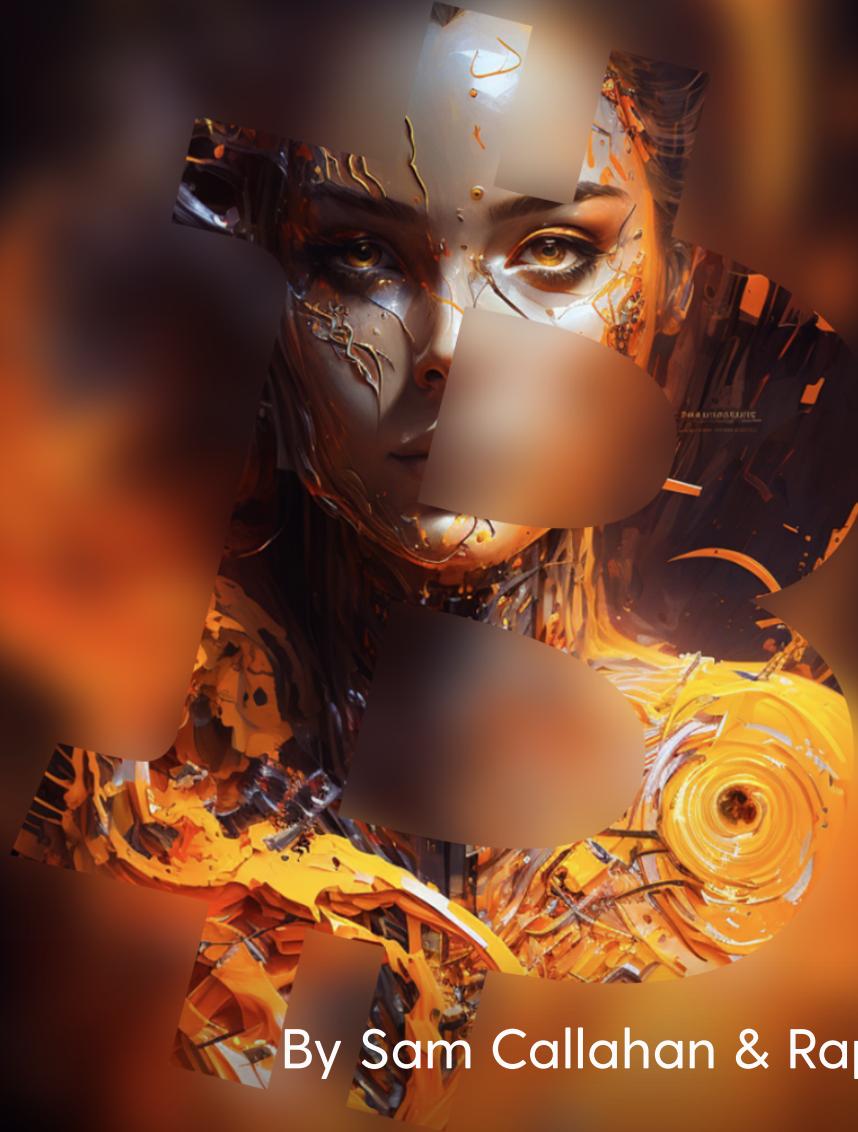


Running the Numbers

**Dollar Cost Averaging vs.
Lump-sum Investing**



By Sam Callahan & Rapha Zagury

Running the Numbers

Dollar Cost Averaging vs. Lump-sum Investing



Sam Callahan

Lead Analyst



Rapha Zagury

Chief Investment Officer

After a client has done their homework and concluded that they want to buy bitcoin, the next decision for them to make is when to buy Bitcoin to get the greatest return on their investment.

We often get clients at Swan who ask us, “Should I buy now?” Or clients who tell us, “I’m sitting on cash. I’m going to wait for the price to drop.”

Some clients decide to purchase their bitcoin all at once at a price they feel is good value. This is called Lump-sum investing – the entire amount of available funds is invested immediately.

An example of this strategy could be an individual inheriting \$10,000 and investing it all immediately. It could also be an individual who has \$1,000 left over from each paycheck and decides to invest it all at once every month. The key here is that all available cash is invested at once.

Other clients decide to use a different strategy. Instead of allocating all of their available funds at once, they buy a specified amount of bitcoin every day, week, or month until the available funds are fully invested. This is called Dollar-Cost Averaging (DCA) – the available funds are invested typically in equal-sized payments at regularly scheduled time intervals over time.

For example – if an investor has \$10,000 to invest, they could choose to purchase \$2,000 upfront and then DCA \$2,000 every week for 4 weeks.

Given Bitcoin’s volatility, it can be difficult for investors to know when is a good time to buy and when is a good time to wait for a better entry point.



It begs the question: Which investment strategy has historically performed better for Bitcoin investors? Have investors who invested their funds all at once (lump-sum) outperformed those that have spread out their buys over time (DCA)?

We wanted to find out the answer to these questions, so we ran the numbers.

The results may surprise you.

Methodology

We began by analyzing the last 6 years in Bitcoin's price history.

To analyze the return on investment of both strategies, we ran a simulation in which we compared different DCA strategies at different time intervals compared to lump-sum investing.

We took a hypothetical scenario where an investor had \$10,000 to invest.

We assumed that this investor would be buying a certain amount of bitcoin upfront, given human behavior. If an investor has already decided they want to buy bitcoin, it is highly likely they would buy at least some bitcoin upfront, even if they did plan to use a DCA strategy.

- 0% upfront means that they did not invest any funds to start, and then they DCA the entire \$10,000 in equally weighted set intervals.
- 25% upfront means they invested \$2,500, and then DCA the \$7,500 in equally weighted set intervals.
- 75% upfront means they invested \$7,500, and then DCA the remaining \$2,500 in equally weighted set intervals.
- 100% upfront is the same as lump-sum investing.

We then analyzed the different upfront strategies with various DCA strategies, including daily, weekly, and monthly time intervals.

Here are the DCA strategies analyzed:

- Daily (10, 15, and 30 days)
- Weekly (4 and 8 weeks)
- Monthly (6 and 12 months)

We ran a simulation from every single day as the starting date until today. We then compared how the different investment strategies have performed historically over different time periods.

Here's what we found.

