

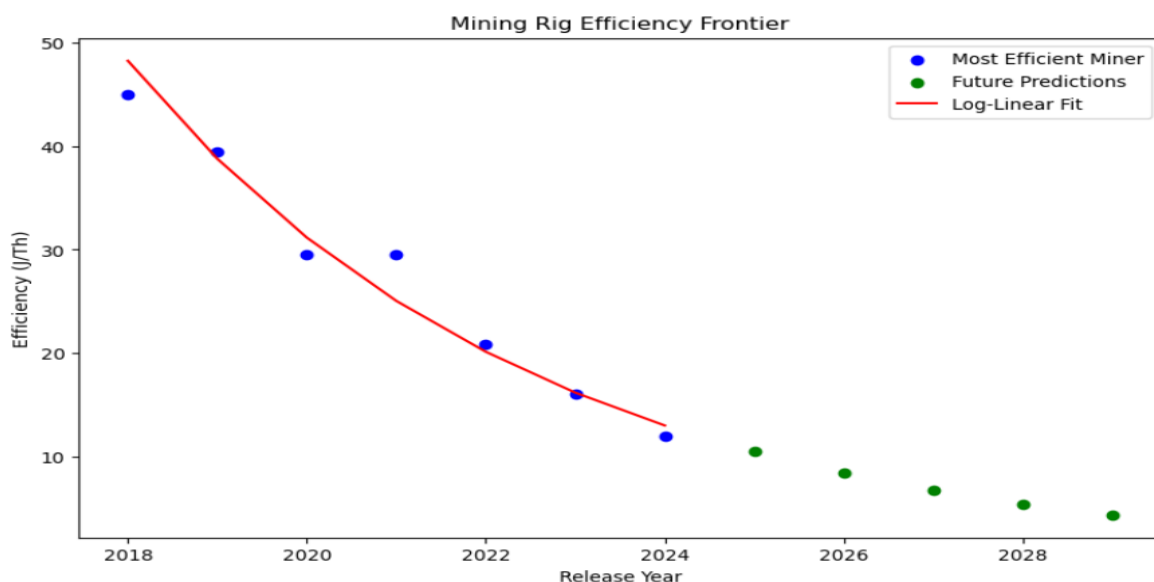
Bitcoin Mining Profitability Analysis: How will investment in S21 XPs perform the remainder of the cycle?

Many people (rightly so) often criticize the bitcoin mining business and its unreliable cashflow structure that is embedded in economics (bitcoin revenue halving every 4 years). So, what kind of return a company can expect when investing today in a leading mining rig – a Bitmain S21 XP?

Here's the fun part – trying to predict mining where Bitcoin price, block rewards and network hashrate will go over the next few years. Each of these factors having a significant effect on bitcoin price. I am cutting this analysis at the next halving date (by end of April 2028) when these rigs will probably be close to worthless. For this model I will be running it 100 times simulating possible Bitcoin and network hashrate changes to get a generalized result of gross mining profits ($GP = \text{Revenue} - \text{electricity cost} - \text{cost of rig}$) for 1 S21 XP and then roll it up to the Exahash level to see how it can scale. We are assuming a \$21 per terahash which amounts to \$5,684 per rig and \$21 million per exahash for the rigs.

Assumptions:

Mining rigs continue to get more efficient: This should be pretty consensus. The data I used for the chart is found here - <https://www.jbs.cam.ac.uk/2023/bitcoin-electricity-consumption/>. Although I did hear Patrick Fleury on a recent podcast suggesting efficiency will settle in the high single digits J/TH – To be seen.



