UNIT III

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DERIVATIVES MARKET

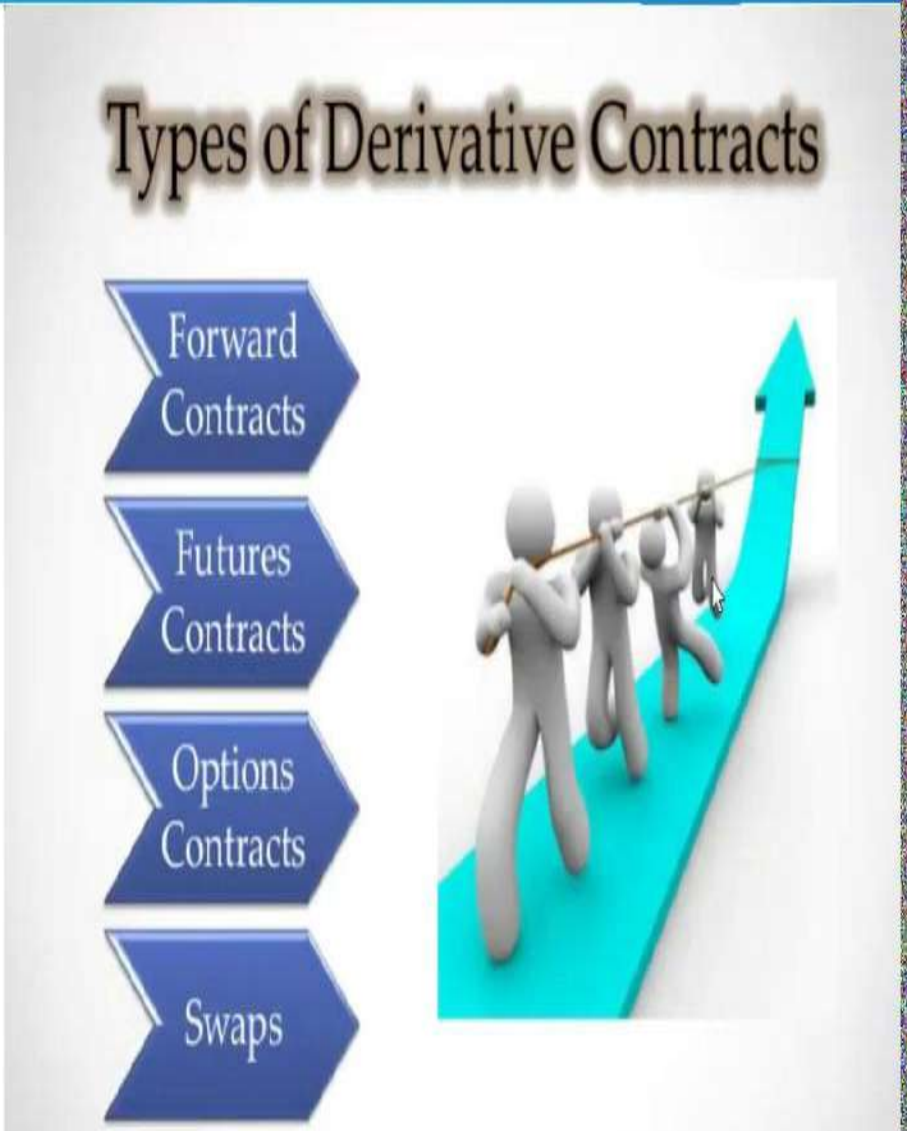
- Derivatives are financial instruments whose *value is derived* from the value of an underlying financial instrument (a treasury bill, a bond or a note) or an individual equity or an equity index or an interest rate or a commodity (e.g.gold)
- Ex: forwards, futures, options, swaps

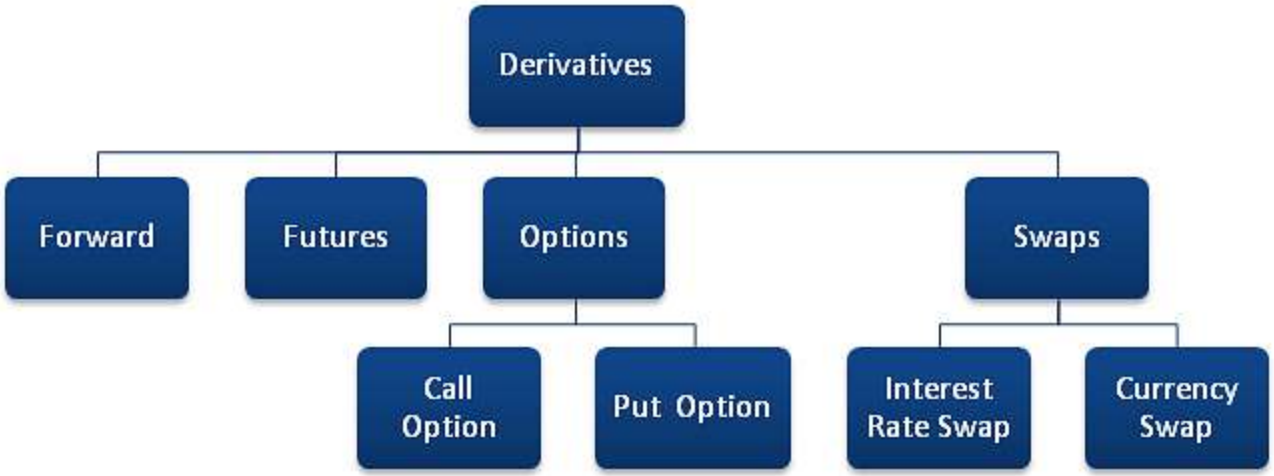
What are Derivatives?

