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RESEARCH REPORT

How effective are common investment strategies with Bitcoin?

An Empirical Study

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Introduction

Cryptocurrencies are a comparatively young asset class, but they seem to have now been accepted by a broad investor base. Retail investors have been investing in crypto the past decade, but now professional traders and institutional investors have begun trading this new asset class.

There is an abundance of trading strategies investors deploy, ranging from reversal patterns such as the head-and-shoulders pattern, to price-based indicators, or oscillators, just to name a few. Each investor has their own strategy they follow and believe in. This report investigates if common trading strategies can be applied to cryptocurrencies and if so, how they may perform. More specifically, this report will examine three of the most commonly known trading strategies, namely, turnaround investing, trend investing and investing according to the old adage "sell in May and go away", more commonly known as the Halloween Factor.

These strategies have been analysed at length in traditional markets. For example, Hannestad (2020) states that due to their reactive nature, trend investing strategies tend to underperform in market turning points and show increased tail risk. Dr Gänitz (2020), on the other hand, shows that there is a benefit to adhering to the Halloween Factor in equity markets.

This report will investigate each of these trading strategies individually and examine how they apply to Bitcoin. Firstly, trend investing will be analysed. This section covers the definition of a trend used in this report, as well as the results. Then, Turnaround Investing is inspected in detail, which is fundamentally different from Trend Investing. The mechanics of this strategy are introduced first, followed by the results of the empirical analysis. Finally, Halloween Investing is considered. Whilst this strategy is not as complex as the other two, it is nevertheless considered an important strategy because it is so well known in the investment industry.

The conclusion of this report summarises the main findings and performance of the three investment strategies when applied to Bitcoin and aims to provide an explanation for the underlying rationale.[1]

1 Note that this analysis is based on historical data, i.e. backward-looking information. There is no guarantee that these strategies will work equally well in the future.

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Data

The research presented in this report requires two types of data, namely, cryptocurrency data and financial market data. This section provides an overview of how the data was sourced and prepared for the ensuing analysis.

The market data was sourced from Bloomberg and covered a time period from 1.1.2009 to 31.3.2020 on a daily basis. All indices were sourced in US Dollars to ensure better comparability. Table 1 provides an overview of the different indices used and their reference ticker symbol.[2] Furthermore, Table 1 provides details of the assets comprising each index and the rationale as to why they were included in this analysis.

Cryptocurrency data was sourced from https://coinmarketcap.com. The full data history of the Bitcoin price was not available, however, prices were available from 29 April, 2013. The currency prices and market capitalisations were sourced daily and are denominated in US Dollars. Please note that for the purposes of this analysis the day's closing price was used.

Trend investing

Generally speaking, a trend is when the price of a certain good or a whole market moves in a specific direction for a prolonged period of time, regardless whether the movement is up or down. The roots of trend investing go back to David Ricardo in the 18th century (Hannestad, 2020).

Trend investing can be divided into several different strategies. The most commonly known strategies are time-series momentum (TSM) and cross-sectional momentum (CSM). The main difference between the two strategies is that TSM is an absolute strategy, where each asset is identified individually and then traded along the identified trend (if the trend is positive – long position should be taken, while a short position should be taken if the trend is negative) while CSM ranks all assets on a relative basis and takes a long position in the upper percentiles and shorts the lower percentiles. Since this report investigates a singular asset, namely Bitcoin, the analysis is based on TSM trend investing as CSM relativity would not apply.

This concept is illustrated diagrammatically in Figure 1. It shows the closing price of Bitcoin as the dotted line, the 5-day moving average is the short-term indicator and the 20-day moving average as the long-term indicator. The point where the short-term MA cuts the long-term MA from below is called the "golden cross" and considered a buy signal. The reason is that the short-term movements indicate a rise in the asset's price compared to the long run. The point where the long-term MA cuts the short-term MA from below is called the "dead cross" and is a signal to sell the asset (CFA Program Curriculum, 2014).

Figure 1 provides an overview of all the time points when the investor should have bought (golden cross) and sold (black cross) Bitcoin. For example, the investor would have bought Bitcoin in mid-June 2019 and sold it again in mid-July 2019. Following this strategy from April 2013 until end of March 2020 would have yielded an annualised return of 307% for the investor.[3]

2 For each index the day's closing price was used (PX LAST)

3 Note that this report assumes that the investor can only take long positions. Since most retail investors only take long positions, short positions were not considered as part of this analysis.

