

Answers for the Bonus Questions on Time Value of Money

1. Periodic Rate = $4\%/4 = 1\%$ /quarter

Number of periods = $5 * 4 = 20$

$$FV_{20} = PV (PVIF_{1\%, 20}) = \$100 (1+0.01)^{20}$$

PV=100, Rate=4%/4=1% (Periodic Rate), Nper=4*5=20, PMT=0, FV=?, CPT

FV=\$122.02

2. First, we have to figure out what the total amount you can have in 20 years, if you receive a 20-year annuity with annual payment of \$50 and invest each payment in an account that pays 10%. This is Ordinary annuity problem.

$$FV_{20} = PMT (PVIFA_{10\%, 20}) = \$50 (PVIFA_{10\%, 20})$$

Type = 0, PV=0, PMT=50, Nper=20, Rate=10%, FV=?. CPT FV=\$2,863.75.

This is the total amount you can have in your account 20 years later. Now the question asks you to figure out the value in your account at the end of year "30".

Thus assuming that you will leave the above amount in your account for another 10 years without any withdrawal, you are supposed to figure out the FV of \$2,863.75 at the end of year 30. Thus,

$$FV_{10} = PV (PVIF_{10\%, 10}) = \$2,863.75 (1+0.1)^{10}$$

PV=2,863.75, Nper=10, PMT=0, Rate=10%, FV=?. CPT FV=\$7,427.83.

- 3.

$$EAR_{\text{first bank}} = \left(1 + \frac{0.1}{4}\right)^4 - 1 = 0.1038 = 10.38\%$$

$$EAR_{\text{second bank}} = \left(1 + \frac{0.09}{365}\right)^{365} - 1 = 0.0942 = 9.42\%$$

Thus, the difference between them is, $10.38 - 9.42 = 0.96\%$

4. First, you need to find out the total health care costs.

The current cost is \$1,000 and it is expected to grow at 10% per year. Therefore,

At 19, $FV = \$1,000 (1+0.1)^{19}$, PV=1,000, Rate=10%, Nper=19, PMT=0, CPT FV = \$6,115.91

At 20, $FV = \$1,000 (1+0.1)^{20}$, PV=1,000, Rate=10%, Nper=20, PMT=0, CPT FV = \$6,727.50

At 21, $FV = \$1,000 (1+0.1)^{21}$, PV=1,000, Rate=10%, Nper=21, PMT=0, CPT FV = \$7,400.25

At 22, $FV = \$1,000 (1+0.1)^{22}$, PV=1,000, Rate=10%, Nper=22, PMT=0, CPT FV = \$8,140.27

Thus, at the end of 18, the present value of total health care costs = \$6,115.91 (PVIF_{6%,1}) + \$6,727.50 (PVIF_{6%,2}) + \$7,400.25 (PVIF_{6%,3}) + \$8,140.27 (PVIF_{6%,4}) = \$24,418.43

This is the amount the parents will need. If they save \$100 per year for 18 years, the amount in the account will be

FV = \$100 (FVIFA_{6%,18}), PV=0, Nper=18, Rate=6, PMT=100, CPT FV = \$3,090.57

Thus, the parents will need \$24,418.43 - \$3,090.57 = \$21,327.86, or this is the amount the government has to support. Therefore the amount the government has to set aside today will be

PV = \$21,327.86 (PVIF_{6%,18}), FV=21,327.86, Rate=6, Nper=18, PMT=0, CPT PV =

\$7,472.08

5. Periodic Rate = $14.75\%/12 = 1.23\%/month$

Number of periods = $30 * 12 = 360$

$PV = 120,000 = PMT (PVIFA_{1.23\%, 360})$

$PV=120,000$, $Nper=12*30=360$, $Rate=(14.75/12)\%$, $FV=0$, $Type = 0$. CPT

$PMT=\$1,493.37$

6. Price of Honda S2000 in 7 years:

$FV_7 = PV (PVIF_{10\%, 7}) = \$25,000 (1+0.1)^7$

$PV=25,000$, $Rate=10\%$, $Nper=7$, $PMT=0$, $FV=?$. CPT $FV=\$48,717.93$.

This is the amount you will need in 7 years to buy the car. Now, we can determine the annual payment for the next 7 years.

$FV = PMT (FVIFA_{14\%, 7})$

$FV=48,717.93$, $PV=0$, $Rate=14\%$, $Nper=7$, $Type=0$. CPT $PMT=\$4,540.14$. Thus to buy Honda

S2000 at \$48,717.93 in 7 years, you have to invest \$4,540.14 at the end of each of the next 7 years at 14%.

7. You need to find out the breakeven where you will be indifferent between two options.

$PV = PMT (PVIFA_{7\%, N})(1+0.07)$

$PV = 100$, $Rate = 7$, $PMT = -10$, $FV = 0$, $Type = 1$, Annuity Due

$\Rightarrow Nper = 15.70$ So, if you leave longer than 15.7 years from now, the lifetime subscription is better.