d. Treasury Bond Futures

The treasury bond futures traded on the CBOT require the delivery of any government bond with a maturity greater than fifteen years, with a no-call feature for at least the first fifteen years. Since bonds of different maturities and coupons will have different prices, the CBOT has a procedure for adjusting the price of the bond for its characteristics. The conversion factor itself is fairly simple to compute and is based upon the value of the bond on the first day of the delivery month, with the assumption that the interest rate for all maturities equals 8% per annum (with semi-annual compounding). The following example calculates the conversion factor for a 9% coupon bond with 18 years to maturity.

Illustration 34.3: Calculation Conversion Factors for T.Bond futures

Consider a 9% coupon bond with 20 years to maturity. Working in terms of a $100 face value of the bond, the value of the bond can be written as follows, using the interest rate of 8%.

$$\text{PV of Bond} = \sum_{t=0.5}^{t=20} \frac{4.50}{(1.08)^t} + \frac{100}{(1.08)^{20}} = \$111.55$$

The conversion factor for this bond is 109.90. Generally speaking, the conversion factor will increase as the coupon rate increases and with the maturity of the delivered bond.

The Delivery Option and the Wild Card Play

This feature of treasury bond futures, i.e., that any one of a menu of treasury bonds can be delivered to fulfill the obligation on the bond, provides an advantage to the seller of the futures contract. Naturally, the cheapest bond on the menu, after adjusting for the conversion factor, will be delivered. This *delivery option* has to be priced into the futures contract.

There is an additional option embedded in treasury bond futures contracts that arises from the fact that the T.Bond futures market closes at 2 p.m., whereas the bonds themselves continue trading until 4 p.m. The seller does not have to notify the clearing house until 8 p.m. about his intention to deliver. If bond prices decline after 2 p.m., the

seller can notify the clearing house of intention to deliver the cheapest bond that day. If not, the seller can wait for the next day. This option is called the *wild card play*.

Valuing a T.Bond Futures Contract

The valuation of a treasury bond futures contract follows the same lines as the valuation of a stock index future, with the coupons of the treasury bond replacing the dividend yield of the stock index. The theoretical value of a futures contract should be –

$$F^* = (S - PVC)(1 + r)^t$$

where,

F* = Theoretical futures price for Treasury Bond futures contract

S = Spot price of Treasury bond

PVC = Present Value of coupons during life of futures contract

r = Riskfree interest rate corresponding to futures life

t = Life of the futures contract

If the futures price deviates from this theoretical price, there should be the opportunity for arbitrage. These arbitrage opportunities are illustrated in Figure 34.8.

This valuation ignores the two options described above - the option to deliver the cheapest-to-deliver bond and the option to have a wild card play. These give an advantage to the seller of the futures contract and should be priced into the futures contract. One way to build this into the valuation is to use the cheapest deliverable bond to calculate both the current spot price and the present value of the coupons. Once the futures price is estimated, it can be divided by the conversion factor to arrive at the standardized futures price.