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cailyn isaac: CRYPTOCURRENCIES and THE moving average strategy

Hamid Elahi and Hubert Pun wrote this case solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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On February 11, 2021, Cailyn Isaac was looking at Bitcoin’s price chart. Amazed by the high volatility of this recent currency, she was trying to find a trading strategy that would allow her to make a profit from the Bitcoin price movement. Her goal was to identify a bullish or bearish Bitcoin market so that she could decide whether to buy or sell. After much research, Isaac decided to use the moving average strategy, a popular technical analysis tool among traders.

bLockChain and Bitcoin: A BRIEF HISTORY

Initiated in 2008 by an unknown entity called Satoshi Nakamoto, Bitcoin was the first decentralized cryptocurrency. In this decentralized system, transactions between two parties were conducted and verified across the network and then recorded in the Bitcoin blockchain. This blockchain technology was a self-sustaining, distributed, and decentralized ledger. The blockchain had no central entity, and all data were recorded and verified by an integrated set of computers. Each block in the blockchain resembled a page in the ledger. The header of each new block referred to the footer of the previous block, thereby forming a chain of blocks. Blocks were connected using a cryptographic function called a “hash function,” which was related to the content of the block. Hash functions converted a large amount of data into a fixed-length number (i.e., a hash). Since the hash of the previous block was incorporated into the description of the block that followed, blockchains were immutable. Changing the content in any way required rebuilding all of the links that connected the blocks, which was virtually impossible. This design made the technology extremely secure.[[1]](#footnote-1)

In addition, because Bitcoins were owned by “Bitcoin addresses,” which were numeric identifiers, users remained pseudonymous during transactions. In this way, Bitcoin ensured better protection of users’ privacy.[[2]](#footnote-2) Bitcoin also reduced transaction costs since the decentralized blockchain allowed users to transfer money directly, without the need for financial institutions. While there was a risk that fraudulent users could double-spend their Bitcoins, as transactions were not controlled by a central authority, Bitcoin blockchain avoided this problem by providing a timestamp for each group of transactions and distributing it to all the nodes in the Bitcoin network. Since each timestamp included the previous timestamp in its hash, all users needed to agree on a single history for each Bitcoin. Thus, the immutability of blockchain data made Bitcoin highly resilient against predators and hackers.[[3]](#footnote-3)

At the same time, Bitcoin did have some disadvantages, including its high energy cost. Bitcoin creation (or “mining”) was power-hungry and involved heavy computer calculations. The process of creating a block in the Bitcoin blockchain included providing “proof of work,” which referred to finding a specific number, called the “nonce,” such that the block content and nonce created a hash with some pre-specified restrictions. The first miner that could successfully find the nonce was awarded a certain number of Bitcoins. As of May 2020, the reward stood at 6.25 Bitcoins, but in an effort to retain the value of the currency, this reward was halved roughly every four years (known as a Bitcoin-halving event). The nonce could be found only by trial and error—a process so computationally expensive that the central processing units of personal computers were insufficient. Instead, special electronic chips called “application-specific integrated circuits” were required, and computers ran almost constantly during the process. Moreover, miners usually formed Bitcoin mining pools to increase the likelihood of successfully mining the nonce.[[4]](#footnote-4) Reports suggested that China controlled 65 per cent of all Bitcoin mining in the world.[[5]](#footnote-5) The amount of electricity that Bitcoin mining consumed was staggering: it was estimated that Bitcoin used more electricity annually than the entire country of Argentina.[[6]](#footnote-6)

The price of Bitcoin had fluctuated significantly since its initiation. Notably, in 2017, Bitcoin blockchain was divided into Bitcoin (BTC) and Bitcoin Cash (BCC). BTC used upgraded blockchain technology with an increased rate of transactions, while BCC used the original, slower version of the technology. On March 7, 2021, BTC’s price was US$52,246.52[[7]](#footnote-7) and BCC’s price was $516.17.[[8]](#footnote-8) In May 2010, Laszlo Hanyecz paid 10,000 Bitcoins for two pizzas worth approximately $25.[[9]](#footnote-9) In February 2021, 10,000 BTC were worth more than $300 million. Over the course of 2017 alone, BTC’s price increased from $1,290 to $13,800—before dropping to $3,300 in 2018. On February 8, 2021, the price of Bitcoin hit its all-time high after Tesla’s chief executive officer, Elon Musk, announced that the company was investing in Bitcoin (a decision that was heavily criticized as being contrary to Tesla’s environmental stance).[[10]](#footnote-10) These fluctuations made Bitcoin an interesting investment opportunity, and one that many investment banks were eager to capitalize on. For instance, Goldman Sachs opened a cryptocurrency desk to trade cryptocurrencies in 2021.[[11]](#footnote-11) Although Bitcoin was the pioneer and most popular cryptocurrency, many other cryptocurrencies had gradually emerged, including Ethereum and Ripple. Facebook also planned to create its own cryptocurrency, Diem, in 2021.[[12]](#footnote-12)

The MOVING AVERAGE STRATEGY[[13]](#footnote-13)

Isaac’s decision to use the moving average strategy was a common one: this strategy was widely used in the trading world to confirm any upward or downward trends once they had been established. A simple moving average was the mean of previous prices, and it filtered out the day-to-day price fluctuations. The strategy used one short-term moving average and one long-term moving average. A shift of momentum occurred when the short-term average crossed through the long-term average. In particular, when the short-term average crossed above the long-term average (known as a “golden cross”), it signalled an upward trend, and thus triggered a “buy” signal. Conversely, a downward trend was established when the long-term average crossed above the short-term average (known as a “death cross”), generating a “sell” signal.

