Homework Assignment - 03

Pg 823: 12 (make a choice between "a" and "b" only), 19
Pg 824: 29, 36, 39

The following question are worth 2 points. Pg 823 12, 19
3 point Pg 824 29, 1.5 points 36, 39

Pg 823 Q12 Which of the following is the most generous interest rate for a one-year CD?
a) 6% simple interest
b) 5.9% compounded annually

Solution: Let's us consider we have to make a CD of $1000

Given: Time is one year \( n = 1 \)

Now using Simple Interest

\[
\text{Interest} = Prt
\]
\[
= 1000 \times 0.06 \times 1
\]
\[
= 60
\]

\[\text{Amount} = \$1000 + \$60 = \$1060\]

\[\text{for a one year CD, 6% is more generous than 5.9% compounded annually.}\]

Option A

Pg 823 Q19 It a new car costs $18000 and loses value at a rate of 20% per year, what is the value after 3 years?

Solution: Value after 3 years = \( P(1-r)^n \) = 18000 \((1 - 0.20)^3\) = $9216
Suppose inflation proceeds at a level rate of 4% per year from mid 2006 through mid 2009.

(a) Find the cost in mid 2009 of a basket of goods that cost $1 in mid 2006.

Projected cost in 2009 = P(1+r)^n
= 1(1+0.04)^3
= $1.1248

(b) What will be the value of a dollar in mid 2009 in constant mid 2006 dollars?

Value of dollar in mid 2009 will be $1

\[
\frac{1}{(1+r)^n} = \frac{1}{(1+0.04)^3} = 0.8889
\]

Pg 824 Q36 What is the present value of a $2000 raise now, over the course of 40 years more of working, if inflation is a steady 3% per year?

Solution: There is a $2000 raise now.
- Present value of $2000 raise today is $2000
- A year from now $2000 stays with you, but today's value of $2000 one year later is $2000(1 + 0.03)
- Similarly over the course of 2 years, the present value of $2000 raise now is $2000 + \frac{2000}{(1+0.03)} + \frac{2000}{(1+0.03)^2}$
- Therefore, for the course of 40 years, we can write

\[
\frac{2000}{(1+0.03)^{40}} + \frac{2000}{(1+0.03)^{39}} + \cdots + \frac{2000}{(1+0.03)^1} + 2000
\]
\[
\text{Answer:} \quad \text{Prize worth} = \$40 \text{ milllion.}
\]

02 It will be received in 20 equal installments of $2 \text{ million.}

03 However 20% of each installment goes as federal tax.

04 Money you get in each installment = $2m - 0.2 \times 0.2m

\[
= \$1.6m
\]

05 Inflation rate = 3% constant over 19 years.

06 There is an earning of 4% interest.

To calculate: how much is prize really worth today.
$1.6M received today is worth $1.6M only.

Next year $1.6M is worth $1.6M \times (1 + 0.03)

However, because of interest rate of 4%, you will get $1.6M \times (1 + 0.04)

Therefore, next year amount (which is) $1.6M \times (1 + 0.04) is worth $1.6M \times (1 + 0.03) due to inflation.

Therefore, a year from now you will have amount equivalent $1.6M + 1.6M \times (1 + 0.04)$ in today's dollars.

Similarly, we can write for a 19-year period amount worth in today's dollars.

\[
= 1.6M + 1.6M \times (1 + 0.04) + 1.6M \times (1 + 0.04)^2 + \cdots + 1.6M \times (1 + 0.04)^{19}
\]

\[
= 1.6M \left[ \frac{1 + 1.04}{1.03} + \frac{1.04^2}{1.03^2} + \frac{1.04^3}{1.03^3} + \cdots + \frac{1.04^{19}}{1.03^{19}} \right]
\]

\[
= 1.6M \left[ \frac{e^{(1.04/1.03)^20} - 1}{(1.04/1.03) - 1} \right]
\]

\[
= 35.1304 \text{ Million}
\]