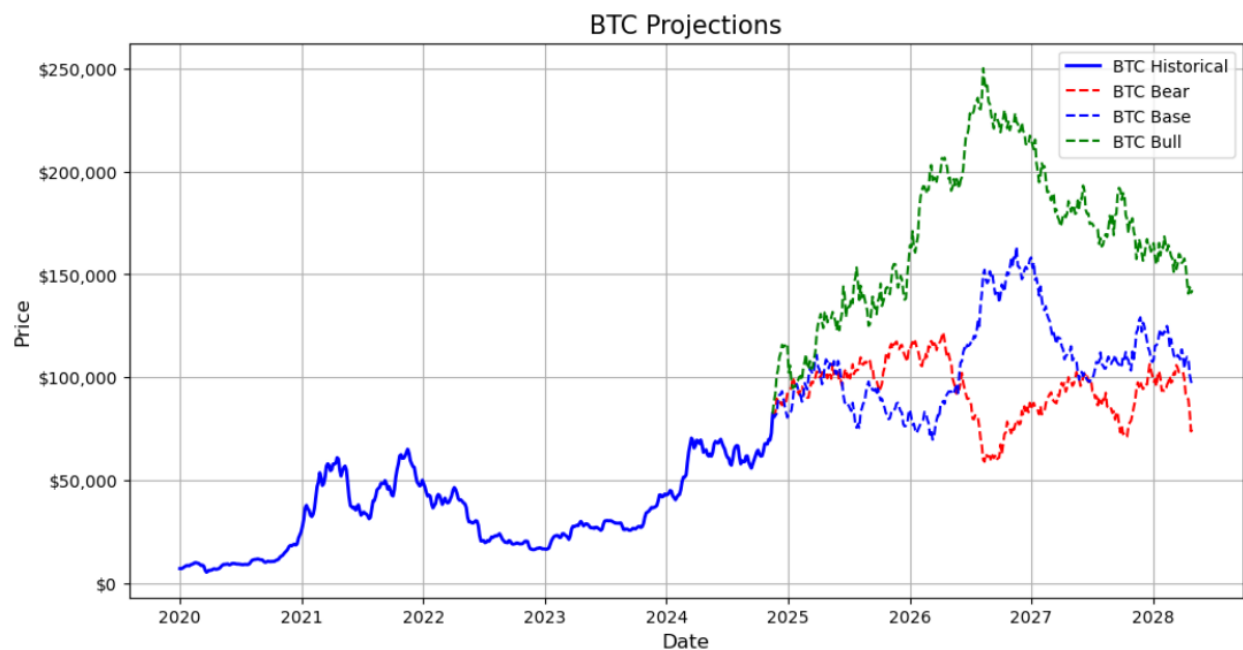
1. **Transaction fees stay consistent:** We will assume total block rewards of 3.3. I don't see how you can model this, but they can only go up. So, this is a potential upside.
2. **Operations:** I am going to assume we maintain 100% uptime over the period, but the operator will also mine at a negative gross margin if economics proceed that way (should only happen in the bear case).

Modeling/Projections:

BTC Price: To showcase different scenarios I attempted to model for a bear, base and bull case for the price of Bitcoin over the next 3.5 years. The logic follows:

- Bear: BTC is basically rangebound from \$60K and \$70K for the next 3.5 years.
- Base: BTC hits \$150K early 2026 and trades down to somewhere between \$75K to \$125K by the end of the period.
- Bull: BTC hits \$250K early 2026 and trades down to somewhere between \$125K to \$175K by the end of the period.

Obviously, I pulled these numbers out of my ass - no one knows what can/will happen. I then threw in some Brownian motion and adjusted the vol slightly based on historical time periods for each case and got something like this.

