**Interest Rate Forwards, Futures, and Futures Options**

Forward Contract = an agreement for the future delivery of something at a specified price at a specified time.

It amounts to a handshake deal – no money is exchanged.

Non-standardized contract specifically tailored to meet the needs of the two parties.

No clearing-house – OTC - Virtually no secondary market

Intended for delivery – the seller intends to deliver the goods – not close out his position

Usually done through large banks, but doesn’t have to be

Credit Risk – one party can fail to deliver on the settlement date as promised.

Contract must specify:

1. What is being sold
2. How many are being sold
3. The future sale price
4. The delivery date

Purchaser – Long Position

Seller – Short Position

With debt instruments, you can hedge against a possible future unfavorable change in interest rates.

Problems with forward contracts:

1. Finding a counter-party
2. Ensuring compliance with the terms of the contract (credit risk)

Futures market overcomes these problems.

Futures are standardized forward contracts bought and sold on an exchange.

The seller agrees to provide a certain standardized commodity to the buyer on a specified future date at an agreed-upon price.

We’ll concern ourselves with Interest Rate Futures where the commodity is a financial instrument.

Clearing-house = Exchange

Primary exchanges is CME Group

Underlying = What is being sold in the future

Futures Price = The sale price

Settlement Date = The delivery date – the date on which the sale will take place

After you enter into a futures contract, the exchange becomes the other party to your contract. – You buy the underlying from the exchange or you sell it to the exchange – This eliminates the problems with the forward contract.

Liquidating a Position:

Taking an offsetting position in the same contract prior to settlement.

You are obligated to buy $100,000 in T-Bonds from the CME and obligated to sell $100,000 of T-Bonds to them. Thus it’s a wash.

About 98% of all futures contracts are offset.

Cash Settlement Contracts:

Short position does not deliver the goods, instead they pay the value of the goods.

Eurodollar Futures Contracts are an example.

T-Bonds

Underlying: Hypothetical 30yr 6% coupon bond

CME publishes acceptable bonds with their conversion factors.

Three options for the seller:

1. Seller can choose among the acceptable bonds. (He’ll choose the cheapest to deliver)

Acceptable bonds are specified by the exchange.

2. Seller chooses the day of the month to deliver (He’ll deliver at the end of the month when there is positive carry and the beginning of the month when there is negative carry).

3. Seller chooses the time to deliver – up to 8:00 pm

Contracts are for delivery in March, June, Sept and Dec.

Ultra T-Bond Futures have fewer acceptable bonds for delivery – goal is to give them a higher duration.

Some Other Interest Rate Futures Contracts

T-Notes:

10yr

5yr

3 yr

2yr

T-Bills:

Muni Bond Index:

Eurodollars: (3-month LIBOR)

Every month for next six months and then quarterly for next ten years

Allows you to enter into a forward contract to swap a fixed rate for a future 3-month LIBOR rate

30 Day Fed Funds

Allows banks to lock in Fed Funds Rate

How the Futures Market Works

Exchange sets initial margin and maintenance margin

Brokerage houses can set it higher.

Initial margin may be in form of Treasury instrument

Variation Margin = amount of cash necessary to bring the account back to the initial margin when it falls below the maintenance margin

Mark-to-Market:

The value of the equity in your position is determined at the end of each day based on the Settlement Price.

If your equity position is < the maintenance margin, you must boost it up to the initial margin.

On the last delivery date, the settle price converges to the spot price, so you have already paid your loss or received your gain.

Example:

Initial Margin for T-Bonds is $10,000 / contract

Maint. Margin is $8,000 / contract

Current Price = 100

You buy one June contract ($100,000) so you are to receive $100,000 of T-Bonds in June.

You put up 10k in cash or treasuries

If the price of the contract increases to 105 at settlement tomorrow, the equity has increased from $10,000 to $15,000 and you can withdraw the $5,000 if you wish. If you do, it leaves you with $10,000 of equity.

If, on the next day, the settlement price drops to 104, you lost $1,000 of equity so you are at $9,000 – No margin call.

If, on the next day, the settlement price drops to 102, you now have $7,000 of equity and you need to add $3,000 to bring it back up to $10,000.

Basic Hedging of Interest Rate Risk with Futures

Macro Hedge = Hedge interest rate risk on the total portfolio

First, calculate the Duration Gap

DURgap = DURA – (L/A ⋅ DURL)

Next, calculate the duration of the futures contract you wish to use as a hedge.

This will be the cheapest to deliver contract.

Then transact in the futures market so that:

VF ⋅ DURF = -(VA ⋅ DURgap)

Where: VF = Value of futures contract

VA = Value of Assets

Macro Hedge Example

You have:

$100 million in assets with a duration of 8.0 years

$80 million in liabilities with a duration of 4.5 years

DURgap = 8.0 – (80/100 ⋅ 4.5)

= 8.0 – 3.6

= 4.4yrs. note that this is a positive gap ⇒ you are hurt if interest rates rise.

You calculate that the cheapest-to-deliver bond has a duration of 27.5 yrs. How many contracts do you buy or sell?

VF ⋅ DURF = -(VA ⋅ DURgap)

VF ⋅ 27.5 = -(100 ⋅ 4.4)

VF ⋅ 27.5 = -440

VF = -440/27.5 = -16

So you need to sell a value of $16 million.

At one contract = $100,000 you must sell 160 contracts.

Now if interest rates rise, the value of your futures contract goes up to offset the decline in the value of your hedged portfolio.

**Interest Rate Futures Options**

With interest rate contracts, futures options are far more popular than options on physicals (options on the debt instruments themselves). This is for two reasons:

1. To price an option, you need to be sure of the current price of the underlying security. Since Interest Rate Futures Contracts are traded on an exchange, and Treasuries are traded OTC, it is much easier to get an accurate and current price on a futures contract than on a treasury.
2. You can’t short squeeze a futures contract because there is an unlimited supply, while there is a limited supply of Treasuries.

Financial Futures Option = the right to long or short a financial futures contract at a specified strike price.

The trading dates are set so that the option must be exercised in advance of the delivery date of the underlying futures contract.

This makes sense since you can’t exercise an option to buy a futures contract where the underlying T-bond was to be delivered last week.

Financial futures options are always American Options. They can be exercised any time prior to the expiration date.

Upon exercise of the option, the futures position of the two parties will be at the prevailing futures price and the option writer will pay the option buyer the economic benefit from exercising the option. This benefit is the difference between the strike price and the current futures price. Of course, the option will only be exercised if there is a benefit (if it is in the money).

When hedging interest rate risk with futures, you “lock in” a price, meaning that you eliminate the possibility of a loss if interest rates move in an unfavorable direction, but at the same time, you eliminate the possibility of a gain if they move in a favorable direction.

When hedging with futures options, you will only exercise your option and enter into a futures contract if interest rates moved in an unfavorable direction for your “at risk” portfolio (the one you are hedging). If rates move in a favorable direction, you will tear up the option and take your gain.

This added benefit of a potential upside to options contracts comes at a price though – the premium.