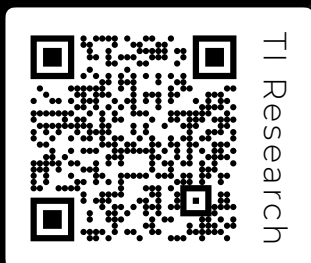


Bitcoin Mining Special Edition - The Third Halving

June 2020

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Find, Create, and Spread Value in Blockchain.

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Executive Summary

- ① **The decline in the proportion hash rate in China** Since September 2019, The estimated hash rate in China has shown a slow downward trend, which has dropped from **75.63% to 65.08%**; while the United States has begun to increase from **4.06% to 7.24%**, up by 78.33%;
- ② **The mining marginal profit falls below 0** After halving, if the miner uses the Antminer S17 +, the electricity cost needs to be controlled below US \$ **0.08** or the operating cost should be kept minimum to maintain profitability; if miners are using the Antminer S9 models, the electricity fee needs to be managed **under US \$ 0.035** or reduce the operating costs is the only way to remain profitable;
- ③ **More than 60** As of the first quarter of 2020, there are **more than 60** existing cloud mining service providing platforms worldwide, of which **9 major platforms** cover major markets and offer cloud hash rate services for **more than 30 algorithms** and tokens;
- ④ **The rise of mining derivatives** TokenInsight is optimistic about the future of crypto asset derivatives, especially when institutions are paying more and more attention to this innovation and such financial products;
- ⑤ **Surging of halving popularity** According to Google Trends data, the search volume of 'Bitcoin Halving' reached more than 100 within a week after halving, and the search volume exceeded **more than 9 times** compared to the second Bitcoin halving (July 3-6, 2016);
- ⑥ **The 16th largest** May 20, Bitcoin mining difficulty was adjusted for the first time after halving. The difficulty fell by 6%, which is considered to be the **16th largest adjustment** in Bitcoin history.
- ⑦ **20%:** The average block time of 1000 blocks (approximately one week) before the halving is 560 seconds, and 689 seconds post halving, which has risen by about 20%, indicating that there have been about **20%** network hash rate during this period gradually exit the network.
- ⑧ **18%** Before the halving, the proportion of transaction fees remained mostly below 6%; After the halving, due to the halving of rewards and the increase in average transaction fees, the proportion of transaction fees fluctuated within the range of **18% -24%**.
- ⑨ **Progressive** TokenInsight believes that with the arrival of the halving, there will be a sell-off of old mining machines in the market. Therefore, 2020 is a pivotal year for the progressive transformation of the mining industry, and the unstructured mining operations will be replaced by **efficient, professional, and refined** management strategies.

OVERVIEW

Bitcoin's Third Halving

" After the third halving, the annual supply growth rate of Bitcoin is about 1.7%, and various challenges emerged in the bitcoin mining ecosystem.

As of May 12, Bitcoin officially completed its third block reward halving at the block height of 630,000. The first halved block was broadcast by AntPool, and the block reward has now been set to 6.25 BTC, and the transaction fees approximately 0.91 BTC.

► The History of Bitcoin Halving (Data updated to May 18, 2020)

	1st Halving	2nd Halving	3rd Halving
Price change	\$2.01-\$1,178	\$163.65-\$19,800	\$3,180-?
Before halving	\$2.01-\$12.22	\$163.65-\$657.61	\$3,180-\$9,323
After halving	\$12.21-\$1,178	\$657.61-\$19,800	-
Bull duration	12+12 months	9+16 months	-
Max drawdown	50.42%	39.55%	-
Max drawdown date	100 days before	24 days before	-
All time high date	368 days after	525 days after	-
Bear duration	14 months	12 months	-

Source: TokenInsight

As a type of asset allocation, Bitcoin's annual supply growth rate after the third halving is about 1.7%, which is lower than gold's 4.8%¹ in 2019, and the U.S. narrow currency (M1) growth rate in 2019 is 4.44%². For the Bitcoin third halving, there are limited new money coming in as for now, in order to support the Bitcoin price in the long run organically, the industry needs to attract newcomers to support the growth of the industry.

The impact of the halving on the Bitcoin mining ecosystem has a long-lasting impact, short term mining costs have risen sharply, miner revenue from fees has risen sharply, some inefficient mining machines have been eliminated during the third halving, upstream and downstream mining operations such as mining farms, mining pools, and mining machine manufacturers will accelerate the reshuffle, and 2020 is a key year for the progressive transformation of the mining industry.

1. 2019 Gold annual supply: <https://www.gold.org/cn/goldhub/research/gold-demand-trends/gold-demand-trends-full-year-2019>
2. The change of USA M1 supply: <https://fred.stlouisfed.org/series/MANMM101USA657S>

