Which altcoins should Bitcoiners have owned?

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Abstract

We analyze coins that are suitable for holding in combination with Bitcoin from the perspective of portfolio management. We design a test to determine whether a coin is compatible with Bitcoin using a new evaluation score based on the Sharpe ratio. During our data measurement period, PENDLE, BGB, AKT, LEO, ANT, and WBTC pass this test.

Keywords: Bitcoin, Sharpe ratio, Optimal portfolio, Cryptocurrency.

JEL Codes: G0, D7, D6.

1 Introduction

A *bitcoiner* is a believer who only recognizes the value of Bitcoin, the first cryptocurrency that has opened up the era of crypto assets (Nakamoto 2008). Some of bitcoiners even look down on Ethereum, and it seems that they don't even recognize the existence of other cryptocurrencies, so-called *altcoins*. We fully admit that Bitcoin has great significance and is a celebrated invention. However, we also see significance and appeal in a number of interesting altcoins, and we would like bitcoiners to share this view with us. For this purpose, we try to find altcoins that bitcoiners should have included in their portfolios. One might think that it is unnecessary meddling. That may be true, but anyway we do it.

In this study, we use time-series data to analyze which altcoins bitcoiners should have held together with bitcoin for portfolio management. Compared to Bitcoin, altcoins are risky assets with more volatile prices. Therefore, it is necessary to consider not only the return but also risk. From this perspective, we design a new index that evaluates Bitcoin-paired portfolios with reference to the Sharpe ratio, an index that measures the excess return per risk unit (Sharpe 1966).

Our idea is as follows. Consider a portfolio that combines an altcoin c with bitcoin. The weights of them are chosen so that the Sharpe ratio of the portfolio is maximized. [1] Then how much higher is the Sharpe ratio in this case than the Sharpe ratio when only Bitcoin is held? The difference between the two values represents the excess return per risk unit that results from successfully incorporating the coin into the portfolio. We call this difference a *score*. A score of zero means that there is no advantage to holding the coin in the portfolio

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[1] This portfolio with the maximum Sharpe ratio would be the optimal risky portfolio for an investor considering an asset allocation problem with Bitcoin, an altcoin, and a risk-free asset, assuming they have mean-variance utility.

over just holding Bitcoin. In fact, it is well known that Bitcoin has high returns and relative price stability among the class of cryptocurrencies. Additionally, the returns of many other cryptocurrencies are typically highly correlated with the return of Bitcoin. Therefore, the score can easily become zero. Then our test for coins is to achieve positive scores in the long term. In our data analysis, we found that only a very small number of coins passed this test. They are PENDLE, AKT, LEO, BGB, ANT, and WBTC.

2 Improvement score of the Sharpe ratio

Let $C \equiv \{b, c_1, c_2, \ldots, c_K\}$ be the set of *coins*, where b denotes Bitcoin and any c_k denotes some other coin. The USD price of one unit of $c \in C$ at time period t is denoted by $p(c,t) > 0$.

Let $T \equiv \{0, 1, 2, \ldots, \tau\}$ be the set of time periods. The *return* of $c \in C$ in $t \in T$ is

$$r(c,t) \equiv \frac{p(c,t) - p(c,t-1)}{p(c,t-1)}. \tag{1}$$

A *Bitcoin-paired portfolio*, or simply a *portfolio*, is $(c,w) \in C \times [0,1]$, where $c \in C$ is a coin held together with Bitcoin and $w \in [0,1]$ is a weight on c. The *return* of portfolio (c,w) in $t \in T$ is

$$r(c,w,t) \equiv w \cdot r(c,t) + (1-w) \cdot r(b,t). \tag{2}$$

Note that $r(b,w,t) = r(b,t)$ for all $w \in [0,1]$ and $t \in T$.

The *excess return* of (c,w) in $t \in T$ is

$$er(c,w,t) \equiv r(c,w,t) - free(t), \tag{3}$$

where $free(t) \geq 0$ denotes an exogenously given return of a risk-free asset. The *standard deviation* of the excess return of (c,w) in T is

$$sd(c,w,T) \equiv \sqrt{\frac{\sum_{t \in T} \left(er(c,w,t) - \bar{er}(c,w,T) \right)^2}{\tau - 1}}, \tag{4}$$

where

$$\bar{er}(c,w,T) \equiv \frac{\sum_{t \in T} er(c,w,t)}{\tau}. \tag{5}$$

The *Sharpe ratio* of (c,w) in T is

$$sr(c,w,T) \equiv \frac{\bar{er}(c,w,T)}{sd(c,w,T)}. \tag{6}$$

We evaluate each coin by how much it can improve the Sharpe ratio when appropriately added to the portfolio consisting only of Bitcoin. The *score* of $c \in C$ in T is

$$score(c,T) \equiv \max_{w \in [0,1]} sr(c,w,T) - sr(c,0,T), \tag{7}$$

where $sr(c,0,T)$ denotes the Sharpe ratio of the portfolio that consists only of Bitcoin in

T. By definition, $0 = score(b, T) \leq score(c, T)$ for all $c \in C$. The value

$$\max_{w \in [0,1]} sr(c, w, T) \tag{8}$$

represents the excess return per risk unit when the weight on c is ideally selected. The closer this value is to $sr(c, 0, T)$, the less attractive it is to hold c together with Bitcoin than to hold only Bitcoin. In fact, if $w = 0$ maximizes $sr(c, w, T)$, then $score(c, T) = 0$, which often happens in reality. In this case, no matter how well one constructs a portfolio using c, it will be inferior to just holding Bitcoin.

We use our scores to identify coins that consistently achieve positive monthly average scores over the long term by excluding coins that have zero monthly average scores in any given month. As we will see in the data analysis in the next section, there are very few coins that pass the test. Therefore, our test is suitable for the purpose of strictly selecting coins that should be held together with Bitcoin.

3 Coins to be held with Bitcoin

We obtained data on coin prices from CoinGecko for the 16-month period from April 1, 2023 to July 31, 2024. The 134 coins we targeted were those that were ranked within the top 200 in terms of market capitalization and had no missing data during the period.[2]

We calculated the score for each coin daily over the 16-month period from April 2023 to July 2024, based on the last 90-day returns. We then used these scores to identify coins that consistently achieved positive monthly average scores over the long term by eliminating coins that had zero monthly average scores in any given month. Only six coins have passed this test of elimination. They are PENDLE, AKT, LEO, BGB, ANT, and WBTC. Table 1 shows the median of the 16 monthly average scores within the 16-month period for each of the six coins. These are the coins that Bitcoiners should have owned for portfolio management.

Coin	Median score
PENDLE	0.2964
AKT	0.2778
LEO	0.2479
BGB	0.2388
ANT	0.1812
WBTC	0.0061

Table 1: Median scores of coins whose scores were always positive within the 16 months

4 Conclusion

We have analyzed coins that are to be held with Bitcoin for portfolio management. For this purpose, we designed a novel evaluation score of coins by using the Sharpe ratio. Out of 134 coins, only six coins survived the test to achieve positive scores over the long term. They are PENDLE, AKT, LEO, BGB, ANT, and WBTC.

[2]This decision was made based on data from CoinGecko at 0:00 (GST) on August 4, 2024.

Since our analysis was conducted by observing price data ex post, it does not tell us ex ante which coins to include in a portfolio and in what proportions. Investigating the properties of the coins discovered in this analysis might help to analyze such a prediction problem, which is an important theme for future research.

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