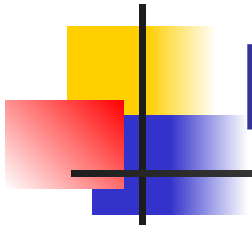
Present Value Essentials

Basic Assumptions:

- All cash payments (receipts)
- Certainty regarding:
  - Amount of cash flows
  - Timing of cash flows
- All cash flows are immediately reinvested at designated interest rate

Basic Concepts:

- For Accounting almost always Present value. I.e.: Answer the question:
- Some amount of money is to be paid or received in the future (or a series of payments), how much is it worth now, given a certain required rate of return



Basic Concepts I:

- Time Value of Money:
  - Invested money earns interest (if in bank) or some rate of return (if invested in something else)
- Compound interest:
  - Money earned on investment is reinvested immediately at required rate of return (interest earned on interest received)

Basic Concepts II:

- Interest; rate of return; discount rate:
  - For PV analysis they mean the same. From now, only "interest" will be used
- Future Value:
  - Value of an investment after a designated period of time, given a specified interest rate

Present Value vs. Future Value

- Present value is based on future value, specifically the compound interest formula. Therefore
- Future value discussion to help you understand present value

Basic Future Value Concepts:

- Invested money earns more money
- $1,000 today is worth more than $1,000 one year from today because:
- $1,000 invested at 10% grows to $1,100 in one year
- $1,100 is the future value of $1,000 @ 10% after one year

Future Value Example:

	Investment	interest rate	interest earned
year 1	$100.00	10%	$10.00
year 2	$110.00	10%	$11.00
year 3	$121.00	10%	$12.10
Value of investment after three years:	$133.10		

FV Example (alternate view):

- $ 1,000 @ 10% grows to
  - $1,100 in one year
  - $1,210 in two years
  - $1,331 in three years OR
- $1,000 * 1.1*1.1*1.1 = $1,331

Future Value Example:

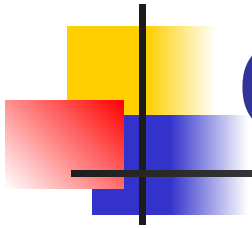
Another way to determine the future value of $100 invested to earn 10%, interest compounded annually:Use the Compound interest formula:

$(1 + r)^n$ Where r = interest rate/compounding period and n = number of compounding periods

$(1 + .1)^3 = 1.331 * 100 = \$133.10$

Compounding:

- Number of times per year interest is calculated
- May be annually, semi-annually, quarterly, etc.
- **However:** Interest rate is expressed on annual basis, unless stated to be for another period. Therefore: if annual interest rate is 10% ----□



Compounding:

- Semi-annual: 5% twice a year
- Quarterly: 2.5% four times a year
- Monthly: 10/12% 12 times a year
- In other words: If more than one compounding period/year, interest rate is divided by # of periods. # of years multiplied by # of periods

Compounding:

- Why does it matter? Because interest adds up faster. E.g.:
- 10%, 3 years, semi-annual compounding: $(1 + .1/2)^{3*2} = 1.34 > (1 + .1)^3 = 1.31$

Future Value Calculation:

- FV of r= 10%, annual compounding and n= 3 years:
- **FV (r, n) = FV (10%,3) = 1.331**
- $100 invested for 3 years at 10% =
- $100 * FV (10%, 3) = X
- $100 * 1.331 = X = $133.10

Present Value (PV):

- Accounting almost always wants to know what something is worth **now**
- PV asks: If $133.10 will be received in 3 years, how much is it worth today if 10% is the appropriate discount rate?
- Use FV formula to answer the question:

PV of $133.10
(to be paid or received in 3 years)

- X * FV(10%,3) = $ 133.10
- X * 1.331 = $ 133.10
- (X* 1.331)/1.331 = $133.10/1.331 = $100
- PV = Reciprocal of FV OR 1/FV
- therefore: PV(10%,3) = 1/FV(10%,3)
- = $1/(1+.1)^3 = .75132$

PV of $133.10
(to be paid or received in 3 years (again))

- $ 133.10 * PV(10%,3) = X
- $ 133.10 * .75132 = X = $100
- This is the equation you must use
- Do not use the formula, use table instead (p. C10)

Part II Annuities

- Basic PV used for single sum payments
  - E.g. a note payable due in 5 years
- **PV of Annuity** used for questions relating to a series of **equal payments at regular intervals**
  - E.g. car payments, payments on a student loan

PV of 3 payments of $ 100 each?

- Payments made at end of each of the next three years, 10% interest rate:
- PVA $100 (10%,3)

PV annuity (PVA) $100, 10%, 3 years:

Option 1:	we could express the above as follows:			
	receive	PV	Factor	answer:
end of year 1	$100.00	(10%,1)	0.9091	$90.91
end of year 2	$100.00	(10%,2)	0.8264	$82.64
end of year 3	$100.00	(10%,3)	0.7513	$75.13
				$248.68

PV annuity (PVA) $100, 10%, 3 years:

Option 2: Use simple algebra, factor out constant:

Restated equation:

$100 * (.9091 + .8264 + .7531) = X

$100 * 2.4868 = X = $248.68

PV annuity (PVA)

Present value of an annuity (PVA) 3 periods, 10% = (.9091 + .8264 + .7531) = 2.4868

Libby ordinary annuity table, page 748:

PVA (10%,3) = 2.4869

Kimmel ordinary annuity table, Appendix C:

PVA (10%,3) = 2.48685

	Present Value (PV) of $ 1		
period	1%	2%	10%
1	0.99	0.98	0.909
2	0.98	0.961	0.826
3	0.971	0.942	0.751
PV of an ordinary annuity of $1			
period	1%	2%	10%
1	0.99	0.98	0.909
2	1.97	1.942	1.736
3	2.941	2.884	2.487

PV annuity due (PVA due)

- Difference: 1st payment is at beginning of period compared to at the end for an ordinary annuity
  - Example: Rent or lease payments
- Libby does not have table for it
- However: not a big problem

PVA due: 3 payments, 10%

Option 1:	we could express the above as follows:			
	receive	PV	Factor	answer:
beginning of	$100.00	(10%,0)	1	$100.00
beginning of	$100.00	(10%,1)	0.9091	$90.91
beginning of	$100.00	(10%,2)	0.8264	$82.64
				$273.55

PVA due: 3 payments, 10%

Option 2: Calculate the factor:

PVA due (10%,3)

= 1 +PVA(10%,2)

= 1 + 1.73554

= **2.73554** * $ 100 = **$2.73.55**

Compared to ordinary annuity: 2.4868