Two parties agree to trade certain goods at a given price on a given date

PRODUCTS IN DERIVATIVE MARKET

- FORWARDS
- FUTURES
- OPTIONS
- SWAPS




Derivatives
Forward
Futures
Options
Swaps
Call Option
Put Option
Interest Rate Swap
Currency Swap

FUNCTIONS OF DERIVATIVES

- The primary function of the derivatives is to transfer price risks associated with fluctuation in assets values. It helps in locking the price.
- The derivative provide three important economic functions.
- →Risk management
- →Price discovery.
- →Transactional efficiency.

PLAYERS IN DERIVATIVE MARKET

1. Hedgers :

- Hedgers seek to protect themselves against price changes in a commodity in which they have an interest.

2. Speculators:

- In any market prices move up and down depending upon the demand for and supply of the goods but in a competitive market it also moves based on the ability of the players to *predict the movements* and their risk appetite. These players are called speculators.
- speculators are prepared to *assume risk in return for quick and large profits.*

3. Arbitrageurs:

- The arbitrageurs look for opportunities for market money out of ***price mismatches*** in two different markets.
- They are specialised in making purchases and sales in different markets at the same time and profits by the difference in prices between the two markets.

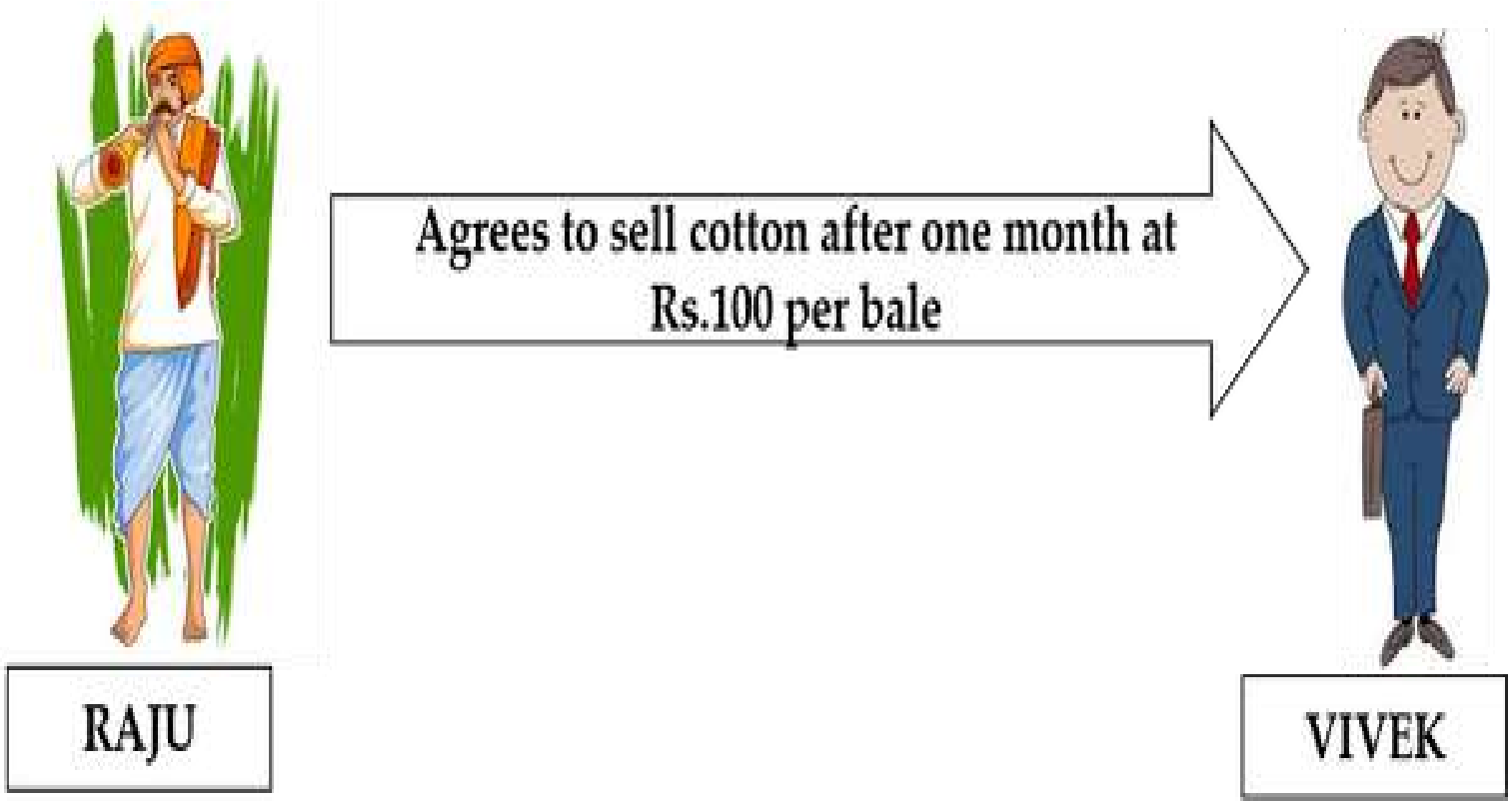
TYPES OF DERIVATIVES

FORWARDS

- A forward contract is an agreement to buy or sell an asset on a specified date for a specified price.
- One of the parties to the contract assumes a long position and agrees to buy the underlying asset on a certain specified future date for a certain specified price.
- The other party assumes a short position and agrees to sell the asset on the same date for the same price, other contract details like delivery date, price and quantity are negotiated bilaterally by the parties to the contract.
- The forward contracts are normally traded outside the exchange.

EXAMPLE

- Raju' is a farmer selling cotton. 'Raju' fears that owing to some reason the price of the cotton will fall after one month from today. Hence, he approaches 'Vivek'.
