

Problem Set 1 answer key

1. Pension plan

Suppose Bob just turns to 20 years old today and his expected age of demise is 85.

1) Suppose he wishes to start saving so that when he is 65 you can have twenty years of \$100,000 annual withdrawals. How much does he need to save annually from now? Suppose annual interest rate is 8% and there is only one compounding for each year. Deposits are made **at the end of each year** while you are saving. Withdrawals are made **at the beginning of each year** after you retire. (Use numerical method to solve this problem)

FV of annual deposit (ordinary annuity) = PV of annual withdrawals (annuity due)

Answer is \$2,743.45

100K for 20yr		45yr savings	
FV	\$0.00	FV	\$1,060,359.92
PMT	-\$100,000.00	PMT	-\$2,743.45
PV	\$1,060,359.92	PV	\$0.00
I	8.00%	I	8.00%
N	20	N	45

2) Suppose he plans to retire when he is 40 years old and still can have \$100,000 annual withdrawal before he reaches 85. How much he needs to save annually from now? Other assumptions are same as question 1). (Use Excel to solve this problem)

Answer is 28.576.29

100K for 45yr		20yr savings	
FV	\$0.00	FV	\$1,307,707.36
PMT	-\$100,000.00	PMT	-\$28,576.29
PV	\$1,307,707.36	PV	\$0.00
I	8.00%	I	8.00%
N	45	N	20

3) Use Excel to graph the relationship between required annual saving (so that he can have \$100,000 annual withdrawal from his retirement age to the age of 85) for each retirement age (from 21 through 65).

See venelin's answer

2. MBA: is it worth?

You are 30 years old today and are considering studying for an MBA. You just received your annual salary of \$80,000 and expect it to grow by 3% per year. MBAs typically earn \$100,000 upon graduation with salaries growing by 4% per year.

The MBA program you are considering is a full-time, 2 year program that costs \$40,000 per year, payable at the end of each study year. You want to retire on your 65th birthday. The relevant discount rate is 8%. Is it worth for you to quit your job in order to do a MBA? (Ignore income taxes and use annual compounding)

(show how to solve the problem in the numerical way, but you may use excel to do the calculations)

Big picture: compare the present value of each option.

Some students did it in numerical way, some used excel from the beginning. The answer should be to talk the MBA. Some students did not count the first 80,000, some did. All these are right. Take credit off only when there is serious mistake.

Bring the homework to me if you feel unsure about it.

3. Michael Smith was in trouble: He was unemployed and living on his monthly disability pay of \$1200. His credit card debts of \$19,000 were threatening to overwhelm this puny income. Every month in which he delayed paying the credit card debt cost him 1.5% on the remaining balance. His only asset was his house, on which he had a 67,000 mortgage.

Then Michael got a phone call from a financial company, the company offered to refinance his mortgage. With the rise in real estate values, his house could now be remortgaged for \$90,000. This amount would allow Michael to repay his credit card debts and even leave him with some money.

Here are some additional facts:

- The new mortgage would be for 25 years and would have an annual interest rate of 9.23%. The mortgage would be repayable in equal monthly payments over this term.
- There are no penalties involved in repaying the \$67,000 existing mortgage.

Answer the following questions:

1) What will Michael's monthly payments be on the new mortgage?

Use payment function to calculate and answer is 769.50

2) Use excel to show the mortgage's amortization schedule, which include beginning balance, monthly payment, interests payment, principal payments and ending balance for every month.

Just check several lines would be fine.

3) After repaying his credit card debts, how much money will Michael have left?

$$90,000 - 67,000 - 19,000 = 4,000$$

4. You've been offered three credit cards:

- 1) APR 19%, on a monthly basis
- 2) APR 19%, on a weekly basis
- 3) APR 18.90%, on a daily basis

Rank the cards based on the EAR

Use EAR formula to

- 1) 20.75
- 2) 20.88
- 3) 20.80