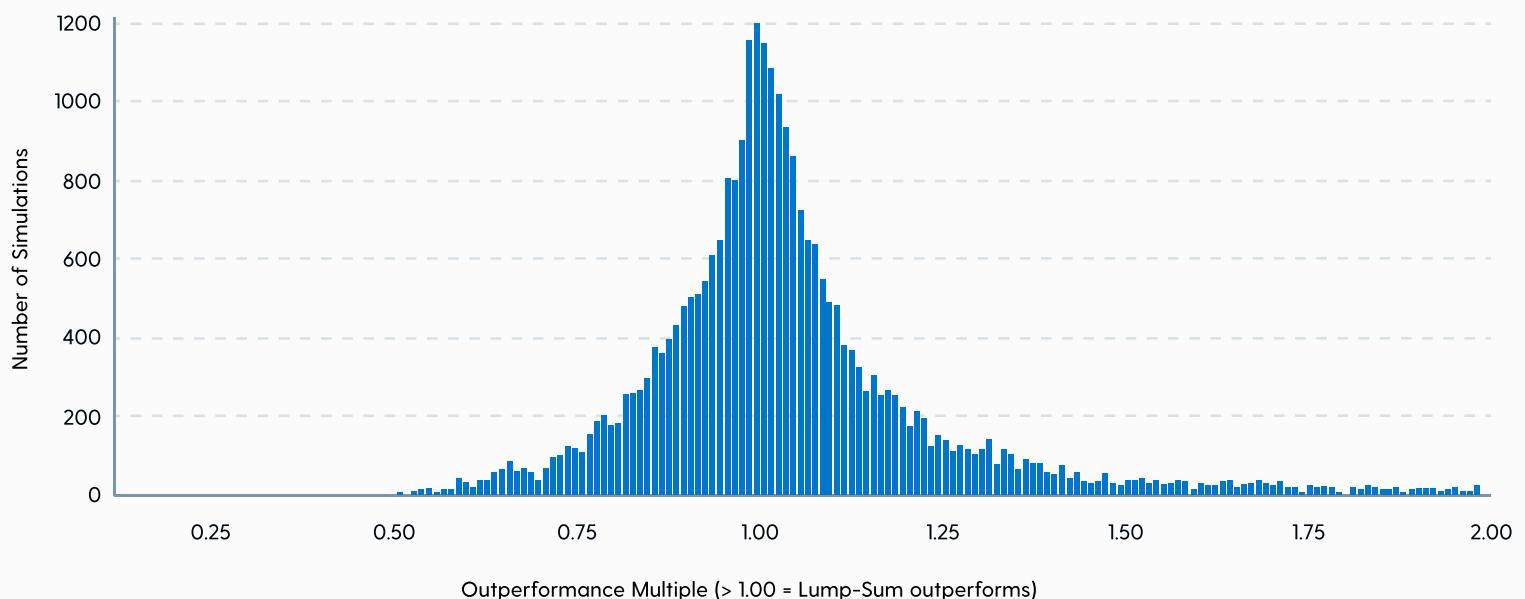
DCA vs. Lump-sum (2017-Today)

First, we looked at how the different strategies have performed in the last 6 years.

We compared the total amount of bitcoin accumulated by all of the DCA strategies vs. lump-sum since January 2017.

On the y-axis is the number of simulations that were run, and on the x-axis is how much lump-sum outperformed the DCA strategies.

Outperformance of Lump-Sum Over DCA (2017 - Today)



A value of 1.00 means that the two strategies returned equal amounts, in other words, a client accumulated the same amount of bitcoin whether they used a lump-sum or DCA strategy. A value above 1.00 means that the lump-sum strategy outperformed DCA. For instance, an outperformance of 1.03 means that the lump-sum strategy accumulated 3% more bitcoin during a given time period.

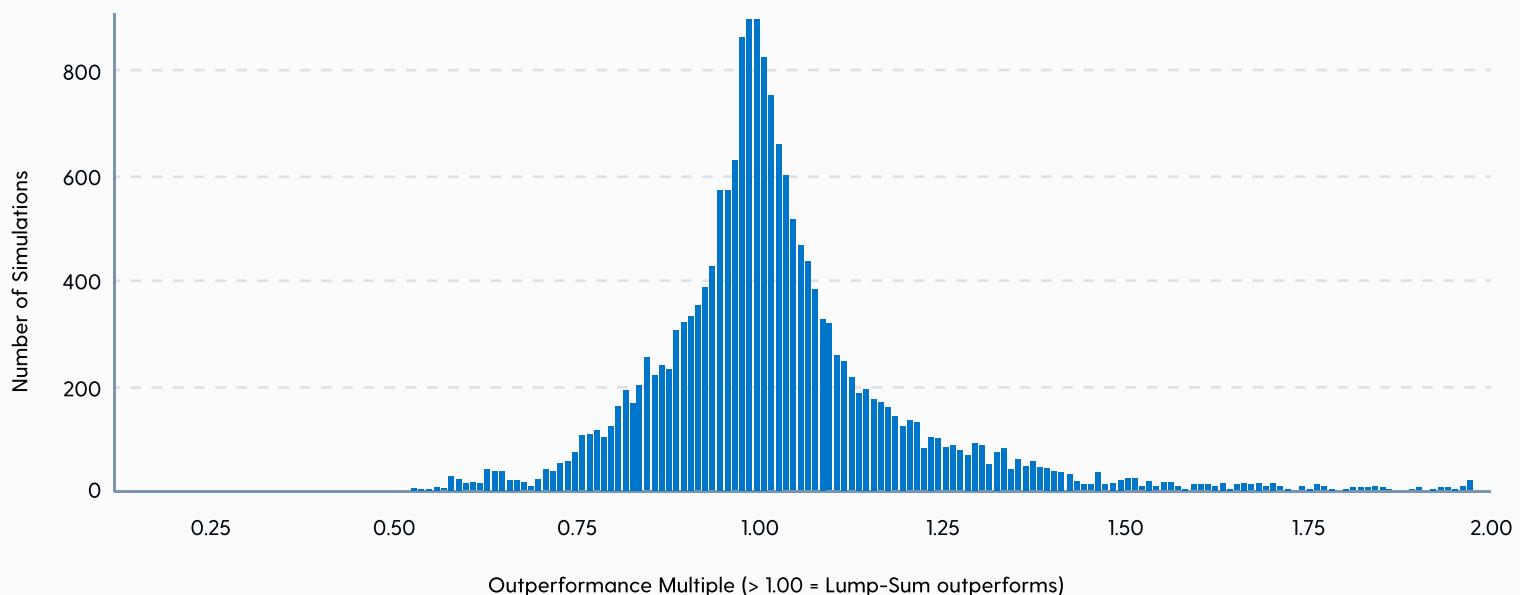
On average, the chart above indicates that lump-sum has generally outperformed DCA strategies since 2017. You can see this by observing how the majority of the simulations were greater than 1, sometimes significantly.

DCA vs. Lump-sum (2019-Today)

Second, we looked at how these different strategies have performed in the last 4 years.

A similar pattern emerges. Lump-sum generally outperformed DCA strategies.

