Security Analysis and Portfolio Management
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Lecture 59
Financial Derivatives-II

Welcome back. So, let us continue from where we left off. In the last lecture towards the end I was discussing the concept of no arbitrage forward price and that is where we take up, we recap what we did last time with respect to this topic.

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We start with the simplest case where there is no income from the underlying asset during the remaining life of the forward contract, no carrying costs also are involved in holding us in a position in the underlying asset and no transaction, transaction costs or market frictions like bid ask spread lending boring spread or commissions etcetera. So, this is the simplistic picture that we are looking at and on this basis, we arrive at a no arbitrage forward price.

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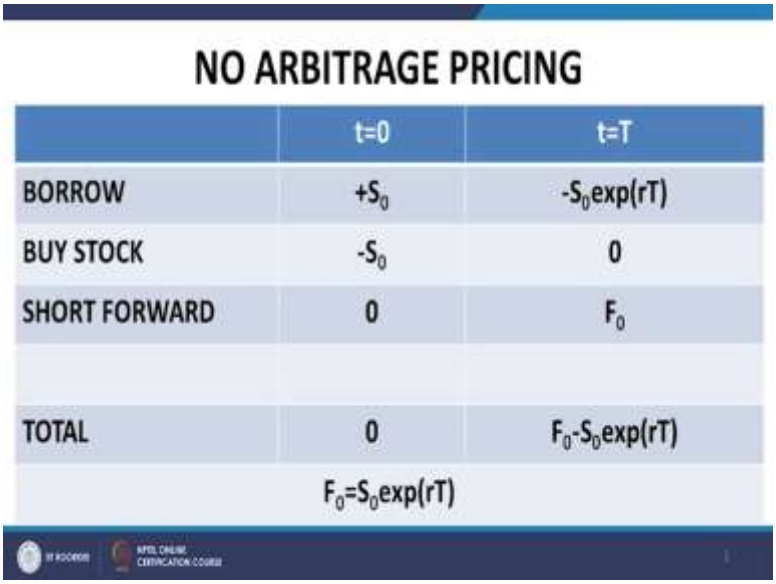

We considered the portfolio or the set of transactions which are represented on this slide, we borrowed a certain amount of money at the risk-free rate from a financier a bank or a financial institution or some other lender. A sum of amount equal to the spot price of the underlying asset the current price of the underlying asset that is represented by S0. We use this borrowing to buy one unit of the underlying asset and keep it with us and against this holding of the underlying ethic we write a forward contract or we take a short position in a forward contract.

Now, as you know the short position in a forward contract envisages the delivery of the underlying asset. So, what will happen at maturity, let us trace the cash flow that maturity at the, at maturity because you are short in the contract you will deliver the underlying asset you already have it in your possession.

Sure, you need not buy it from the market, you use the asset that you have already bought a t equal to 0 at the beginning of the relevant period and you use it for satisfying your obligation under the forward contract. So, against that the party was long in the forward contract will pay you the forward price which was agreed upon at t equal to 0 and which is F0.

So, the cash flows in relation to the forward contract will be number 1, the forward price that you receive and number 2 of course, it would be the delivery of the underlying asset which you already have in your possession. However, the other cash flow that will take place is the repayment of the borrowing that you have taken at t equal to 0 together with interest their own. So, assuming continuous compounding the total amount that is to be repaid is equal to S0 exponential rT.

So, in other words, the net cash flow activity equal to capital T that is the majority of the forward contract is equal to F0 minus S0 exponential rT. Now, let us look at where the concept of arbitrage comes into play. We see from this slide at, that at a t equal to 0, there is no net cash flow, there is no net cash flow. And furthermore, we are making the assumption that the forward contract is default free, we are not accounting for the possibility of default on the forward contract.

If that is the case, and we are also boring at the risk-free rate. So, if that is the case, there is no incremental risk involved in this portfolio or involved in this set of transactions that we are undertaking. So, that being the case, we have two situations, we have two characteristics. Number 1, you have no cash outflow at t equal to 0 and there is no incremental risk. Hence, by the principle of no arbitrage the cash flow at t equal to capital T that is when the majority of the forward contract must also necessarily be 0. So that being the case, we get F0 is equal to S0 exponential rT.

So, this is the simple no arbitrage forward price. In this in this scenario where there are no anticipated inflows during the holding of the forward contract or during the remaining term of the forward contract and no anticipated carrying costs as well as well as no free market frictions.

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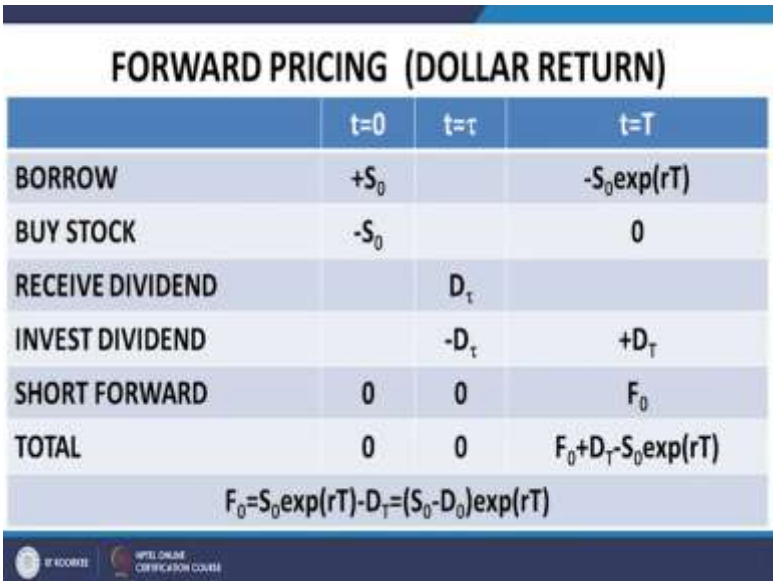

Now, we relax these assumptions a little bit, we assume that at t equal to 0 when we enter into the forward contract, when we take a position in the forward contract, we expect the underlying asset to yield or to realize a certain amount of dividend at a point in between or during the remaining life of the forward contract.

