**Invoice Prices and T-Bill Quotes**

Invoice Prices

For bonds purchased between coupon payments, coupon interest accrues linearly (by convention) based on the number of days in the coupon period.

Treasury trades settle on the next business day after the trade date. The settlement date is the date that is used to establish the date of new ownership. When we say that a bond is bought or sold on a certain date, for simplicity, you can assume that we are referring to the settlement date.

Treasury Bonds – based on actual day counts

Corporate Bonds – 30 days/month and 360 days/year

Money Market Instruments – actual days in a month but 360 days/year

Example:

An 8% 5 yr Treasury note due 5/15/02 has a YTM of 7%. Its price is 101.496.

The coupon period between 5/15/00 and 11/15/00 had 184 days.

The next coupon period 11/15/00 – 5/15/01 had 181 days.

Note: A coupon period will never have fewer than 181 days and never more than 184 days.

If the bond is purchased on 10/1/00, 139 days have elapsed since 5/15/00, so the accrued interest per dollar is:

(139/184) (.08/2) = .03022 = 3.022% of face must be paid in addition to the quoted (clean) price.

Invoice Price of Bond = Clean price plus accrued interest.

101.496 (clean price) + 3.022 (accrued interest) = 104.518 (invoice price)

The invoice price of the bond can also be computed as the present value of the future cash flows

Since 139/184 is the proportion of the coupon period since the last payment, it follows that 45/184 is the proportion of the semi-annual period remaining till the next coupon payment. So, the present value of the note will be calculated as:

Invoice Price = 4/(1+r)45/184 + 4/(1+r)1+(45/184) + 4/(1+r)2+(45/184) + 104/(1+r)3+(45/184)

where r is the semi-annual yield (BEY/2).

In our example of YTM = 7%, which gives us 104.518.

The PRICE function in Excel calculates the PV of the cash flows in this way and then subtracts the accrued interest to give the clean price

Treasury Bill Quotes

Yield on a Discount Basis:

 Commonly used by bond traders by convention

 Easier to calculate than YTM before calculators

Yield on a discount basis = 100 – Price · 360

 100 days to maturity

Yield on a discount basis understates both EAR and BEY

Example:

T-bill matures in 90 days

Current price is 99

Yld on a discount basis = 100 – 99 · 360 = .04 = 4%

 100 90

 BEY = 100 – 99 · 365 = 4.097%

 99 90

EAR: EAR = (FV/PV)n – 1 where n = # of compounding periods in a year

 = (100/99)365/90 – 1 = .0416 = 4.16%

T-bill quotes:

Note: Price is not quoted

 Discount rate is quoted

How do we find the price?

Yld on a discount basis: d = 100 – P · 360

1. n

d = discount rate (yld on a discount basis)

P = Price

n = days to maturity

Solve algebraically for P



Bond Equiv. Yield = 100 – P · 365 When n < 182 days

 P n

Note that we put P in the denominator instead of 100 and use 365 instead of 360.

This gives us the BEY but it’s still not the EAR.

EAR here assumes compounding every 90 days

BEY assumes annual compounding with semiannual cash flows

When n< 182, you can easily convert from Yield on a Discount Basis to BEY using:

BEY = 365d

 360 – dn

If n > 182 days, it gets a little tricky because the calculation must reflect the fact that a T-bill does not pay interest, but a T-Bond would make a semi-annual interest payment before maturity.



BEY =