Outperformance of Lump-Sum Over DCA (2019 - Today)

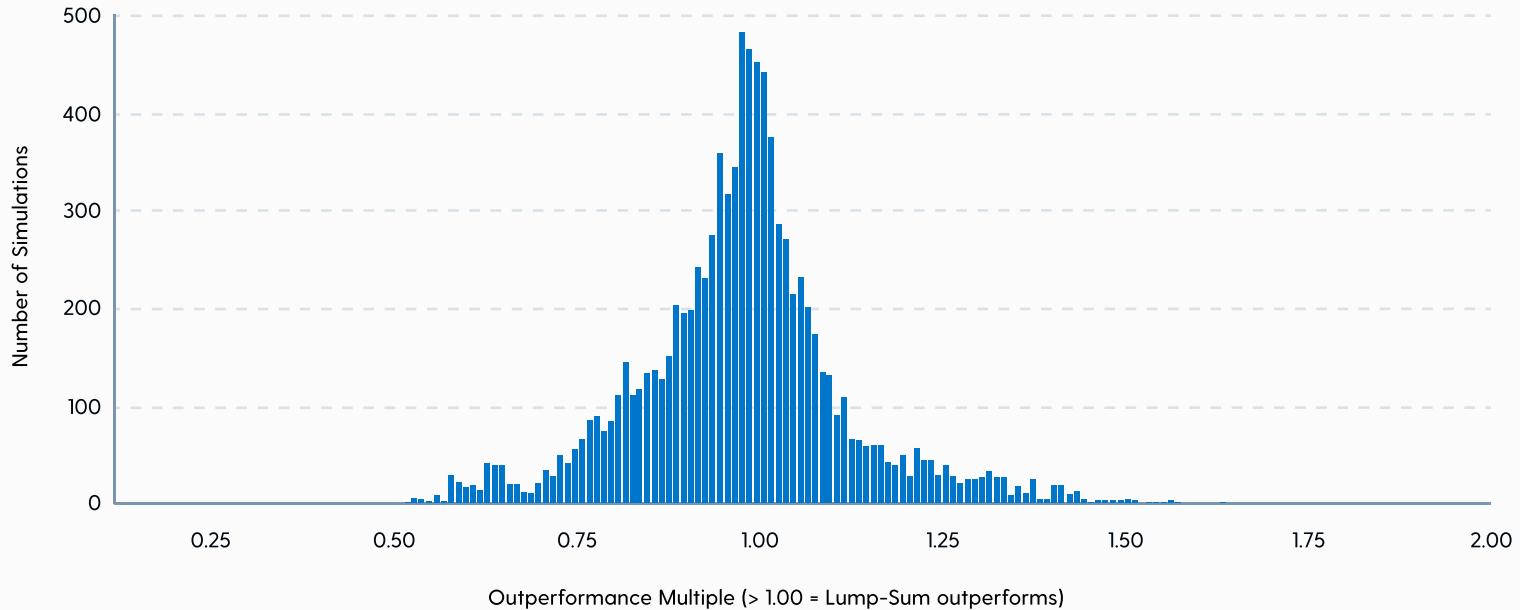


DCA vs. Lump-sum (2021-Today)

Third, we compared the performance of both strategies in the last 2 years.

The following chart shows how DCA strategies had improved performance compared to lump-sum during this period, with more simulations scoring <1 than previous time periods.

Outperformance of Lump-Sum Over DCA (2021 - Today)



This is to be expected during bear markets as DCA strategies allow for an investor to have cash on hand to accumulate more bitcoin as the price moves downwards or chops sideways, whereas lump-sum investors are already fully invested. Lump-sum investors have to stomach the drawdowns on paper, and don't have additional capital to lower their cost basis like DCA investors.

So, in general, lump-sum strategies outperform DCA strategies, except for periods where an individual invested all of their available funds right before an extended period of downward price action.

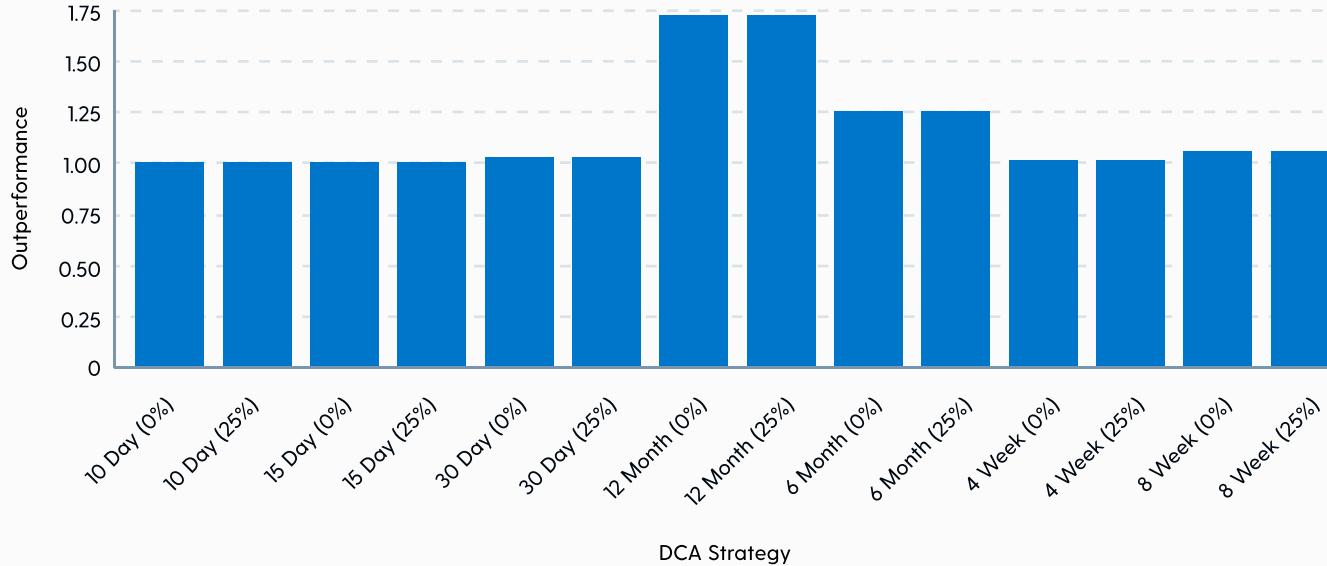
Which DCA Strategy Outperformed?

When we dig deeper into the data, we find that the longer DCA strategies underperformed the shorter DCA strategies, highlighting once again that sitting on the sidelines can be costly when investing in Bitcoin.