The industry standard was to use a five-day, 10-day, or 20-day moving average as the short-term moving average and a 50-day, 100-day, or 200-day moving average as the long-term moving average. However, consider the following example (illustrated in Exhibits 1 and 2), where a two-day moving average (was used as the short-term average, and a five-day moving average () was used as the long-term trend. For instance, on day 5, and . A buy signal was generated on day 8 because the short-term moving average crossed above the long-term moving average, while a sell signal was generated on day 10 because the long-term moving average crossed above the short-term moving average.

MAKING A DECISION

Isaac knew that she could use the moving average strategy to determine the general trend of the price of Bitcoin. She wanted to ascertain two things: (1) how effective the simple moving average strategy was in this situation, and (2) the optimal number of days in the short- and long-term moving averages of Bitcoin’s price. She retrieved Bitcoin’s price history for the previous year (see Exhibit 3) from Yahoo! Finance and began to analyze the data.

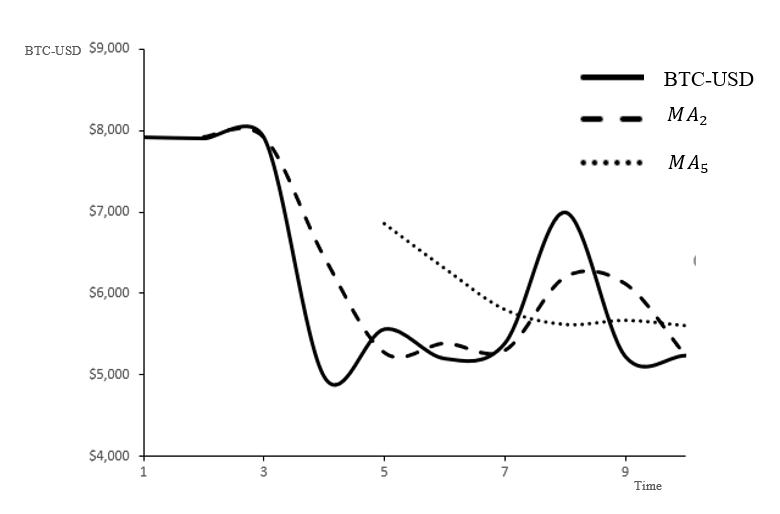
EXHIBIT 1: comparing bitcoin’s two-day and five-day moving averages over a 10-Day period (IN US$)

| **Day** | **BTC-USD** |  |  |
| --- | --- | --- | --- |
| 1 | $7,923.64 |  |  |
| 2 | $7,909.73 | $7,916.69 |  |
| 3 | $7,911.43 | $7,910.58 |  |
| 4 | $4,970.79 | $6,441.11 |  |
| 5 | $5,563.71 | $5,267.25 | $6,855.86 |
| 6 | $5,200.37 | $5,382.04 | $6,311.20 |
| 7 | $5,392.31 | $5,296.34 | $5,807.72 |
| 8 | $7,000.13 | $6,196.22 | $5,625.46 |
| 9 | $5,225.63 | $6,112.88 | $5,676.43 |
| 10 | $5,238.44 | $5,232.03 | $5,611.37 |

Note: BTC = Bitcoin; USD = US$; MA2 = two-day moving average; MA5 = five-day moving average

Source: Created by the case authors.

EXHIBIT 2: graphical comparison of bitcoin’s two-day and five-day moving averages over a 10-day period (IN US$)



Note: BTC = Bitcoin; USD = US$; MA2 = two-day moving average; MA5 = five-day moving average

Source: Created by the case authors.

EXHIBIT 3: Bitcoin prices on selected dates in 2020 and 2021 (IN US$)

| **Date** | **BTC-USD** |
| --- | --- |
| 10/2/2020 | 9,856.6113 |
| 11/2/2020 | 10,208.236 |
| 12/2/2020 | 10,326.055 |
| 13/2/2020 | 10,214.38 |
| 14/2/2020 | 10,312.116 |
|  |  |
| . | . |
| 8/2/2021 | 46,196.465 |
| 9/2/2021 | 46,481.105 |
| 10/2/2021 | 44,985.324 |

Note: BTC = Bitcoin; USD = US$

Source: Created by the case authors.

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13. This strategy was also sometimes called “the simple moving average strategy” to distinguish it from the more sophisticated exponential moving average strategy. [↑](#footnote-ref-13)