

M118 SECTION 3.3 – Future Value of an Annuity: Sinking Funds

1) **Annuity** – a sequence of equal periodic statements

Ordinary Annuity – payments made at the end of a time interval (we are only going to consider ordinary annuities in this class)

Suppose you deposit \$100 every 6 months for 3 years at 6% compounded semiannually. How much would you accrue at the end of that 3 years?

$$S = 100 + 100(1.03) + 100(1.03)^2 + 100(1.03)^3 + 100(1.03)^4 + 100(1.03)^5$$

$$1.03S = 100(1.03) + 100(1.03)^2 + 100(1.03)^3 + 100(1.03)^4 + 100(1.03)^5 + 100(1.03)^6$$

$$1.03S - S = 100(1.03)^6 - 100$$

$$.03S = 100 [(1.03)^6 - 1]$$

$$S = \frac{100 [(1.03)^6 - 1]}{.03}$$

In General The Future Value (FV) of an ordinary annuity that has payment (PMT) with r interest rate/year and n compounding periods per year

$$FV = \frac{PMT \left[\left(1 + \frac{r}{n} \right)^{nt} - 1 \right]}{\frac{r}{n}}$$

a) What is the value of an ordinary annuity after 10 years if \$1000 is deposited every 6 months at 8 % compounded semiannually?

TVM SOLVER: N= 20

I = 8

PV= 0

PMT = -1000

FV = ?

FV = \$29,778.08

P/Y = 2

C/Y = 2

b) Now find the total interest earned. $29778.08 - 20(1000) = \$9778.08$

or use TVM SOLVER $\sum \text{Int}(\text{1st period, last period}) = \sum \text{Int}(1, 20) = 9,778.08$

BALANCE SHEET: #30 If \$2000 is deposited at the end of each quarter for 2 years into an ordinary annuity earning 7.9% compounded quarterly, construct a balance sheet showing the interest earned during each quarter and the balance at the end of each quarter.

N=

I =

PV=

PMT =

FV =

P/Y =

C/Y =

SINKING FUNDS: An account established for accumulating funds to meet future obligations.

#28 Parents have set up a sinking fund in order to have \$120,000 in 15 years for their children's education. How much should be paid semiannually into an account paying 6.8% compounded semiannually?

N=
I =
PV=
PMT=
FV =
P/Y =
C/Y =

A company establishes a sinking fund with \$1000 monthly payments at 10% compounded monthly. How long will it take before you have \$100,000?

$$100000 = 1000 \frac{(1 + \frac{.10}{12})^{12t} - 1}{\frac{.10}{12}}$$

TVM SOLVER will have answer in months

N= ? N= 74
I = 10
PV= 0
PMT= -1000
FV = 100000
P/Y = 12
C/Y = 12

74 months = 6.09 years

t = 6.09 years

Algebra can not be used to solve for interest rates. So you MUST use either TVM solver of Graphical techniques.

An individual makes annual deposits of \$1000 into an annuity. After 20 years it is worth \$55,000. What annual compound rate has the annuity earned?

$$N = 20$$

$$I = ?$$

$$I = 9.64\%$$

$$PV = 0$$

$$PMT = -1000$$

$$FV = 55000$$

$$P/Y = 1$$

$$C/Y = 1$$