The chart below highlights how monthly DCA strategies drastically underperformed other DCA strategies from 2017-2023

In the figure below, a 10 Day (0%) strategy means a daily DCA strategy across 10 days, with zero percent allocated upfront. A 4 Week (25%) strategy means a weekly DCA strategy across 4 weeks, with 25% of capital allocated upfront.

DCA Strategies Outperformance Compared to Lump-Sum



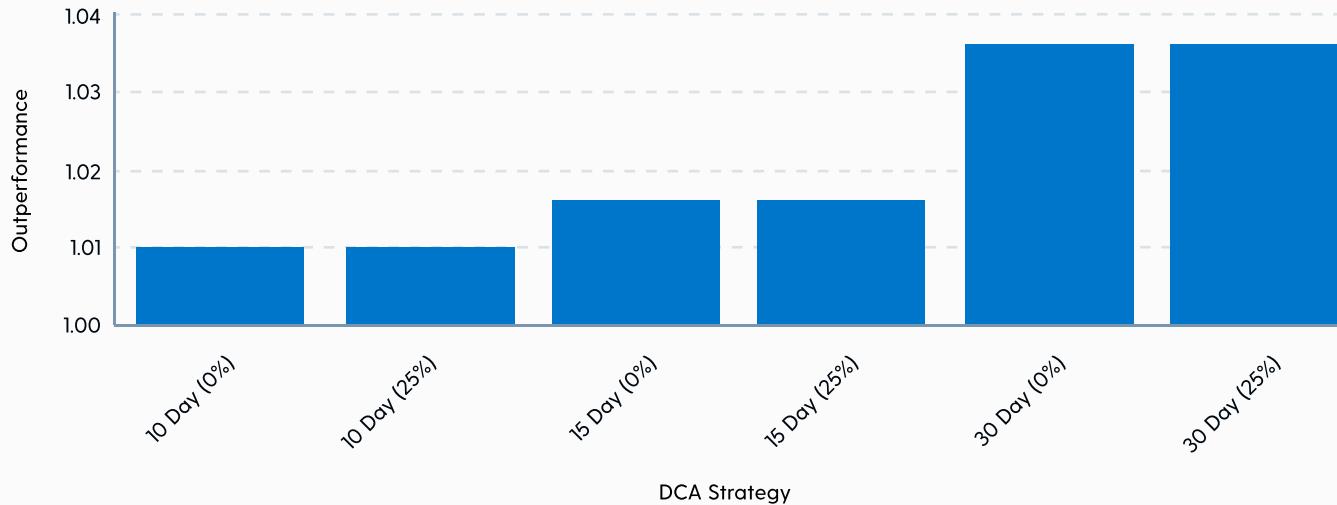
This data shows that the average 12-month DCA strategy accumulated nearly 75% less bitcoin compared to the average lump-sum strategy, and the average 6-month DCA strategy accumulated around 25% less bitcoin.

This trend can be further observed when you look at each DCA strategy more granularly.

Here, the average 10-day daily DCA strategy outperformed the average 15-day and 30-day strategies, and all three slightly underperformed the average lump-sum from 2017-2023.

Daily DCA (2017-2023):

Daily DCA Average Performance vs. Lump-Sum (2017-2023)

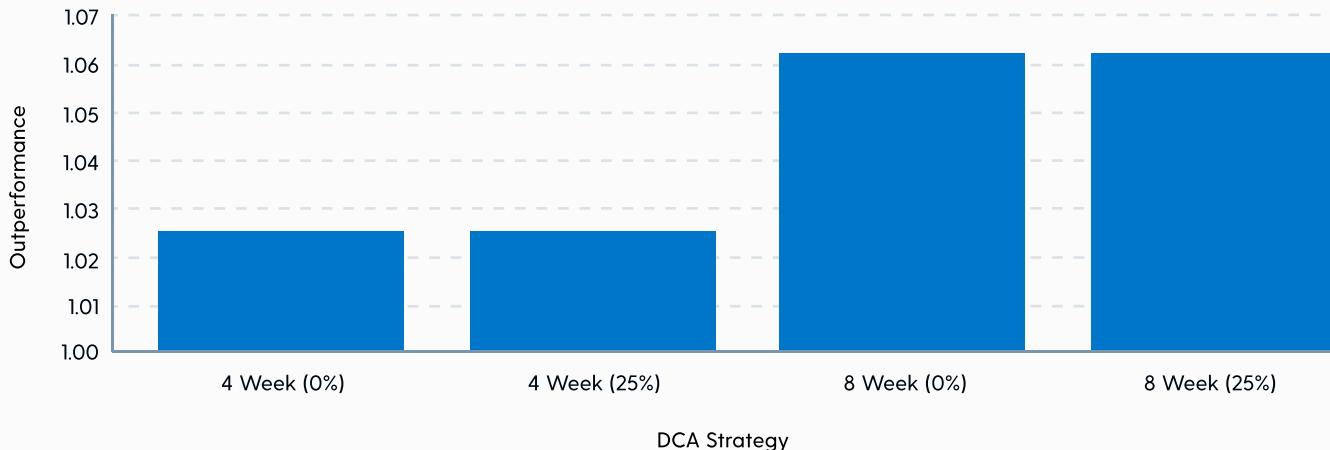




Weekly DCA (2017-2023):

This chart shows how the average 4-week DCA strategy outperformed the average 8-week DCA strategy, while both underperformed the average lump-sum.

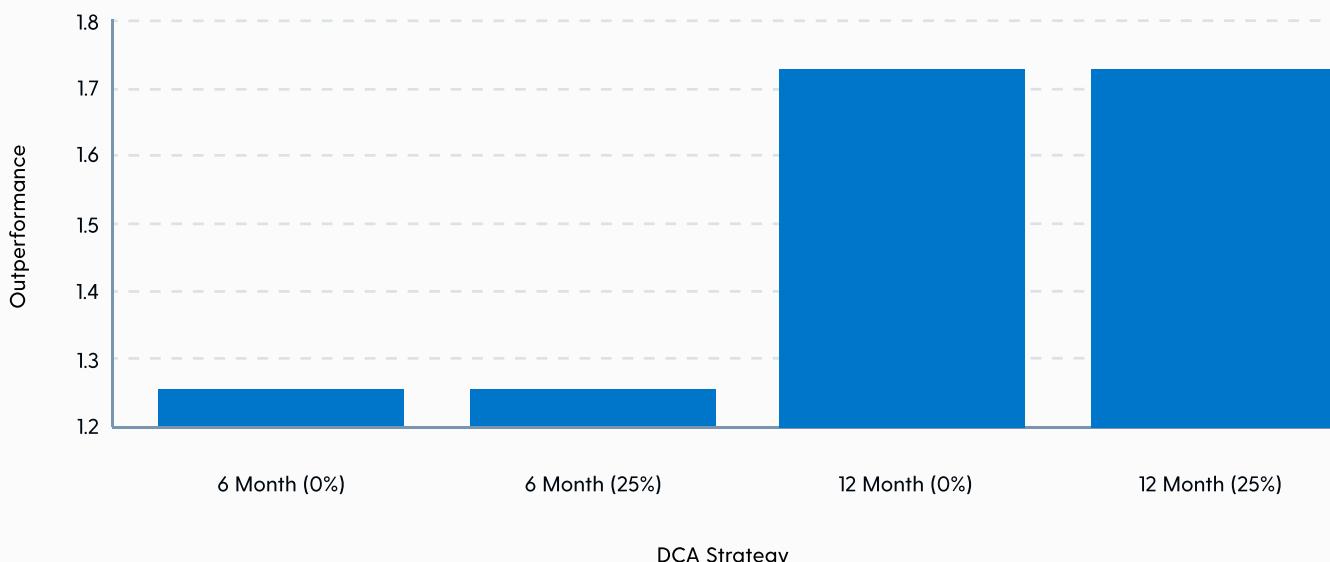
Weekly DCA Average Performance vs. Lump-Sum (2017-2023)