Let me repeat, we now relax the assumption, one of the assumptions and we assume that during the remaining life of the forward contract, a certain amount of cash inflow will take place for example, on account of dividends. Let us see how this alters a situation, we again borrow an amount equal to as not and we use this amount to buy one unit of the underlying asset.

So, and so far as these two transactions are concerned, it is the same as earlier, we also take a short position in a forward contract as the forward price that prevails at t equal to 0 that is F0. So, now, at some point in between t equal to 0 and the maturity of the forward contract that is t equal to capital T, let us say t equal to tau there occurs a cash inflow, there is anticipated a cash inflow on account of dividend will often amount let us call it D tau.

Now, we invest this amount as soon, as and when we receive this amount, we invest this amount at the risk-free rate and this investment will give us an amount equal to D capital T on the date of maturity of the forward contract. So, the next situation is as depicted on this diagram at, and depicted on this table, at t equal to 0 there is no net cash flow at t equal to tau again there is no net cash flow because the amount that you have received as dividend you have immediately reinvested at the risk-free rate.

And the net cash flow at t equal to capital T that is on maturity is equal to F0 plus DT minus S0 exponential rT. Now, following the same reasoning that I expanded in the earlier case. When we are talking about the previous pricing scenario, that because, we are assuming the forward contracts to be default free and we are borrowing and investing at the risk-free rates, there is no incremental risk involved on the, in this operation, and as a result of which the net cash flow on maturity has to be 0 because, there is no net cash flow at t equal to 0 or at any intermediate for t equal to tau.

Now, that being the case the net cash flow at maturity must also be 0, which gives us that F0 is equal to S0 exponential rT minus DT. And if we take D0 as the present value of DT at the risk-free rate, then we can represent this expression as F0 is equal to S0 minus D0 in brackets exponential rT.

So, in other words, the effective cost in this case of holding the asset has reduced from S0 to S0 minus D0 because the very fact or the mere fact of holding the asset with us, holding the underlying asset with us is entitled, entitling us to a cash inflow of T0 at, or a cash inflow having a present value of D0 and therefore, the net cost that is involved in holding the asset comes down by that amount.

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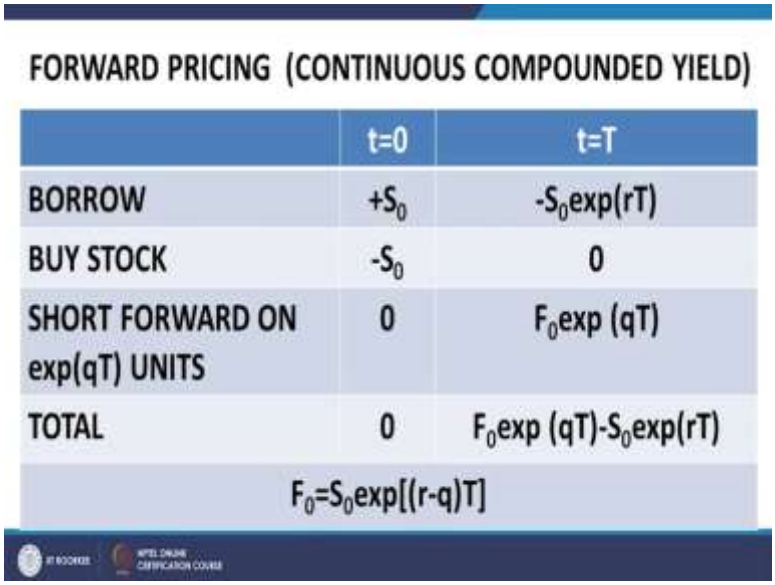

Let us now look at a slightly modified situation where instead of having an absolute amount as a cash inflow, we are getting a yield, a continuously compounding yield on holding the asset. In other words, in this situation, the mere fact of holding the asset entitled us to, entitles us to a continuously compounded yield.

So, in that case, in this case here we again, we borrow an amount S0 and we use that amount to buy one unit of the underlying asset. But, in this case, because the asset is yielding at the rate q per unit time or the asset is having a continuously compounded yield q per unit time. So, one unit of the asset will grow to e to the power qT units of the asset at the point of time of maturity of the forward contract.

Therefore, when we write a short position in the forward contract, it has to be written not on one unit of the underlying asset, but on e to the power qT units of the underlying asset. Let me repeat, we write a short forward position or we take a short forward position not on one unit of the underlying asset, but on e to the power qT units of the underlying asset.

So, that being the case the realization or the cash inflow that will arise on account of the short position on the, in the forward contract will be equal to F0 exponential qT. F0 is the forward price per unit of the asset we have a contract on e to the power qT units of the underlying asset. So, the realization will be F0 e to the power qT and against my short position what I will do is I will deliver e to the power q units of the underlying asset which has been accumulated by keeping or by taking a position of one unit of the underlying asset at t equal to 0.

One unit of the underlying asset has grown to e power qT units of the underlying asset. And what is the amount that I have to repay to the to the bank or the financial institution that is S0 e to the power rT, where r is the risk-free rate. So again, using the arguments of no arbitrage because you calculate t equal to 0 is 0 because there is no incremental risk on the premise that the forward contract is default free, we end up with a situation where F0 is equal to S0 exponential r minus q into T.

And this was a situation where we had cash inflows during the remaining life of the forward contracts, there could be a situation where instead of cash inflows, there occur cash outflows on account of carrying costs in which situation in which scenario, the equations will be algebraically modified and we shall have the expression equations or the expressions that are present on or that are here on this slide.