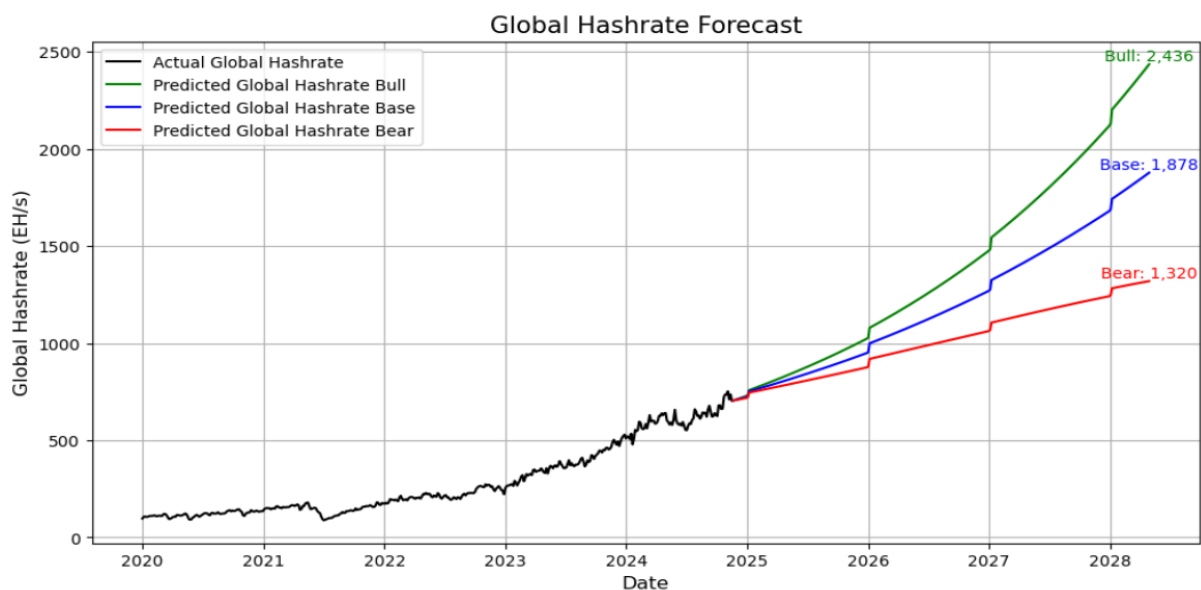


Global Hash Rate: As BTC appreciates it can drive the global Hash rate up to a certain point, but it then gets to a point where machines/power cannot be supplied fast enough to account for the price appreciation. Especially considering expected power usage for AI, it seems like there will be more power/data center shortage going forward – this makes it hard to quantify. However, mining rigs will continue to get more efficient and naturally push up global hash rate unless mining economics decrease drastically. Based on previously assumed progression in efficiency I am hypothesizing in a bear scenario there is little investment made in new rigs and network efficiency does not improve at the same rate the technology does. Keeping with the logic, if Bitcoin price appreciated rapidly, network efficiency will keep up with or even outpace the rate at which individual rig efficiency is increasing.

For the **Bull case**, I extrapolated the current trend to project higher growth. For the **Base case**, I tempered the growth by reducing it by 20%, while for the **Bear case**, I reduced it by 50%. My rationale is as follows:

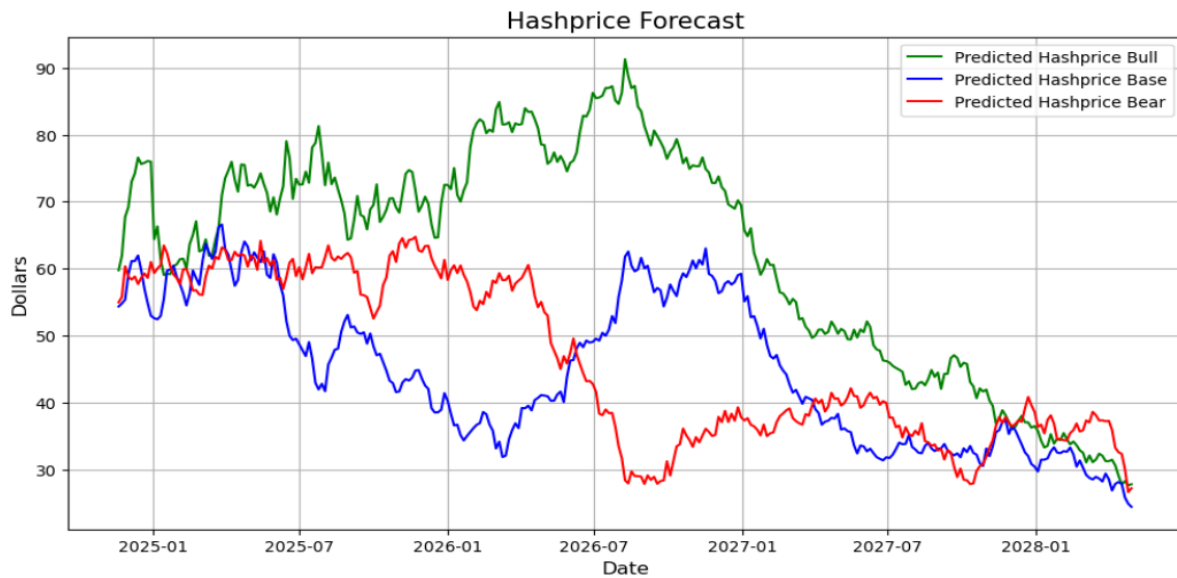
Take miner efficiency as an example: if rigs become ~50% more efficient over the projection period, this would effectively double the hashrate for the same power input. Based on my assumption of a ~60% improvement in miner efficiency, this results in more than doubling the hashrate, which aligns with my Base case (e.g., $1878/750 \approx 2.5$). This same logic underpins the projections for the Bull and Bear cases, with adjustments reflecting higher and lower efficiency outcomes, respectively.