Table 1: Bloomberg Tickers

Index	Ticker	Overview
MSCI World incl. Emerging Markets	MXWD	This index was chosen to represent the performance of the full opportunity set of large- and mid-cap stocks across 23 developed and 26 emerging markets. It aims to reflect the overall economic condition of the existing equity markets. As of December 2019, it covers more than 3,000 constituents across 11 sectors and approximately 85% of the free float-adjusted market capitalization in each market.
MSCI World excl. Emerging Market	MXWO	The MSCI World index represents the equity markets of 23 developed countries. It was included into this report to provide a relevant overview of the economic conditions in the developed and therefore more stable equity markets worldwide.The index is a market cap weighted stock market index of 1,644 stocks from companies throughout the world.

There is no set rule over which time the short-term and long-term moving averages should be computed. Rather than limiting this report to the 5-day MA and 20-day MA just outlined, it was analysed how the annualised return changes as the length of the moving averages is altered. These results are presented in Table 2. The analysis was run with a short-term MA of 7 - 28 days, with 7-day increments representing full trading weeks, and a long-term MA of 30 - 360 days, with 30-day increments representing calendar months.

Regardless of which strategy is chosen, the return on investment is always positive and averages approx. 90%. Most returns in excess of 100% are achieved with a short-term MA of max. 14 days and a long-term MA of max. 90 days. Particularly, the top left part of the matrix shows the largest returns, indicating that a strategy with a short short-term MA and a short long-term MA yield the best results.

