"102 The Magic of Compounding"
Morningstar Investment Curriculum

Paul Madison

So now we are going to look at the Magic of Compounding.

Try This With
Business Majors On The Strip?

$10,000 x 30 ?

$.01 + .02 + .04 +.08.....?

Introduction

When you were a kid, perhaps one of your friends asked you the following trick question: "Would you rather have $10,000 per day for 30 days or a penny that doubled in value every day for 30 days?" Today, we know to choose the doubling penny, because at the end of 30 days, we'd have over $10 million versus the $300,000 we'd have if we chose $10,000 per day.
Compound interest is often called the eighth wonder of the world, because it seems to possess magical powers, like turning a penny into $10 million. The great part about compound interest is that it applies to money, and it helps us to achieve our financial goals, such as becoming a millionaire, retiring comfortably, or being financially independent.

$1 Invested @ 10%

- 1st year earnings $.10
- 2nd year earnings $.11
- 5th year earnings $.15
- 10th year earnings $.24
- 25th year earnings $.98

A dollar invested at a 10% return will be worth $1.10 in a year. Invest that $1.10 and get 10% again, and you'll end up with $1.21 two years from your original investment. The first year earned you only $0.10, but the second generated $0.11. This is compounding at its most basic level: gains begetting more gains. Increase the amounts and the time involved, and the benefits of compounding become much more pronounced. After 25 years we are earning essentially what our original investment was.

Compound Interest Formula

$$FV = PV \times (1+i)^{N}$$

FV = Future Value
PV = Present Value
i = Interest Rate per period
N = Number of periods (years)

Here is the Compound Interest Formula

Which says that the Future Value is equal to the Present Value times one + the periodic interest rate all raised to the power of N where N is the number of periods.

- ***Different ways to get to a $1,000,000***
  - **Jack**
    - Saves $25,000/yr. for 40 years
  - **Jill**
    - Invests $1
    - Doubles her money every year for 20 years

Who Wants to Be a Millionaire

As a fun way to learn about compound interest, let's examine a few different ways to become a millionaire. First we'll look at a couple of investors and how they have chosen to accumulate $1 million.
1. Jack saves $25,000 per year for 40 years.
2. Jill starts with $1 and doubles her money each year for 20 years.

While most would love to be able to save $25,000 every year like Jack, this is too difficult for most of us. If we earn an average of $50,000 per year, we would have to save 50% of our salary!

In the second example, Jill uses compound interest, invests only $1, and earns 100% on her money for 20 consecutive years. The magic of compound interest has made it easy for Jill to earn her $1 million and to do it in only half the time as Jack.
However, Jill's example is also a little unrealistic since very few investments can earn 100% in any given year, much less for 20 consecutive years.

Quick Sidebar – ***Rule of 72***

- Rule of 72 (*I learned this from my Mom*)
  - Divide 72 by a rate of return, it tells you how many years it will take to double your money
    - **72 ÷ 7% Rate of Return = ~10 years**
  - Divide 72 by number years you want to double your money, it gives you the rate of return required
    - **72 ÷ 5 years = ~15% Rate of Return**

We like to find Companies that give us a 15% Rate of Return so that we can double our money every 5 years!

Talking about compounding reminds me to tell you about a rule of thumb that my mother taught me.

Rule of 72 says you divide 72 by a rate of return and it will tell you how many years you need to double your money. So 72 divided by a 7% return says it will take 10 years to double our money.

Or conversely you can divide 72 by the number years you want to take to double your money and it will tell you what rate of return you will need to achieve the double.

So 72 divided by 5 years tells us that we need to target roughly a 15% rate of return to double our money in 5 years.

This 15% is a target rate that Growth Investors like to look for!

For those that are interested my nephew Tom has done some work to determine why 72 is used which is very interesting if you are a geek...oh that's right this room is probably full of geeks.

Time Is On Your Side!

Between the two extremes of Jack and Jill, there are realistic situations in which compound interest helps the average individual. One of the key concepts about compounding is this: The earlier you start, the better off you'll be.

