Formulas

Conversion of the 13-week Treasury Bill auction clearing price to an ACT/360 simple interest rate:

$$r_t = \frac{360}{L} \times \left(\frac{100}{P_t} - 1 \right) \tag{1}$$

Where,

$r_t =$ ACT/360 simple interest rate at issue date t

$P_t =$ 13-week Treasury Bill auction clearing price at issue date t

$L =$ number of days from (and including) the issue date of the 13-week Treasury bill to (and excluding) the maturity date of the 13-week Treasury bill

For example, on September 10, 2012, Treasury auctioned a 91-day Treasury bill at a price of 99.974722. The converted ACT/360 simple interest rate is:

$$\frac{360}{91} \times \left(\frac{100}{99.974722} - 1 \right) = 0.0010003 = 0.10003\% .$$

This rate is likely to be truncated or rounded to the nearest tenth of a basis point but the final decisions on precision will be determined later.

Assuming a \$100 notional, the formula below illustrates how to arrive at the *Dirty Price* at settlement date T_0, the amount of money due at settlement.

$$\begin{aligned}
\frac{\textit{Dirty Price}}{100} = & \frac{\frac{1}{360} \sum_{T_{-1} \le t < T_1} \max(r_t + s, 0)}{1 + \frac{1}{360} \sum_{T_0 \le t < T_1} (r_t + m)} \\
& + \frac{\frac{1}{360} \sum_{T_1 \le t < T_2} \max(r_t + s, 0)}{[1 + \frac{1}{360} \sum_{T_0 \le t < T_1} (r_t + m)] \times [1 + \frac{1}{360} \sum_{T_1 \le t < T_2} (r_t + m)]} \\
& + \cdots \\
& + \frac{1 + \frac{1}{360} \sum_{T_{N-1} \le t < T_N} \max(r_t + s, 0)}{[1 + \frac{1}{360} \sum_{T_0 \le t < T_1} (r_t + m)] \times \cdots \times [1 + \frac{1}{360} \sum_{T_{N-1} \le t < T_N} (r_t + m)]}
\end{aligned} \tag{2}$$

Where,

$T_0 =$ settlement date

$T_{-1} =$ start of the *Interest Accrual Period*

$r_t =$ *Index Rate* on day t [1]

$s =$ *Spread*

$m =$ *Discount Margin*

Note,

$T_{-1} \le T_0$

When $T_{-1} < T_0$, there will be *Accrued Interest*

The next coupon payment is T_1

All other coupon payments ($T_2, T_3, \ldots T_N$) continue until maturity with a quarterly *Frequency of Interest Payments*

Day Count convention is ACT/360

Reset Frequency is daily

$\max(r_t + s, 0)$ because of the *Minimum Interest Rate*

Define the *Accrued Interest* as the accrual amount as of the settlement date T_0, that is,

$$Accrued\ Interest = 100 \times \frac{1}{360} \sum_{T_{-1} \le t < T_0} \max(r_t + s, 0) \tag{3}$$

The *Clean Price* is derived by subtracting the *Accrued Interest* from the *Dirty Price*. [2]
That is,

$$Clean\ Price = Dirty\ Price - Accrued\ Interest \tag{4}$$

An example calculation can be found on the Bureau of the Public Debt's website at http://www.treasurydirect.gov/instit/statreg/auctreg/DMCalc.xlsm.

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[1] *Index Rate* r_t beyond the settlement date T_0 is fixed at the value obtained from the last available good fixing.

[2] This methodology does not enable a *Clean Price* of par any time when the *Discount Margin* equals the *Spread* because (1) the *Accrued Interest* is not discounted to the settlement date, and/or (2) when the *Minimum Interest Rate* is binding.