Figure 1 - Trend Investing Illustration

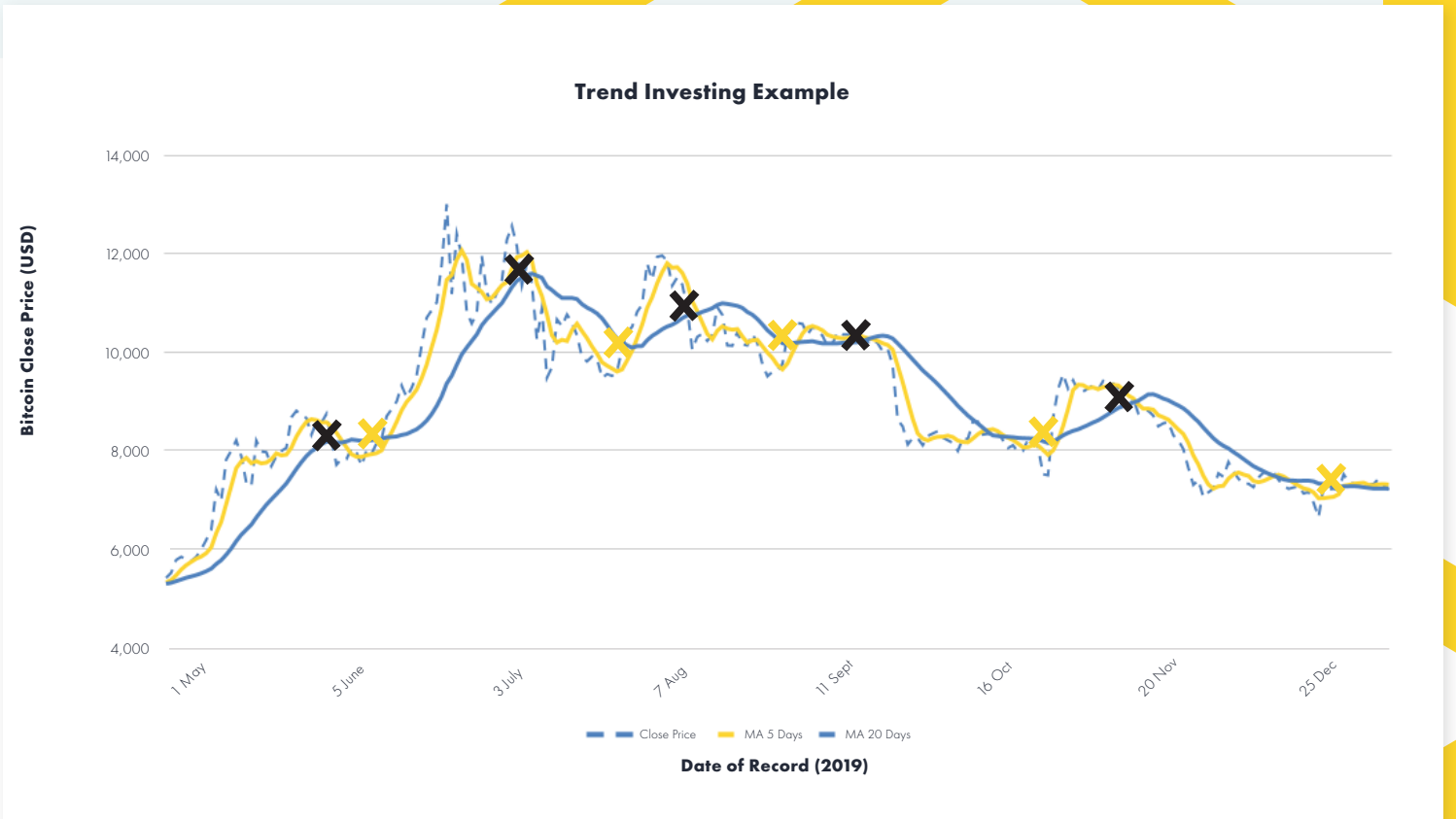


Table 2 - Trend Investing Results

Trend Investing - Annualised Return		Long-term Moving Average (days)											
		30	60	90	120	150	180	210	240	270	300	330	360
Short-term Moving Average (days)	7	105%	107%	107%	92%	81%	95%	96%	88%	90%	97%	94%	97%
	14	97%	103%	94%	91%	86%	74%	98%	84%	77%	94%	92%	83%
	21	96%	87%	91%	86%	86%	82%	84%	78%	86%	83%	83%	79%
	28	66%	72%	86%	96%	101%	85%	73%	72%	78%	71%	85%	74%

The main question that arises is whether trend investing outperforms a simple buy and hold strategy. In order to answer this question, the annualized return for a buy and hold strategy is first calculated: Based on the data used in this report, the earliest price available was $144.54 per Bitcoin on 29 April, 2013. For this report, the most recent price of one Bitcoin was $7,302.09 on 9 April, 2020. This translates into an annualised return of 75.8% per annum for the time period.

Returning to the results in Table 2, it is evident that most of the combinations of long-term and short-term moving averages outperform the buy and hold strategy. The strategies which outperform are highlighted in the table. It is of particular interest that almost all strategies outperform the benchmark. Even the strategies that do not beat the benchmark perform in line with the benchmark.

This analysis, of course, focusses on the entire time period of approx. 8 years. Investors might also wish to know how the strategies performed on a year-by-year basis. In the interest of brevity this is analysed using the strategy with a 7-day short term MA and a 30 day long-term MA. The results of this analysis are presented in Table 3.

Two patterns emerge from this table. Firstly, the returns of trend investing appear to outperform the buy and hold strategy during periods of price declines, as observed for the years 2014 and 2018. This result is in line with expectations because a declining price would trigger a sell order for the investor such that they would exit the position prior to further price declines. Secondly, the returns of trend investing appear to underperform the buy and hold strategy during upturns. Again, this is in line with expectations. The reason is that it takes the short-term MA a few days to change direction when the market is picking up. Therefore, the trend investor would only enter the market once the market has already experienced signs of recovery. The buy and hold investor, however, would have already owned Bitcoin at that point in time and benefitted from the price increase. Whilst the numbers in Table 3 may appear as if the buy and hold strategy is more lucrative, the trend investing strategy yields higher returns overall because it protects the investors losses more effectively

Turnaround investing is the opposite of trend investing. Rather than waiting for a trend to emerge and jumping on the train once it has, turnaround investors try to assess whether an asset is under- or overvalued and will buy or sell the asset accordingly.

One method to identify buy or sell signals in turnaround investing are through the use of Bollinger bands. Bollinger bands are used to identify extreme price movements in comparison to historical data. From a mathematical perspective they are confidence intervals around the moving average over the last n days (CFA Program Curriculum, 2014).

