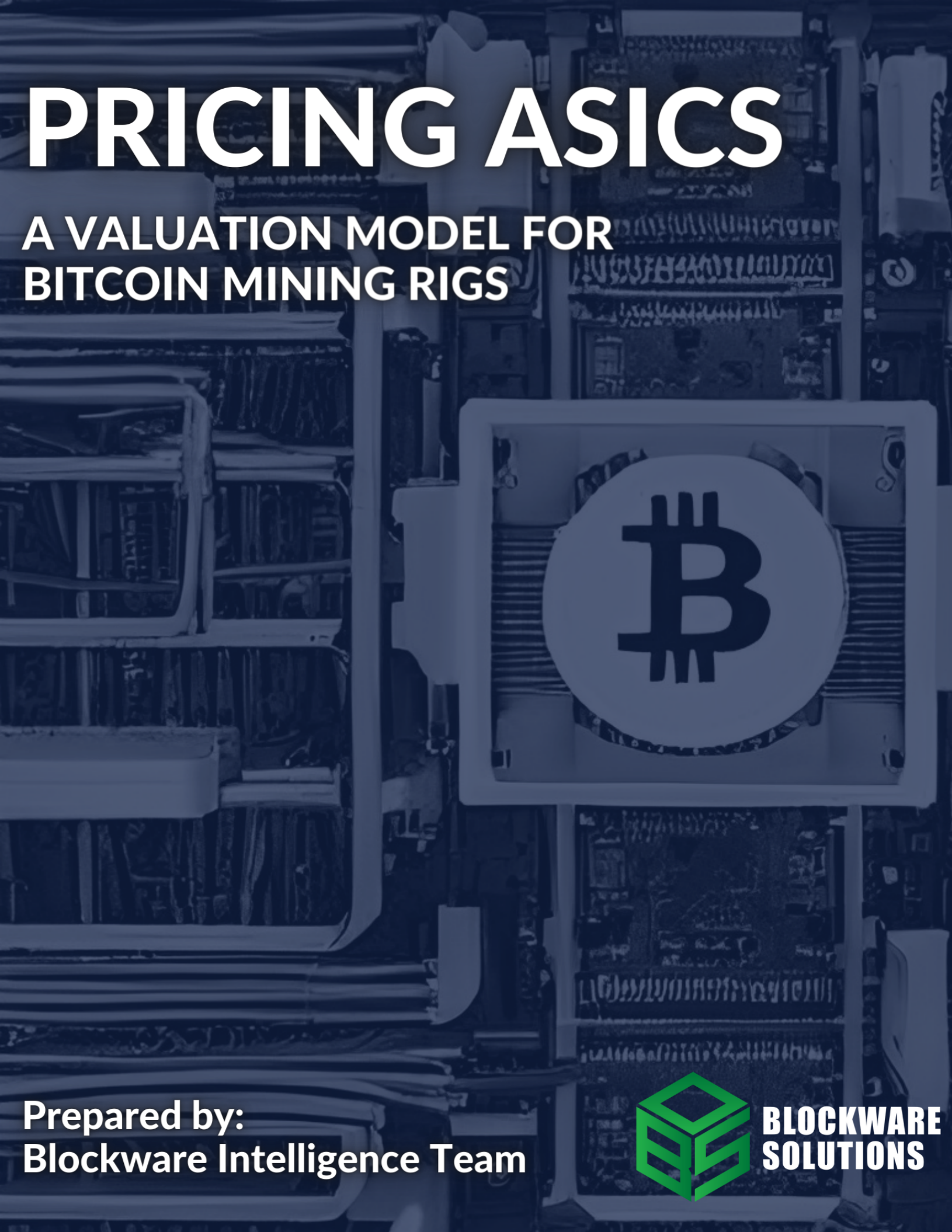
PRICING ASICS

A VALUATION MODEL FOR BITCOIN MINING RIGS



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BLOCKWARE SOLUTIONS

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1. Executive Summary

Bitcoin mining rigs (ASICs) are a special segment of computer hardware that can be priced as a derivative of BTC and time. This report will use the terms mining rigs, ASICs, and machines interchangeably. Historically, the first Bitcoin ASICs depreciated quickly due to next-generation ASICs being multiples more efficient than their predecessor. Over the past few years, ASICs have clearly started to commoditize as technology approaches the limits of what is thermodynamically possible.[1]

Due to the commoditization of ASICs, the Bitcoin mining industry has experienced a tectonic shift when attempting to determine the market value of this hardware. ASICs are no longer run for 6-12 months until they end up as e-waste. These machines now retain their value for significant periods of time and a large (yet fragmented) secondary market has developed for their nearly inevitable resale to a miner with a lower energy cost.