- 'Raju' enters into a **'forward contract'** with 'Vivek' and fixes the price of the cotton at **Rs.100 per bale**.
- Now, Raju has secured himself through this forward contract.
- This is because even if the price falls below Rs.100 per bale after one month, 'Raju' will still be selling the cotton at Rs.100 per bale.
- Needless to say, Vivek will be under the **obligation to buy** the cotton at Rs.100 per bale even if the price is below Rs.100 after one month.
- This way, Raju can **hedge his risk**.


Agrees to sell cotton after one month at
Rs.100 per bale
RAJU
VIVEK

Two things can happen here:

- If after one month, the price of the cotton falls below Rs.100 to say, Rs.80,
- then ‘Raju’ will be at a profit of Rs.20 as he
- can sell the cotton at Rs.100 per bale which was pre-fixed whereas the market price after one month is only Rs.80.

- But if, after one month the price of cotton instead of falling, actually increases to Rs.150 per bale, in such case, ‘Vivek’ will be at a profit of Rs.50.
- This is because he will be buying the cotton at a pre-fixed price of Rs.100 and now after one month, he can sell it at Rs.150 per bale.

However, there is a twist in the tale. It may happen that:

- When the price falls below Rs.100, 'Vivek' refuses to buy and breaches the contract or
- When the price rises above Rs.100, 'Raju' refuses to sell and breaches the contract.
- These types of risk of non performance of contract arises in a forward trade where the transaction is done ***over-the-counter*** **(OTC)** without involving any middleman.

Hence, *Future* contract is preferred over *Forward* contract.

- Add a middleman (Stock exchange) to regulate the contract, that will how exactly a **'Future contract'** would work in stock market.

The salient features of forward contracts are:

- They are *bilateral* contracts and hence exposed to counter-party risk
- Each contract is *custom designed*, and hence is unique in terms of contract size, expiration date and the asset type and quality.
- The contract price is generally not available in public domain
- On the expiration date, the contract has to be settled by delivery of the asset, or net settlement.
- The forward markets face certain limitations such as:

