

1. On the back of parking tickets, you'll notice if you pay the ticket today, it will cost \$10. However, if you do not pay it today, you will have to pay \$20 (1/2 a year from now) in January when you register. Assume that the annual interest rate is 8% per year, which makes the "half-year" interest rate roughly 4% (Use 4% in this question). Should you pay the ticket now or wait 6 months?

$$P (\$10 \text{ today}) = \$10$$

$$P (\$20 \text{ } \frac{1}{2} \text{ year from now}) = A / (1 + R) = \$20 / 1.04 = \$19.23 \text{ (using the "half year" } R)$$

Pay today.

2. Everyone knows it is a pain to go to the parking office, because it takes a bunch of time to go there, wait in line, etc. Now suppose to pay the ticket today costs the \$10 and \$9 worth of your time. Should you pay the ticket now or wait 6 months? Use the same value for R as you used in #1.

$$P (\$10 \text{ today} + \$9 \text{ today}) = \$19$$

$$P (\$20 \text{ } \frac{1}{2} \text{ year from now}) = \$19.23.$$

You still pay today.

3. You are a NY Firefighter. You are very unhappy that NYC sent you into "ground zero" with inadequate masks, causing you to have some respiratory problems. You sue, and you are offered a hefty settlement. You will collect your choice of the following options:

Option 1 - \$1000 today

Option 2 - \$200 one year from now, and every year there after

Option 3 - \$1500 one year from today

- a. Which do you choose if the interest rate is 10%?

$$PV \text{ Option 1} = \$1000$$

$$PV \text{ Option 2} = P = a / R = \$200 / 0.10 = \$2000$$

$$PV \text{ Option 3} = P = A / (1 + R) = (\$1500 / 1.10) = \$1363$$

You are receiving the money, and want the option with the highest present value, choose option 2.

- b. Which do you choose if the interest rate is 4%?

$$PV \text{ Option 1} = \$1000$$

$$PV \text{ Option 2} = P = a / R = \$200 / 0.04 = \$5000$$

$$PV \text{ Option 3} = PV \text{ Option 3} = P = A / (1 + R) = (\$1500 / 1.04) = \$1442$$

Choose option 2 again.

4. After having a huge bunion removed, your doctor charges you \$500. You may either pay \$500 now, or pay \$625 in one year. Which should you choose if
- the interest rate is 20%
 - the interest rate is 25%
 - the interest rate is 30%

Present Value of \$500 today is \$500 regardless of the interest rate.

Present Value of \$625 one year from now,

$$\text{For } R = 20\%, \quad P = A / (1 + R) = \$625 / (1 + 0.20) = \$625 / 1.20 = \$520.83$$

$$\text{For } R = 25\%, \quad P = A / (1 + R) = \$625 / (1 + 0.25) = \$625 / 1.25 = \$500$$

$$\text{For } R = 30\%, \quad P = A / (1 + R) = \$625 / (1 + 0.30) = \$625 / 1.30 = \$480.77$$

Since you are paying here, you want to choose the option with the smallest present value.

For a ($R=20\%$), you will choose to pay the \$500 now.

For b ($R = 25\%$), you will be indifferent

For c ($R = 30\%$), you will choose to pay the \$625 a year from now

5. Assume $R = 20\%$. What is the value of a perpetuity that pays \$300 every year if the first payment is
- today?
 - one year from today?
 - two years from today?

$$P = (a / R) + a = (\$300 / 0.20) + \$300 = \$1500 + \$300 = \$1800$$

$$P = a / R = \$300 / 0.20 = \$1500$$

$$P = (a / R) - a / (1 + R) = (\$300 / 0.20) - \$300 / (1.20) = \$1500 - \$250 = \$1250$$

6. Expected inflation is 5%. The unemployment rate is 6%. The real interest rate is 4%. The default premium is 2%. There's a 10% chance of showers. What is the nominal interest rate?

