quoting bids and asks
- Master agreements usually defined how transactions between two parties would be handled
- But some transactions were cleared through central counterparties (CCPs). A CCP stands between the two sides to a transaction in the same way that an exchange does

Since 2008…

- OTC market has become regulated. Objectives:
  - Reduce systemic risk: e.g. bank defaults ripple effect
  - Increase transparency
- In the U.S and some other countries, standardized OTC products must be traded on swap execution facilities (SEFs) which are electronic platforms similar to exchanges
- CCPs must be used to clear standardized transactions between financial institutions in most countries
- All trades must be reported to a central repository

Size of OTC and Exchange-Traded Markets



Source: Bank for International Settlements. Chart shows total principal amounts for OTC market and value of underlying assets for exchange market

The Lehman Bankruptcy

- Lehman's filed for bankruptcy on September 15, 2008. This was the biggest bankruptcy in US history
- Lehman was an active participant in the OTC derivatives markets and got into financial difficulties because it took high risks and found it was unable to roll over its short term funding
- It had hundreds of thousands of transactions outstanding with about 8,000 counterparties
- Unwinding these transactions has been challenging for both the Lehman liquidators and their counterparties

How Derivatives are Used

- To hedge risks
- To speculate (take a view on the future direction of the market)
- To lock in an arbitrage profit
- To change the nature of a liability
- To change the nature of an investment without incurring the costs of selling one portfolio and buying another

GBP/USD Forward Rates, Dec 27, 2024

	Bid	Ask
Spot	1.25589	1.25978
1-month forward	1.25565	1.25953
3-month forward	1.25506	1.25914
6-month forward	1.25413	1.25854

GBP: British pound

https://www.fxempire.com/currencies/gbp-usd/forward-rates

Forward Price

- The forward price for a contract is the delivery price that would be applicable to the contract if were negotiated today (i.e., it is the delivery price that would make the contract worth exactly zero)
- The forward price may be different for contracts of different maturities (as shown by previous table)

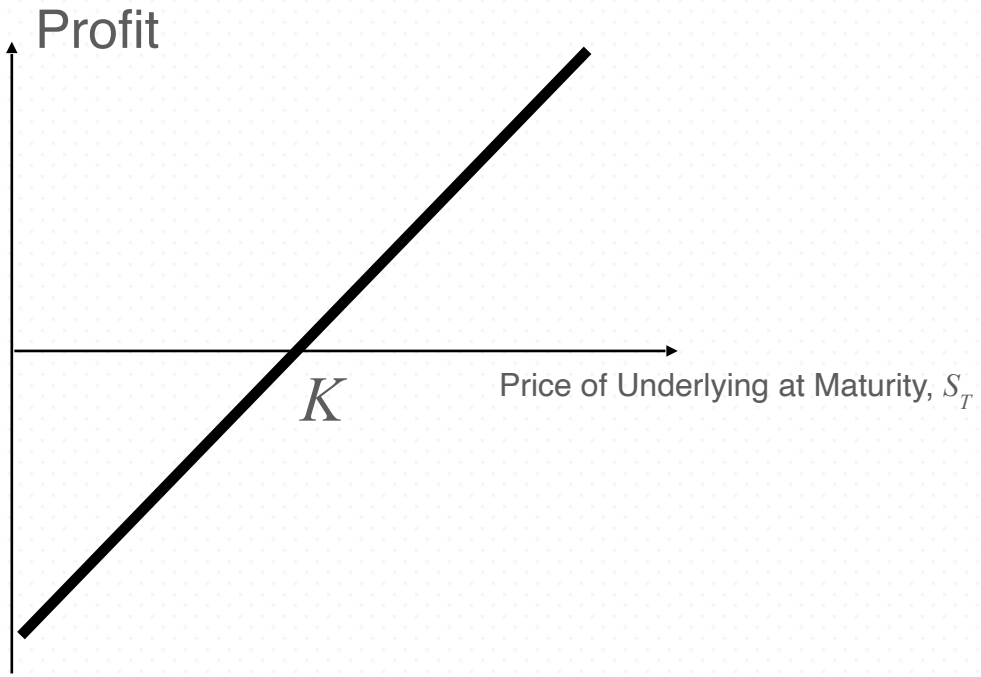
Terminology

- The party that has agreed to buy has what is termed a long position
- The party that has agreed to sell has what is termed a short position