Additionally, each iteration of the model incorporates a hash rate volatility factor, which adjusts the final target within a range of $\pm 15\%$ to account for variability.

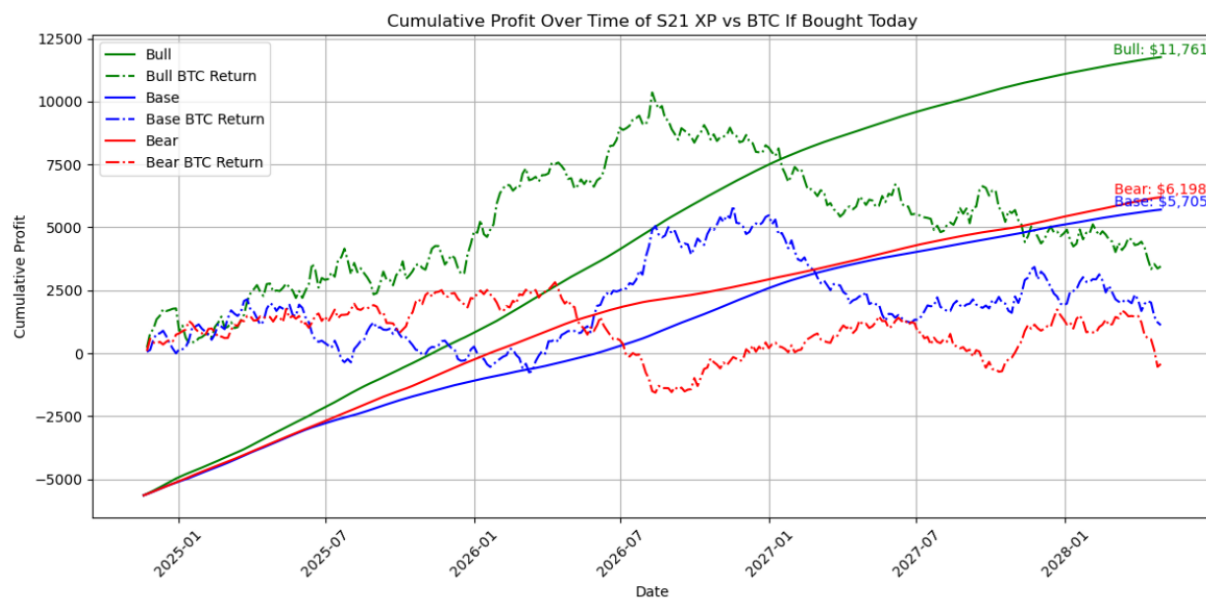


Hash Price: Based on previously stated inputs, we can see the hash price each case. As you can see only in bull cases do mining economics really improve.

