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INTEREST RATE RESOURCE CENTER TOOLS & ANALYTICS

CALCULATING U.S. TREASURY FUTURES CONVERSION FACTORS

Every cash note or bond that is eligible for delivery into a Treasury futures contract has a conversion factor that reflects its coupon and remaining time to maturity as of a specific delivery month. A conversion factor is the approximate decimal price at which $1 par of a security would trade if it had a six percent yield-to-maturity.

A common misconception is that the DV01 of a Treasury security remains fixed as the yield of the instrument changes. In truth, the price-yield relationship of a Treasury security is nonlinear; as yields fluctuate, the DV01 of a Treasury security changes.

A bond's conversion factor is defined as:

factor = a x [(coupon/2) + c + d] – b

where factor is rounded to four decimal places, and:

coupon	is the bond's annual coupon in decimals.
n	is the number of whole years from the first day of the delivery month to the maturity (or call) date of the bond or note.
z	is the number of whole months between n and the maturity (or call) date rounded down to the nearest quarter for the 10-Year U.S. Treasury Note and 30-Year U.S. Treasury Bond futures contracts, and to the nearest month for the 2-Year, 3-Year and 5-Year U.S. Treasury Note futures contracts.

v = { z.....if z < 7 or { 3.....if z ≥ 7 (for US and TY)[1]

or { (z – 6).....if z ≥ 7 (for TU, 3YR, and FV)[2]

$a = 1/1.03^{v/6}$

b = (coupon/2) x (6 – v) / 6

$c = \{1/1.03^{2n}$..... if z < 7 or $\{1/1.03^{2n+1}$..... if otherwise

d = (coupon/0.06) x (1 – c)

Available from the Interest Rate Resource Center at www.cmegroup.com/ircenter: *U.S. Treasury Futures Conversion Factor Tables* and *U.S. Treasury Futures Conversion Factor Calculator*. In addition, to learn more about Treasury futures invoice pricing and the Treasury futures delivery process, please refer to the brochure *U.S. Treasury Futures Delivery Process*, also available from the Interest Rate Resource Center.

[1] TY and US indicate, respectively, the 10-Year U.S. Treasury Note futures contract and the 30-Year U.S. Treasury Bond futures contract.

[2] TU, 3YR, and FV indicate, respectively, the 2-Year, 3-Year and 5-Year U.S. Treasury Note futures contracts.

EXAMPLE #1: 2-YEAR U.S. TREASURY NOTE FUTURES CONTRACT[3]

Calculate the conversion factor for the 1-1/2s of October 31, 2010 (i.e., CUSIP 912828JP6) for the December 2008 expiry.

The first day of the December 2008 delivery month is Monday, December 1, 2008.

The 1-1/2s of October 31, 2010 have a calculated remaining maturity of **1 year, 10 months** based upon an actual remaining maturity of 1 year, 10 months and 30 days.[4]

n = 1
z = 10
v = 4
coupon[5] = **0.015**
a = $1/1.03^{(4/6)}$ = 0.980487
b = (0.015/2) x (6 – 4) / 6 = 0.002500
c = $1 / 1.03^{(2 \times 1) + 1}$ = 0.915142
d = (0.015/0.06) x (1 – 0.915142) = 0.021215
factor[6] = 0.980487 x [(0.015/2) + 0.915142 + 0.021215] – 0.002500 = 0.922939, which is rounded to **0.9229**

EXAMPLE #2: 3-YEAR U.S. TREASURY NOTE FUTURES CONTRACT[7]

Calculate the conversion factor for the 1-1/8s of January 15, 2012 (i.e., CUSIP 912828KB5) for the March 2009 expiry.

The first day of the March 2009 delivery month is Sunday, March 1, 2009.

The 1-1/8s of January 15, 2012 have a calculated remaining maturity of **2 years, 10 months** based upon an actual remaining maturity of 2 years, 10 months and 14 days.[8]

n = 2
z = 10
v = 4
coupon[9] = **0.01125**
a = $1/1.03^{(4/6)}$ = 0.980487
b = (0.01125/2) x (6 – 4) / 6 = 0.001875
c = $1/1.03^{(2 \times 1) + 1}$ = 0.862609
d = (0.01125/0.06) x (1 – 0.862609) = 0.025761
factor = 0. 980487 x [(0.01125/2) + 0.862609 + 0.025761] – 0.001875 = 0.874675, which is rounded to **0.8747**

[3] The contract grade for delivery into the 2-Year U.S. Treasury Note futures contract shall be U.S. Treasury notes that have an original maturity of not more than five years, three months and a remaining maturity of not less than one-year, nine months but not more than two years, zero months.

[4] Remaining maturity of the actual note is calculated in complete one-month increments from the first day of the corresponding delivery month to the maturity date of the note.

[5] The coupon is the actual note coupon rounded to the nearest one-eighth of one percent (rounded up in the case of ties).

[6] The conversion factor for any note shall be the price at which it will yield six percent (rounded to four decimal places) based on the formula found in Standard Securities Calculation Methods published by the Securities Industry Association.

