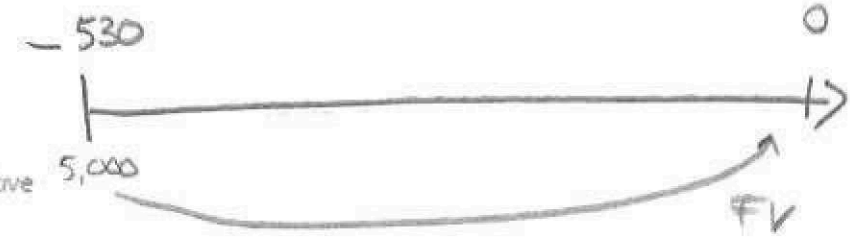
Class 3 Notes - does not need to be submitted

Part 1: Review Practice Problems from last class

More practice problems:

Q1:

Symantec Federal Account Executive
5d • Anyone



If you worked everyday, making $5000/day, from the time Columbus sailed to America (1492 for those that don't remember the song), to today, you would still not be a billionaire, and you would still have less money than Jeff Bezos makes in a week. - - I stumbled across this "fun" fact yesterday and am still #mindblown

30 • 2 Comments

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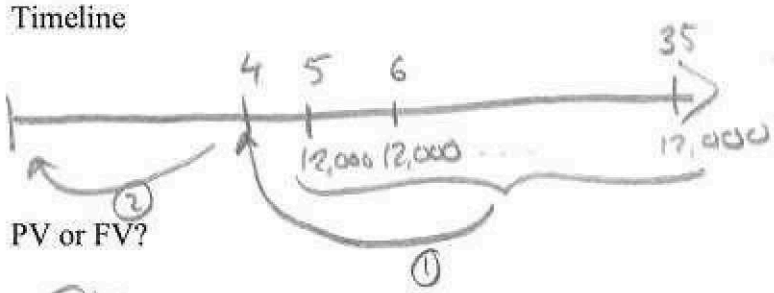
If 5,000 once, 530 years ago, at rate of 5%: $5{,}000 \cdot 1.05^{530} = 8.697 \cdot 10^{14}$

If 5,000 every year @ 5%: $5000\left[\frac{1.05^{530}-1}{0.05}\right] = 1.6995 \cdot 10^{16}$

Q2: You want to buy a house in 5 years. You plan on paying an annual mortgage of $12,000 for 30 years. – starting in 5 years
Your discount rate is 7.5%.

- How much do you need to have at t = 4?
- How much do you need to have right now?

1) Timeline



2) PV or FV?

PV

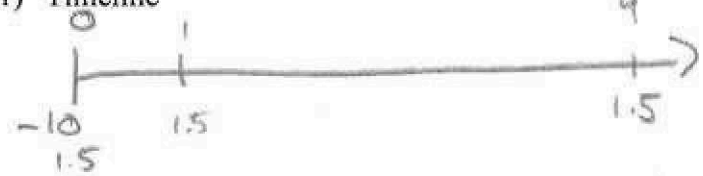
3) Formula and calculate

(1) $12{,}000\left[\frac{1-\frac{1}{1.075^{30}}}{0.075}\right] = 141{,}724.64$ at $t = 4$

$\frac{141{,}724.64}{1.075^{4}} = 106{,}123.48$ at $t = 0$

Q3: A firm wants to build a new factory for $10 million. The cost is incurred right now. The revenues from this factory will be $1.5 million every year for 10 years, starting right now. If the discount rate is 6.8%, is this a good investment?

1) Timeline



2) PV or FV?

PV

3) Formula and calculate

$$PV = 1.5\left[\frac{1-\frac{1}{1.068^{10}}}{0.068}\right] = 10.63 \quad \text{as of } t=-1$$

$$\hookrightarrow 11.36 \quad \text{as of } t=0 \quad >10$$

Good investment

OR

$$1.5\left[\frac{1-\frac{1}{1.068^{9}}}{0.068}\right] + 1.5$$

$$= 9.8565 + 1.5$$

$$= 11.36 \quad >10$$

Good investment

Q4:

Your co-op agrees to hire you part-time. You are offered a $1,400 monthly salary for 12 months. Your discount rate is 1.5% monthly. What is the PV of this offer?

↑ starting at end of month

1) Timeline

2) PV or FV

PV

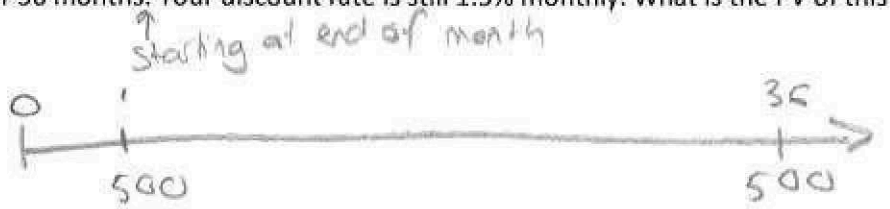
3) Calculate

$$PV = 1400\left[\frac{1-\frac{1}{1.015^{12}}}{0.015}\right] = \$18,680.53$$

Q5:

Alternatively, you could work a part-time job on campus for the full remaining 3 years. The campus job offers $500 per month for 36 months. Your discount rate is still 1.5% monthly. What is the PV of this offer?