- ***Different ways to get to a $1,000,000***
  - **Luke**
    - Saves $2,000/yr. Between 24 and 30
    - Earns 12% after tax return until 65
    - Saved only $12,000 (6 yrs. times $2,000)
  - **Leia**
    - Saves $2,000/yr. between 30 and 65
    - Earned 12% after tax return until 65
    - Saved $72,000 (Six times as much!)

Let's consider the case of two other investors, Luke and Leia, who would also like to become millionaires. Say Luke put $2,000 per year into the market between the ages of 24 and 30, that he earned a 12% after tax return. He continued to earn 12% per year until he retired at age 65 even though he never put any more money in after age 30. Leia also put in $2,000 per year, earned the same return, but waited until she was 30 to start and continued to invest $2,000 per year until she retired at age 65. In the end, both would end up with just shy of $1 million. However, Luke had to invest only $12,000 (i.e., $2,000 for six years), while Leia had to invest $72,000 ($2,000 for 36 years) or six times the amount that Luke invested, just because she waited six years later before she started to invest.

Young + Compounding = Success

- Jack
  - Saved $1,000,000 (40 yrs. @ $25,000)
  - No Earnings
- Luke *Our Hero*
  - Saved $12,000 (6 yrs. @ $2,000/yr.)
  - **Earned $947,700**
- Leia
  - Save $72,000 (36 yrs. @ $2,000/yr.)
  - **Earned $896,900**

Clearly, investing ***EARLY*** can be at least as important as the actual amount invested over a lifetime. Therefore, to truly benefit from the magic of compounding, it's important to start investing early. I CANNOT stress this fact enough! After all, it's not just how much money you start with that counts, it's also how much time you allow that money to work for you.
In our first example,
Jack had to save $25,000 a year for 40 years to reach $1 million without the benefit of compound interest.
Luke and Leia, however, were each able to become almost millionaires by saving only $12,000 and $72,000, respectively, in relatively modest $2,000 increments. Luke and Leia earned almost $950,000 and $900,000, respectively, due to compound interest. Gains beget gains, which beget even larger gains. This is again is the magic of compound interest.

Luke is our Hero for getting it done early!

Every Decade Is Important

Begin at	Saved Per Yr.	Total Saved	Earned
25	$ 1,040	$ 42,600	$957,400
35	$ 3,300	$ 102,000	$898,000
45	$ 10,900	$ 229,500	$770,500
55	$ 43,200	$ 475,500	$524,500
65	$1,000,000	$1,000,000	$ 0

Because I am a geeky engineer I thought I would build you a little table.

So starting at different ages to get to a $1,000,000 here is what you have to save per year if you are good and get a 12% return per year.

If you have not started until you are 65, you better be rich and famous so that you are making a over a million a year so that you can save your 1 million dollars.

- ***More savers***
  - **Charlotte**
    - Saves $2,000/yr. Between 24 and 30 (Same as Luke)
    - Earns 8% after tax return until 65
    - Worth $253,000
  - **Rose**
    - Saves $2,000/yr between 24 and 30 (Same as Luke)
    - Earned 4% after tax return until 65
    - Worth $56,600 (1/20th of Luke)

Why is Compound Interest Important to Stock Investing

In addition to the amount you invest and an early start, the rate of return you earn from investing is also crucial. The higher the rate, the more money you'll have later.

Let's assume that Luke from our previous example had two sisters who,

at age 24, also began saving $2,000 a year for six years.

But unlike Luke, who earned 12%, sister Charlotte earned only 8%,

while sister Rose did not make good investment decisions and earned only 4%. When they all retired at age 65, Luke would have just under a million.

Charlotte would have just over $250,000, about a fourth of Luke

and Rose would have just under $57,000. Even though Luke earned only 8 percentage points more per year on his investments, he would end up with almost 20 times more money than Rose.
Clearly, a few percentage points in investment returns or interest rates can mean a huge difference in your future wealth. Therefore, while stocks may be a riskier investment in the short run, in the long run the rewards can certainly outweigh the risks.

