**Table 5.1 APR vs. EAR**

Definition:

rf(T) = [100/P(T)] – 1 (1)

1 + EAR = [1 + rf(T)]1/T (2)

APR =rf(T) / T (3)

From (2), (1 + EAR)T = 1 + rf(T) (4)

From (3), rf(T) = APR \* T (5)

From (4) and (5), (1 + EAR)T = [1 + APR \* T] (6)

⇒ APR \* T = (1 + EAR)T – 1

⇒ APR = [(1 + EAR)T – 1]/T (7)

From (6) (1 + EAR)T = [1 + APR \* T]

⇒ (1 + EAR) = [1 + APR \* T]1/T

⇒ EAR =[1 + APR \* T]1/T  – 1 (8)

**Bank Lending Rate Example with Multiple Payments**

Bank lending rate of APR = 10% with monthly payments.

What is the effective annual rate (EAR)?

1 + EAR = (1 + APR/N)N, where N is the number of payments per year.

1 + EAR = (1 + 0.10/12)12 = 1.1047, Hence EAR = 10.47%

Substituting N = 1/T into 1 + EAR = (1 + APR/N)N,

we obtain 1 + EAR = (1 + APR \* T)1/T  or

EAR = (1 + APR \* T)1/T – 1 (8)