Trend investing

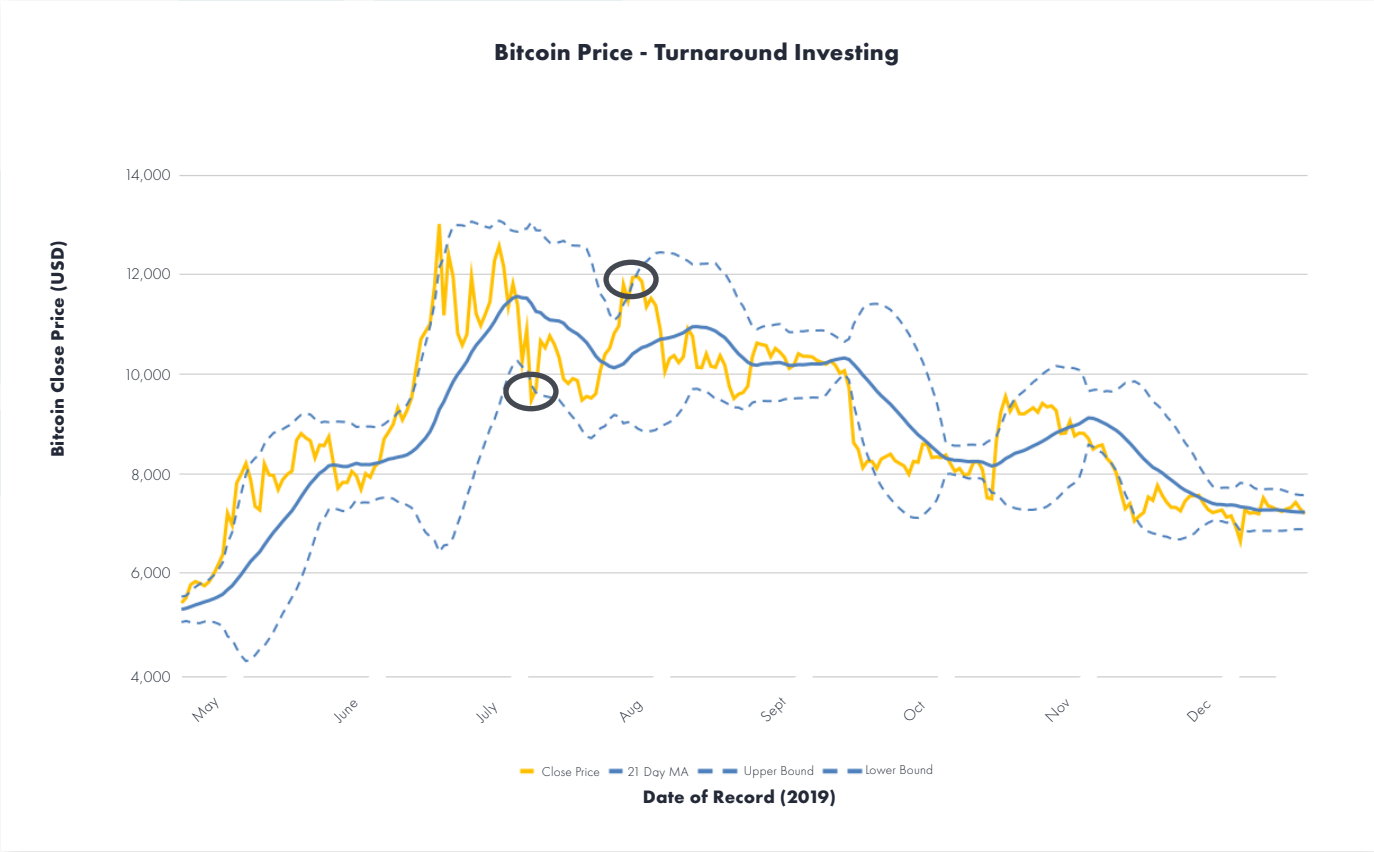
Figure 2 illustrates turnaround investing diagrammatically. It shows the Bitcoin close price as well as its 21-day moving average. Around the moving average the Bollinger bands were constructed using 2 standard deviations. Turnaround investing would aim to buy Bitcoin when it is considered undervalued, i.e. near the lower bound of the Bollinger band, and sell Bitcoin when it is considered overvalued, i.e. near the top of the Bollinger band. One such example is shown in the blue circles: the turnaround investor would have bought Bitcoin around 17th July 2019 and sold Bitcoin around the 7th August 2019.

Similarly to trend investing there is no set rule as to how to set the parameters for this analysis. The length of the moving average, as well as the width of the Bollinger bands, may be altered. Additionally, it can be altered when a trade is made. For example, the investor could decide to buy/sell only when the price breaches the Bollinger band. Alternatively, the investor could decide to buy/sell when the price is within 0.2% or 1% of the Bollinger band. Since several alternatives exist, this report has investigated various options. The length of the moving average was changed from 7 to 70 days, representing 1 - 10 trading weeks. Furthermore, the width of the Bollinger band was changed from 2 to 3 standard deviations. The boundary for the trading decision was also adjusted. In these hypothetical scenarios, the investor decided to trade whenever the Bitcoin price moved within 0.2% - 1% of the Bollinger band. The results of the analysis are outlined in Table 4.