  → Lack of centralization of trading

  → Illiquidity and

  → *Counterparty risk*

Forward Contract Example

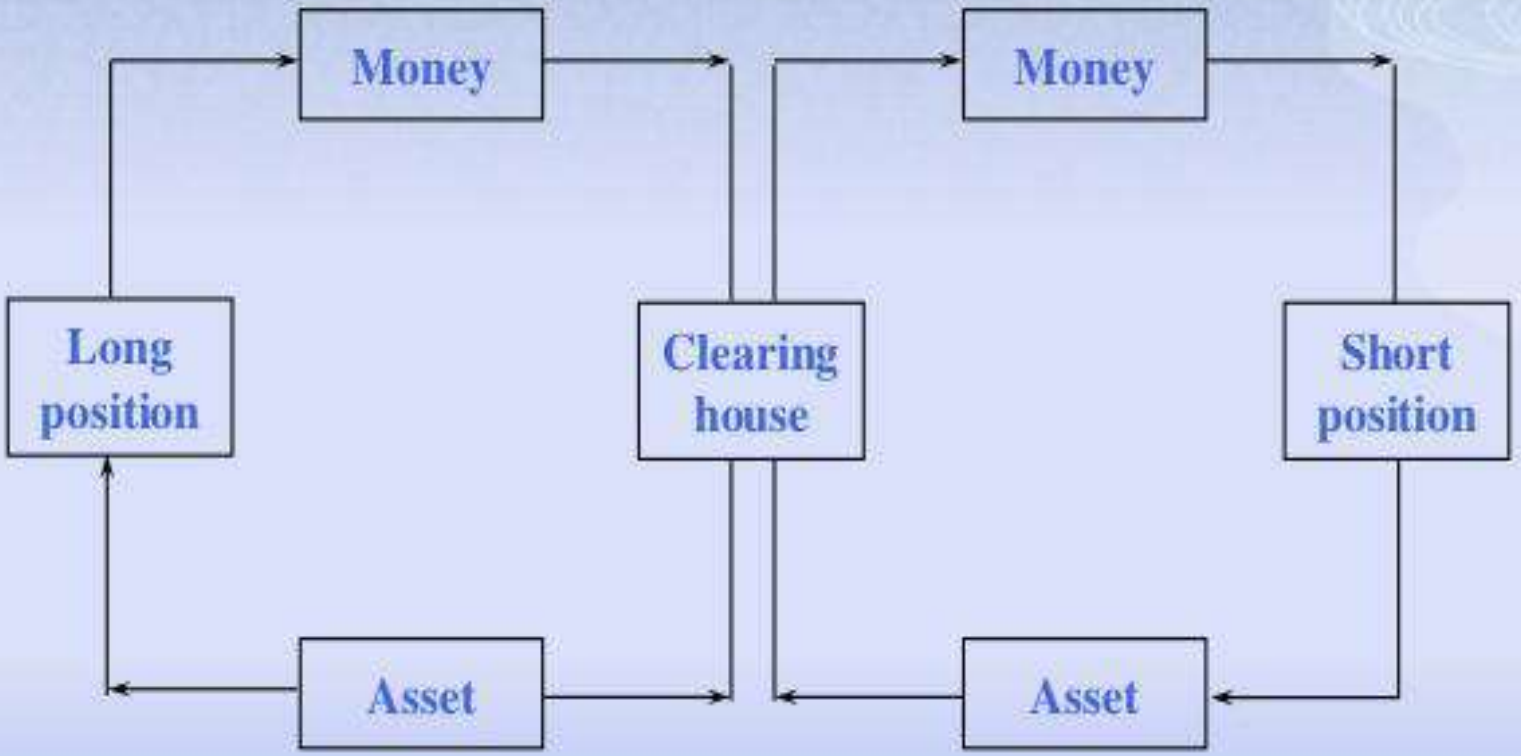
At the starting point,

Then 3 months later…

FUTURES

- Futures contract is a *standardized* transaction taking place on the futures exchange.
- Futures market was designed to solve the problems that exist in forward market.
- A futures contract is an agreement between two parties, to buy or sell an asset at a certain time in the future at a certain price
- Unlike forward contracts, the futures contracts are standardized and *exchange traded*
- To facilitate liquidity in the futures contracts, the exchange specifies certain *standard quantity and quality* of the underlying instrument that can be delivered, and a standard time for such a settlement.

The Role Of The Clearing House



- Futures' exchange has a division or subsidiary called a *clearing house* that performs the specific responsibilities of paying and collecting daily gains and losses as well as **guaranteeing** performance of one party to other.
- A futures' contract can be *offset* prior to maturity by entering into an equal and opposite transaction.
- More than 99% of futures transactions are offset this way.

Offsetting a Futures Contract

- Today: Sell 1 Dec Wheat @ $2.85
  - Obligation to deliver wheat at a CBT approved warehouse in December and will be paid $2.85 (± delivery discounts).
- October 30: Buy 1 Dec Wheat @ $3.00
  - Obligation to accept wheat at a CBT approved warehouse in December and will pay $3.00 (± delivery discounts).
- The two contracts cancel each other, the trader settles the price difference of 15 cents.

- Yet another feature is that in a futures contract gains and losses on each party's position is credited or charged on a daily basis, this process is called *daily settlement or marking to market*.
- Any person entering into a futures contract assumes a long or short position, by a small amount to the clearing house called the ***margin money***.