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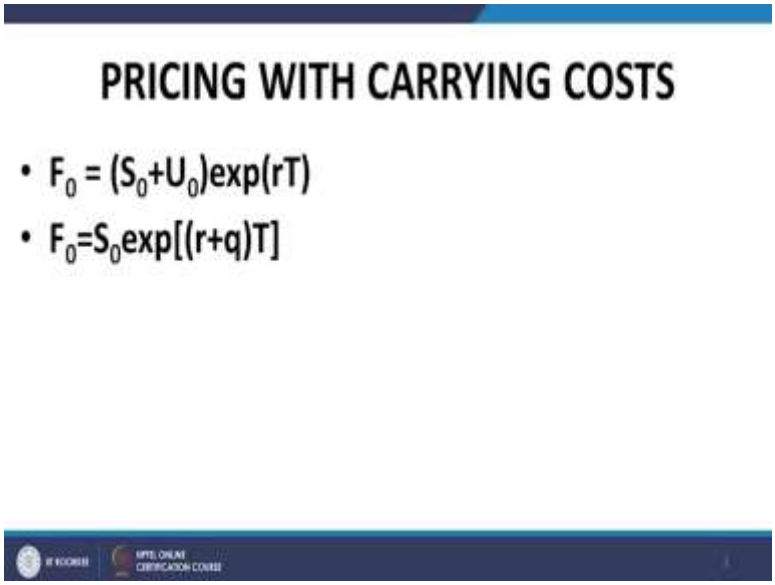

Now, as I mentioned in my last lecture, there is a difference between the forward price and the value of the forward contract.

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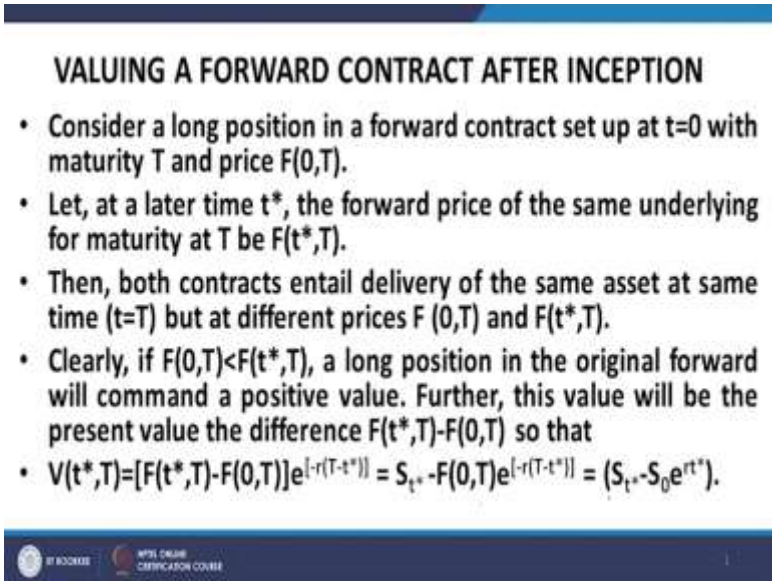

The value of the forward contract is the net worth of that forward contract or it is the amount of money that you would expect to get if you assign that your obligation under the forward contract to third party. So, that is the net of both the both the issues or both the legs of the forward contract in some sense. You see, the point is the important point is we have to understand that the value of the forward contract at t equal to 0 is equal to 0.

The forward price is the price which makes the value of the forward contract at t equal to 0 that is at the point of inception of the forward contract equal to 0. However, as time passes, we live in a dynamic environment and as a result of which the market perception or the market's expectations of the value of the worth of the underlying asset on the date of maturity of the forward contract would change.

And in other words, the forward price would change as you move along the timeline. That would result in what? That would result in the forward contract that I have entered into a t equal to 0 acquiring either a positive or negative value from my perspective. Let me explain this with an example.

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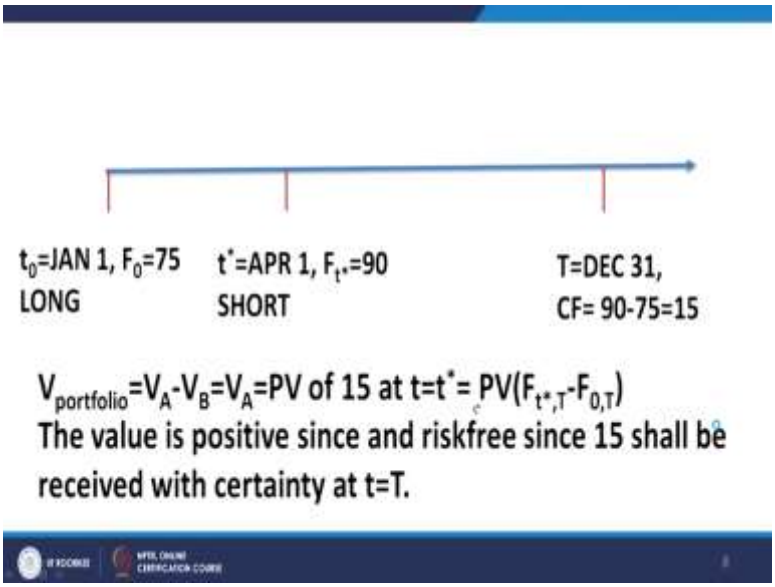

Let us look at this particular situation. Let us say at t equal to 0 and that is January 1 of say 2021, I enter into a forward contract to buy 1 US dollar at us at INR 75. Let me repeat at t equal to 0 that is January 1, 2021. I enter into a forward contract to buy 1 US dollar for INR 75.

As time passes let us say we are now at t equal to t star and that is let us say April 1, 2021 in the arbitrary rate. And what we find now is that the dollar has appreciated substantially in the markets and as a result of which if I now enter into a forward contract to buy 1 US dollars, I will not get the forward price of 75, INR 75 I will have to pay INR 90 for this. I repeat I have to pay INR 90.

