

The Power of Time and Compounding

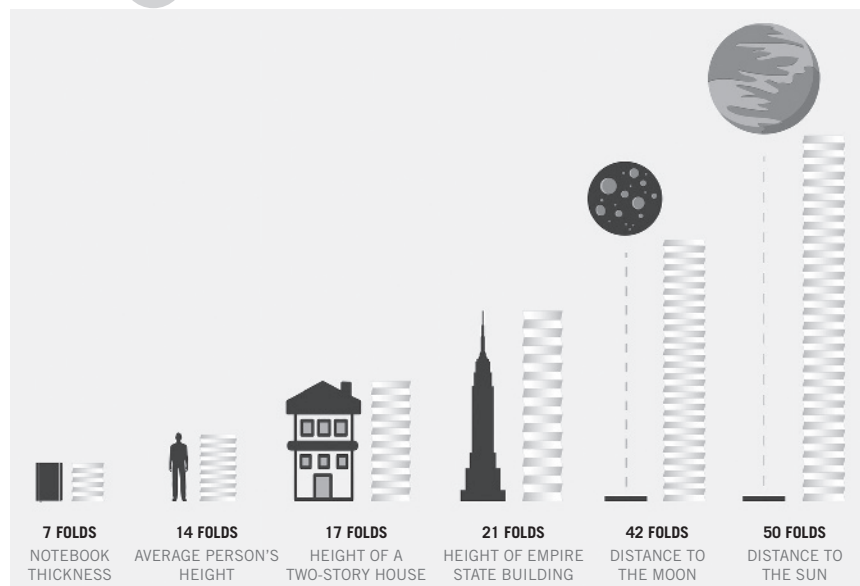
The most powerful tool you have for reaching your goals is time.

Time mixed with the power of compounding is the most potent combination for wealth creation. Compound interest allows you to grow wealth faster by earning a return on your past returns. This isn't a linear relationship; it's exponential, and that power is the most underappreciated component of a financial plan. The human brain simply isn't good at visualizing exponential things, which may explain why it's so difficult to fully appreciate a plan that fully leverages the power of compounding.

Let's try to fix that.

Imagine you take a sheet of standard printer paper with a thickness of 0.1 mm. Fold it over once and it gets twice as thick. Fold it again and you've doubled the thickness of the paper again; two folds make the paper four times as thick. Fold it a third time and now the paper is eight times as thick. If you could fold that piece of paper 50 times, the paper would stretch 95 million miles or approximately the distance from Earth to the sun. At 100 folds, it matches the radius of the universe (see Figure 1.1).

Unfortunately, it isn't possible to fold a piece of paper more than eight times (try, I dare you). But the underlying math of repeatedly doubling the thickness of paper is exciting when we apply the same exponential growth to your savings.

FIGURE 1.1 THE THICKNESS OF A FOLDED PIECE OF PAPER

THE POWER OF COMPOUND INTEREST

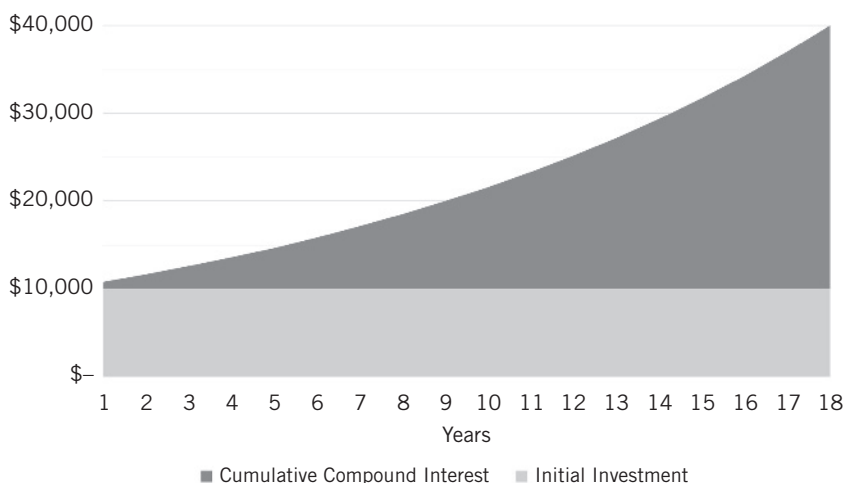
How many times can you double your money during your lifetime? That depends on your age and rate of return. With these inputs, we can use a rule of thumb known as “The Rule of 72.” Simply assume a reasonable rate of return for planning purposes (between 7 percent and 9 percent over a multidecade time period) and divide 72 by that rate. This calculates the period of time it would take for your money to double.¹

