Introduction to Derivatives

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Introduction to Derivatives
What is a Derivative?

Definition:

- A derivative is a financial instrument whose value depends on **(or is derived from)** the value of an **underlying asset.**

Underlying assets can be:

- Commodities (oil, wheat, gold)
- Financial assets (stocks, bonds, currencies)

- Indices (S&P 500, VIX)
- Interest rates, credit spreads, weather

Where can they be traded:

1. **Exchanges**
   a) CME
   b) CBOE
   c) ICE
   d) MEXDER

2. **Over-the-Counter (OTC)**
   a) Directly between market participants (banks, fin. Institutions, fund managers, companies)

OTC v.s. Exchange-Traded:

OTC	Exchange
Customized contracts	Standarized Contracts
Counterparty risk	Clearinghouses gurantees
Less regulation	Regulated

Introduction to Derivatives
Most simple types…

Forward Contract:

- An agreement to buy or sell an asset at a certain **time in the future** and for a certain **price.**
- This type of derivatives are traded on the OTC market.
- The party that agrees to buy the asset at some point in the future for a pre specified price is said to assume a **long position.**
- The party that agrees to sell the asset at some point in the future for a pre specified price is said to assume a **short position.**

Example:

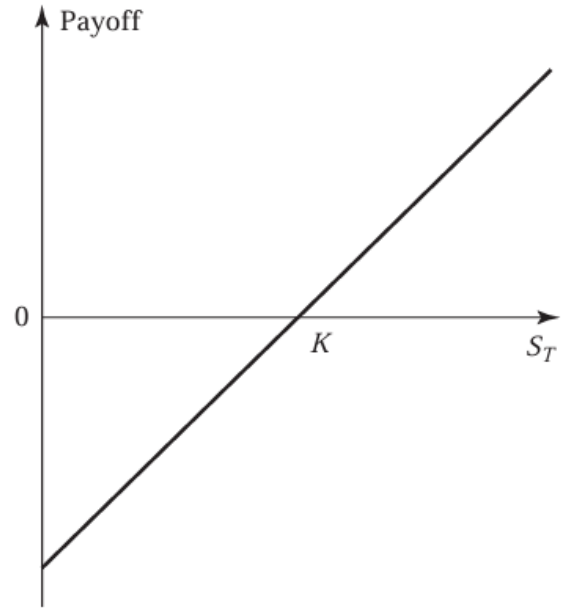
- Today is August 15
- A food company (party A) agrees to buy **1,000 bushels of wheat** from a farmer (party B**) 3 months from now**.
- They both agree a price of **$5 per bushel (forward price)**.
- Three months after, the current price of the bushel at that time is **$6 (spot price)**.
- The farmer delivers 1,000 bushels and receives $5,000 in total from the food company.
- **Who won and who lose money in this situation?**

Introduction to Derivatives
Forward Payoff

Example:

- The buyer saved $1,000 because if it wasn't for the forward contract, he would've pay $6,000 for the entire lot but he only paid $5,000.
- As the price of the wheat would've keep going up, the food company would've saved more and more.
- The difference between the price of the wheat at expiration of the contract S_T, and the agreed price (delivery price) K, represents the **payoff of the forward contract** at that time F_T for the counterparty with the **long position.**
- **Forward Contract Long Position:**
  $F_T = S_T - K$

Payoff Function:



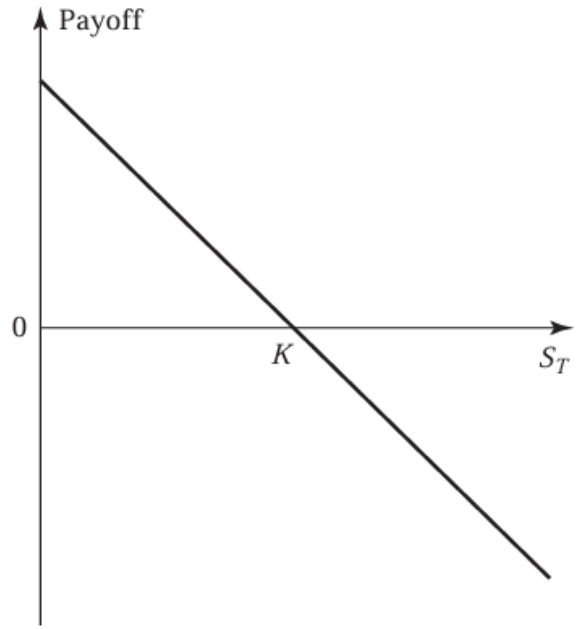
Introduction to Derivatives
Forward Payoff

Example:

- The farmer lost the opportunity of selling at $6 and he instead agreed on selling its product on a lower price, thus losing an extra $1000.
- As the price of the wheat would've keep going up, the farmer would've lost the opportunity of charging more.
- The difference between the agreed price (delivery price) $\boldsymbol{K}$ and the price of the what at expiration of the contract $\boldsymbol{S_T}$ represents the **payoff of the forward contract** at that time $\boldsymbol{F_T}$ for the counterparty with the **short position.**
- **Forward Contract Long Position:**

$$\boldsymbol{F_T = K - S_T}$$

Payoff Function:



Introduction to Derivatives
Most simple types…

Future Contract:

- An agreement to buy or sell an asset at a certain **time in the future** and for a certain **price (**Same economic function as forwards).
- This type of derivatives are traded on **exchanges.** Thus, they are **more standardized contracts in terms of the specifications (asset type, quality, quantity, delivery date, etc.)**.
- There is also party with a **long position** and a party with a **short position.**

Differences against forwards:

- As the two parties to the contract do not necessarily know each other, **the exchange also provides a mechanism that gives the two parties a guarantee that the contract will be honored.**
- It requires additional conditions to enter and hold the contract whether you want to go long or short:

  a) Margin requirements
  b) Daily settlement
  c) Delivery procedures
  d) Bid-Offer Spreads and limits

Introduction to Derivatives
Most simple types…

Options:

- A contract giving the **buyer the right, but not the obligation**, to **buy** or **sell** an asset at a predetermined price **(strike price)** on or before a certain date **(expiration date)**.
- The **seller (writer) has the obligation** to fulfill the contract if the buyer chooses to exercise the option.
- Traded both on exchanges (standardized) and OTC markets (customized).

Types of Options:

1. **Call Option** → Right to **buy** the underlying asset.
2. **Put Option** → Right to **sell** the underlying asset.

Differences from Futures and Forwards:

- Buyer is not obliged to transact (has a choice).
- Involves an **upfront premium** paid by the buyer to the seller.

Introduction to Derivatives
Option example

Prices of Call Options on Alphabet (GOOGL) quoted on May 3, 2016; Stock Price: Bid $695.86 – Ask $696.25

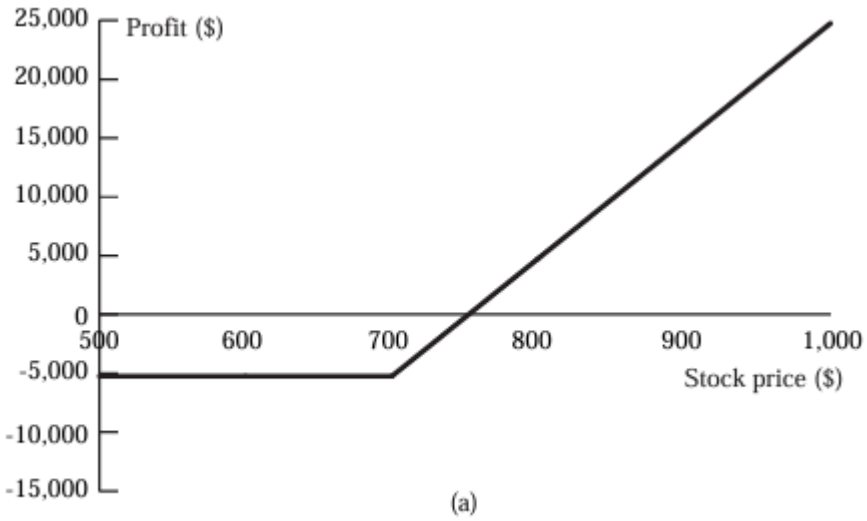
Strike price	*June 2016*		*September 2016*		*December 2016*	
($)	*Bid*	*Offer*	*Bid*	*Offer*	*Bid*	*Offer*
660	43.40	45.10	60.80	62.70	72.70	76.70
680	29.20	30.60	47.70	50.70	60.90	64.70
700	18.30	18.90	37.00	39.20	49.70	52.50
720	9.90	10.50	27.50	29.50	40.10	42.80
740	4.70	5.20	19.80	21.60	31.40	34.40

Expiration Date

Exercise Price (Strike Price)

Option Premium (Price)

Payoff function of 100 Call Options on Alphabet (GOOGL) with expiry on December 2016 at $700 strike



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720	9.90	10.50	27.50	29.50	40.10	42.80
740	4.70	5.20	19.80	21.60	31.40	34.40

Prices of Put Options on Alphabet (GOOGL) quoted on May 3, 2016;
Stock Price: Bid $695.86 – Ask $696.25

Strike price	*June 2016*		*September 2016*		*December 2016*	
($)	*Bid*	*Offer*	*Bid*	*Offer*	*Bid*	*Offer*
660	7.50	8.20	24.20	26.20	35.60	38.10
680	13.30	14.00	31.90	33.80	43.40	46.00
700	21.70	23.00	40.80	42.70	52.40	55.20
720	33.10	34.80	51.10	53.20	62.60	65.20
740	47.70	49.60	63.10	65.20	74.10	76.70

Expiration Date

Exercise Price (Strike Price)

Option Premium (Price)

Introduction to Derivatives
Types of Traders

Type of traders:

- **Hedgers** – Reduce exposure to price fluctuations.
- **Speculators** – Profit from expected price movements.
- **Arbitrageurs** – Exploit price discrepancies.

Key characteristics or objectives:

- **Hedgers:** Risk reduction, not profit maximization.
- **Speculators:** Risk-taking for potential gain.
- **Arbitrageurs:** Risk-free profit opportunities.