In other words, if I want to enter into a forward contract as on time t equal to t star equal to April 1, 2021. I will have to pay INR 90 for getting 1 US dollars on the date of maturity of the forward contract. Let us assume that the date of maturity is thirty first December, 2021. That means what? That means let me repeat the points at t equal to 0 if I entered into a forward contract for buying 1 Dollar on thirty first December, 2021. I would get the US dollars by paying INR 75 as on thirty first December 2021.

If I now enter into a forward contract that is on April 1, 2021. I would get one US dollars as on thirty first December, 2021 by paying a price of INR 90. So, what I do is let us say I create a portfolio where I am long in the contract of January 1, let us call it contract A and I am short in the April 1 contract let us call it contract B. What happens to the US dollars? Because I am long in the in the January 1 contract, with contract A, what I will get is I will get 1 US dollar by paying INR 75 as on thirty first December, 2021.

What I can do is the dollars that I get under contract A I can redeem my short obligation under contract B by using that dollar which I got at INR 75. However, because the second contract envisages the purchase of US dollars at INR 90 what I would get I get is 1, I would receive on account of delivering that 1 US dollar is INR 90.

In other words, the portfolio that I have organized comprising of a long position in contract A, short position in contract B, we will result in a net cash inflow of INR 15 as on 31st December, 2021. So, obviously, the value of this portfolio at this point that is April 1, 2021 that is t equal to t star will be equal to the present value of this excess that is 15 discounted at the risk-free rate.

So, the value of the portfolio which comprises of a long position in A, short position in B, at this point that is at the point t equal to t star is equal to the present value of the difference in the forward prices. But we know that on the date of inception of a contract, of a forward contract its value is 0.

That means VB is equal to 0. So, what do we get, we get the value of the contract A, the value of the contract A which was entered into a t equal to 0 that is January 1, 2021 as on April 1, 2021 is equal to the difference between the two forward prices that is, let us call it F0 t minus F t star t and you take the present value of that as at the point t equal to t star that is the value of the contract A as on t equal to t star.

So, I hope this example clarifies to you what we exactly mean by the value of a forward contract in contradistinction with the forward price. Now, we talk about futures.

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Now, as I mentioned, futures are very akin to a very similar to forward contracts, but they have some very special features as well. Future are agreements to buy or sell an asset for a certain price at a certain time. So, they are, in that sense to that extent, they are identical to forward contracts. But they have certain special features. The most important feature is that for futures contracts are tradable at exchanges which are organized or which are structured for this particular purpose, like we have the NSE and the BSE in India.

The futures contracts are tradable on such exchanges. We have also the MC X, which does trading and commodity futures. So, as a consequence of this or as a necessity, a necessary requirement mandate of the fact that futures are tradable, we need to have two special properties embedded in the futures contract.

One is obvious, that is that the futures must be standardized. Futures must be standardized, in order that we have adequate liquidity in those futures contracts in the market. That is there should be adequate number of people available at any point in time who are willing to buy or sell or take up positions in the futures contracts.

If you have a very special futures contract, let us say on 200 or 2,981 Dollars, then it may be very difficult to find a counterparty with that kind of an interest or a requirement for entering into or taking a position in the futures contract. So, Futures need to be standardized pretty much in the same sense as currency needs to be standardized. So that is one thing that is necessary in the context of the tradeability of futures contract.

The second is slightly more intriguing, involved. It is in so far as the risk of default is concerned. Now, please note, I have emphasized this point earlier also, in my introduction, that in the case of forward contracts, it is a private contract between two parties. And as a result of that fact, because it is a contract between A and B, both A and B have adequate opportunity to assess the creditworthiness of the other party and take adequate remedial measures to safeguard their position, or in other words, they are taking that credit risk whatever the level of the risk is, explicitly with full knowledge of the facts.

So that is one situation where the forwards as far as the forwards are concerned. However, when we talk about futures, you see futures need to be tradable. And in order that futures need to be tradable, we need to be able to sell the, our obligation under the futures contract to a third party.

For example, if A and B are involved in the creation of a futures contract, then B needs to be able to transfer his interests in the future to C, A may transfer to somebody else whatever. Now, the problem arises, if the, as far as A and B are concerned, they may know each other or at least they would have had opportunity to assess the default risk of each other. But when B transfer this leg to C, and it is without the knowledge of A then an issue arises, what is the level of creditworthiness of C?

Because C also has an obligation to A in terms of the futures contract which has been transferred by B. So, that means what? That means C's creditworthiness is impacting A and if the, if we have this kind of a situation prevailing the market, trading is bound to be inhibited, because everybody would be worried about the level of risk of the counterparty when it trades in a future contract, whether that trade counterparty is in a good enough position or has adequate credit worthiness to honour his obligation under the futures contract.

So, that remedy for that has to be looked at and that is remedied by the fact that the clearing house intervenes this, the exchange that with the trading in the futures contract is intervenes and the clearing also of that exchange at which the futures contract is being created intervenes as a counterparty to both the legs of the futures contract.

And they are divided into two contracts, contract between A and the clearinghouse and contracts between B and clearinghouse, or in other words, clearinghouse guarantees the performance of both the legs of the contract, the contract between that involves the let us say that involves the payment of the price and the contract that involves the recovery or the receipt of the underlying asset.

So, that is the fundamental point that in so far as futures are concerned, the performance of the contract is guaranteed by the performance of both the legs of the contract are guaranteed by the Clearinghouse which acts as an intermediary to both the parties that are holding positions in the futures contract. So, now the issue arises, let us, before proceeding further on this topic, which is very interesting.

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Let us go through the terminology first. As far as the lot size is concerned, you see you cannot obviously have a futures contract on 0 US dollar you need to have a certain basic amount certain fundamental amount which needs to be covered by a futures contract. For example, in India usually we have a futures contract and 500 shares or shares trading at a certain minimum value.