$$R = r + \pi^e + \rho^d = 4\% + 5\% + 2\% = 11\%$$

7. Suppose your grandpa's ear hair is growing at a rate of 3.5% a year. How many years until it doubles in length?

$$T = 70 / G = 70 / 3.5 = 20 \text{ years}$$

8. Suppose the list of reason why you hate Econ 212 has doubled in the last 10 class periods. How fast is the list growing each class period?

$$T = 70 / G \quad G = 70 / T = 70 / 10 = 7 \quad \text{The list is growing 7\% per class period.}$$

9. If you put \$500 in your savings account today, how much money will be in your account in 4 years, if $R = 6\%$?

$$A = P * (1 + R)^n = 500 * 1.06^4 = \$500 * 1.26248 = \$631.24$$

10. Your wealthy aunt has a terminal disease and will kick the bucket in exactly 10 years. She will leave you \$1,000,000 in her will. However, you'd like to go on an extravagant trip across Europe today, and thus you want to convert these future dollars into current dollars. Assuming that everyone believes your Aunt is good for the money, what's amount of money can you get today in exchange for the \$1,000,000 10 years from now? Assume $R = 8\%$.

$$P = A / (1 + R)^n = \$1,000,000 / (1.08)^{10} = \$1,000,000 / 2.1589 = \$463,193.49$$

This question is double extra credit, but mostly for your amusement. There are obviously some simplifications here, so don't base your decision to stay in school, or quit school, based on this example.

The following facts are true. You are trying to decide whether to go to college or not.

- Today is August 15th, 2002. You are a freshman to be at CU.
- Due to advances in medical technology, you will live forever. Congratulations.
- The cost of attending CU will include a total of \$20,000 in tuition and fees.
- You'll live in the same apartment, eat the same food, have the same amount of fun (right?), etc. whether you go to Clemson or start working today.
- If you don't attend CU, you will earn \$30,000 a year for the rest of your life, beginning today. This is a \$30,000 perpetuity with the first payment today (not a year from today).

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- If you do attend CU, you have to pay \$20,000 in tuition, and to simplify the problem, let's say it's all due today. However, due to your fine education, you will earn \$50,000 a year for the rest of your life. Your first day of work will be 8/15/2007. (You were on the 5 year plan).

Some help

If you go to college, and the date was 8/15/2006, this would look like a standard perpetuity of \$50,000, as the first payment would be one year away. However, 8/15/2006 is four years away. Therefore, if you go to college, you get a standard perpetuity of \$50,000, but one you don't get the perpetuity for 4 years. Also, don't forget to subtract out the \$20,000 you paid for tuition.

Summary

	<u>8/15/2002</u>	<u>8/15/2003</u>	<u>8/15/2004</u>	<u>8/15/2004</u>	<u>5/15/2006</u>	<u>8/15/2007</u>	<u>8/15/2008</u>	...
No college	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000
Go to college	-\$20,000	\$0	\$0	\$0	\$0	\$50,000	\$50,000

Questions

Assume R = 10%

What the present value of lifetime earnings if you don't go to college?

What the present value of lifetime earnings if you do go to college? (Don't forget to pay tuition)

Should you go to college?

No College

Perpetuity with first payment today $P = (a / R) + a = \$30,000 / 0.10 + \$30,000 = \$300,000 + \$30,000 = \$330,000$

Go to college

Assume its 8/15/2006. You have a standard perpetuity, with first payment one year from today. $P = a / R = \$50,000 / (0.10) = \$500,000$.

This means all of your future wages of \$50,000 are equivalent to having \$500,000 on 8/15/2006.

But as of today, 8/15/2006 is 4 years away. That is, you have \$500,000, but you don't get it for 4 years. $P = \$500,000 / 1.1^4 = \$341,507$.

Now, subtract out the cost of tuition of \$20,000, leaving you with \$321,507.

No College = \$330,000

College = \$321,507

You shouldn't go to college. In light of the newspaper article I read the other day about an advisor being sued over giving some bad advice to a student, this is a hopeless unrealistic example. I'd be happy to tell you what's not realistic if you're super interested.

As an alternative, you could have calculated:

$$P = a / R - a / (1+R) - a / (1+R)^2 - a / (1+R)^3 - a / (1+R)^4 = \$341,507$$