To make the math nice and even, let’s say we earn an 8 percent return on your money. According to the Rule of 72, it takes nine years to double your money ($72 \div 8 = 9$). Ready for the compounding part? (See Figure 1.2.)

Let’s start with \$10,000 and continue to assume we earn a return of 8 percent. After nine years, the Rule of 72 tells us we will have \$20,000. It should seem obvious that the \$20,000 then takes another nine years to double, so we will have \$40,000 after 18 years. As we will see in a moment, the earnings on interest becomes disproportionately larger than the earnings on the initial investment.

¹The Rule of 72 is an approximation. The equation is $2 = 1 \times (1 + \text{Rate of Return})^Y$, where Y is the time to double.

FIGURE 1.2 **GROWTH OF \$10,000 INVESTMENT WITH AN 8 PERCENT RETURN: INITIAL INVESTMENT VERSUS CUMULATIVE COMPOUND INTEREST**



To see how good planning can maximize the benefit of compound interest, we can draw from Benjamin Franklin's financial plan. At his death, Franklin's will left 1,000 pounds sterling (then worth about \$9,000) to his adopted home of Philadelphia and his native city, Boston.²

Franklin wanted trustees to loan the money to apprentices, much in the same way he received assistance early in his career. His will also stipulated that the interest collected from the loans should stay invested so it could compound over time. After 100 years, both cities could withdraw 75 percent of the funds to use for infrastructure projects that would improve the quality of life for those living in these cities like bridges, roads, water systems, and public buildings. Then in another 100 years, the cities could withdraw the remaining balance for additional infrastructure and city betterment projects.

Franklin estimated a 5 percent annual rate of returns from the loans. It turned out to be 4 percent. He was off by one percentage point, but remember that financial success depends less on marginally higher returns than it does on saving and time. This case serves as a perfect example of this phenomenon.

The cities made their first withdrawals in 1890. The fund grew from Franklin's initial contribution of \$9,000 to \$500,000 over a period of

²The Last Will and Testament of Benjamin Franklin, <http://www.constitution.org/primary/sources/lastwill.html>.

100 years (that's about \$13 million in today's dollars). When the cities could make their second withdrawal in 1990, they gained access to another \$6.5 million (or \$12 million in today's dollars). Franklin understood the power of compounding. He knew that good planning and time were the essential ingredients to having it work in your favor.

You probably won't get to work with a 100-year time horizon, but you will get several decades to allow your investments to earn compound returns if you start saving now. The way Franklin structured his will provides a great illustration of how thoughtful planning and time can best capture the power of compounding. The more time you have, the more your wealth benefits from this compounding effect. Once you create a well-thought-out financial plan that focuses on maximizing your wealth as a means to meet your goals, you can sit back and let time do its thing.

MAKE COMPOUND INTEREST WORK FOR YOU: SAVE EARLY AND SAVE OFTEN

The most important rule in planning for retirement is to save early and often. How early and how often? Start as soon as you begin earning an income and save some of every paycheck. If you haven't been saving, then the time to start is now. Saving early gives you what we've just seen is critical to leveraging the power of compounding: a long time horizon.

Compound interest is like rolling a snowball downhill. As it rolls along, it collects more snow with each rotation. The further it rolls, the more mass it can exponentially gain. That's exactly how Benjamin Franklin's initial \$9,000 contribution turned into \$500,000 over 100 years with a 4 percent rate of return. It's also why Warren Buffett says, "Life is like a snowball. The important thing is finding wet snow and a long hill." The wet snow is the interest you reinvest to pick up even more interest as you roll along. The long hill is the multiple decades you give yourself if you start saving early.