So, that is called the lot size, lot size is the number of units of the underlying which are covered by one futures contract. So, it is the minimum quantity, that is quantity that is specified in the futures contract. The contract value is the futures price that is per unit of the underlying asset into the lot size.

Expiry is the last date after which one can hold the futures. Margin. Well, margin which we will talk about in a few minutes, but it is essential that whenever you enter into a futures contract, you deposit a certain amount of money with your broker, that is called margin but we should be coming back to it.

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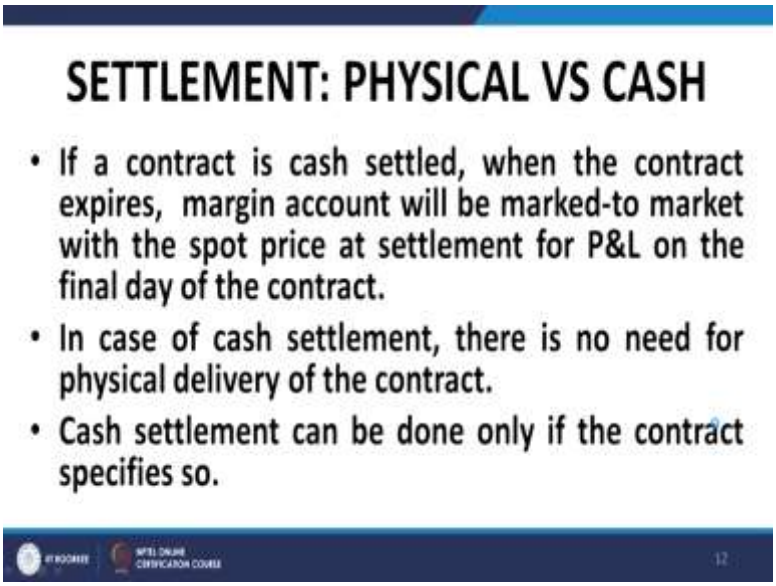

Now, the futures contract as I mentioned, futures contracts are contracts which are entered into t equal to 0 which envisage the settlement at t equal to capital T, which is the maturity of the futures contract by delivery of the underlying asset against the payment of the price both of which are, the characteristics of both of which are agreed upon t, at t equal to 0, that is the price the mode of delivery, the quality of delivery in whatever the case may be.

So, now, the important thing is this is the broad scenario under which futures operate. However, in certain situations, it is impracticable to give delivery or it is undesirable maybe to give delivery of the underlying asset. For example, if you have futures on a stock index, how can you deliver a stock index?

So, in that situation, what happens is, we mark the final value of the futures contract to the spot price prevailing on the date of maturity of the futures contract and then a cash settlement takes place between whatever is the obligation as for the futures contract in terms of the underlying asset, what is the market value of that asset, and on that basis, a final mark to market takes place, which settles the contract which is called cash settlement.

Of course, there are pure contracts which envisage which physical settlement in which case the underlying asset is actually delivered under the futures contract. So, there are two fundamental ways in futures in which a futures contract can be settled. One is number one by obviously by delivery of the underlying asset. And the second is by delivering or by exchanging a certain amount of cash, which tantamount to the delivery of the underlying asset in terms of value.

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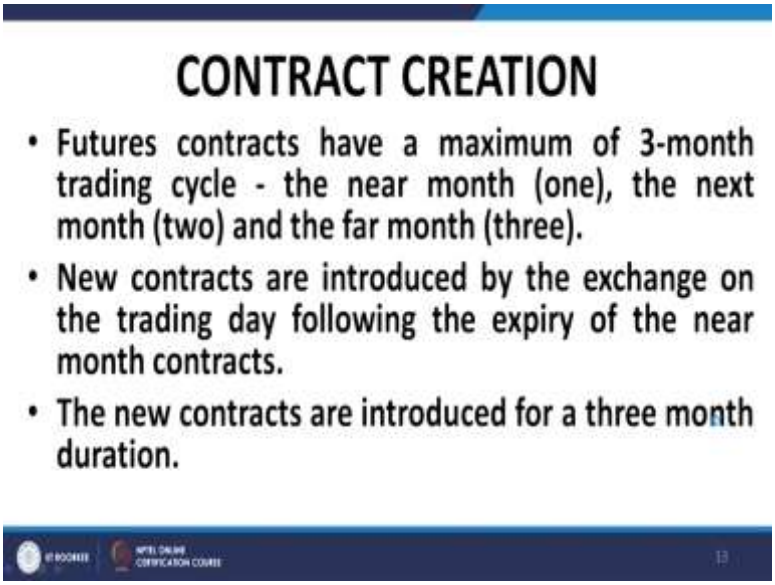

As far as the contract creation is concerned, futures contracts have a maximum of three-month trading cycle, the near month, the middle month or the next month, and the far month. New contracts are introduced by the exchange on the trading date following the expiry of the near month contracts. The new contracts are introduced for a three-month duration.

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This way at any point in time, there will be three contracts available for trading in the market for each security one year month, one mid-month, and one far month duration respectively.

So, this is how the contracts keep on recycling. In other words, when the near month contract expires, the very next day a fresh contract is introduced for trading by the exchange with a three-month majority. So, the mid-month contract becomes a new near month contract, the

farther becomes, contract becomes a new mid-month contract and so on. So, the cycle is continued perpetually.