The standardized items in a futures contract are:

- **Quantity** of the underlying
- **Quality** of the underlying
- The date and month of delivery
- The units of price quotation and minimum price change
- Location of settlement

Mechanics of Futures Trading

Opening Position

- When an investor takes a position in the market by buying a futures contract, the investor is said to be in a ***long position or to be long futures.***
- If, instead, the investor's opening position is the sale of a futures contract, the investor is said to be in ***a short position or short futures.***

LIQUIDATION

- A party to a futures contract has two choices on liquidation of the position.
- First, the position can be liquidated prior to the settlement date.
- The alternative is to wait **until the settlement** date.
- For some futures contracts, settlement is made in cash only.
- Such contracts are referred to as ***cash-settled*** contracts.

Mechanics of Futures Trading (cont'd)

Role of the Clearinghouse

- Associated with every futures exchange is a clearinghouse.
- A futures contract is an agreement between a party and a clearinghouse associated with an exchange.
- The clearinghouse makes it simple for parties to a futures contract to unwind their positions prior to the settlement date.
- When an investor takes a position in the futures market, the clearinghouse takes the opposite position and agrees to satisfy the terms set forth in the contract.
- Because of the clearinghouse, the investor need not worry about the ***financial strength*** and ***integrity of the party taking the opposite side of the contract.***
- Besides its guarantee function, the clearinghouse makes it simple for parties to a futures contract to unwind their positions prior to the settlement date.

Futures Terminology

Marking-to-market:

In the futures market, at the end of each trading day, the margin account is adjusted to reflect the investor's gain or loss depending upon the futures closing price. This is called marking-to-market.

Mechanics of Futures Trading-Margins

Initial Margin

Definition

Initial Margin is the *initial deposit* you make to your broker when you open a new futures position whether long or short.

Introduction

- Initial margin, also known as Futures Requirement, Original Margin or Initial Margin Level (IML).
- Initial margin is the first of three margins and is actually nothing more than a deposit one gives to the broker when one open any futures positions.

Purpose of Initial Margin

- Initial Margin serves as the starting point for new futures positions from which profits will be added on to and losses deducted from.
- In fact, the initial margin is a ***kind of guarantee*** that you have the money to pay for your losses should losses occur right the very first day the futures position is put on.

How is Initial Margin Determined?

- Initial margin is calculated as a ***percentage of the full contract value.***
- The main purpose of Initial Margin is to make sure that one have enough cash to cover losses incurred due to a large single day move.
- As such, initial margin requirement is generally determined based on ***the volatility of the asset*** being covered.
- The more volatile the underlying asset is, the higher the margin requirement would be.

Maintenance Margin

- Maintenance Margin is the minimum amount of cash one need to have in the futures trading account in order to remain in a futures position.
- If cash balance, or Margin Balance, falls below this level, one would receive the ***"Margin Call"***,
- which is a notification from the broker to top up the margin balance with cash ***back up to its initial margin level.***

Purpose of Maintenance Margin

The purpose of maintenance margin is really the clearinghouse's way of limiting their risk exposure to non-performing futures contracts.

- One of the reasons why futures traders can trade futures with confidence is that performance of each futures contract is guaranteed by the clearinghouse.
- Now, in order to make good such a guarantee, clearinghouses need a way of limiting their risk exposure as well and the whole margin system in futures trading is the answer.

