$A_1 = 250$

$A_2 = 250(0.04) + 250$

$A_3 = 250 + 250(0.04) + 250(0.04)^2$

$A_n = \sum_{n=1}^{n} 250(0.04)^{n-1}$

$A_{40} = 250\left(\frac{1-0.04^{40}}{1-0.04}\right) = 260.41\overline{6}$

$A_\infty = 250\left(\frac{1}{1-0.04}\right) = 260.41\overline{6}$

$\frac{X^3}{X^2} \quad \frac{(1-X)^3}{(1-X)^2}$

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25 $P_1 = 0$

$P_2 = 250(0.04)$

$P_3 = 250(0.04) + 250(0.04)^2$

Time Value of Money

money is worth more in your pocket today

1. today you can invest.
2. uncertainty in the future (inflation, disaster)

In order to value money you receive in the future you need to determine its present value.

Ex for 10 years you will invest $100 annually at a guaranteed 5%

Future Value, FV is just a compounding exercise.

FV = ?

$Q_1 = 100$

$Q_2 = 100(1.05) + 100$

$Q_3 = 100(1.05)^2 + 100(1.05) + 100$

$Q_{10} = \sum_{n=1}^{10} 100(1.05)^{n-1} = 100\left(\frac{1-1.05^{10}}{1-1.05}\right)$

$FV \approx 1257.79$

Present Valueing (ie discounting) is the "inverse" of FV.

instead of $100(1.05) \rightarrow$ 1yr

$\frac{100}{1.05} \leftarrow$ 1yr

Ex Lotto. Jackpot $50 million.

1. money NOW! $20 million.
2. 20 payments of $1,020,000 over 20 years.

Value option 2

let's say we can get 7%.

$Q_1 = 1.02$

after year 1 $Q_2 = 1.02/1.07$

$Q_3 = 1.02/(1.07)^2$

$Q_4 = 1.02/(1.07)^3$

$Q_{20} = 1.02/(1.07)^{19}$

$\sum_{n=1}^{20} Q_n = 1.02\left(\frac{1-\left(\frac{1}{1.07}\right)^{20}}{1-\frac{1}{1.07}}\right)$

$= 1.02\left(\frac{1-0.25844}{1-.93458}\right)$

$\approx 1.02\left(\frac{0.74156}{0.06542}\right)$

$\approx 11.5623.$