In this Blockware Intelligence Report, we describe:

- How intelligent miners think about purchasing modern Bitcoin mining rigs.
- A method to calculate beta (to BTC) and theta (time decay) on mining rigs to forecast future market prices.
- Why mining Bitcoin is an attractive method to accumulate BTC and potentially outperform buying and holding spot BTC.

[1] “2023 Market Forecast.” Blockware Intelligence, Blockware Solutions, https://www.blockwaresolutions.com/s/2023-Forecastpptx.pdf.

2. Valuing Bitcoin Mining Rigs

There are an infinite number of variables that affect the market prices of Bitcoin mining rigs. Of course, this is impossible to model perfectly, and many times a simple model that avoids overfitting will provide the most accurate future projections.

Historical prices of Bitcoin ASICs can be modeled using the historical price of BTC and time. In derivatives, this is beta (ASIC volatility compared to BTC volatility) and theta (time decay).

Logically, the market value of Bitcoin ASICs is highly related to the price of Bitcoin. Bitcoin ASICs are machines that produce a cash flow denominated in BTC itself. As the USD price of BTC goes up or down, the machine's USD cash flows follow.

Time is the all-encompassing variable. Bitcoin ASICs do decay over time for a variety of reasons including more efficient ASICs being released, increasing mining difficulty, and Bitcoin block subsidy halvings. Instead of trying to accurately predict when new machines are produced and what mining difficulty will be over the next few years, it is easier to use historical data to analyze how machines decay over set periods of time.

Using linear regression, we can model the market price of Bitcoin mining rigs using these two variables. This enables us to determine their respective coefficients to understand how both the BTC price and time have affected the market price of specific mining rig models.

$$ln(Rig\ Price) = \beta_0 + \beta_1 \bullet Time + \beta_2 \bullet ln(BTC\ Price)$$

3. Modeling the Market Price of Bitcoin Mining Rigs

Building a linear regression model based on real historical data of mining rig market prices and BTC price, we can estimate the beta and theta of mining rig models. If statistically significant, it enables us to say, “holding time equal, a 1% change in the price of BTC would likely result in an X% change in the market price of the mining rig.” It also would enable us to say, “holding the price of BTC equal, an additional month of time would likely result in the market price of the mining rig dropping by Y%.”

S19 (March 2020 - August 2022)[2]

Below is the summary of our first model. Surrounded by a lot of math, the model results are interesting and statistically significant.

```
Call:
lm(formula = log(rig_price) ~ months_past + log(btc_price), data = S19)

Residuals:
     Min       1Q   Median       3Q      Max
-0.17912 -0.07539 -0.02506  0.07874  0.27419

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    -0.880066   0.351350  -2.505   0.0183 *
months_past    -0.017047   0.002861  -5.959 2.04e-06 ***
log(btc_price)  0.961791   0.037331  25.764  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1079 on 28 degrees of freedom
  (4 observations deleted due to missingness)
Multiple R-squared:  0.9688,  Adjusted R-squared:  0.9666
F-statistic: 434.9 on 2 and 28 DF,  p-value: < 2.2e-16
```

1. **Theta = 0.017**
    a. Holding the price of BTC equal, an additional month of time would likely result in the market price of the mining rig dropping by 1.70%.
2. **Beta = 0.96**
    a. Holding time equal, a 1% change in the price of BTC would likely result in a 0.96% change in the market price of the mining rig.

The multiple R-squared sits at 0.9688. This reveals that 96.88% of the variability observed in the rig market price is explained by the regression model. The model explains the market value of the mining rig holds a very tight beta with the price of BTC, and its market value is slowly depreciating over time due to increasing mining difficulty, block subsidy halvings, and new generation ASICs being announced and released (S19XP).

[2] "Historical ASIC Price Index Data." Hashrate Index, https://data.hashrateindex.com/asic-index-data.

A critical component of theta (time decay) is that mining rigs, if plugged in, are producing BTC over time. All miners should have a goal to profitably mine BTC faster than their rig's market value decays.

