Chapter 4
Time Value of Money 1:
Analyzing Single Cash Flows

1. Future Value of a Lump Sum
2. Present Value of a Lump Sum
3. Rule of 72

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**Future Value - Compounding**

Future Value - What is something worth in the future at a rate of interest.

ex. $1,000 today - put in bank for 1 year at 5%

\[
\begin{array}{ccc}
0 & \text{i = 5\%} & 1 \\
\hline
PV = $1,000 & & FV_1 = \\
\end{array}
\]

\[
FV_1 = PV + \text{Interest} = $1,000 + \text{Interest} = $1050
\]

\[
\text{Interest} = PV \times i = $1,000 \times 0.05 = $50
\]

**How about in 2 years?**

\[
\begin{array}{ccc}
0 & \text{i = 5\%} & 1 & 2 \\
\hline
PV = $1,000 & $1,050 & FV_2 = \\
\end{array}
\]

\[
FV_2 = PV + (PV \times i) = PV (1 + i)
\]

Compounding = interest on interest

General form of equation = \( FV_N = PV (1 + i)^N \)
2 ways to solve

(1) equation  \( FV_{n} = PV \cdot (1 + i)^{n} = $1,000 \cdot (1.05)^{2} = $1,102.50 \)

(2) Calculator  \( PV = 1,000, N = 2, \ I = 5\% \)  \( \text{cpt FV} = -1,102.50 \)

Calculator Rules

1. Clear Register
2. Set to 1 period per year
3. Set proper mode (Begin or End)

Present Value - Discounting

Present Value - What a future sum of money is worth today

\[
\begin{array}{c|c|c}
0 & i = 10\% & 1 \\
\hline
PV = ? & \text{FV}_1 = $1,320
\end{array}
\]

2 ways to solve

(1) equation  \( PV = FV_{n} / (1 + i)^{n} = $1,320 / (1.10)^{1} = $1,200 \)

(2) Calculator  \( FV = 1,320, N = 1, I = 10\% \)  \( \text{cpt PV} = -1,200 \)

Fred Flagstone of Carson City, Nevada, while combing through his great-grandmothers trunk of remembrances, found a State of Nevada Bond that was issued the day Nevada became the 36th state on October 31, 1864. This State of Nevada bond has a face value of $100 and a stated interest rate of 22%. Why do you think the interest rate is so high? If the State of Nevada agrees to pay Fred the face value of this bond plus interest through October 31 of last year, how much will he receive?
Example: How long will it take a $1,000 investment to double if it is invested in an account paying 8% interest?

PV = -$1,000
FV = +$2,000
I = 8%

N = 9.0065 yrs

The “Rule of 72”. A method to approximate when solving for N or I.

N = 72 / i

or

i = 72 / N

A recent advertisement in the financial section of a magazine carried the following claim: "Invest your money with us at 8 percent, compounded annually, and we guarantee to double your money sooner than you imagine." Ignoring taxes, approximately how long would it take to double your money at a nominal rate of 8 percent, compounded annually? How long if the rate is 4%? How much if the rate is 16%?

If you had invested $10,000 in Fidelity's Magellan fund when Peter Lynch became the fund manager on 5/31/77 your money would have grown to $233,139.61 by the time Lynch retired on 5/30/92. What is the annual rate of return on your investment?