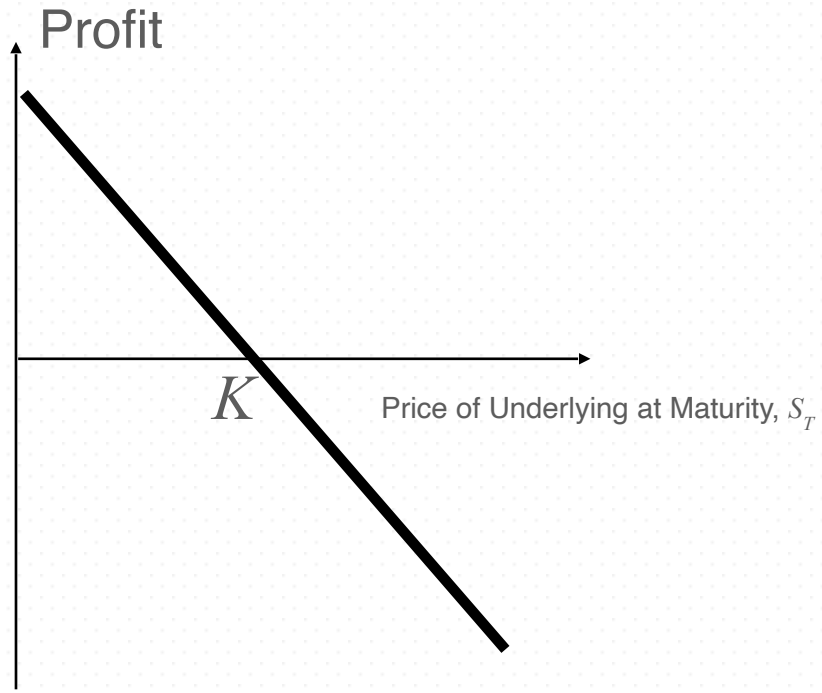
Example

- On May 21, 2020, the treasurer of a corporation enters into a long forward contract to buy £1 million in six months at an exchange rate of 1.2230
- This obligates the corporation to pay $1,223,000 for £1 million on November 21, 2020
- What are the possible outcomes?

Profit from a Long Forward Position (K= delivery price=forward price at time contract is entered into)



Profit from a Short Forward Position (K= delivery price=forward price at time contract is entered into)



Futures Contracts

- Agreement to buy or sell an asset for a certain price at a certain time
- Similar to forward contract
- Whereas a forward contract is traded OTC, a futures contract is traded on an exchange

Exchanges Trading Futures

- CME Group (formed when Chicago Mercantile Exchange and Chicago Board of Trade merged)
- InterContinental Exchange
- B3 (Brazil)
- Tokyo Financial Exchange (Tokyo)
- and many more (see list at end of book)

Examples of Futures Contracts

- Agreement to:
  - Buy 100 oz. of gold @ US$1800/oz. in December
  - Sell £62,500 @ 1.2500 US$/£ in March
  - Sell 1,000 bbl. of oil @ US$40/bbl. in April

1. An Arbitrage Opportunity?

- Suppose that:
  - The price of a non-dividend-paying stock is $60
  - The 1-year forward price of the stock is $65
  - The 1-year US$ interest rate is 5% per annum
- Is there an arbitrage opportunity?

2. Another Arbitrage Opportunity?

- Suppose that:
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The Forward Price of a Non-Dividend Paying Stock

- If the spot price is S and the forward price for a contract deliverable in T years is F, then
- $F = S(1+r)^T$
- where r is the 1-year (domestic currency) risk-free rate of interest.
- In our examples, S = 60, T = 1, and r =0.05 so that
- F = 60(1+0.05) = 63

1. Oil: An Arbitrage Opportunity?

- Suppose that:
  - The spot price of oil is US$50
  - The quoted 1-year futures price of oil is US$60
  - The 1-year US$ interest rate is 5% per annum
  - The storage costs of oil are 2% per annum
- Is there an arbitrage opportunity?

2. Oil: Another Arbitrage Opportunity?

- Suppose that:
  - The spot price of oil is US$50
  - The quoted 1-year futures price of oil is US$40
  - The 1-year US$ interest rate is 5% per annum
  - The storage costs of oil are 2% per annum
- Is there an arbitrage opportunity?