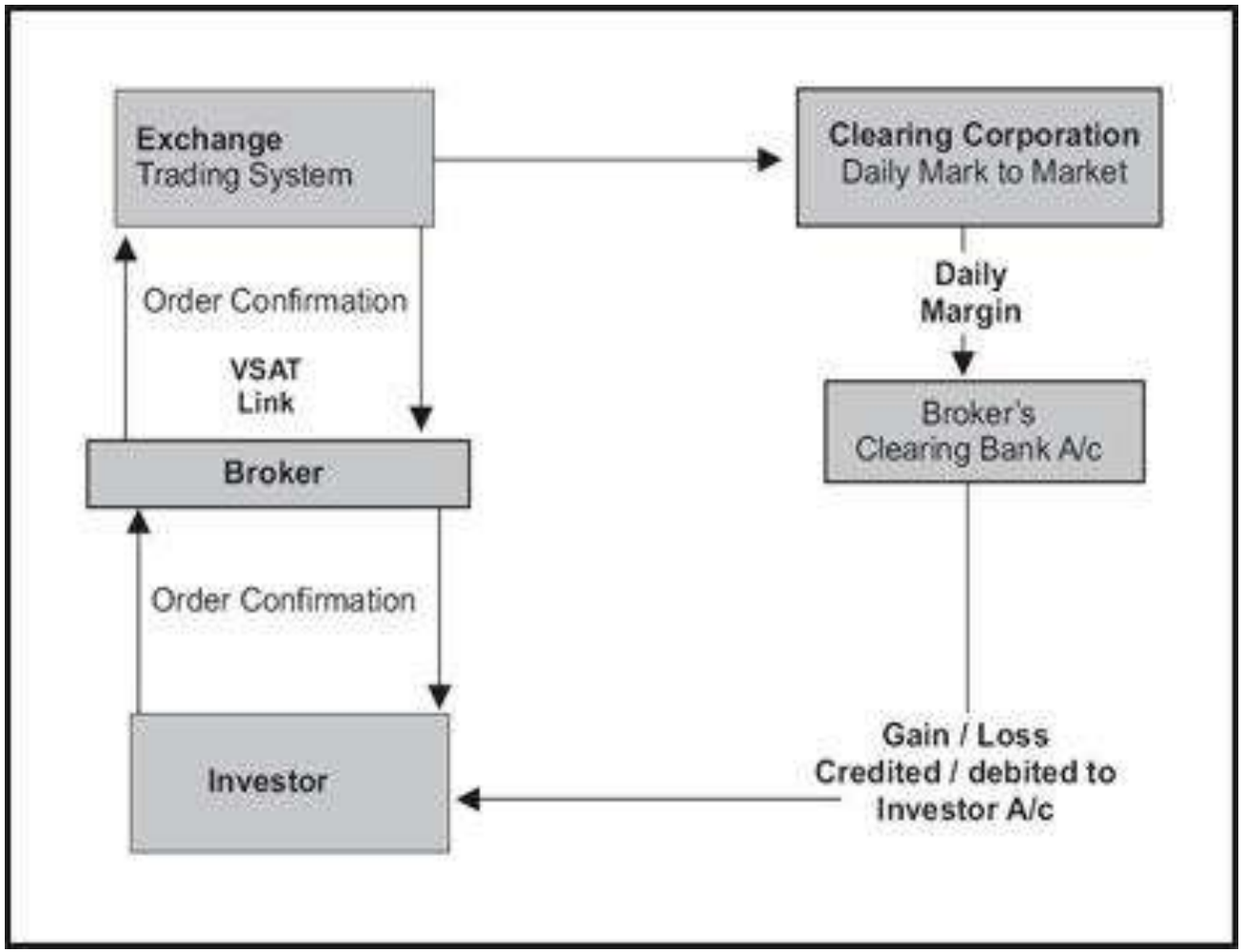
- By having futures traders deposit an initial margin when opening a new futures position, the clearinghouse is guaranteed that there are cash available so that losses for the day can be deducted against.
- Once this margin balance drops to a low level, the risk of that cash running out and the trader going into default on the next loss increases.
- As such, futures traders would be required to top up cash to their margin account once that low level is reached and this low level is the Maintenance Margin level.

Variation Margin

Definition

- Variation Margin is additional amount of deposit one need to make to the trading account in order to maintain sufficient money for loss deduction after significant losses have taken place.

- Variation margin is simply an amount of money needed to bring your margin balance back up to the **initial margin level** (not maintenance margin level) after sufficient losses have brought it below the required Maintenance margin level.
- Variation margin in futures trading is simply topping up your futures account with more cash so that future losses can be deducted from.


Exchange
Trading System
Clearing Corporation
Daily Mark to Market
Order Confirmation
VSAT
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Broker
Order Confirmation
Investor
Gain / Loss
Credited / debited to
Investor A/c

Guar seed Contract specifications
(Applicable for contracts expiring in June 2013 and thereafter)

(Updated on 13 May 2013)

Type of Contract	Futures Contract
Name of Commodity	Guar Seed
Ticker symbol	**GUARSEED**
Trading System	NCDEX Trading System
Basis	Ex- warehouse Jodhpur, inclusive of Sales Tax/VAT
Unit of trading	1 MT
Delivery unit	1 MT
Initial Margin	**10%**
Maximum Order Size	500 MT
Quotation/base value	Rs per Quintal
Tick size	Rs 10
Quality specification	Whitish: 98 % basis Foreign Matter: 0.5% basis Damaged seed: 0.5% basis Moisture: 8 % basis
Quantity variation	+/- 2%
Delivery center	Jodhpur (up to the radius of 50 Km from the municipal limits)
Additional delivery centres	Bikaner, Nokha, Barmer, **Sriganganagar, Adampur** and Deesa (up to the radius of 50 Km from the municipal limits) with location wise premium/discount as announced by the Exchange from time to time.
Trading hours	As per directions of the Forward Markets Commission from time to time, currently - Mondays through Fridays - 10:00 a.m. to 05:00 p.m. Saturdays - 10.00 a.m. to 2.00 p.m. The Exchange may vary the above timing with due notice
Delivery Logic	Compulsory delivery
No. of active contracts	As per launch calendar

Marking to Market, Example.

- The entire daily resettlement process is illustrated with the following example.
- On November 6, 2001, you sell one gold futures contract for delivery in December 2001.
- You sell the contract at 10 AM, when the futures price is $285/oz.
- The initial margin requirement is $1000, and that sum of money is transferred from your cash account to your margin account.
- The settlement price at the close on November 6 is $286.40/oz.
- Your account is marked to market, and your equity at the close is $860.
- The futures price rose by $1.40/oz, and one contract covers 100 oz of gold; therefore, you have lost $140 on the short position.