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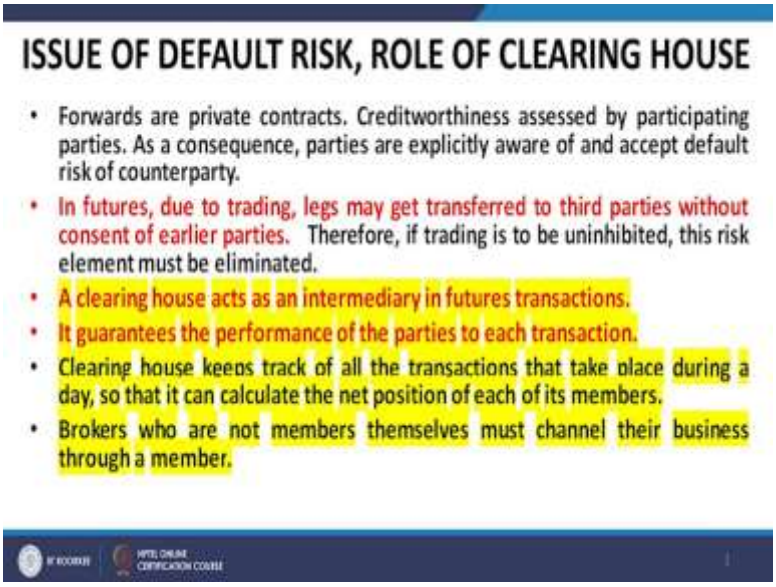

Now, we come back to the issue of default. So, I have explained the issue of default risk substantively in the beginning of this lecture or earlier part of this lecture. Now, the issue that I want to address is that, how does the excellent the exchange or the clearing house manage its risk. You see as I mentioned, the clearinghouse becomes an intermediate party to both the legs of the contract and guarantees performance of both the legs of the contract.

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Now, that being the case if either party defaults and the loss of default would fall on the shoulders of the clearing house. How does the clearing house protect itself against the

possibility of such loss is another very interesting issue? Well, it does so, by the combined operations of marking to market together with margining.

So, these two phenomena, phenomena occurring in conjunction, that is marking to market and margining ensure that the clearinghouse does not or the possibility of default is virtually eliminated by the parties and as a result of which the clearinghouse does not suffer damage, does not suffer detriment due to the default of either parties. How does this process of the marking to market and margining operate, let us now understand that.

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Let us take an example to illustrate what we mean by marking to market. Let us say a particular finance financing company has introduced a scheme. Under this scheme an investor is to deposit INR 50,000 and he would be allocated 10 grams of gold. And depending at let us say t equal to 0 and the scheme operates for three days. Whatever is the closing price of gold as per a certain benchmark quotation and let us say the MCX price or whatever the case may be, certain benchmark.

The profit or loss on the, for the day is credited or debited to the account of the investor. In other words, let me repeat a t equal to 0 you take a position or you investor in a scheme of let us say a particular financing company XYZ limited. Under the scheme XYZ limited allocates not delivers please note, it allocates 10 grams of gold and depending on the price fluctuation during the day and the next 3 days, the amount by which your investment increases or decreases is credited or debited to your account forthwith at the end of the particular day based on a benchmark quotation.

So, that is how the scheme operates. Let us assume that you start you invest in that scheme at by taking a position of taking one unit let us say that costs 50,000 rupees.

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Let us say that is the situation at t equal to 0, let us say at t equal to 1 that is on the first day, the value of gold has increased to or the value of that investment has increased to 51,000. As a result of which 1000 is credited to your margin account as you can see on this slide. So, this is the position as far as day 1 is concerned.

On day 2, let us assume that the value of gold has declined and as a result of it the worth of your investment of 10 grams has gone down to 48,000 rupees and as a result of it the loss that you have incurred of 3000 rupees is debited to your margin account. And now, at the end of the third day, what happens? At the end of the third day the coin is sold in the market at let us say 55,000 rupees and or that 10-gram gold coin is a hypothetical or are in reality sold in the market by the financing company and it realizes 55,000 rupees and the profit of 7000 rupees is credited to your margin account.

So, this is how this situation would look like. This process is called marking to market. At the end of every day, whatever is the market position is captured by your holding or your position. In other words, your position is scaled to the market level at the end of trading of every day. This is a simplified version of the marking to market process. Let us now look at how this marking to market process operates. In the case of futures contracts.

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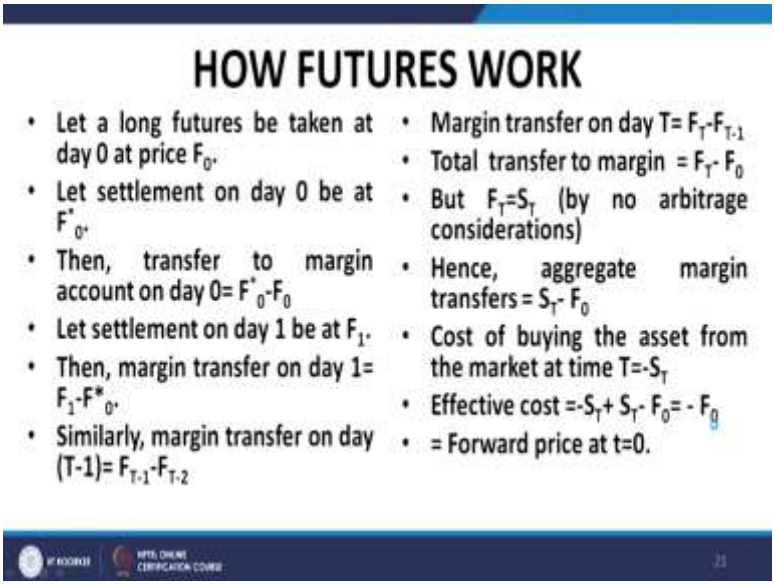

Let us say we take a long futures position at day 0 at a price of F0, you take a long futures position, let us say, on the morning of day 0 at the price of F0. And let the settlement price at the end of day 0 be F star, I repeat, you take a futures position at the beginning of trading or during, during the day's trading offer t equal to 0 or zeroth day, and the settlement price at the end of zeroth day turns out to be F0 star.