Monthly DCA (2017-2023):

This chart shows how the average 6-month DCA strategy outperformed the average 12-month DCA strategy by a significant margin, and both drastically underperformed the average lump-sum.

Monthly DCA Average Performance vs. Lump-Sum (2017-2023)





One major takeaway from this data is that the longer an investor took to deploy capital, the more they underperformed compared to a lump-sum investment.

Moral of the story: when investing in Bitcoin, historically, the earlier an investor gets their capital in, the better.

Why Has Lump-sum Consistently Outperformed?

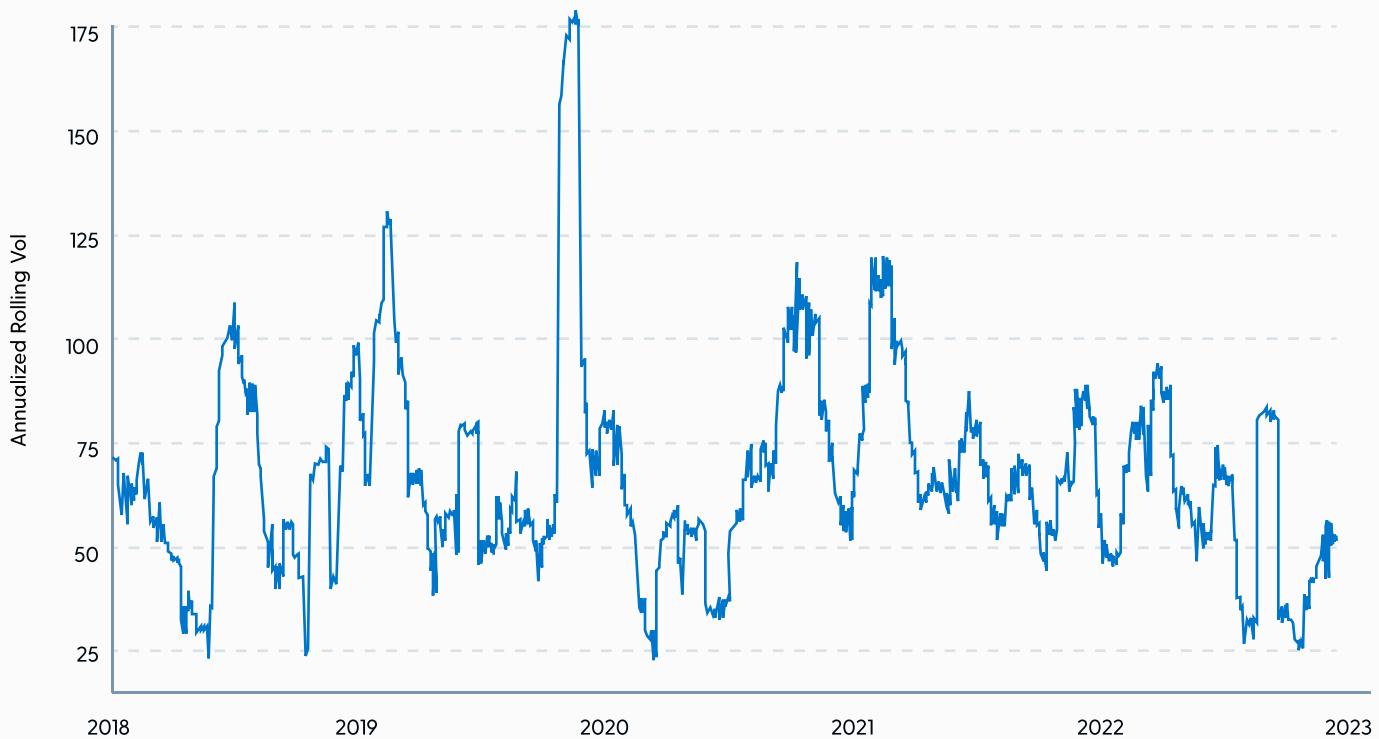
The results above tell us that historically an investor who decided to do lump-sum investing experienced a greater return on investment than one who dollar-cost averaged.

The question is: why?

The answer is: upwards volatility. When Bitcoin moves up, it explodes.

It's no secret that Bitcoin is a volatile asset. As it stands today, volatility is an inherent trait of Bitcoin. Here is a chart of Bitcoin's 30-day rolling volatility that highlights the wild price swings that occur in Bitcoin.

Historical 30-Day Rolling Annualized Volatility



This volatility makes it extremely difficult for investors to try to time when Bitcoin's price is going to rise or drop.

For individuals who choose to dollar-cost average, it is not necessarily true that they are not timing the market. By not investing all of their available funds at once, they are implicitly choosing to hold cash, which means they believe that Bitcoin's price will chop sideways or move down.

