

BUSN3049 Corporate Finance

Tutorial 3

1. Find the EAR, or stated rate, in each of the following cases.

Stated Rate (APR)	Number of Times Compounded	Effective Rate (EAR)
10.2%	Quarterly	
18.0%	Monthly	
13.5%	Daily	
9.5%	Semiannually	

Answer

Here we are given the EAR and need to find the APR. Using the equation for discrete compounding:

$$EAR = [1 + (APR/m)]^m - 1$$

EAR, $r = 10.2\%$ and $m = 4$, we have

$$EAR = [1 + (0.102/4)]^4 - 1 = 0.1060$$

EAR, $r = 18\%$ and $m = 12$, we have

$$EAR = [1 + (0.18/12)]^{12} - 1 = 0.1956$$

EAR, $m = 365$ and $r = 13.5\%$, we have

$$EAR = [1 + (0.135/365)]^{365} - 1 = 0.1445$$

EAR, $m = 2$ and $r = 9.5\%$, we have

$$EAR = [1 + (0.095/2)]^2 - 1 = 0.0973$$

2. What is the relationship between the value of an annuity and the level of interest rates? Suppose you just bought a 10-Year annuity of \$5,200 per year at the current interest rate of 10 percent per year. What happens to the value of your investment if interest rates suddenly drop to 5 percent? What if interest rates suddenly rise to 15 percent?

Answer

The present value of an annuity falls as r increases, and the present value of an annuity rises as r decreases. The future value of an annuity rises as r increases, and the future value of an annuity falls as r decreases.

Here we need to calculate the present value of an annuity for different interest rates. The present value of an annuity equation is

$$PVA = C(\{1 - [1/(1 + r)^t]\}/r)$$

For interest rate of 10% and $t = 10$, we get

$$PVA = 5,200(\{1 - [1/(1 + 0.1)^{10}]\}/0.1) = 31,951.75$$

At an interest rate of 5%, the present value of the annuity is:

$$PVA = 5,200(\{1 - [1/(1 + 0.05)^{10}]\}/0.05) = 40,153$$

And, at an interest rate of 15%, the present value of the annuity is:

$$PVA = 5,200(\{1 - [1/(1 + 0.15)^{10}]\}/0.15) = 26,097.6$$

3. Imagine you are discussing a loan with a somewhat unscrupulous lender. You want to borrow \$18,000 for one year. The interest rate is 14.6 percent. You and the lender agree that the interest rate on the loan will be $0.146 \times 18,000 = \$2,628$. So, the lender deducts this amount from the loan up front and gives you \$15,372. In this case, we say that the discount is \$2,628. What's wrong here?

Answer



Figure 1: Time Line

To find the APR and EAR, we need to use the actual cash flows of the loan. In other words, the interest rate quoted in the problem is only relevant to determine the total interest under the terms given. The cash flows of the loan are the \$18 000 you must repay in one year, and the \$15,372 you borrow today. The interest rate of the loan is:

$$\begin{aligned} 18,000 &= 15,372(1 + r) \\ r &= (18,000/15,372) - 1 \\ r &= 0.1709 \end{aligned}$$

Because of the discount, you only get the use of \$15,372 and the interest you pay on that amount is 17.1%, not 14.6%.