Hedging Strategies for Interest Rate Movements

Def^{n}: A <u>hedge</u> is a position taken in the futures market to offset a potential loss in the Cash or Spot markets.

Because the futures Contract is a derivative instrument consisting of fixed income Securities its price is inversely related to the level of interest rate.

Contract Characteristics

Daily Price Limit - Maximum trading price range (potential price risk and possible illiquidity)

Variable Price Limit - The "free fall" pricing possible when price move the daily limit (worst Case for daily price risk)

Last Day of Trading - Timing during month (delivery date selection and management strategy)

Delivery Date - During a month or at a month when delivery may be made (important pricing option)

Initial Margin - Funds required to initiate trades (liquidity management)

Trading Hours - Period of time when contract may be initiated or offset (how early west coast Kodgers have to come to work!)

Long Versus Short Hedge (Terminology)

A long hedge means the trader buys a futures contract. The position obligates the holder either to:

> Take delivery of securities at the pre-established price on some future date
>
> Or
>
> Sell the contract (offset), closing out the position through the clearing house before the delivery date.

E.g. A long hedge is an appropriate strategy when a financial institution manager expects interest rates to decline (contract price ↑).

A short hedge occurs when the trader sells a futures contract, incurring an obligation either to:

Delivery the underlying securities at some future point

Or

Close out the position before delivery by buying an offsetting contract.

Most contracts are settled by offset rather than delivery of securities - largely due to convenience

Long Interest Hedge

On June 1990, the manager of the money reserve of a casualty insurer expects interest rate to fall. He is certain that premium income in Sept. 1990 will be $10 million. Current 91 day T-Bill rate are 10%. He would like to lock-in this rate by taking a future position on 90-day T-Bills.

Long Interest Hedge

Falling Interest Rates

I.

Cash Market	Futures Market
June	
T-bill discount yield at 10%	
a) Price of 91-day T-bills, $10 million par: $9,747,222[a]	Buy 10 T-bill contracts for September delivery at 10% discount yield
	Value of contracts: $9,750,000[b] (b)
September	
T-bill discount yield at 8%	
Price of 91-day T-bills, $10 million par: $9,797,778	Sell 10 September T-bill contracts at 8% discount yield
	Value of contracts: $9,800,000

II.

Cash Market Loss		Futures Market Gain	
June cost	$9,747,222	September sale	$9,800,000
September cost	9,797,778	June purchase	9,750,000
Loss	($ 50,556)	Gain	$ 50,000
	Net Loss: ($556)		

III.

Effective Discount Yield with the Hedge (using Equation 4.3)

$$\frac{\$10{,}000{,}000 - (\$9{,}797{,}778 - \$50{,}000)}{\$10{,}000{,}000} \times \frac{360}{91} = 9.978\%$$

a) At a discount yield of 10%, the price of a 91-day T-bill (from Equation 4.5) is:

$$P_0 = \$10{,}000{,}000\left[1 - \frac{0.1\,(91)}{360}\right] = \$9{,}747{,}222$$

b)

[a] T-bill futures contracts are standardized at 90-day maturities, resulting in a price different from the one calculated in the cash market.

Short Interest Hedge

Suppose that a Bank in September 1990 wants to hedge $5 million in short-term CDs expected to reprice in 90 days. If market rates go up the institution would have to offer higher rates on the new CDs ⇒ reducing net interest margin. Futures are used to cover losses from rising interest rates.

Short Interest Hedge

Rising Interest Rates

I.

Cash Market	Futures Market
September	
Certificate of deposit rate: 7%	Sell 5 T-bill contracts for December delivery at 7% discount yield
Interest cost on $5 million in deposits (3 months): $87,500	Value of contracts: $4,912,500
December	
Certificate of deposit rate: 9%	Buy 5 December T-bill contracts at 9% discount yield
Interest cost on $5 million in deposits (3 months): $112,500	Value of contracts: $4,887,500

II.

Cash Market Loss		Futures Market Gain	
September interest	$ 87,500	September sale	$4,912.500
December interest	112,500	December purchase	4,887.500
Loss	($ 25,000)	Gain	$ 25,000

Net Result of Hedge: $0

III.

Net Interest Cost

$112,500 − $25,000 = $87,500

These two examples are extremely simplified –

They do not consider:

(1) Transactions Costs, broker's fees and the opportunity cost of the margin deposit.

(2) Differences that might occur between the change in the future yield and the change in spot yields

(3) Correlation between the future price and the securities being hedged.

Note Also:

A protective hedge not only limits the institution's loss from unfavorable interest rate movements, but also reduces potential gains from favorable changes in rates. i.e. Insurance costs something - Usually the price of the premium.

Factors that Influence Hedging Effectiveness

Basis Risk

Basis is the difference between the price of the future contract and the spot price of the underlying financial asset.

$$\text{Basis} = P_{spot} - P_{future}$$

To execute a perfect hedge, one where the cash market loss is exactly offset by a future market profit, the hedge must accurately predict the basis and adjust the size of the hedge accordingly.

Although cash : future markets are closely related - they are not perfectly correlated each has its own supply / demand characteristics.

