BLITZ METRICS

Price Mining Floor vs Hash Mining Floor:

Debunking the myth of "cost of mining a Bitcoin"

by *Peter Ng & Colin Platt*

Introduction

Valuation metrics in the cryptocurrency space are notoriously immature. This leads to a lack of convergence on price discovery mechanisms, and is a factor contributing to the observed price volatility. This fact, combined with the experimental nature of these technologies, networks and assets has meant that even relative value metrics are unreliable for traders.

As such, "cost of mining" a coin has frequently been used by the misinformed as a metric to suggest prices of a certain coin have gone below the production cost. Not only do they provide wildly inaccurate figures to reverse engineer their target buy price, but they fail to comprehend the causal relationship between price and hashrate. In this report, we seek to correct this misunderstanding with logic and illustrations.

In part 2 of this report, we present a new comparative metric, termed "Hash Mining Floor" (HMF), and at the same time provide a methodology that historically demonstrated 95% accuracy for predicting future 120 days of hashrate. This metric allows us to gauge and monitor coins that have broken the HMF and are at risk from delisting and/or 51% attacks from malicious miners. This type of metric provides short indicators that have previously been known only to a small subset of miners. We wish to create a standardized metric across which all proof-of-work (PoW) coins can be compared against for reference to traders and investors.

Blitz Metrics is developed by Blitz Network. The HMF is the first of many metrics that we hope to introduce to the cryptosphere. After an in-depth report explaining how the metric works, we will follow up with more regular reports on coins that are nearing their respective HMFs.

The Bitcoin Mining Industry

Many models of the Bitcoin mining industry fail to explain its economic functioning and structure. Those models are based on an oversimplified vision of a vertically integrated miner who operates according to a singular economic interest. In reality, over the past 10 years of Bitcoin's existence, actors in the mining sector have specialised into a strata of tasks, each with their own economic interest. Their goals are not only fixed to the profitability of mining as a whole, but Pareto efficient within the industry itself.

Participants in the Bitcoin mining industry can roughly be categorised into one or more of the following five categories:

1. Logistics
2. ASIC designers and manufacturers
3. Hosting solutions
4. Mining pool operators
5. Financial products

Each participant within the mining value chain offers a specific service and has a varying degree of control of the hashrate. Because of their interconnectedness, these specialists also rely on other specialists to maximise the value attributable to the entire vertical. In practice this stipulates two important observations: hashing follows profitability, and actors not maximising profitability get pushed out of the system.

The empirical results have shown that, while conditions can temporarily exist allowing participants to deviate from maximising profits by mining ahead of price, over time revenues to be derived from mining is a more decisive factor in determining the success or failure of a particular coin. Price volatility in the coin does not cause an abrupt decisive action by a vertically integrated miner, but a cascade of adjustments by the segregated players pursuing profit maximisation that is not specific to a singular coin. This in turn can be simplified to the simple, yet powerful observation: Hashrate follows price.

Hashrate Follows Price

It has become common to assume that there is a price floor for Bitcoin based on the cost of mining. This misunderstanding can be traced as far back as 2010, prior to the establishment of a liquid market for bitcoin, when Satoshi Nakamoto himself advocated for a production cost based approach to pricing bitcoin stating:
"In the absence of a market to establish the price, NewLibertyStandard's estimate based on production cost is a good guess and a helpful service (thanks). The price of any commodity tends to gravitate toward the production cost. If the price is below cost, then production slows down. If the price is above cost, profit can be made by generating

and selling more. At the same time, the increased production would increase the difficulty, pushing the cost of generating towards the price."[1]

In reality, with liquid markets for bitcoin, miners are constantly seeking to maximise returns, which is a function of the price of Bitcoin, and their input cost of hashing.

