

Time Value of \$

Time value of money (From last time)

Interest for one year:

$$B_2 = B^1(1 + r)$$

For a second year compounded:

$$B_3 = B_2(1 + r) = B_1(1 + r)^2$$

...

For further years:

$$B_N = B_1(1 + r)^N$$

$$\text{or } F = P(1 + r)^N$$

also

$$P = F(1 + r)^{-N}$$

If money earns 11% compounded annually, which of the following is worth the most?

- \$355 received today.
- \$155 received today plus \$550 received 10 years from today.
- \$635 received 10 years from today.
- \$55/ year for ten years, starting one year from today.

- \$355 received today.

$$P = 355$$

- \$155 received today plus \$550 received 10 years from today.

$$P = 155 + 550(1.11)^{-10} = 348.70$$

- \$635 received 10 years from today.

$$P = 635(1.11)^{-10} = 233.64$$

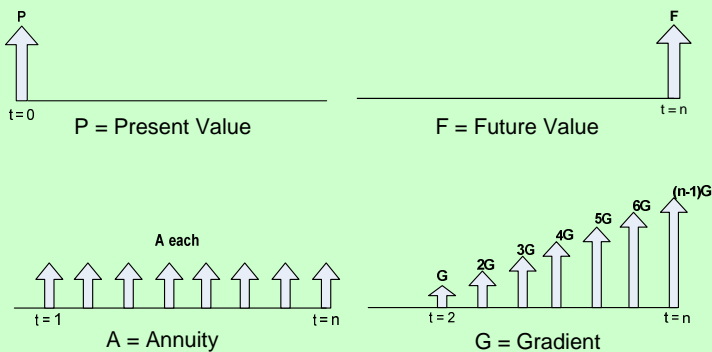
- \$55/ year for ten years, starting one year from today.

could bring adjust each year (10 years)

This type of cash flow is called an annuity

Handout: Time Value of Money

Standard Cash Flow Types



Conversion Factors

- Present Value given an Annuity (Uniform Series Present value) or P given A

- Symbol: $(P/A, i\%, n)$
 $= (P/A, 11, 10)$ for this example

- Formula:

$$(P/A, 11\%, 10) = \frac{(1.11)^{10} - 1}{0.11(1.11)^{10}} = 5.889$$

$$P = 5.889(55) = 323.91$$

The best choice is?

What if the interest rate were 10%?

For 10% interest

- \$355 received today.
 $P = 355$
- \$155 received today plus \$550 received 10 years from today.
 $P = 155 + 550(1.10)^{-10} = 155 + 212 = 367$
note $(1.10)^{-10} = 0.3855$
- \$635 received 10 years from today.
 $P = 635(1.10)^{-10} = 245$
- \$55/ year for ten years, starting one year from today.
 $(P/A, 10\%, 10) = \frac{(1.1)^{10} - 1}{0.1(1.1)^{10}} = 6.144$
 $P = 6.144 (55) = 337.95$

Can also look up this factor in a table (FE guide on line)

- Find
1. interest table
 2. column for factor ratio
 3. row for year

Do first page of problems

Excel functions (on back)

- Annuity NPV(rate, n, payment)
 $= NPV(10, 10, 55)$

Any cash flow - use problem last problem on sheet
(9 years of \$500 and year 10 of 15000, interest of 15)

- NPV(rate, series)

Net present value can compare alternatives for the same invest e.g. which plant is cheaper. Difficult to compare completely different investments. The alternative is the Discounted Cash Flow Return On Investment (ROI)

- DCFROI in Excel
IRR(series, guess)
show with above series and - 7500 in year zero

Try problems on back as time allows

- Spreadsheet setup for
1. Calculating NPV in problem 6B.
 2. Calculating DCFROI for an initial payment of \$7,500

	B	C	D	E	F
1	Cash Flow				
2	year	payments	Interest =	12%	
3	0	-7500	NPV	=NPV(F2,C4:C13)	
4	1	500	or		
5	2	500	DCFROI	=IRR(C3:C13)	
6	3	500			
7	4	500			
8	5	500			
9	6	500			
10	7	500			
11	8	500			
12	9	500			
13	10	15000			

The interest rate must have the % sign or be in fractional rate (e.g., in this case the interest cell must be **12%** or **0.12**)

