



IIT ROORKEE



NPTEL ONLINE
CERTIFICATION COURSE

QUANTITATIVE INVESTMENT MANAGEMENT

LECTURE 52

Futures – 2

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ISSUE OF DEFAULT RISK

- Forwards are private contracts.
- Creditworthiness assessed by participating parties.
- As a consequence, parties are explicitly aware of and accept default risk of counterparty.
- **In futures, due to trading, legs may get transferred to third parties without consent of earlier parties.**
- Therefore, if trading is to be uninhibited, this risk element must be eliminated.
- This risk is eliminated by the exchange clearing house guaranteeing contract performance.

THE ROLE OF THE CLEARING HOUSE

- A clearing house acts as an intermediary in futures transactions.
- It guarantees the performance of the parties to each transaction.
- Clearing house keeps track of all the transactions that take place during a day, so that it can calculate the net position of each of its members.
- Brokers who are not members themselves must channel their business through a member.



RISK MANAGEMENT BY FUTURES EXCHANGES

- Since clearing house guarantees performance of futures, it needs to protect itself against loss.
- **Marking to market.**
- **Margining system.**



MARKING TO MARKET



HOW FUTURES WORK

- Let a long futures be taken at day 0 at price F_0 .
- Let settlement on day 0 be at F_0^* .
- Then, transfer to margin account on day 0 = $F_0^* - F_0$
- Let settlement on day 1 be at F_1 .
- Then, margin transfer on day 1 = $F_1 - F_0^*$.
- Similarly, margin transfer on day $(T-1)$ = $F_{T-1} - F_{T-2}$
- Margin transfer on day T = $F_T - F_{T-1}$
- Total transfer to margin = $F_T - F_0$
- But $F_T = S_T$ (by no arbitrage considerations)
- Hence, aggregate margin transfers = $S_T - F_0$
- Cost of buying the asset from the market at time T = $-S_T$
- Effective cost = $-S_T + S_T - F_0 = -F_0$
- = Forward price at $t=0$.

MARKING TO MARKET

- All futures contracts **of a given type** are scaled to the settlement price on settlement at the end of each day. Hence, this mechanism is termed as **MTM**.
- The difference in price is carried to the margin accounts of respective parties holding long & short positions in the contract.



- **At the end of each trading day, the margin account is adjusted to reflect the investor's gain or loss for the day.**
- **A trade is first settled at the close of the day on which it takes place. It is then settled at the close of trading on each subsequent day.**



IMPLICATIONS OF MTM

- Defaults are detected within one day of the occurrence of default.
- Defaults are restricted to one day's price fluctuations.
- Hence, the motivation to default is much less.



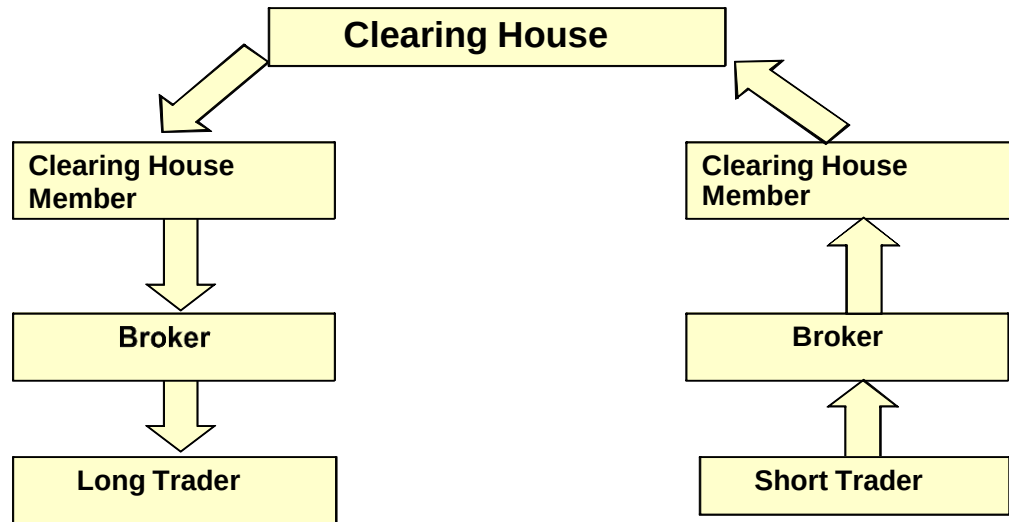
- **Possibility of loss due to this one day default is well covered by margin requirements.**
- **In forwards default could result in the cumulative impact of price changes over the entire life of the contract as there is only one cash flow (which occurs at contract maturity).**