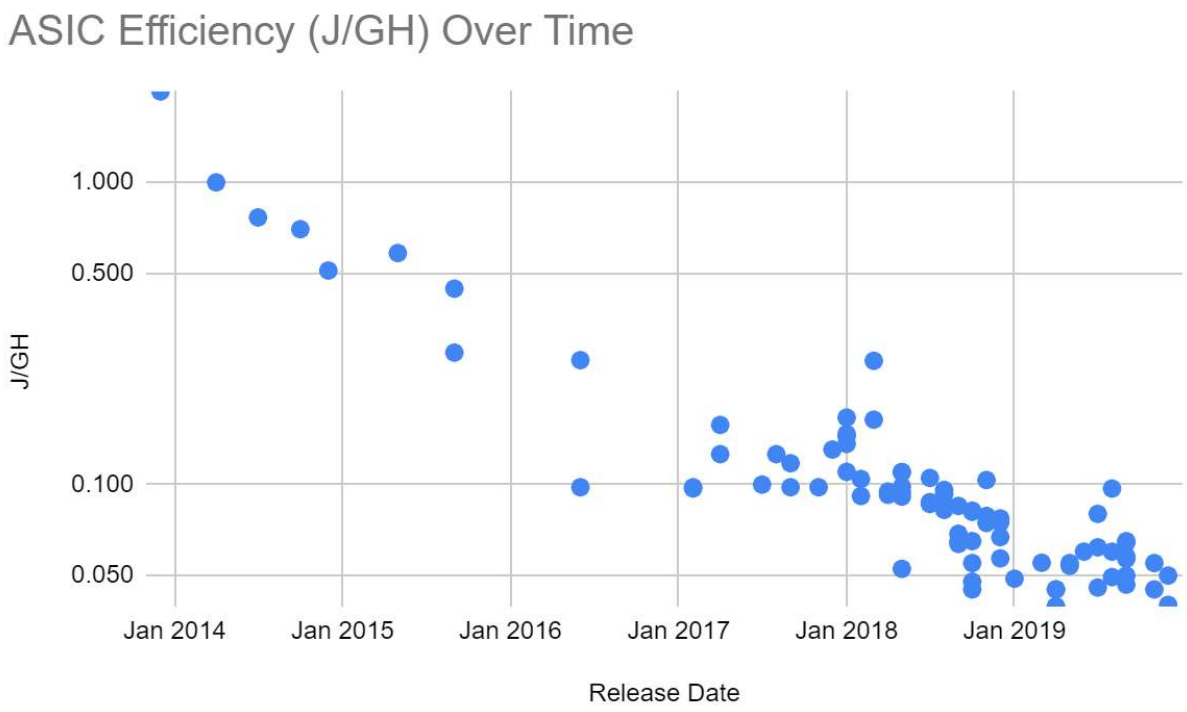
The price floor misunderstanding also fails to acknowledge a critical difference from commodities, one which Satoshi themself programmed in. Unlike commodities, an increase or decrease in production (hashrate) in the short term does not alter the rate of new Bitcoin being supplied to the market in the long term. Satoshi, while arguably wrong on the causation of this, foresaw at the time that eventually price would dictate hash, adding: "*In later years, when new coin generation is a small percentage of the existing supply, market price will dictate the cost of production more than the other way around.*"

Impact of Mining Hardware Investment

With the advent of ASICs, arguments for supply side economics in Bitcoin have crumbled, as the value of this capital expense deteriorates to scrap metal once the coin becomes worthless. Due to the residual value of GPU rigs repurposed for other economic activity, we can always assign a depreciation based marginal cost to the daily use of GPUs. ASICs on the other hand can only produce one type of hashrate, and hence marginal cost models cannot be accurately used to derive production costs. Buying an ASIC machine thus becomes a multi year, long position of the produced cryptocurrency, which doubles down the importance of demand side economics.

The complexity of ascertaining the hash supplied to meet the revenues from mining bitcoin is also multi-faceted. Total mining input costs vary greatly. There are a variety of electricity input costs, generally negotiated at the hosting solution level, from retail power prices all the way down to near zero. ASIC efficiency is also an important factor, with successive generations of ASICs historically increasing their efficiency by 3-4x each generation, and 10-20x every other generation. This rapid increase of ASIC efficiency over time, coupled with diverse operating cost bases means that even very large price drops leaves sufficient hashrate to support the network.

[1] https://bitcointalk.org/index.php?topic=57.msg415#msg415



It has also been observed that the time between an ASIC manufacturer creating a new ASIC and their operational starting date on the rack is approximately 9 months. Purchasing newer machines, for which the wafers have already been produced, take approximately 3 months from the time of ordering to the operational starting date for hashing. Due to the greater efficiency of later model machines when compared with existing stock, miners receiving new ASICs are less sensitive to the price fluctuations of Bitcoin during the first six months of their ASICs coming online.

After the initial six months, when miners expect to have mined approximately 80% of the Bitcoin that they will mine over the life of a particular ASIC, miners constantly monitor price, mining pool profitability and seek to optimise their input costs. In addition, they must factor their relative position to make decisions as to whether to reinvest into new ASICs, decommission or sell old ASICs, switch ASICs off/on. These decisions are based primarily on the price of Bitcoin, and the relative input cost of the miner versus the rest of the mining industry. Such decisions also take place over differing time scales with some investment decisions conflicting with other divestment decisions (i.e. turning off old machines, and purchasing newer ASICs).

Logical Models For Hashrate Fluctuation

This model can be demonstrated intuitively in the following three illustration illustrations:

Illustration 1:

Assume there is only one type of ASIC and it is widely available at X watts per hash. Improvements to efficiency are impossible. Electricity costs are tiered at 1 cents, 2 cents, 3 cents, 4 cents and 5 cents per kilowatt hour and there are 2 million machines mining at each price tier. The average mining cost is 3 cents for the 10 million machines. What happens when the price drops so that it is no longer profitable to mine at 5 cents?