Table 3 - Trend Investing vs. Buy and Hold Annual Comparison

Year	Returns	
	Trend Investing	Buy and Hold
2013	376%	422%
2014	-31%	-58%
2015	65%	37%
2016	5%	122%
2017	984%	1318%
2018	-37%	-73%
2019	65%	87%
2020	22%	1%

Figure 2 - Turnaround Investing Illustration



In line with the table in the previous sections, all strategies that outperform the benchmark of 75.8% are highlighted in Table 4. As shown, only one strategy out of 149 outperform the buy and hold benchmark. The average return of all turnaround strategies investigated is a mere 1%, so it appears that turnaround investing does not yield satisfactory results when applied to Bitcoin.

The performance of the one strategy that outperformed the benchmark was investigated further. Due to its stringent threshold, the strategy rarely triggers a buy or sell order. In most years the strategy was equivalent to the buy and hold strategy because the strategy would not have required the investor to buy or sell. Since this particular strategy resulted in trading behaviour akin to buy and hold, it was not investigated further. Instead, the analysis was focused on the MA length of 21 days with a standard deviation of 3 and a 0.2% distance from the boundary. As shown in Table 4, this strategy was one of the few that consistently yielded in positive returns.

The results of this strategy are presented in Table 5. Whilst it appears as if turnaround investing protected the investors losses during 2014 and 2018, no discernible pattern can be observed. In some of the bullish years, turnaround investing outperformed the benchmark, whereas in other bullish years it underperformed significantly. Based on the results from the previous section and the benchmarking analysis, it appears that turnaround investing is not suitable for Bitcoin.

Table 4 - Turnaround Investing Results

Length Moving Average (Days)	Standard Deviation	Distance from boundary (%)				
		0.2%	0.4%	0.6%	0.8%	1.0%
7	2	-19%	-22%	-25%	-28%	-25%
7	2.5	102%	-17%	-27%	-28%	-27%
7	3		30%	72%	20%	-21%
14	2	8%	7%	11%	6%	3%
14	2.5	14%	8%	0%	2%	6%
14	3	33%	25%	11%	2%	1%
21	2	-2%	-1%	-5%	-7%	-9%
21	2.5	12%	10%	10%	9%	11%
21	3	51%	46%	14%	5%	10%
28	2	0%	-3%	-6%	-7%	-9%
28	2.5	2%	1%	9%	6%	6%
28	3	30%	25%	20%	19%	22%
35	2	4%	2%	1%	-1%	-2%
35	2.5	7%	10%	16%	16%	16%
35	3	5%	4%	6%	5%	4%
42	2	5%	5%	5%	0%	0%
42	2.5	-1%	0%	1%	0%	0%
42	3	17%	16%	15%	5%	-4%
49	2	-4%	-6%	-6%	-4%	-5%
49	2.5	-1%	-5%	-5%	-6%	0%
49	3	1%	-2%	5%	4%	4%
56	2	-7%	-5%	-5%	-6%	-6%
56	2.5	7%	0%	0%	-3%	-4%
56	3	-6%	-6%	-7%	-8%	-8%
63	2	-11%	-11%	-11%	-12%	-13%
63	2.5	-3%	-3%	-3%	-4%	-4%
63	3	-8%	-8%	-9%	-9%	-9%
70	2	-11%	-11%	-12%	-12%	-12%
70	2.5	-6%	-7%	-7%	-8%	-9%
70	3	-10%	-10%	-12%	-12%	-12%

Table 5 - Turnaround vs. Buy and Hold Annual Returns

Year	Returns	
	Trend Investing	Buy and Hold
2013	19%	422%
2014	-52%	-58%
2015	82%	37%
2016	12%	122%
2017	1,738%	1,318%
2018	-40%	-73%
2019	6%	87%
2020	13%	1%

Sell In May And Go Away

The previous two sections analysed trend- and turnaround investing. Another commonly known investment strategy for retail investors is the Halloween strategy, also referred to as "sell in May and go away".

Dr Gänitz (2020) describes this strategy as selling assets in early May and re-entering the positions after Halloween. The assumption underlying this strategy is that assets underperform during the summer months compared to the winter months. Astonishingly, this trend was found to hold true for large indices across the world.

This section investigates whether this trend is equally applicable to Bitcoin. By calculating average monthly returns for the years 2013-2019 it could be assessed whether this phenomenon also holds true for the first cryptocurrency. Returns were compared against the MSCI World. Of course, it would not be expected that the monthly returns are equal between the three assets, but if the theory is also applied to cryptocurrencies, it would be expected that returns follow a similar pattern. The results of the analysis are presented in Figure 3.