MARGINING SYSTEM

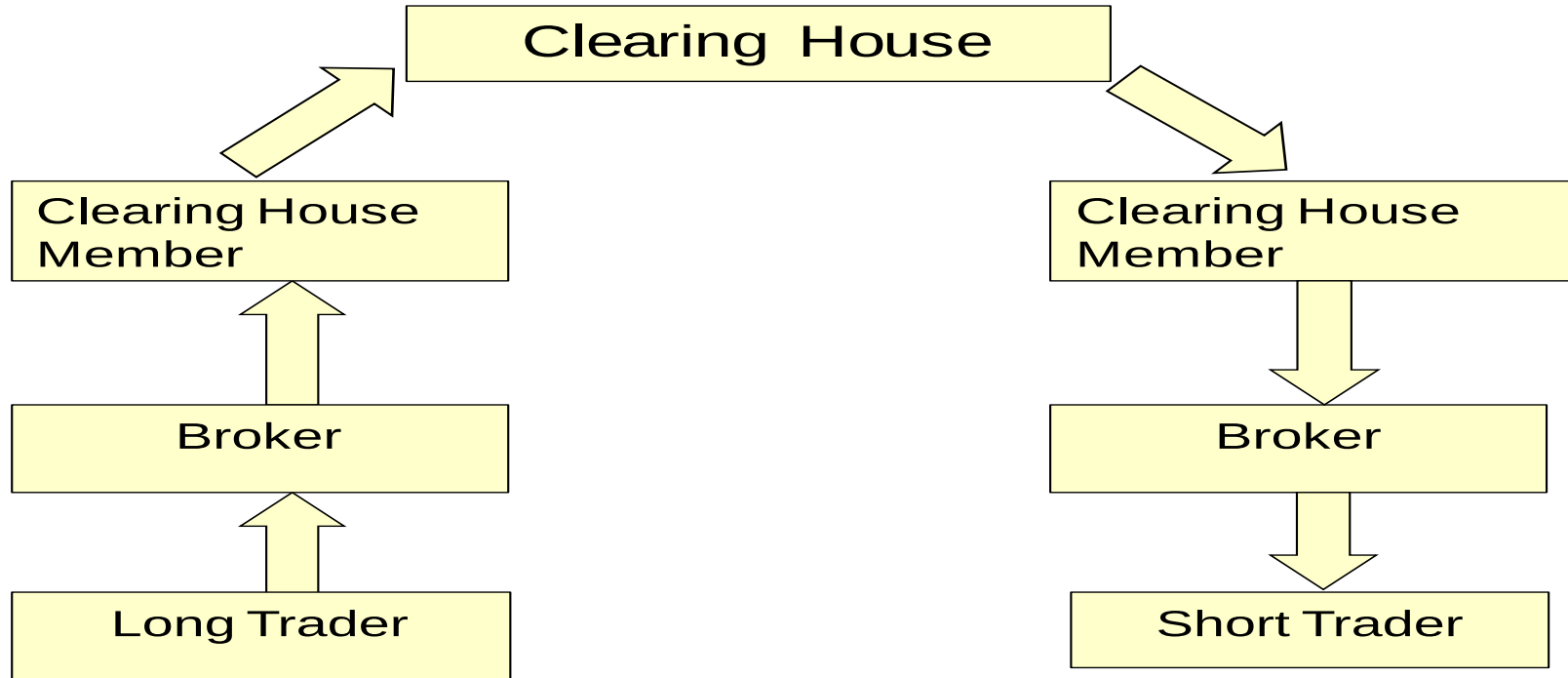
- INVESTOR/TRADING MARGIN
- BROKER MARGIN
- CLEARING MARGIN
- INITIAL MARGIN
- MAINTENANCE MATRGIN