Then an amount F0 star minus F0 would be transferred to your margin account at the end of settlement or consequent to the settlement of day 0, then on the next day, if you keep on holding on to that position, and the day closes at the settlement price of F1, then an amount equal to f one minus F0 star would be transferred to your margin account.

Of course, the transfer could be positive or negative, depending on whether the value the price has increased or decreased. So, an amount equal to F1 minus F0 star would be transferred to your margin account at the end of the argument of day one and this process would continue. Let us say you keep on holding the futures up to day capital T. And then what happens the transfer on the final day would be equal to FT minus FT minus 1.

Therefore, the total transfer to the margin account from that part, you took a position in the futures that is at t equal to 0 to the time that you exited the position at t equal to capital T that is the date of maturity of the futures contract is equal to F capital T minus F0. Please note all the intervening terms will cancel out.

For example, it would be F1 minus F0 star plus F0 star minus F0 and so on, on the left-hand side it will continue up to FT and so the net result would be FT minus F0. This is the amount

that would be present in your margin account provided you are not made any additions or withdrawals from that on that account.

But at, on the date of maturity of the futures contract by no arbitrage considerations, I will come back to it. By no arbitrage considerations the futures price as on the date of maturity of the futures price will be equal to the spot price of the underlying asset. So therefore, F capital T will be equal to S capital T, where S capital T is a spot price prevailing in the market as on the maturity of the futures price. This is on the considerations of no arbitrage. But I will come back to it in a minute.

But for the moment, let us take that FT is equal to ST. Therefore, what happened the aggregate margin transfers now turns out to be S capital T minus F0, S capital T minus F0 because S capital T is equal to F capital T on consideration of no arbitrage. The cost of buying the asset from the market is ST because it is the cash outflow it is minus St. So, the cost of buying the asset is minus St, the proceeds that you have realized on account of the position in the futures account as present in your margin account is equal to ST minus F0.

So, the net cash or the net cost that you paid for acquiring the asset from the market is equal to minus ST plus FT minus F0, that is equal to minus F0, which was the original forward price at which the futures price was, our futures contract was conceived. So, that is how the futures satisfy the requirement of the definition that they are analogous to the forward contracts. So, marking to market let us come back to it for a minute.

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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 marking to market. That difference in price is carried to the margin accounts of the respective parties holding long and short positions in the contract. Please note this is a 0-sum game.

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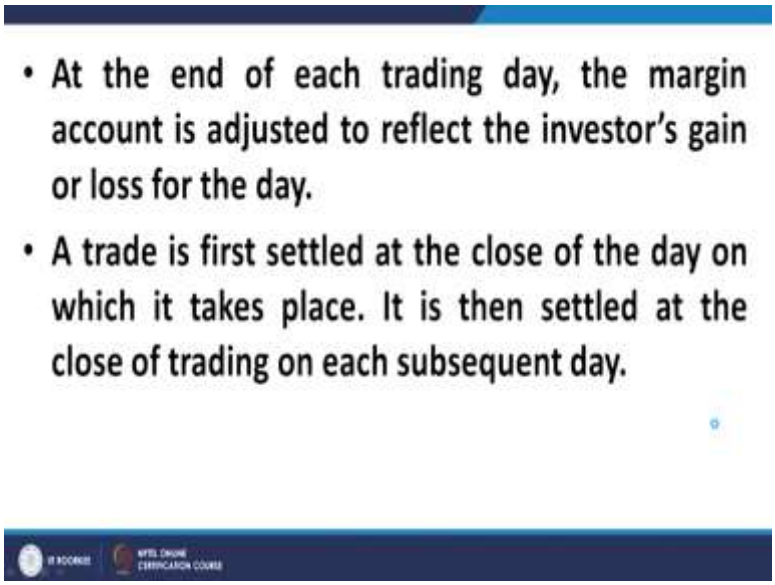

At the end of each trading day, the margin account is adjusted to reflect the investors gain or loss for the day a trade is first settled at the close of the day on which it takes place at then, it is then settled at the close of trading on each subsequent day. Now, the implications of marking to market. This is very important; this is how marking to market helps the clearing house in in overcoming the risk of defaults and the risk of losses due to the default on the futures positions of its members.

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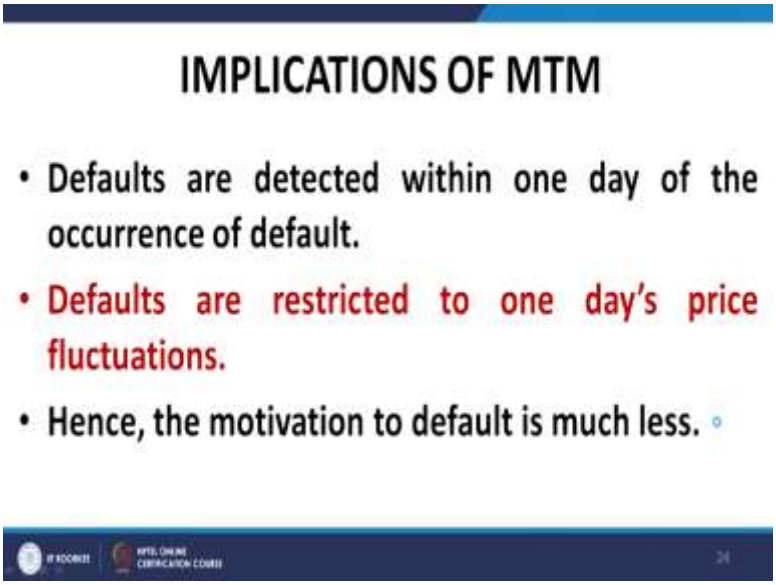

Number 1: defaults are detected within one day of the occurrence of default. This is natural because marking to market is taking place on a day-to-day basis. So, if a party were who is to replenish on whose account, who has incurred a loss during the day, that loss would be debited to his margin account.

