

# U. S. Treasury bill yield calculations

A problem set prepared by Pamela Peterson Drake, Florida Atlantic University

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## Formulas

$$\text{Discount-basis yield} = \left( \frac{\text{face value} - \text{purchase price}}{\text{face value}} \right) \left( \frac{360}{\text{number of days to maturity}} \right)$$

$$\text{Investment yield} = \left( \frac{\text{face value} - \text{purchase price}}{\text{purchase price}} \right) \left( \frac{365}{\text{number of days to maturity}} \right)$$

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1. For each of the following Treasury Bills, calculate the discount basis yield and the investment yield:

T-Bill	Maturity	Price per \$100	Discount basis yield	Investment yield
A	28-day	99.7667		
B	91-day	99.2480		
C	182-day	98.3190		
D	14-day	99.8769		
E	91-day	99.2214		
F	182-day	98.4631		

2. Suppose the investment yield on a 182-day T-bill is 4%. What is its discount-basis yield?

## Solutions

1.

T-Bill	Maturity	Price per \$100	Discount basis yield	Investment yield
A	28-day	99.7667	3.000%	3.048%
B	91-day	99.2480	2.975%	3.039%
C	182-day	98.3190	3.325%	3.429%
D	14-day	99.8769	3.165%	3.213%
E	91-day	99.2214	3.080%	3.147%
F	182-day	98.4631	3.040%	3.130%

Example: T-Bill A

$$\text{Discount-basis yield} = \left( \frac{\$100 - 99.7667}{\$100} \right) \left( \frac{360}{28} \right) = (0.002333)(12.85714) = 2.99957\%$$

$$\text{Investment yield} = \left( \frac{\$100 - 99.7667}{\$99.7667} \right) \left( \frac{365}{28} \right) = (0.00233846)(13.035714) = 3.04835\%$$

2. First, solve for the purchase price of the T-bill, given the investment rate and the days to maturity:

$$\left( \frac{\$100 - P}{P} \right) \left( \frac{365}{182} \right) = \left( \frac{\$100 - P}{P} \right) (2.005495) = 4\%$$

Solve for P in

$$\left( \frac{\$100 - P}{P} \right) = \frac{0.04}{2.005495}$$

using Algebra:

$$\$100 - P = \left( \frac{0.04}{2.005495} \right) P$$

$$\$100 = \left[ \left( \frac{0.04}{2.005495} \right) P \right] + P = \left( 1 + \frac{0.04}{2.005495} \right) P$$

$$\$100 = 1.019945 P$$

$$P = \$98.044483$$

Second, solve for the discount-basis yield:

$$\text{Discount-basis yield} = \left( \frac{\$100 - 98.044483}{\$100} \right) \left( \frac{360}{182} \right) = (0.019555)(1.978022) = 3.86802\%$$