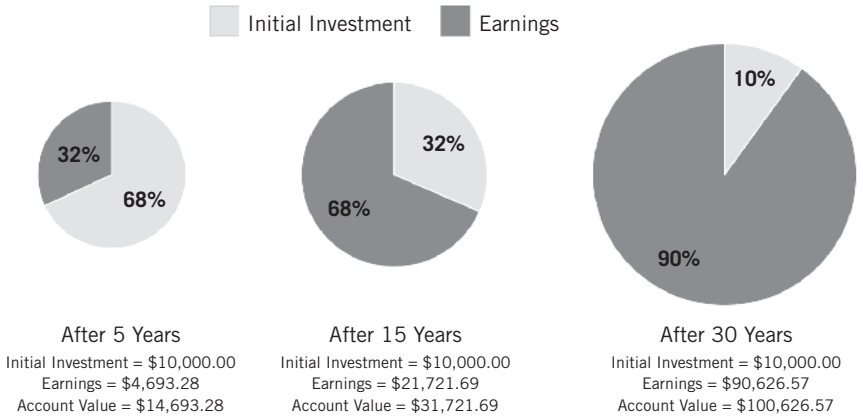
Figure 1.3 returns to our simple example of a \$10,000 investment that earns 8 percent each year. Even though the interest rate remains unchanged at 8 percent, the amount of interest income increases every year. Just as a snowball accumulates more snow with each rotation as it increases in size, your investment generates a greater amount of earnings as the return is applied to a larger amount each year.

Over time, the interest earned surpasses that of the initial investment, which you can see in Figure 1.4. If you withdraw the interest earnings each year rather than reinvesting those earnings, then you receive \$24,000 in interest payments over 30 years (\$800 per year). However, reinvesting

FIGURE 1.3 GROWTH OF \$10,000 INVESTMENT WITH AN 8 PERCENT RETURN: INCREASE IN INTEREST EARNINGS

Year	Value	Interest Earnings	Increase in Interest Earnings from Previous Year
1	\$10,000	\$800	—
2	\$10,800	\$864	\$64
3	\$11,664	\$933	\$69
4	\$12,597	\$1,007	\$74
5	\$13,605	\$1,088	\$81
6	\$14,693	\$1,175	\$87

FIGURE 1.4 GROWTH OF \$10,000 INVESTMENT WITH AN 8 PERCENT RETURN: CHANGES IN PROPORTIONS OF INITIAL INVESTMENT VERSUS EARNINGS OVER TIME



the interest each year earns you an additional \$66,626 in interest on top of the \$24,000 earned by the initial investment. While this math is compelling on its own, saving early creates an even more impressive impact.

Let’s imagine two recent college graduates named Michelle and Matt, who each earn an 8 percent rate of return on their investments. Michelle starts investing today by making a \$250 contribution each month to her retirement account. After ten years of these monthly investments, Michelle

FIGURE 1.5 THE IMPACT OF SAVING EARLY IN LIFE

Michelle	versus	Matt
\$250	Monthly Contributions Years 1–10	\$0
\$0	Monthly Contributions Years 11–40	\$250
10 Years	Number of Contributions Years	30 Years
\$30,000	Total Contributions	\$90,000
8%	Hypothetical Growth Rate	8%
\$509,605	Value After 40-Year Period	\$375,074

needs the \$250 to cover additional expenses related to relocating for a new job. She doesn’t make any further contributions to the account and doesn’t touch the balance until she retires 30 years later.

Matt, on the other hand, is still in the college mindset and figures there is plenty of time to save for retirement later. Ten years from now, he begins investing \$250 every month until he retires 30 years later. Whose nest egg is bigger at retirement? Let’s take a look.

As you can see in Figure 1.5, Michelle comes out ahead despite contributing less money to her account for fewer years than Matt. The secret behind Michelle’s success? Starting early, which gives her a longer time horizon than Matt. As your time horizon increases, so does the effect of compounding. Even though Michelle made a smaller total contribution, her investment had more time to benefit from the effects of compounding.

