

## Section 2 – Basic Level Annuities

An annuity is a cashflow with payments at equal time intervals. An annuity is level if the amounts of the cashflow are equal. We are mainly interested in calculating the value of the annuity at different points in time.

We focus our attention on annuities with payments of 1 since the value at any time of an annuity with payments of  $R$  is equal to  $R$  times the value at that same time of the annuity with payments of 1.

Consider an annuity with  $n$  payments of 1. If the payments are considered to be made at the end of each payment period, then the annuity is referred to as an annuity immediate or ordinary annuity. If the payments are considered to be made at the beginning of each period, then the annuity is referred to as an annuity due.

FORMULAS: (*VEP* means “value each payment”)

Annuity Immediate (aka Ordinary Annuity) Notations and Formulas

$$a_{\overline{n}|}^{\text{VEP}} = v + v^2 + \dots + v^n \stackrel{\text{closed form}}{=} \frac{1 - v^n}{i}$$

$$s_{\overline{n}|}^{\text{VEP}} = 1 + (1+i) + \dots + (1+i)^{n-1} \stackrel{\text{closed form}}{=} \frac{(1+i)^n - 1}{i}$$

Annuity Due Notations and Formulas

$$\ddot{a}_{\overline{n}|}^{\text{VEP}} = 1 + v + \dots + v^{n-1} \stackrel{\text{closed form}}{=} \frac{1 - v^n}{d}$$

$$\ddot{s}_{\overline{n}|}^{\text{VEP}} = (1+i) + (1+i)^2 + \dots + (1+i)^n \stackrel{\text{closed form}}{=} \frac{(1+i)^n - 1}{d}$$

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