Marking to Market, Table.

On all subsequent days, the account is **marked to market**. If the futures price falls, your equity rises. If the futures price rises, your equity declines. Maintenance margin calls will have to be met if your account equity falls to a level equal to or below $750.

Date	Gold Price	Cash Flow	Begin. Equity	Maint. Margin Call	Ending Equity
11/6	285.00		1000		
11/6 (end)	286.40	(140)	860	0	860
11/7	288.80	(240)	620	380	1000
11/10	289.00	(20)	980	0	980
11/11	288.60	40	1020	0	1020
11/12	290.70	(210)	810	0	810
11/13	292.80	(210)	600	400	1000
11/14	292.80	0	1000	0	1000

The future contract was entered on 12th Aug.

- One Contract (Lot Size) – 100 Shares
- Initial Margin -10%
- Maintenance Margin 90% of Initial Margin.
- An investor wants to buy two contracts of the company in futures market. Prepare the investors Margin A/C with a
  - Long Position(two contracts)
  - Short Position(two contracts)

Date	Future Price
Aug 12th	300
Aug 13th	301
Aug 14th	303
Aug 17th	303
Aug 18th	300
Aug 19th	297
Aug 20th	296

Working Notes

- Value of contract = (100units x 2Contracts) x 300Rs = **60,000Rs** → value of futures contract
- IM = 10% of 60,000 = 6000 rupees
- MM = 90% of 6000 = 5400 rupees
- Margin Call = 6000 – 5200 = 800 rupees → Variation Margin

Margin A/C (Long Position)

Profits →Prices Increases

Losses → Prices Decreases

Date	FuturePrice	Opening Balance	Mark to Market		Closing Balance
			Profit/Loss	Margin Call	
Aug 12th	300	6000	-	-	6000
Aug 13th	301	6000	200		6200
Aug 14th	303	6200	400		6600
Aug 17th	303	6600	-		6600
Aug 18th	300	6600	(600)		6000
Aug 19th	297	6000	(600)		5400
Aug 20th	296	5400	(200)	800	6000

Margin A/C (Short Position)

Profits →Prices Decreases

Losses → Prices Increases

Date	Future Price	Opening Balance	Mark to Market		Closing Balance
			Profit/Loss	Margin Call	
Aug 12th	300	6000			6000
Aug 13th	301	6000	(200)		5800
Aug 14th	303	5800	(400)		5400
Aug 17th	303	5400	-	-	5400
Aug 18th	300	5400	600		6000
Aug 19th	297	6000	600		6600
Aug 20th	296	6600	200		6800

- The settlement price of sensex future contract on a particular day was **4600** rupees. The initial margin is at 10,000 while maintenance margin fixed at 8000 rupees. Multiple of each contract is 50. The settlement price following four days are as follows:

Day	Settlement Price
1	4700
2	4500
3	4650
4	4750
5	4700

Working Notes

- Initial Margin = 10,000
- Maintenance Margin = 8000
- No. of Contracts= one contract
- Lot size = 50 shares
- Total no of units = 50 units
- Settlement price = 4600 rupees

Margin A/C (Short Position)

Profits →Prices Decreases

Losses → Prices Increases

Date	Future Price	Opening Balance	Mark to Market		Closing Balance
			Profit/Loss	Margin Call	
1	4700				
2	4500				
3	4650				
4	4750				
5	4700				
1	4700				
2	4500				

Margin A/C (Long Position)

Profits →Prices Increases

Losses → Prices Decreases

Date	Settlement Price	Opening Balance	Mark to Market		Closing Balance
			Profit/Loss	Margin Call	
1	4700				
2	4500				
3	4650				
4	4750				
5	4700				
1	4700				
2	4500				

Key Terms for Forward/Futures Contracts

Futures price: agreed-upon price (similar to strike price in option markets).

Positions

Long position - agree to buy.

Short position - agree to sell.

Interpretation

Long : believe price will rise.