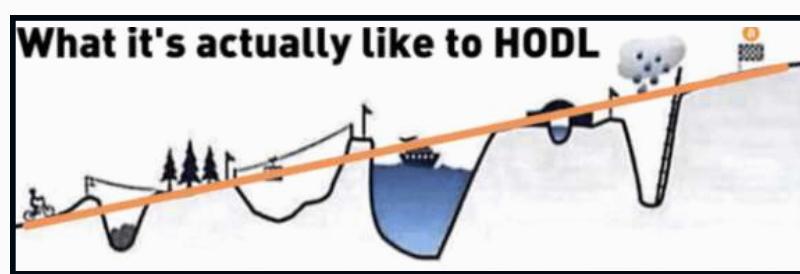
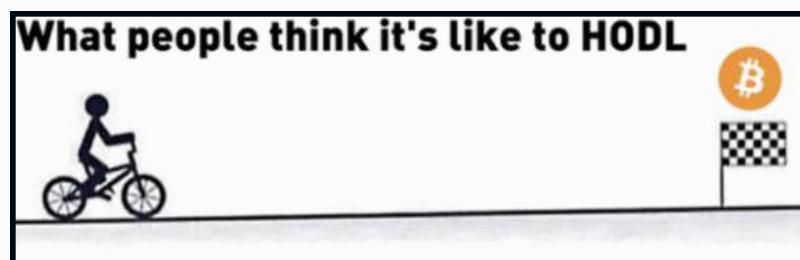
These investors hope that by dollar-cost averaging, they will be able to lower their overall cost basis as Bitcoin's price chops sideways or drops lower. This is corroborated by the data above, where DCA strategies typically outperform lump-sum strategies during bear markets.

The problem is that a majority of Bitcoin's gains historically have occurred in short, explosive movements to the upside. There is a significant opportunity cost to sitting on the sidelines in Bitcoin, which is why lump-sum historically outperforms DCA strategies.

There's an old saying on Wall Street that stocks climb up the stairs but come down on the elevator. But with Bitcoin, it appears to be the opposite. For the majority of the time, Bitcoin trades mostly sideways or grinds lower, only to have explosive movements to the upside.

This is likely why holding Bitcoin can feel particularly challenging for investors, given its volatility and the historical behavior of its price movements.

For long-term investors, holding bitcoin in their portfolio can feel a lot like this.

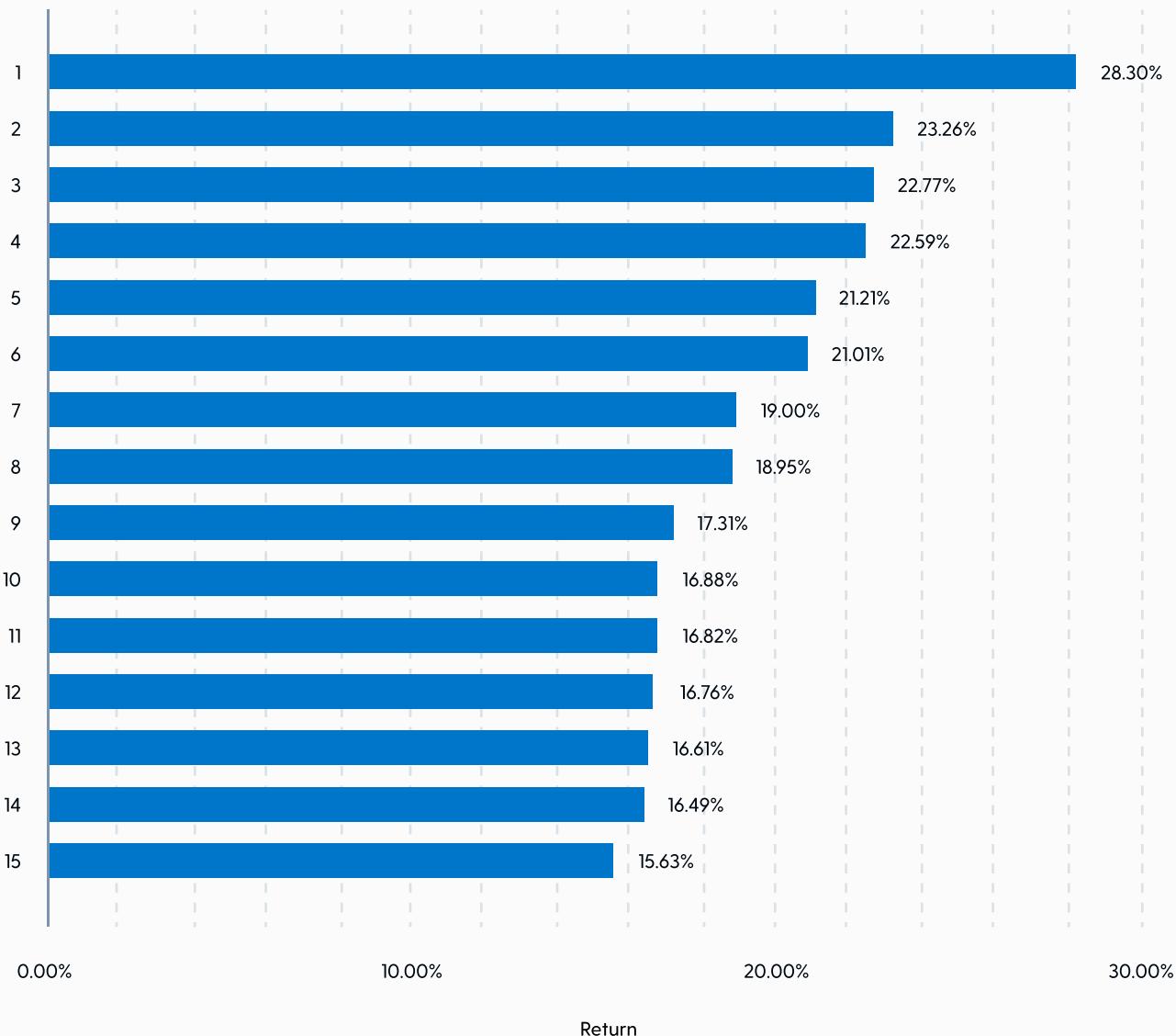




There are far more red days than green days for long-term Bitcoin investors, but those few green days are massive. Therefore, it's absolutely vital that investors do not miss these days to capture the gains from Bitcoin's price appreciation.

The data confirms this. The table below shows the top 15 three-day Bitcoin moves over the last 5 years.

Top-15 Three-day Upward Price Movements (2018-2023)



If an investor had invested \$100 dollars into Bitcoin on February 1st, 2018, by today, that \$100 would be \$227.



But if an investor had invested \$100 dollars into Bitcoin that same day, but missed the top 15 three-day price movements, their original investment would be worth only \$15!

In other words, if an investor had missed these 15 largest 3-day periods during this time period, their total return was -84.6%. This was during a period when the total return of Bitcoin increased by +127%!

This is likely why DCA as an investment strategy has underperformed lump-sum investing in Bitcoin.

With lump-sum investing, an individual is sure to capture all the gains that occur in these periods of explosive price appreciation, whereas an individual who DCA's risks having a portion of their funds still on the sidelines as they allocate over time.