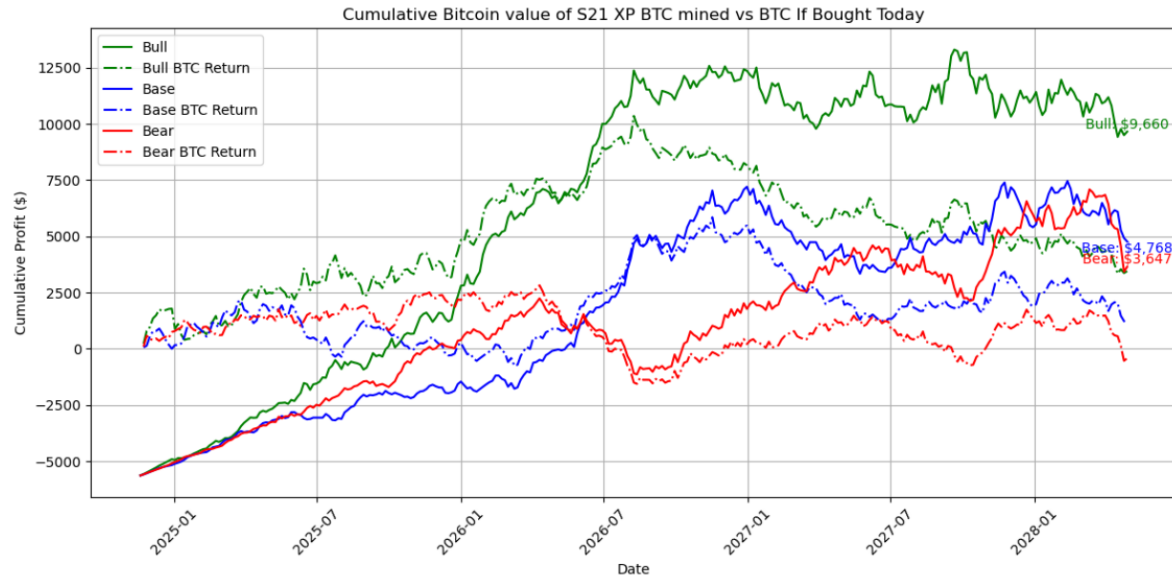
S21 XP Return:



Based on previous inputs, here are the results (vs if you put that money directly into Bitcoin of course). This iteration of the model uses a constant 3.5 c/KWH electricity charge. This first output assumes that you **sell the Bitcoin** immediately when you mine it:



This model exhibits under the same conditions, how would the returns fair if you held the bitcoin and **did not sell** it. Funny how all the GP numbers are higher in the version above (1 BTC = 1 BTC) My model is assuming a significant Bitcoin price correction – which might never happen.



Results:

As shown above, the miners should outperform Bitcoin based on the assumed projected mining economics (Hashrate and BTC price). On a **Yearly Basis** these are the gross profits you can expect from 1 EH/s of Bitmain's S21 XPs over the next ~3.5 years:

BTC Case	KWH - .025	KWH - .035	KWH - .045
Bear	\$1,157,292	\$603,498	\$49,704
Base	\$7,009,706	\$6,455,912	\$5,902,118
Bull	\$11,946,348	\$11,392,554	\$10,838,760

Then here is the **standard deviation** of the profits (same for each energy cost structure):

BTC Case	Std Dev
Bear	\$1,496,020
Base	\$1,645,146
Bull	\$1,919,821

As you can see there is a decent amount of variability to both the downside and the upside based on the model. Another consideration to make is that the S21 XPs will still have some sort of value at the end of this Bitcoin Halving period (I am assuming they have none).

Conclusion

This model demonstrates that, with effective scaling and operational excellence, Bitcoin mining has the potential to remain sustainably profitable, particularly if Bitcoin continues to appreciate. Keep in mind – this illustrates some of the most optimal conditions for mining: Low J/TH, 100% uptime and low power cost. Then the next question becomes how much it costs to run this operation? If you spend \$200 mil + a year on SGA you will need a lot of this type of hash to remain profitable. Just a reminder that only the most scaled and efficient miners will thrive in all market conditions.