Now, you can see why the most important rule of retirement savings is save early. For what it’s worth, if Michelle or Matt had found a way to save \$250 a month from the time they graduated college at age 22 to the day they retired at age 67, they would have retired with \$1,318,635. In other words, saving less than \$10 a day can add up to over \$1 million in wealth. Can you find an extra \$10 a day to contribute to your investment account?

It’s easy to procrastinate with savings, particularly for long-term goals such as retirement, but understanding the power of compounding should convince you to do otherwise. Of course, we shouldn’t forget that the exponential power of compounding can work against you, too.

THE DARK SIDE OF COMPOUNDING

The impact of inflation also compounds over time, but this is *not* good news. Inflation works against you by decreasing the buying power of your hard-earned savings. For example, a dollar bill acquired at the founding

of the Federal Reserve in December 1913 and tucked under the mattress for safekeeping would buy a mere four cents of what it snared back then. Inflation has historically averaged about 3 percent. According to the Rule of 72, that means your purchasing power gets cut in half every 24 years.

Investment costs and taxes create a similar drag on your rate of return. Let's continue with the previous example in which you save \$250 a month into an investment account that earns 8 percent a year from age 22 to age 67. Without costs and taxes, you would retire with \$1,318,635. Because investing is not a costless activity, let's assume you pay 1.5 percent for investment-related fees. These fees come directly out of your 8 percent return and reduce your ending balance to \$807,125.

Taxes also reduce returns if you aren't using a tax-deferred account like an IRA or an employer-sponsored retirement plan. The impact of taxes will vary by your state of residence, income level, and mix of investment accounts. Given all the variables, let's simply assume that you pay taxes equal to 6 percent of your investment balance each year. Continuing with our example from before, the ending balance after costs and taxes comes to \$713,230. In other words, the negative impact of compounding from investment fees and taxes wiped out more than half of your investment account.³

Another area that compounding can work against you is when you take on debt. Unfortunately, many people need to take on debt at some point in their lives. Most people could not afford a home without a mortgage. Many others couldn't pay for higher education without student loans. These are both examples of good debt because they can positively contribute to your overall net worth. Unlike a car that depreciates in value the moment you drive it off the dealer's lot, a home's price generally appreciates at a rate similar to inflation. As for education, student loans are an investment in your ability to earn a higher income.

Credit card debt, on the other hand, is bad debt because it's typically the result of unnecessary consumption or poor planning—and, more importantly, comes with high interest rates and low minimum payments.

³The tax rate used in this example is a round number since everyone has different tax circumstances. The gains realized from selling assets you hold less than 12 months are subject to the short-term capital gains tax rate, which is equal to your highest marginal ordinary income tax bracket. The gains realized from selling assets you hold 12 months or longer are subject to the long-term capital gains rate, which is 15 percent for married couples filing taxes jointly earning between \$78,751 and \$488,850. Married couples filing taxes jointly earning \$488,851 or more will pay a 20 percent capital gains tax. Unless you live in a state that has no income taxes, you will also owe state income tax on your gains. All of the income levels and tax rates in this footnote are as of 2019. Visit www.irs.gov for current tax brackets.

That combination of factors plus compound interest makes the cost of using credit cards enormous. Imagine buying a new TV for \$2,500 using a credit card with a 16 percent annual percentage rate (APR) and making minimum payments of \$50 until the balance is paid off. In this scenario, compounding creates \$3,994 in interest costs over the nearly 22 years it takes to pay off the original \$2,500 purchase.

SMALL DECISIONS AND GOOD HABITS LEAD TO BIG RESULTS

It's simple to achieve financial success if you can make decisions that take advantage of the power of compounding over time. Whether you're saving early and often, systematically adding to your investment portfolio, or staying the course in times of uncertainty, time has the power to turn small habits into incredible results.

The problem is there are lots of decisions to make. Should you invest or pay down debt? Where should you keep cash savings? What types of investment accounts should you use first? Should you rent or buy a home? What percentage of your income should you save? The decisions you make today will have compounded effects decades later—but before you can start making good choices, you first must take time to figure out what you're trying to get out of life.