[7] The contract grade for delivery into the 3-Year U.S. Treasury Note futures contract shall be U.S. Treasury notes that have an original maturity of not more than 5 years, 3 months and a remaining maturity of not less than 2 years, 9 months but not more than 3 years, 0 months.

[8] Remaining maturity of the actual note is calculated in complete one-month increments from the first day of the corresponding delivery month to the maturity date of the note.

[9] The coupon is the actual note coupon rounded to the nearest one-eighth of one percent (rounded up in the case of ties).

EXAMPLE #3: 5-YEAR U.S. TREASURY NOTE FUTURES CONTRACT[10]

Calculate the conversion factor for the 2-3/4s of October 31, 2013 (i.e., CUSIP 912828JQ4) for the December 2008 expiry.

The first day of the December 2008 delivery month is Monday, December 1, 2008.

The 2-3/4s of October 31, 2013 have a calculated remaining maturity of **4 years, 10 months** based upon an actual remaining maturity of 4 years, 10 months and 30 days.[11]

n = 4
z = 10
v = 4
coupon[12] = **0.0275**
a = $1/1.03^{(4/6)}$ = 0.980487
b = (0.0275 / 2) x (6 – 4) / 6 = 0.004583
c = $1/1.03^{(2 \times 4)+1}$ = 0.766417
d = (0.0275/0.06) x (1 – 0.766417) = 0.107059
factor = 0.980487 x [(0.0275/2) + 0.766417 + 0.107059] – 0.004583 = 0.865330, which is rounded to **0.8653**

EXAMPLE #4: 10-YEAR U.S. TREASURY NOTE FUTURES CONTRACT[13]

Calculate the conversion factor for the 3-3/4s of November 15, 2018 (i.e., CUSIP 912828JR2) for the December 2008 expiry.

The first day of the December 2008 delivery month is Monday, December 1, 2008.

The 3-3/4s of November 15, 2018 have a calculated remaining maturity of **9 years, 9 months** based upon an actual remaining maturity of 9 years, 11 months, and 14 days.[14]

n = 9
z = 9
v = 3
coupon[15] = **0.0375**
a = $1/1.03^{(3/6)}$ = 0.985329
b = (0.0375/2) x (6 – 3)/6 = 0.009375
c = $1/1.03^{(2 \times 9)+1}$ = 0.570286
d = (0.0375/0.06) x (1 – 0.570286) = 0.268571
factor = 0.985329 x [(0.0375/2) + 0.570286 + 0.268571] – 0.009375 = 0.835651, which is rounded to **0.8357**

[10] The contract grade for delivery into the 5-Year U.S. Treasury Note futures contract shall be U.S. Treasury notes that have a remaining maturity of not less than four years, two months and an original maturity of not more than five years, three months.

[11] Remaining maturity of the actual note is calculated in complete one-month increments from the first day of the corresponding delivery month to the maturity date of the note.

[12] The coupon is the actual note coupon rounded to the nearest one-eighth of one percent (rounded up in the case of ties).

[13] The contract grade for delivery into the 10-Year U.S. Treasury Note futures contract shall be U.S. Treasury notes that have a remaining maturity of not less than six years, six months and an original maturity of not more than ten years, zero months.

[14] Remaining maturity of the actual note is calculated in complete three-month increments from the first day of the corresponding delivery month to the maturity date of the note.

[15] The coupon is the actual note coupon rounded to the nearest one-eighth of one percent (rounded up in the case of ties).

EXAMPLE #5: 30-YEAR U.S. TREASURY BOND FUTURES CONTRACT[16]

Calculate the conversion factor for the 4-1/2s of May 15, 2038 (i.e., CUSIP 912810PX0) for the December 2008 expiry.

The first day of the December 2008 delivery month is Monday, December 1, 2008.

The 4-1/2s of May 15, 2038 have a calculated remaining maturity of **29 years, 3 months** based upon on an actual remaining maturity of 29 years, 5 months and 14 days.[17]

n = 29
z = 3
v = 3
coupon[18] = **0.045**
a = $1/1.03^{(3/6)}$ = 0.985329
b = (0.045/2) x (6 – 3) / 6 = 0.011250
c = $1/1.03^{(2 \times 29)}$ = 0.180070
d = (0.045/0.06) x (1 – 0.180070) = 0.614948
factor = 0.985329 x [(0.045/2) + 0.180070 + 0.614948] – 0.011250 = 0.794274, which is rounded to **0.7943**

[16] The contract grade for delivery into the 30-Year U.S. Treasury Bond futures contract shall be U.S. Treasury bonds that have a remaining maturity of 15 years to the call date if callable, or 15 years to the maturity date if non-callable.

[17] Remaining maturity of the actual bond is calculated in complete three-month increments from the first day of the corresponding delivery month to the call date in the case of callable bonds or to the maturity date in the case of non-callable bonds.

[18] The coupon is the actual bond coupon rounded to the nearest one-eighth of one percent (rounded up in the case of ties).

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