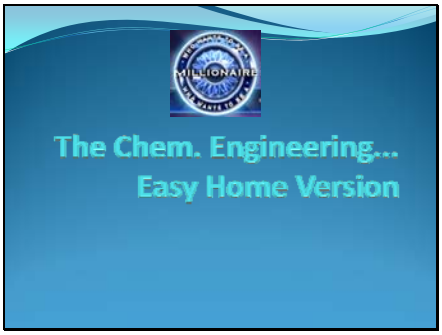
Compound Interest Helps Us Obtain Life's Goals

The Bottom Line

Compound interest can help you attain your goals in life. In order to use it most effectively, you should start investing early, invest as much as possible, and attempt to earn a reasonable rate of return.

QUESTIONS?

ONE MORE THING.....



Let's look at some Millionaire examples that might hit more to home

Key to building wealth

Investing is good but the real key to wealth is ...

..... Savings!

.....and no debt!

Simple Savings Plan

- $100/month for 40 years at say 9.6% interest
- Will be just over $560,000
- Engineers have an even better opportunity

Rough Chem. Eng. Starting Salary

- $72,000/year or $6,000/month
- Take home maybe 70% of that
- So call it $4,000/month

When I started 35 years ago I had to work 4 months to earn $6,000

My Plan A

- Put $1,000/month in your company retirement plan! **(Yes that's right 25% of your take-home!)**
- Never let it hit the checking account!
- **TAKE ADVANTAGE OF ANY COMPANY MATCH!**
- 5% match ... throws in another $300 a month!

.....Side Bar.....

- If that $1,000 is in a retirement account
- You will reduce you monthly taxes by $300 or more
- So it will only really cost you $700!!

Rest of Plan A....

- Put Raises into Savings not Lifestyle
- At least ....the amount over inflation!
- Example 5% raise ... inflation is 3% put the 2% away.

Savings account return 3%

With my Plan A

after 20 years your investment will be...

.....$1 million

Kind of hard to makeup that amount if you start at age 45!

Average Market Return 9.6%

With my Plan A

after 20 years your investment will be...

.....$1.8 million

Beat the market by 5% (14.6%)

With my Plan A

after 20 years your investment will be...

.....$3.1 million

If you learn how to do individual stocks ....

.....and you are good.....

....you can beat the market by 5% or better!

But Wait You Say.....

"I don't want to save 25%!"

OK OK ...I get it you have been a poor college student

..... You have all these things you want to buy.....

..... So here is Plan B

Plan B - The 12½% 30 Year Option

How about $500 (12½%) a month as a base
(remember that is only $350 or less after tax)

Still try to put as much of your raises away as possible

This lets you "live it up a bit" in the short term

But maybe we need to retire 10 years later ... Say 55

Plan B Savings Return of 3%

In 30 years your investment will be...

.....$2 million

REALLY hard to makeup that amount if you start at age 45!

Plan B - Market Return of 9.6%

In 30 years your investment will be...

.....$4.9 million

Plan B – Market Beater 14.6%

In 30 years your investment will be...

.....$11.6 million

That should really intrigue you to beat the market!

QUESTIONS

1. Using the rule of 72, an investment earning 10% per year would double in approximately how many years?

a . 10.

b . 7.

c . 5.

2. Using the rule of 72, if you invested $10,000 at 12% per year, in 12 years, you would have:

a . $20,000

b . $30,000

c . $40,000

3. Which of the following is not a component of compound interest?

a . Time.

b . Interest rate.

c . Financial calculator.

4. If you had invested $1 and doubled your investment 20 years in a row, you would have $1 million. In the last year (year 20), you would have made how much money?

a . $100,000

b . $50,000.

c . $500,000.

5. Which of the following is not true?

a . The earlier you invest, the more money you'll have in the future.

b . The lower the interest rate, the more money you'll have in the future.

c . The longer you invest, the more money you'll have in the future.