1. 2 million miners shut off.
2. Difficulty adjusts as there is 360 BTC out of 1800 mined less per day.
3. There is now 25 percent more BTC to be made per machine operator that is still profitable.
4. The thousands of machine operators at 1-4 cents will opt to buy those 2 million machines for near zero as they are worthless at their current location.
5. Due to some 4 cent operators being too far (marginal profit does not cover logistics cost), not all 2 million machines will be redistributed.

Impact on total hashrate: less than 10%

Looking at a more dramatic example

Illustration 2:

Same situation as above. Except the price drops dramatically so that even 2 cents are not profitable:

1. 8 million miners shut off.
2. Difficulty adjusts as there are 1440 BTC out of 1800 mined less per day.
3. There is now 400% more BTC to be made per machine operator that is still profitable.
4. Due to the increased profitability, now even 5 cents is profitable again.
5. The 4 cents and 5 cents operators will know the difficulty adjustment will seesaw and end up in a position that is ultimately unprofitable for them. So they sell their machines ASAP.
6. The 1, 2, 3 cent operators will wait and see. Leaving 40% of hashrate looking to redistribute.
7. 2 cents at 10 million machines, means that the remaining tiers of 1, 2 and 3 cent operators can still be profitable, if their average electricity cost is in total below 2.
8. Since 1 cent operators stand to profit the most, chances are that the average is indeed below 2.
9. After some period, the machines are redistributed, but due to the cost and time required to build out new facilities (3-6 months) and as per point 5 in illustration 1, we are likely to lose hashrate in the redistribution.

Impact on total hashrate: less than 30%

Illustration 3:

Using the examples in 1 & 2. Now we assume that there is only one electricity price of X cents. And five mining designs. Each with 2 million machines in distribution. The price drops below the efficiency needed for the worst two designs:

1. 4 million miners shut off.
2. Difficulty adjust so there is 67% more BTC to be mined per remaining operator.
3. The second worst design may switch back on.
4. Three months later, the best three designs will have made new asic machines.
5. Due to higher hash per watt ratio, the total hashrate will drop much less as the new asics have higher output.

Impact on total hashrate: less than 20%

Reality is a mixture of all three illustrations, with the existence of zero cost electricity mining, as well as ongoing improvements to ASIC performance. Which is why devastating drops to more than 80% from all time highs have had no effect on the stability of the hashrate for the coin. 80% ATH drops have happened 5 times already. With such empirical evidence readily available, we wonder why there is an abundance of such "cost of mining" reports. Furthermore, as we will later show, the price dictates hash in a time lagged fashion. PMF in the absence of a price dictated hash calculation is essentially worthless misinterpretation.

Part 1: Conclusion

There is no logical or empirical evidence suggesting a PMF (price mining floor), where we expect the price to rebound because it has fallen past the "cost of mining". Demand side economics logic means hashrate follows price, and not vice versa. Price hikes cause a delayed reaction in hashrate hikes due to the time and cost involved in employing new hardware. Price dumps cause a dampened reaction in hashrate drops due to the elimination of low efficiency hardware or high electricity cost operators. Post elimination is quickly adjusted by the remaining miners to profit from the reduced competition, causing a delay in hashrate drop.

Part 2 of this report will be an in depth analysis of up and down price movements to derive an estimation for the future hashrate of up to 120 days at least 95% accuracy historically. We will be using this prediction model to monitor proof-of-work coins that have reached a HMF (hash mining floor), and regularly provide our readers with a short signal for coins that are about to break the HMF in the near future.

Disclaimer

Please note the following important information:

The information and discussions (Content) on this report is for informational purposes only. Content on the Report is not a recommendation, endorsement, or offer to buy, sell, or trade cryptocurrencies, digital assets or any financial instruments.

All market prices, data and other information are not warranted as to completeness or accuracy, are based upon selected public market data, reflect prevailing conditions, and Research's views as of this date, all of which are accordingly subject to change without notice. Research has no obligation to continue offering reports regarding this topic. Reports are prepared as of the date(s) indicated and may become unreliable because of subsequent market or economic circumstances.

Information we discuss is general and publicly available. Content on the Report may not be comprehensive and does not purport to be a full discussion of the relevant information or the law relating to such information.

Please note that there are risks associated with investing in cryptocurrencies, digital assets or any financial instruments, which may include loss of principal, high volatility and an inability of converting to other crypto or fiat currencies. Some investments in cryptocurrencies may use leverage, which will accentuate gains or losses. In addition, past investment performance is not a guarantee or predictor of future investment performance.

Therefore, users of our Report are solely responsible for the merits and risks associated with the use of any Content on the Report and should not rely on any Content whatsoever for investment, buying, selling or trading decisions. Users should seek independent advice from a professional in connection with any investment decision.

Accordingly, we will not be liable under any theory of liability or cause of claim, or otherwise, for any damage, expense or other loss you may suffer arising out of use or reliance of Content on the Report. Any use of such information is at your sole risk.