The top panel of Figure 3 shows the unedited monthly returns of Bitcoin and compares them to the MSCI World. The return in November is most notable, as it averages at approx. 70%. This is due to the return in November 2013 when the return was over 450%. Since one value hardly stipulates a trend, it was excluded from the analysis.

Figure 3 - Halloween Effect Results

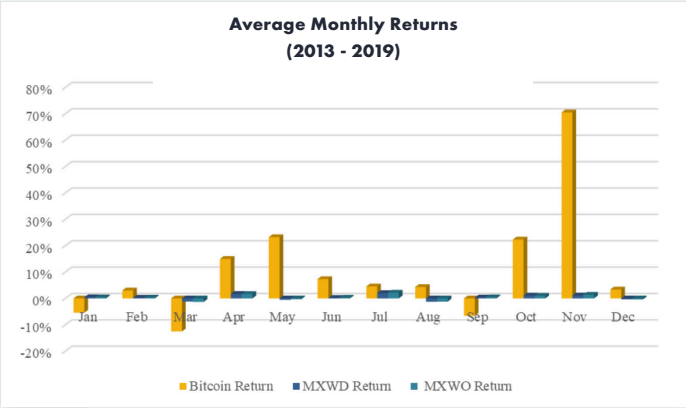
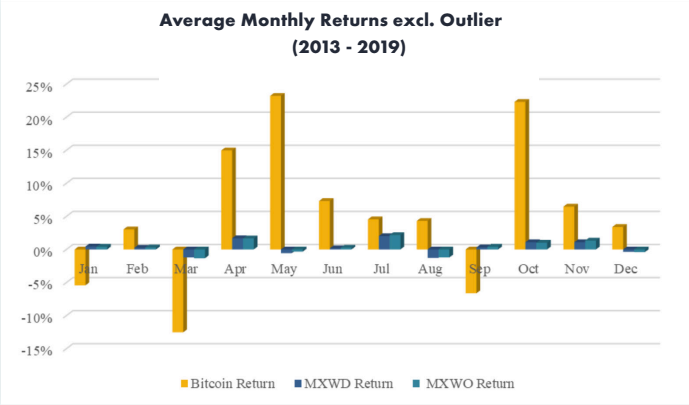


Figure 3 - Halloween Effect Results



The bottom panel shows the average returns for Bitcoin without the November 2013 outlier. Based on the data from 2013-2019 there does not appear to be an obvious difference between the returns during the summer months and the winter months. On the contrary, the average return in May and October are rather high, whereas the March average return is less than -10%. This analysis consequently did not find evidence that Bitcoin is subject to the Halloween effect.

Conclusion

The previous three sections described the three investment strategies and the results achieved when applied to Bitcoin. Bitcoin was found not to be subject to the so-called Halloween effect, where a good performance is assumed if assets are sold in May and they are not entered into again until after Halloween.

The analysis of trend investing, for which various scenarios with different short- and long-term MA were created, showed a return in excess of the "buy and hold" benchmark achieved with in almost every single scenario. Even the scenarios that did not beat the benchmark performed relatively closely to it. Accordingly, it was found that trend investing is well applied to Bitcoin and offers excellent returns.

The result of the analysis of turnaround investing is comparatively less obvious. It was shown that returns can range from -28% to 102%. Furthermore, no discernible pattern was observed in the results. The empirical evidence supports the conclusion that trend investing beats turnaround investing for Bitcoin.

Comparing both investment strategies to a buy and hold strategy, trend investing clearly outperformed it. Turnaround investing, however, significantly underperformed it on average and also underperformed trend investing. This shows that investors benefit from following a trend investing strategy with Bitcoin compared to the other strategies investigated. If the investors plan to follow a turnaround investing strategy, however, they would be better off to simply buy and hold Bitcoin instead.

As outlined in Robeco (2019), trend investing generally outperforms turnaround investing strategies for equities as well. Investors tend to be overoptimistic at the beginning of a hype cycle only to be disappointed too quickly, driving them to exit their positions. Trend investing makes use of these psychological biases, thereby benefitting the investor. This logic applies equally, if not more so, to Bitcoin. The trend investing strategy benefits from other investors' hypes and protects oneself from investors selling their assets prematurely. This effect is exacerbated even more by Bitcoin's volatility. The significant volatility of cryptocurrency gives trend investors ample opportunities to earn returns significantly higher than what can be achieved with buy and hold or turnaround investing strategies.

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