Topic: Treasury Bills

Taylen purchased a 90 day US Treasury Bill which will mature for 100,000 and has a quoted rate of 6%.

Calculate the Price that Taylen paid to purchase this Treasury Bill.

Solution:

$$\text{Quoted Rate} = 0.06 = \frac{360}{90}\frac{100,000 - \text{Price}}{\text{Maturity Value}}$$

$$0.015 = \frac{100,000 - \text{Price}}{100,000}$$

$$1500 = 100,000 - \text{Price}$$

$$\text{Price} = 100,000 - 1500 = 98,500$$

A US Treasury Bill matures for 100,000 at the end of 200 days and has a price of P_{TBILL}^{US}.

A Canadian Treasury Bill matures for 100,000 at the end of 200 days and has a price of P_{TBILL}^{CAN}.

The Quoted Rate for both the US and the Canadian Treasury Bill is 7.25%.

Calculate $P_{TBILL}^{CAN} - P_{TBILL}^{US}$.

Solution:

Canadian

$$\text{Quoted Rate} = \left(\frac{365}{\text{Days to Maturity}}\right)\left(\frac{\text{Interest}}{\text{Price}}\right) \Longrightarrow 0.0725 = \left(\frac{365}{200}\right)\left(\frac{100{,}000 - \text{Price}}{\text{Price}}\right)$$

$$\Longrightarrow (0.0725)\left(\frac{200}{365}\right)(\text{Price}) = 100{,}000 - \text{Price} \Longrightarrow \text{Price} = \frac{100{,}000}{1 + (0.0725)\left(\frac{200}{365}\right)} = 96{,}179.18$$

United States

$$\text{Quoted Rate} = \left(\frac{360}{\text{Days to Maturity}}\right)\left(\frac{\text{Interest}}{\text{Maturity Value}} =\right) \Rightarrow 0.0725 = \left(\frac{360}{200}\right)\left(\frac{100{,}000 - \text{Price}}{100{,}000}\right)$$

$$\Longrightarrow (0.0725)\left(\frac{200}{360}\right)(100{,}000) = 100{,}000 - \text{Price} \Longrightarrow \text{Price} = 100{,}000 - (0.0725)\left(\frac{200}{360}\right)(100{,}000)$$

$$= 95{,}972.22$$

$$Answer = 96{,}179.18 - 95{,}972.22 = 206.96$$

Sam has a choice of the following two investments:

a. A United States Treasury Bill which matures in 275 days for 100,000. This Treasury Bill has a price of 95,000.

b. A Canadian Treasury Bill that has the same quoted rate as the United States Treasury Bill. The Canadian Treasury Bill matures for 110,000 at the end of 170 days.

Determine the price of the Canadian Treasury Bill.

Solution:

US

$$QR = \frac{360}{275} \cdot \frac{100,000 - 95,000}{100,000} = 0.065454545$$

Canadian

$$QR = \frac{365}{170} \cdot \frac{110,000 - P}{P} = 0.065454545$$

$$\frac{110,000 - P}{P} = 0.030485678$$

$$110,000 - P = 0.030485678P$$

$$P = \frac{110,000}{1.030485678} = 106,745.78$$

Christine has the choice of two investments:

a. With Investment A, Christine will invest 10,000 today. The investment will earn an annual effective interest rate of i. Using the Rule of 72, Christine believes that she will have 40,000 at the end of 17 years.

b. Investment B is a US Treasury Bill which has a price of 10,000 today and a maturity value of 10,240.16. The quoted rate on the Treasury Bill is i.

Calculate the annual effective interest rate earned by Investment B.

Solution:

The amount quadruples in 17 years so it doubles in 8.5 years.

$$\text{Using the Rule of 72} \Longrightarrow \frac{72}{i} = 8.5 \Longrightarrow i = \frac{72}{8.5} = 8.47059\%$$

For the US Treasury Bill, we need to find its duration.

$$QR = 0.0847059 = \left(\frac{360}{x}\right)\left(\frac{240.16}{10{,}240.16}\right) \Longrightarrow x = 99.6742$$

Then we solve for the annual effective interest rate.

$$(10{,}000)(1+i)^{\frac{99.6742}{365}} = 10{,}240.16$$

$$1+i = (1.02416)^{\frac{365}{99.6742}} = 1.09079 \Longrightarrow Answer = 0.09079$$

Some students rounded the number of days to 100 and completed the calculation which is reasonable.

Megan buys a US Treasury Bill with a maturity period of 120 days. The quoted rate on the US Treasury Bill is 0.09000 and the price is 9506.

Megan also buys a Canadian Treasury Bill with a maturity period of 120 days

The US Treasury Bill and the Canadian Treasury Bill have the same maturity value and the same price.

Determine the quoted rate on the Canadian Treasury Bill.

Solution:

For the US Treasury Bill,

$$QR = 0.09 = \left(\frac{360}{120}\right)\left(\frac{MV - 9506}{MV}\right) \Longrightarrow 0.03MV = MV - 9506$$

$$\Longrightarrow 9506 = MV - 0.03MV \Longrightarrow MV = \frac{9506}{0.97} = 9800$$

For the Canadian Treasury Bill,

$$QR = \left(\frac{365}{120}\right)\left(\frac{9800 - 9506}{9506}\right) = 0.09407$$