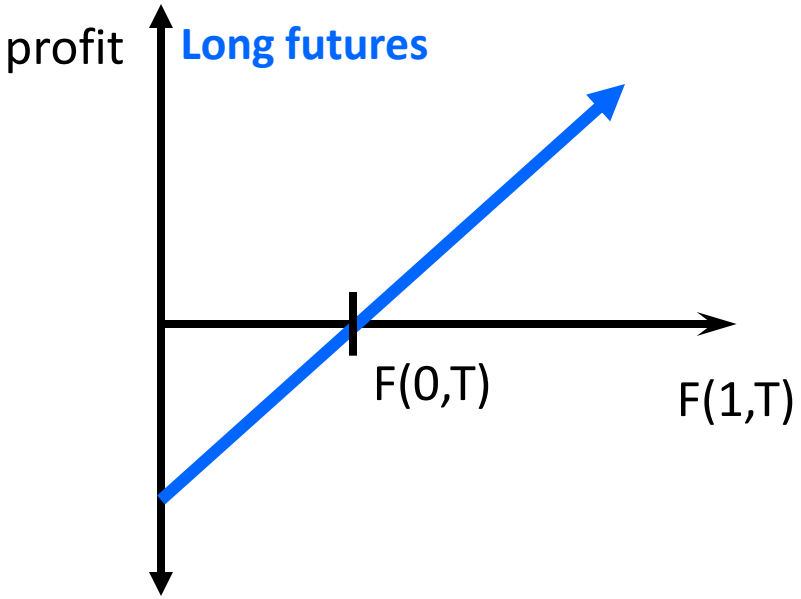
Short : believe price will fall.

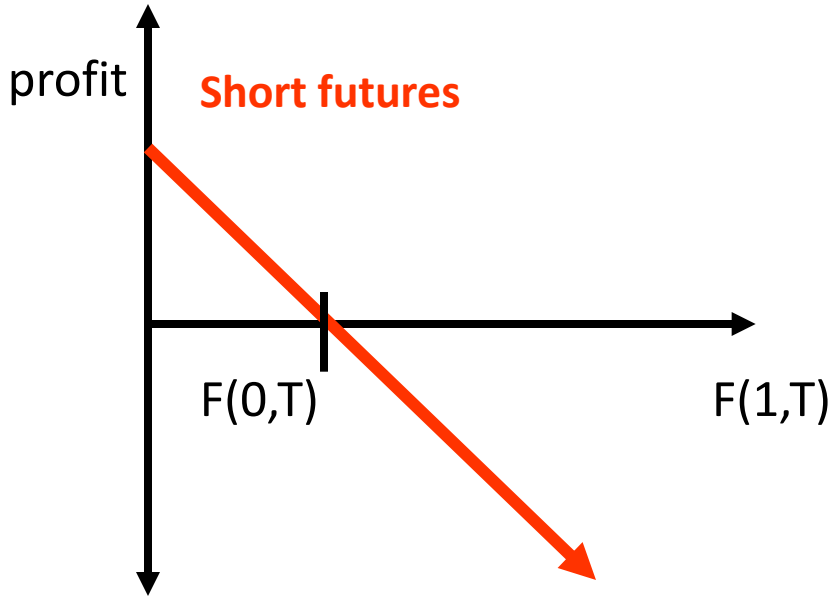
Profits on positions at maturity (zero-sum game)

Long = spot price S_T minus futures price F_0.

Short = futures price F_0 minus spot price S_T.

Futures Contracts
Payoff Profiles





The long profits if the next day's futures price, F(1,T), exceeds the original futures price, F(0,T).

The short profits if the next day's futures price, F(1,T), is below the original futures price, F(0,T).

Consumption vs Investment Assets

- Investment assets are assets held by significant numbers of people purely for investment purposes (Examples: gold, silver)
- Consumption assets are assets held primarily for consumption (Examples: copper, oil)

Notation for Valuing Futures and Forward Contracts

S_0: Spot price today

F_0: Futures or forward price today

T: Time until delivery date

r: Risk-free interest rate for maturity T

The Forward Price

If the spot price of an investment asset is S_0 and the futures price for a contract deliverable in T years is F_0, then

$$F_0 = S_0 e^{rT}$$

where r is the T-year risk-free rate of interest.

In our examples, S_0 =40, T=0.25, and r=0.05 so that

$$F_0 = 40e^{0.05\times0.25} = 40.50$$

When an Investment Asset Provides a Known Income (page 113, equation 5.2)

$$F_0 = (S_0 - I)e^{rT}$$

where I is the present value of the income during life of forward contract

When an Investment Asset Provides a Known Yield (Page 115, equation 5.3)

$$F_0 = S_0 e^{(r-q)T}$$

where q is the average yield during the life of the contract (expressed with continuous compounding)

- **Futures price = (Spot price * (1 + *r*)^*t*) + (net cost of carry)**

- The above formula consists of:
- **Futures price** = the agreed futures price at which the transaction will take place at the future date
- **Spot price** = the current market price for the commodity
- ***r*** = the risk-free rate of return
- ***t*** = time to maturity of the contract (the future date on which the transaction is to take place)
- ***net cost of carry*** = the cost incurred to hold the commodity until the maturity date, less any benefit from holding the commodity during that period

- The value of a futures position at maturity is the difference between the delivery price K*K* and the underlying price S_T*ST* at the time of maturity:
- For a long position, the payoff is S_T - K*ST*−*K*, and it will benefit from a higher underlying price.
- For a short position, the payoff is K - S_T*K*−*ST*, and it will benefit from a lower underlying price