Options

- A call option is an option to buy a certain asset by a certain date for a certain price (the strike price)
- A put option is an option to sell a certain asset by a certain date for a certain price (the strike price)

Stock Options Volume Leaders

Sat, Dec 28th, 2024 Help

The highest option volume strikes showcase the most bought and sold options of the day.

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Symbol	Price~	Type	Strike	Exp Date	DTE	Bid	Ask	Last	Volume	Open Int	Vol/OI	Delta	IV	Last Trade	Links
+ NVDA	137.01	Call	138.00	01/03/25	6	2.17	2.20	2.18	87,786	7,146	12.28	0.45497	37.01%	12/27/24	
+ NVDA	137.01	Call	140.00	01/03/25	6	1.35	1.38	1.36	87,567	50,951	1.72	0.33381	36.00%	12/27/24	
+ NVDA	137.01	Call	140.00	01/24/25	27	5.20	5.30	5.25	73,431	18,087	4.06	0.46052	42.97%	12/27/24	
+ NVDA	137.01	Call	144.00	01/03/25	6	0.45	0.47	0.46	60,649	11,990	5.06	0.14602	35.55%	12/27/24	
+ NVDA	137.01	Call	142.00	01/03/25	6	0.81	0.82	0.81	43,929	36,909	1.19	0.22815	35.63%	12/27/24	
+ NVDA	137.01	Call	145.00	01/03/25	6	0.34	0.35	0.34	40,996	30,571	1.34	0.11403	35.55%	12/27/24	
+ NVDA	137.01	Call	136.00	01/03/25	6	3.20	3.30	3.20	39,691	7,011	5.66	0.57654	37.40%	12/27/24	
+ AAPL	255.59	Call	260.00	01/03/25	6	0.72	0.75	0.73	39,264	14,829	2.65	0.22830	17.00%	12/27/24	
+ AAL	17.35	Call	18.00	03/21/25	83	1.25	1.28	1.28	37,456	45,102	0.83	0.48409	46.35%	12/27/24	
+ NVDA	137.01	Call	140.00	01/17/25	20	4.25	4.30	4.25	37,256	249,220	0.15	0.44272	42.42%	12/27/24	
+ NKLA	1.1500	Call	1.0000	01/03/25	6	0.1600	0.2100	0.2100	35,285	245	144.02	0.73907	219.17%	12/27/24	
+ NKLA	1.1500	Call	1.0000	01/10/25	13	0.2000	0.2500	0.2200	35,174	253	139.03	0.73062	162.22%	12/27/24	

American vs European Options

- American option: holder has the right to exercise the option at any time during its life.
- European option: holder has the right to exercise the option only on the expiration date.
- Most traded options in the US are American style. Exceptions: foreign currency options, some stock index options.

Nvidia Call Option Prices from IBKR (Dec 27, 2024); Stock Price is last traded @ $136.62

Strike Price	Jan 17'25 Bid	Jan 17'25 Ask	Mar 21'25 Bid	Mar 21'25 Ask	May 16'25 Bid	May 16'25 Ask
115	22.65	23.30	27.5	28.45	29.80	31.35
125	13.95	14.55	21.00	21.25	24.15	24.40
135	6.4	6.95	14.9	15.35	18.75	19.05
145	2.5	2.55	10.10	10.8	14.25	14.45
155	0.76	0.78	7.2	7.3	10.70	10.90

Nvidia put Option Prices from IBKR (Dec 27, 2024); Stock Price is last traded @ $136.62

Strike Price	Jan 17'25 Bid	Jan 17'25 Ask	Mar 21'25 Bid	Mar 21'25 Ask	May 16'25 Bid	May 16'25 Ask
115	0.56	0.59	4.6	4.7	6.40	6.55
125	1.56	1.58	7.55	7.65	9.85	9.95
135	4.3	4.4	11.65	11.80	14.25	14.50
145	9.85	10.90	17.00	17.15	19.55	20.35
155	17.80	18.5	23.35	23.85	25.75	28.35

Options vs Futures/Forwards

- A futures/forward contract gives the holder the obligation to buy or sell at a certain price
- An option gives the holder the right to buy or sell at a certain price