And he would be, he would be in certain circumstances if the margin falls below certain level, let us call them that is called the maintenance margin. If the margin account, amount or the margin balance falls below the maintenance margin is asked to bring in further margin to replenish the shortfall within the next day.

So, then net result of this procedure is that the defaults or the possibility of default is, the possibility if a member is not able to bring in further margin to into his account to replenish the shortfall between the maintenance margin and the margin on after debiting the loss, then that amount, it would be in default, and that default would be detected by the exchange forthwith by the next day.

And as a result, which the amount of default, the cumulative amount of default would be confined to the one day's price change. Please note because the prior day's price change would already have been accounted for in the margin. And if the, if the trader or the investor has not defaulted, then it is fine if the trader or investor has defaulted, the exchange would have known the fact of the default by the next day.

So, the bottom line is that in any case, whenever there is a default, it comes to the notice of the exchange by the next year. Thus, the amount of default would be equal to the change in

price on a particular day. And hence, because this change in price on a particular day is going to be small, if you compare it with a forward contract, where the change in price where there is only one transaction at the end of the majority of the forward contract rather than the maturity of the forward contract.

Therefore, the cumulative effect of all the price changes would manifest and so that the date on the on which a forward contract is to be settled. Here what is happening is at the end of every trading day the settlement is taking place and therefore the loss that the investor faces is confined to one day's price change.

And naturally, the motivation to default on such accounts would be less because the amounts are naturally likely to be less compared to the cumulative effect that occurs in the case of a forward contract.

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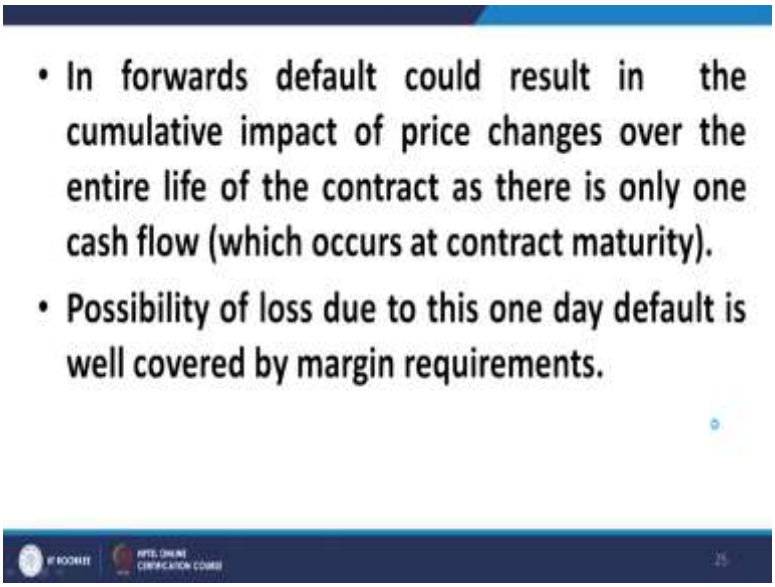

So, in forwards default could result in the cumulative impact of price changes over the entire life of the contract as there is only one cash flow, which occurs at contract maturity. The possibility of loss due to this one-day default is well covered by margin requirements.

Now, I have just mentioned that the maximum default in the case of futures contract would be equal to one day's price change. Now, this is usually covered by maintaining a certain amount of margin in the account of the investor with the broker and the broker with the clearing house member and the clearing house member with the clearing house.

So, that is how the margining system operates. Margining system operates as a three-tire structure, the investor is required to keep the margin with the broker, broker is required to

keep the margin with the clearing house member and the clearing house member is required to keep the margin with the clearing house itself.

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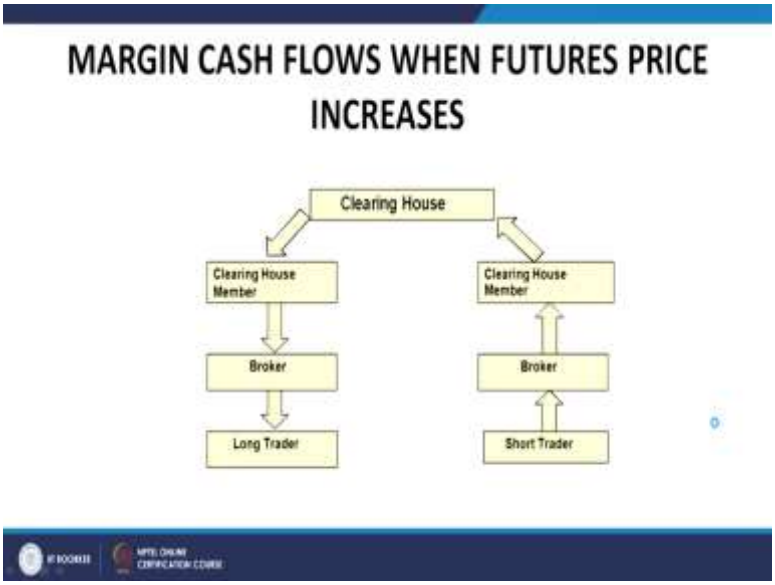

These are the representative cash flows, if there is an increase in price, the long credit or the long investor benefits. So, his margin account is credited and the short investor loses out. His account is debited and the flow is shown here in this diagram.

From the short trader to the broker, broker to the clearing house member, member to the clearing house, clearing house to the clearing house member of the long party who transfers to the broker of the long party are transferred to the account of the long party itself. So, this is the margin cash flows and futures price decreases.

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So, let us recap what are the implications of margining plus marking to market. Fundamental default restricted to one day's price movements; extreme cases of default covered by margins. And of course, there is the issue of leverage futures provide greater leverage and spot positions because they you can hold the same kind of futures position, you can hold the same kind of payoff profile by investing only the margin amount. So, we will take this up from here in after the break. Thank you.