S9 (January 2018 - August 2022)[3]

Below is the summary of our second model. Surrounded by a lot of math, the model results are again interesting and statistically significant.

```
Call:
lm(formula = log(rig_price) ~ months_past + log(btc_price), data = S9)

Residuals:
    Min      1Q  Median      3Q     Max
-1.2928 -0.3598  0.0650  0.4117  1.3803

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    -6.730416   1.314396  -5.121 4.34e-06 ***
months_past    -0.090702   0.008259 -10.982 2.88e-15 ***
log(btc_price)  1.544612   0.156393   9.877 1.30e-13 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5849 on 53 degrees of freedom
Multiple R-squared:  0.6995,  Adjusted R-squared:  0.6881
F-statistic: 61.68 on 2 and 53 DF,  p-value: 1.458e-14
```

1. **Theta = 0.0907**
    a. Holding the price of BTC equal, an additional month of time would likely result in the market price of the mining rig dropping by 9.07%.
2. **Beta = 1.54**
    a. Holding time equal, a 1% change in the price of BTC would likely result in a 1.54% change in the market price of the mining rig.

The multiple R-squared sits at 0.6995. This reveals that 69.95% of the variability observed in the rig market price is explained by the regression model. The drop in R-squared is likely because this ASIC has experienced more than one Bitcoin price cycle, and it is deeply unprofitable for

[3] "Historical ASIC Price Index Data." Hashrate Index, https://data.hashrateindex.com/asic-index-data.

nearly all miners. From January 2018 to August 2022 the S9 went from being the best machine out there to being outdated. As the rig decayed, its beta likely increased as it became mostly scrap metal that only becomes valuable again during bull markets.

The high beta and high theta are likely a result of virtually no miners being able to profitably run the hardware at today's Bitcoin price and mining difficulty. The hardware market value has dropped from $1,000s to under $50 indicating the price has decayed significantly over time, but during the previous bull run starting in 2020, the market price actually outperformed BTC significantly (high beta) as the rig went from deeply unprofitable to profitable. As previously mentioned by Blockware's late cofounder Matt D'Szouza, old-generation ASICs can occasionally be thought of as cheap call options on the price of BTC, especially in the trough of bear markets.

5. Looking Forward to 2023 and 2024

Using beta and theta to model how the BTC price and time affect the market prices of various Bitcoin mining rig models is useful for planning and running a successful mining operation.

New generation machines typically have a lower beta to BTC, indicating that they don't increase in value as fast in a bull market, but they also have natural downside protection by not falling as much in a bear market. In addition, there is much more confidence in new-generation rigs having a comfortable operating margin in a bear market, even if the BTC price falls further.

The older generation machines have a higher beta to BTC, indicating that ASIC models themselves which have tight or negative operating margins provide potentially more upside than holding spot BTC itself during a bull market. Due to halvings, difficulty adjustments, and newer more efficient models being released, mining rigs do decay over time. The critical objective of any miner is to mine BTC faster than the rigs decay or own less efficient models that have the potential to appreciate more than spot BTC during a bull market. We saw S9s outperform spot BTC by over 3x from October 2020 to May 2021, and now it's possible that S19s may also outperform spot BTC from their price bottom during the next bull market as they get older and their beta becomes higher more like an old generation model.

Looking forward to 2023 and 2024, capital allocators can think of S19j Pros as higher beta plays with tighter cash flows under current market conditions, whereas S19 XPs can be thought of as slightly lower beta plays with more consistent and reliable operating margins. This means that S19j Pros have more upside potential, but more risky operating cash flows, and S19 XPs have slightly less upside potential, but safer operating cash flows. Of course, both machines will perform well if Bitcoin is on the cusp of another parabolic bull market.

6. About Blockware Solutions

While the Bitcoin mining case is compelling, it is difficult to procure ASICs, build large mining facilities, and source inexpensive scalable electricity all on your own. As an institution, hedge fund, or HNWI, it is logical to purchase and host ASICs with a trusted partner like Blockware Solutions.

With Bitcoin mining experience dating back to 2013, Blockware Solutions has sold over 300,000 ASICs, hosted 400+ MW of clients, and mined thousands of BTC from the Blockware Mining Pool.

If you are looking for a trusted partner to assist you in deploying capital to the Bitcoin mining space, Request a Quote from Blockware Solutions.