1) Timeline



2) PV or FV

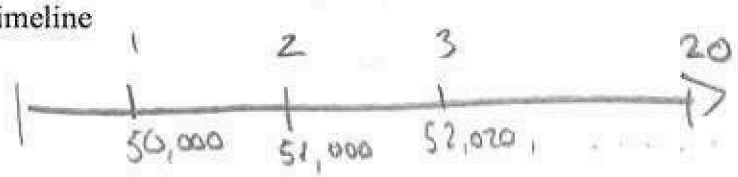
PV

3) Calculate

$$PV = 500\left[\frac{1-\frac{1}{1.015^{36}}}{0.015}\right] = 13,830.34$$

Q6: You will get paid $50,000 per year for 20 years starting at t = 1 but your salary increases / grows by 2% every year. If your discount rate is 7%, what is your current net worth?

1) Timeline



2) PV or FV

PV

3) Calculate

$$PV = C\left[\frac{1-\left(\frac{1+g}{1+r}\right)^{t}}{r-g}\right] = 50,000\left[\frac{1-\left(\frac{1.02}{1.07}\right)^{20}}{0.07-0.02}\right]$$

$$= \$616,002.96$$

New formula:

Growing Annuity

Look out for the words: "growing at a rate of g% every year for t years"

- Book covers PV only, so we also cover PV only
- Like the normal annuity formula, this formula brings you to the year before the first cash flow!

$$PV = C \left[\frac{1 - \left[\frac{1+g}{1+r} \right]^{t}}{r - g} \right]$$

t: # of CFs included ("for t years")

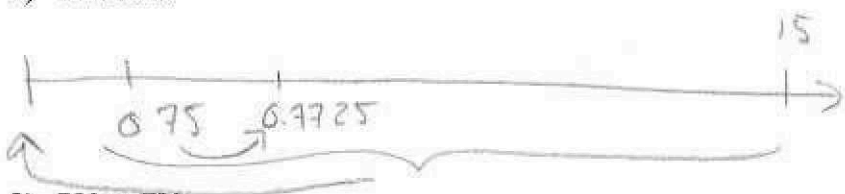
C: The first CF that's growing

r - g: growth rate

PV: Brings you to year before the first CF that's growing

Q7: V-good lawns Co. will pay a dividend every year for the next 15 years, starting next year. The dividend will be $0.75 at first (next year), but it will grow by 3% every year. Your discount rate is 9%. How much are you willing to pay for a share of this stock right now?

1) Timeline



2) PV or FV

PV

3) Calculate

$$PV = 0.75 \left[\frac{1 - \left[\frac{1.03}{1.09} \right]^{15}}{0.09 - 0.03} \right] = \$7.15$$

Q8: V-good lawns Co. will pay a dividend of $1 every year forever, starting next year. How much are you willing to pay for a share of this stock right now? Discount rate = 5%

1) Timeline

2) PV or FV

PV

3) Calculate

New formula:

Perpetuity

Note that FV(Perpetuity) does not exist!

Just like the annuity formula, the perpetuity formula brings you to the year before the first cash flow.

$$PV = \frac{C}{r}$$ ← first CF

Growing Perpetuity

Note that FV(Perpetuity) does not exist!

Just like the annuity formula, the perpetuity formula brings you to the year before the first cash flow.

$$PV = \frac{C}{r-g}$$ ← first growing CF

g ← growth rate

Q9: V-good lawns Co. will pay a dividend of $1 every year forever, starting next year. How much are you willing to pay for a share of this stock right now? Discount rate = 5%

1) Timeline

2) PV or FV

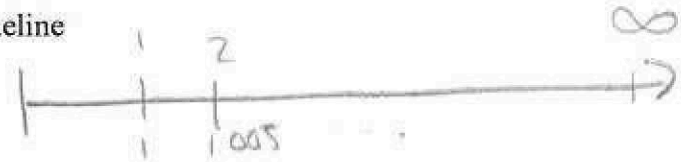
PV

3) Calculate

$PV = \frac{1}{0.05} = \$20$

Q10: V-good lawns Co. will pay a dividend of $1 next year. Analysts expect it to believe to grow at a rate of 0.5% forever. How much are you willing to pay for a share of this stock right now? Discount rate = 5%

1) Timeline



2) PV or FV

PV

3) Calculate

$PV = \frac{1}{0.05 - 0.005} = \$22.22$