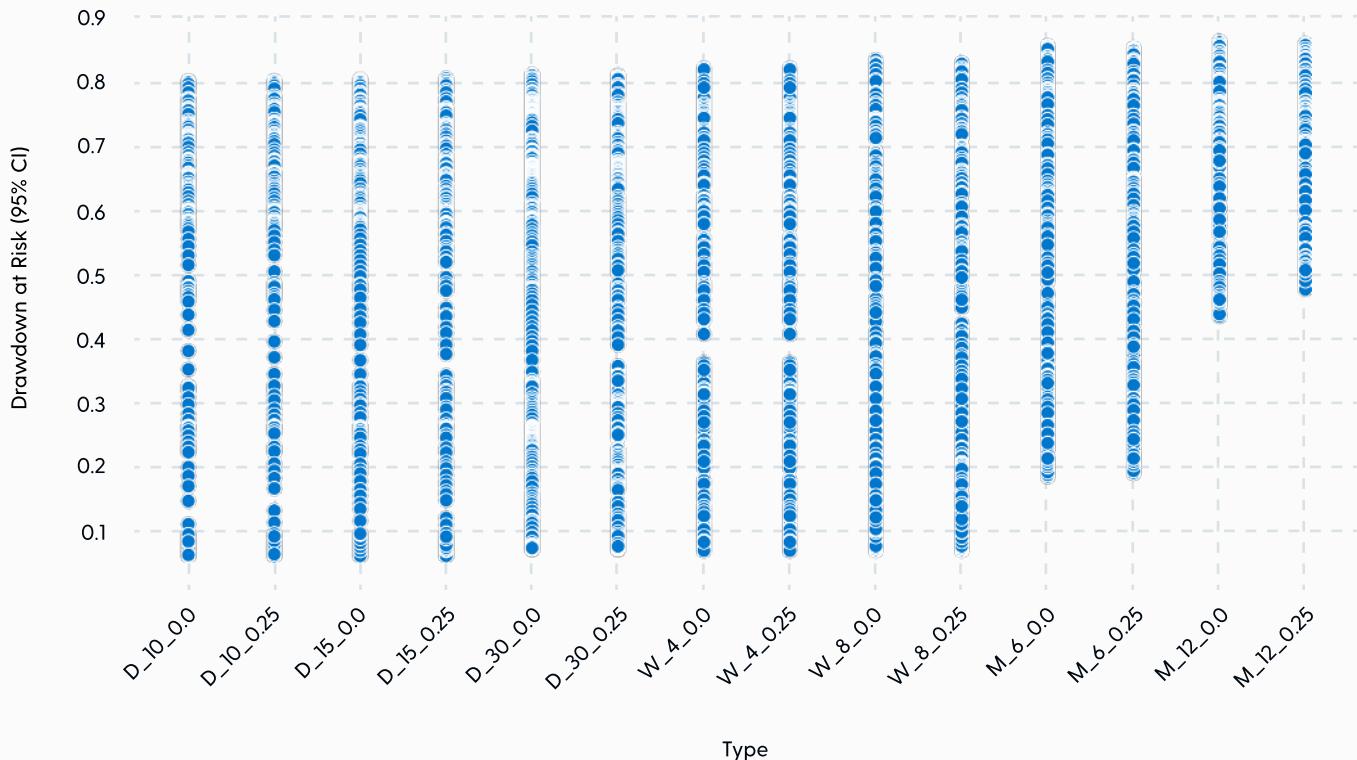
One might scoff at this and say, “Well, when you DCA, you also have a chance of missing big drawdowns, unlike lump-sum.”

But when you look at the data, that is not the case because the risk of missing down days and missing up days is not symmetrical. As we mentioned earlier, the price of Bitcoin tends to move sideways or grind most of the time downwards and then shoot upwards. If you miss these largest green days, the long-term impact on the total performance of the portfolio is much greater than not having exposure to the down days.

When you look at the drawdown risk between strategies, you will find that the drawdown risk actually increases from daily to weekly to monthly DCA strategies.

The following chart shows the drawdown risk for the different DCA strategies compared to lump-sum. The higher the drawdown at risk, the worse it is.

Drawdown at Risk of DCA Strategies vs. Lump-sum



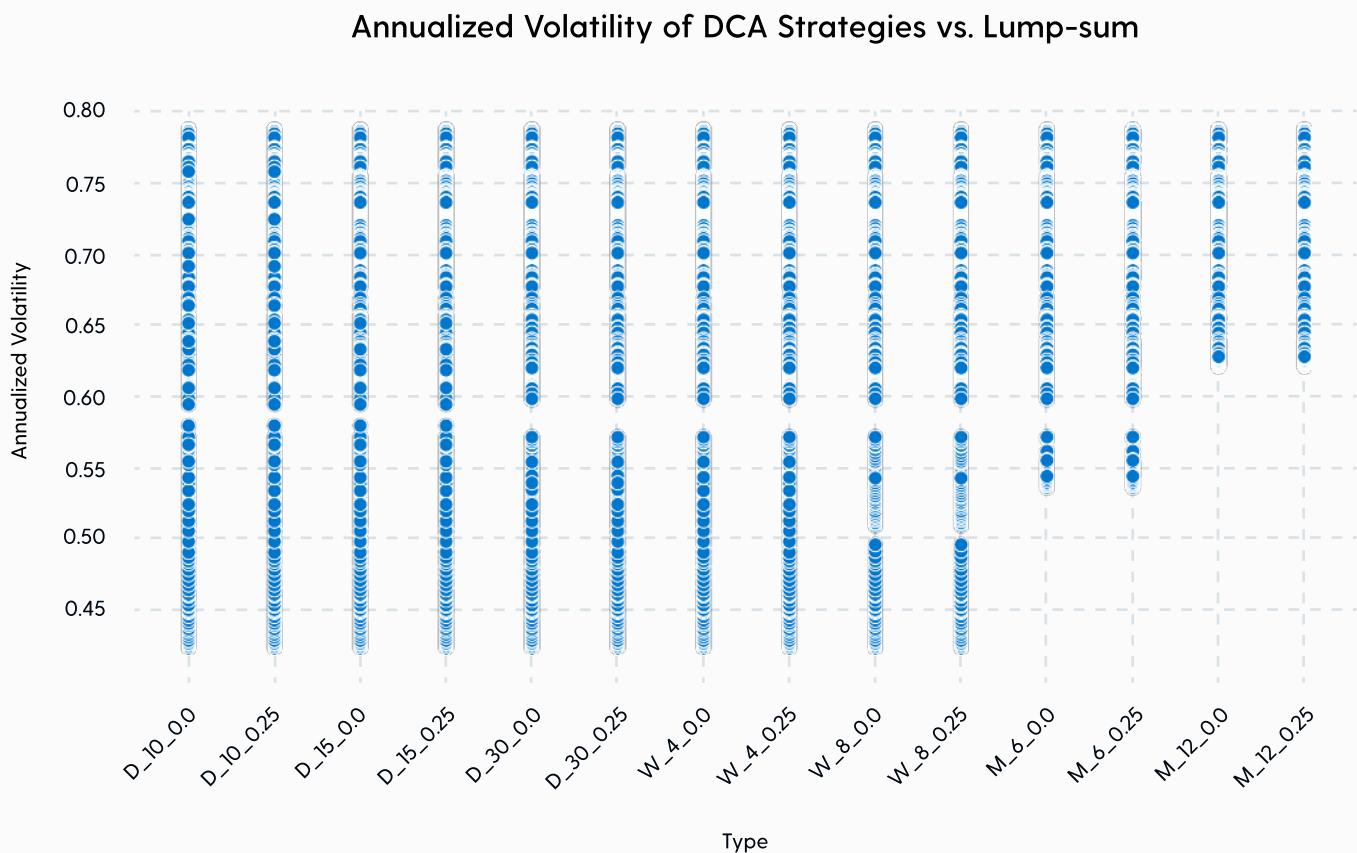
Notice on the chart above how the monthly DCA strategies do not have exposure to bitcoin during periods of low drawdown risk like the daily and weekly strategies. This means that monthly DCA strategies have more exposure overall to periods of high drawdown risk compared to shorter DCA strategies because they failed to be exposed to bitcoin during the bear market.