The net cost associated with an interest hedge can be decomposed into 2 parts:

Net Cost = ① # Contracts (Terminal difference between spot & future price)

$$\Rightarrow Q(P_{term\ spot} - P_{term\ future})$$

+ ② # Contracts (Initial future price)

$$\Rightarrow Q(P_{initial\ future})$$

With Respect to our long interest hedge:

$$\text{Net Cost} = 10\underbrace{(\$979,777.80 - 980,000.00)}_{P_{\text{term Spot}} - P_{\text{term future}}} \text{ Basis Portion of the Hedge}$$

$$+ 10 (\$975,000)$$

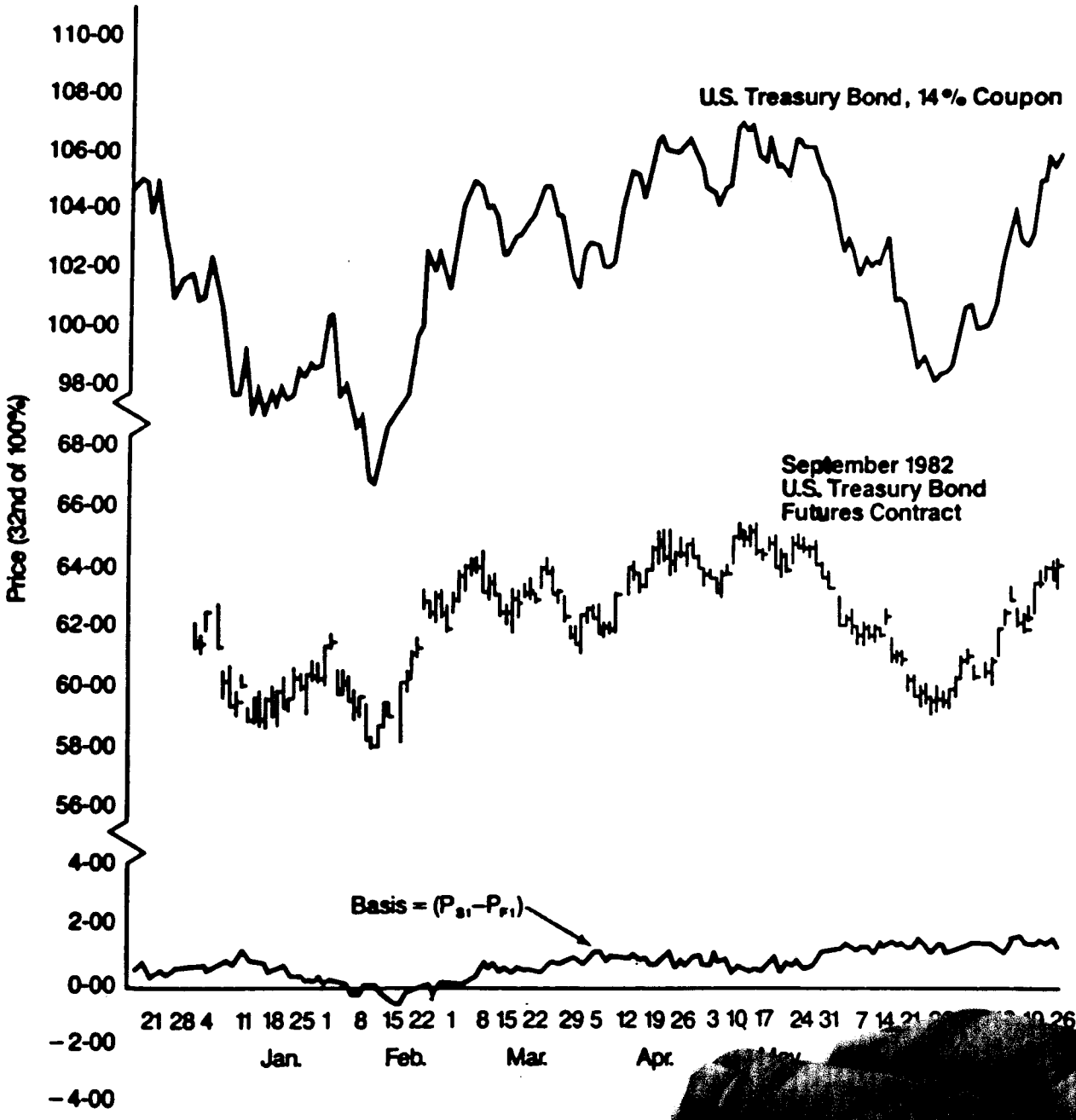
$$= -\$2,222 + \$9,750,000$$

$$= \$9,747,778$$

The basis at the time the position is closed out - $(P_{\text{term Spot}} - P_{\text{term future}})$ determine the success or failure of the hedge.

Basis Risk T-Bond Futures

Prices of Treasury Bonds and Treasury Bond Futures, December 1981-July 1982.



Source: Chicago Board of Trade, *Guide to Financial Futures*, p. 39. Cha
ration, Chicago, Illinois.

Cross Hedging / Correlation Risk

Whenever a futures hedge is constructed on another instrument other than the Cash market security — the hedge is called a <u>cross hedge</u>.

Basis risk is even greater on these hedges than when the same security is used on both side of the hedge.

Cross Hedge Risks

① Difference in maturity structure may increase basis risk

E.g. Short-term assets hedged with futures on a long-term security.

A change in the slope of the yield curve would effect short and long-term yields differently ⇒ differing impacts on the pricing of the short-term assets and the long-term futures contract.

Cross Hedging Risks

② Difference in Coupon Rate and/or terms to maturity will alter basis risk.

Even if the changes in yields were the same on two securities, the resulting price changes may vary with differences in Coupon rate and/or terms to maturity.

E.J. Duration Theorems for Bonds and Fixed Income Securities