MARGIN CASH FLOWS WHEN FUTURES PRICE INCREASES



MARGIN CASH FLOWS WHEN FUTURES PRICE DECREASES



IMPLICATIONS OF MARGINING+MARKING TO MARKET

- **Default restricted to one day price movements.**
- **Extreme cases of default covered by margins.**
- **Leverage.**



EXAMPLE 1

- On May 8, you took a long position in one June IMM CHF contract at an opening price of \$0.6350. The initial margin was \$1,500 and the maintenance margin was \$1,200. The settlement prices for May 8,9,10 were \$0.6280, \$0.6355, \$0.6335. On May 11 you closed out the position at \$0.6365. Compute the cash flows on your account assuming that the opening balance was \$1,500 and there were no cash additions or withdrawals other than gains and losses from your futures position and any additional variation margin. The contract multiple is CHF 125,000 per contract.

Day	Trade Price (\$)	Settle Price (\$)	Daily Gain (\$)	Cumul. Gain (\$)	Margin Balance (\$)	Margin Call (\$)
1	0.6350				1500	
1		0.6280	-875	- 875	625	875
2		0.6355	937.50	62.50	2437.50	
.....		0.6335	-250	-187.50	2187.50	
6	0.6365		375	187.50	2562.5	



EXAMPLE 2

- Suppose that you enter into a short futures contract to sell July silver for \$17.20 per ounce. The size of the contract is 5,000 ounces. The initial margin is \$4,000, and the maintenance margin is \$3,000.
- What change in the futures price will lead to a margin call?



SOLUTION

- Size of contract: 5,000 oz; Futures price: \$ 17.20
- Initial margin: \$ 4,000; Maintenance margin: \$ 3,000
- Thus, margin call will occur when \$ 1,000 is wiped off from the margin.
- Since this is a **SHORT** position, the loss will occur when the futures price increases.
- Thus, price increase to induce a margin call $1,000/5,000=0.20$ i.e. a price of \$ 17.40.

EXAMPLE 4

- At the end of one day a clearing house member is long 100 contracts, and the settlement price is \$50,000 per contract. The initial margin is \$2,000 per contract. On the following day the member becomes responsible for clearing an additional 20 long contracts, entered into at a price of \$51,000 per contract. The settlement price at the end of this day is \$50,200. How much does the member have to add to its margin account with the exchange clearing house?



- **Margin credited on original holding:**
- **$100 \times (50,200 - 50,000) = 20,000$**
- **Margin required on new contracts:**
- **$20 \times 2,000 = 40,000$**
- **Loss debited in margin on new contracts:**
- **$20 \times (50,200 - 51,000) = 16,000$**
- **Additional net margin to be posted: 36,000**



MARGINING, LEVERAGE & RISK

- Let us assume that you invest in 100 units of stock at S_0 at $t=0$. your investment is $100 S_0$. This amount you borrow at $r\%$.
- Let the price of stock rise to S_0+1 at $t=1$.
- Your profit is $=100-100rS_0$
- Let us, now assume that you long futures with margin @10% with the same investment i.e. $100 S_0$. You can long futures on 1000 units of stock at $S_0(1+r)$ approx.
- Thus, for the same price change you make a profit of $1000[(S_0+1)-S_0(1+r)]-100rS_0=1000-1100rS_0$



A BRIEF RECAP: KEY TAKEAWAYS SO FAR

- Theoretical Forward Prices $F(0,T)=S(0)\exp(rT)$
- Forwards are private contracts, futures are exchange traded.
- Futures carry no default risk, performance guaranteed by clearing house.
- Clearing house protects itself against loss due to default by **marking to market & margining.**

- Due to MTM, maximum loss due to default restricted to one day's price change.
- Incidence of MTM default detected on very next day.
- This default risk also covered by adequate margins.