If investors are using a monthly DCA strategy, they will miss the best buying opportunities at the bottom of the bear market. In other words, their average cost basis will be higher compared to shorter DCA strategies, meaning they will have higher drawdown risk when the price falls. Thus, investors who DCA over long periods of time are more likely to see their wealth on paper drawdown more significantly, putting them at greater risk of making poor investment decisions.

This is just another argument for why it might be better for investors to choose a lump-sum investment strategy or shorter DCA strategies compared to longer DCA strategies.



The same trend can be observed when analyzing annualized volatility across the different DCA strategies. The higher the annualized volatility, the more rocky of a ride investors experienced using that strategy.



The chart above shows how monthly DCA strategies all had annualized volatility above 60%, but the other DCA strategies had annualized volatility below 60%.

This highlights once again how monthly DCA strategies are likely to not have exposure during the boring times when Bitcoin's price is grinding sideways, which makes up a majority of the time. These time periods help dampened the overall volatility of the position. When using monthly DCA strategies, you are more likely to have exposure to highly volatile periods without having exposure during the less volatile periods.

Most investors believe that with DCA strategies, they are protecting themselves from large downward price movements or high levels of volatility, but this data shows that DCA does not historically provide any significant protection against volatility or drawdown risk compared to lump-sum, and that the longer the DCA strategy is, the more drawdown risk and volatility an investor is likely to experience.



Considerations Beyond the Data

This data makes a convincing argument for lump-sum investing when considering an allocation to Bitcoin. It shows that historically lump-sum strategies have outperformed DCA strategies and have resulted in lump-sum investors accumulating more bitcoin than their DCA counterparts. It also shows that the earlier an investor allocates to Bitcoin, whether that is lump-sum or by choosing daily DCA over weekly and monthly DCA, the better their return will be over the long term.

Not only that, but this data shows that DCA does not provide any substantial benefit when it comes to protection against downside risk or volatility risk. This is likely due to the nature of Bitcoin's price action in that it has sharp upward price movements and tends to grind sideways or downwards for long periods of time.

All of this data points to one fact, with Bitcoin, you should invest as early as possible. It hurts to wait because one might miss out on large, short-lived price movements that will make up a majority of their returns, and these price movements are impossible to predict.

One caveat is that this is all based on historical data. And there's no guarantee that the future will be shaped like the past.

But there is an even larger caveat...lump-sum only outperforms other strategies if the investor can hold their bitcoin long term. The main factor of whether or not an investment in Bitcoin is successful or not is the ability of an investor to hold long-term to take advantage of its Compound Annual Growth Rate (CAGR). Any strategy that makes holding more difficult for an individual investor will likely result in inferior returns.

Therefore, the best strategy is the one that allows an investor to hold through Bitcoin's volatility and sleep well at night, whether it's DCA or lump-sum. The "right" strategy is unique to every investor regardless of what the historical data says.

Every investor is different. It's hard for investors to sit on their hands and survive Bitcoin's volatility when they are in the wrong strategy for them. That's why it's vital for investors to tailor their Bitcoin strategy to their own risk tolerance, their own financial situation, and their own conviction level to prevent a stressful situation that could lead to emotional decisions and selling too soon.



In Morgan Housel's fabulous book "The Psychology of Money," he explains how Warren Buffett's net worth as it stands today is around \$84 billion. Of that, around \$81 billion came after he was in his mid-60s. Housel goes on to explain, "The real key to his success is that he's been a phenomenal investor for three-quarters of a century...His skill is investing, but his secret is time."

Housel continues..."But good investing isn't necessarily about earning the highest returns, because the highest returns tend to be one-off hits that can't be repeated. It's about earning pretty good returns that you can stick with and which can be repeated for the longest period of time. That's when compounding runs wild."

Here is Bitcoin's CAGR compared to gold and the S&P 500 over the last 10 years.

CAGR of Bitcoin vs. Other Asset Classes

	Bitcoin	Gold	S&P 500
1 year	-41%	-6%	-6%
2 year	-33%	+4%	+3%
3 year	+36%	+3%	+11%
4 year	+55%	+9%	+10%
5 year	+17%	+7%	+8%
6 year	+62%	+7%	+9%
7 year	+77%	+6%	+11%
8 year	+73%	+6%	+9%
9 year	+49%	+4%	+9%
10 year	+86%	+2%	+10%

Source: CaseBitcoin.com



As you can see, the longer an investor holds Bitcoin, the more attractive the CAGR is.

Albert Einstein was once quoted as saying, “Compound interest is the eighth wonder of the world.” This quote holds true for investing in Bitcoin too.

To date, Bitcoin has provided extraordinary compounded returns for investors in its lifetime. Therefore, when an individual decides to invest in Bitcoin, they should do so with the goal of holding their investment for a long time to take advantage of this compounding and should consider an investment strategy that allows them to reach that objective, regardless of which investment strategy has historically performed better.

In the end, holding Bitcoin for longer durations is the single biggest factor when it comes to whether or not an investor will succeed with their Bitcoin investment. Investors should choose the investment strategy that best suits themselves to maximize their chances of holding their Bitcoin position for the long term.

Bitcoiners run the numbers. Trust, but verify, below.

Link to Github repo where anyone can clone, modify and/or submit a PR to the models above.