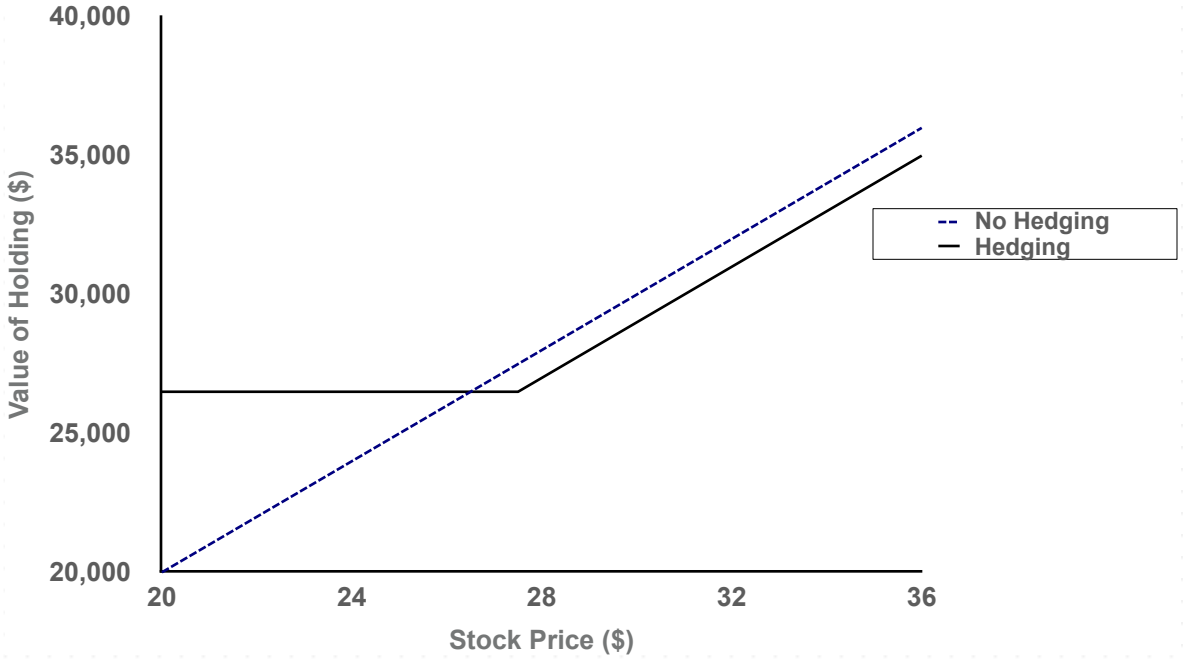
Types of Traders

- Hedgers
- Speculators
- Arbitrageurs

Hedging Examples

- A US company will pay £10 million for imports from Britain in 3 months and decides to hedge using a long position in a forward contract
- An investor owns 1,000 shares currently worth $28 per share. A two-month put with a strike price of $27.50 costs $1. The investor decides to hedge by buying 10 contracts

Value of Shares with and without Hedging



Speculation Example

- An investor with $2,000 to invest feels that a stock price will increase over the next 2 months. The current stock price is $20 and the price of a 2-month call option with a strike of 22.50 is $1
- What are the alternative strategies?

Arbitrage Example

- A stock price is quoted as £100 in London and $120 in New York
- The current exchange rate is 1.2300
- What is the arbitrage opportunity?

Dangers

- Traders can switch from being hedgers to speculators or from being arbitrageurs to speculators
- It is important to set up controls to ensure that trades are using derivatives in for their intended purpose
- What can go wrong: SocGen's big loss in 2008.

Hedge Funds

- Hedge funds are not subject to the same rules as mutual funds and cannot offer their securities publicly.
- Mutual funds must
  - disclose investment policies,
  - make shares redeemable at any time,
  - limit use of leverage
- Hedge funds are not subject to these constraints.
- Hedge funds use complex trading strategies and are big users of derivatives for hedging, speculation and arbitrage

Examples of Hedge Fund Strategies

- Long/Short Equities
- Convertible Arbitrage
- Distressed Securities
- Emerging Markets
- Global Macro
- Merger Arbitrage

Takeaways

- Capital markets overview
- Future and forwards
- Options
- Type of players

Reference

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2. Hull, John. *Options, futures and other derivatives, 11th edition*. Upper Saddle River, NJ: Prentice Hall, 2022.