THE CURRENT BITCOIN MINING DEVELOPMENT

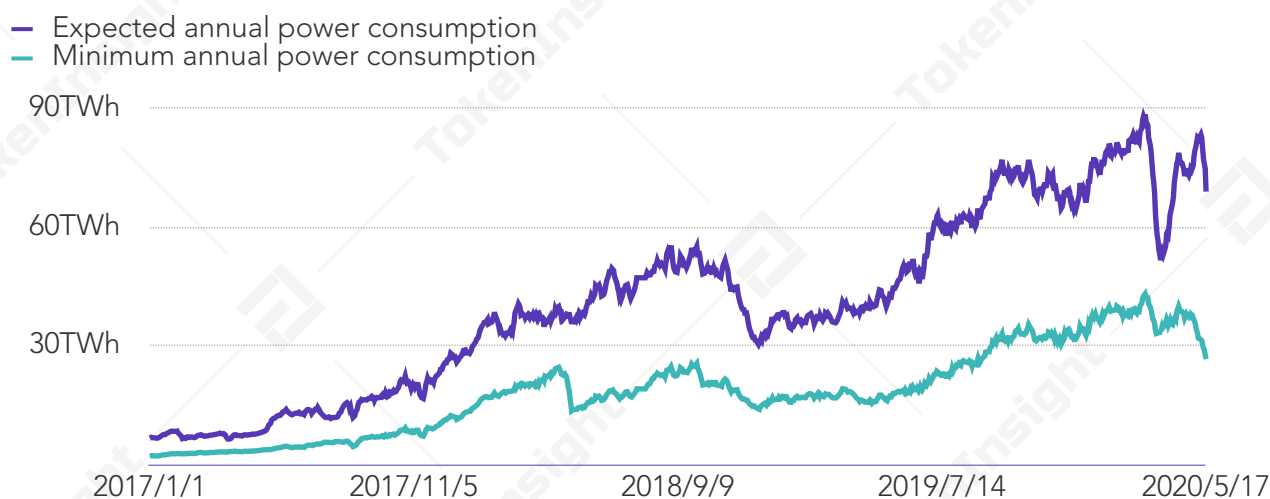
Bitcoin Mining Industry

“ China's average monthly hash rate may decline, the United States seizes market share ”

According to the data from the Bitcoin Electricity Consumption Index (CBECI) released by the Cambridge Centre for Alternative Finance (CCAF), as of May 7, 2020, the world's annual power consumption is 20863 trillion watts per hour (TWh), Bitcoin mining power consumption is estimated to be 69.03TWh a year, accounted for 0.33% of the global electricity usage.

► Bitcoin Mining Power Consumption Index

Source: Cambridge Centre for Alternative Finance, TokenInsight



CCAF pointed out that although CBECI is more accurate than others, its accuracy is still limited. Since the precise energy consumption of the Bitcoin network cannot be determined, CBECI offers a range of possibilities, including minimum annual power consumption and estimated annual power consumption.

The minimum annual power consumption assumes that miners use the most efficient mining machine for mining. The estimated annual power consumption assumes that miners use both old and new mining machines at the same time, rather than a single type of mining machine for mining.

It can be seen from the above figure that after the market suffered a sharp decline on March 12, 2020, the minimum annual power consumption index of Bitcoin mining declined, and the estimated annual power consumption was more obvious. At the same time, after halving, the estimated annual power consumption has also shown a downward trend.

TokenInsight believes that Bitcoin's estimated power consumption can reflect the emotions of miners to a certain extent. The main factors affecting Bitcoin mining are Bitcoin price and mining rewards. When the market is negative, the attitude of the miners will also be negative.

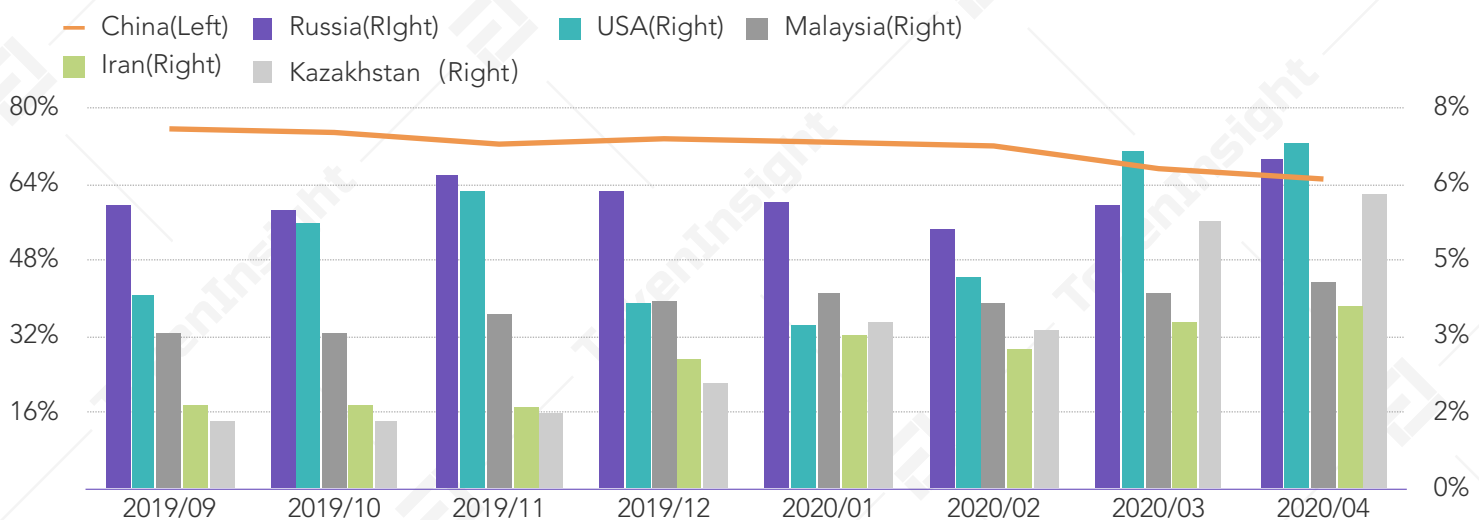
In addition, due to the impact of the halving, there will be a gradual shut off of the older generation miners, resulting in a slow decline in Bitcoin mining power consumption.

According to the average monthly hash rate estimated by CCAF, China's Bitcoin hash rate continues to occupy a sizeable position, and the overall rate remains above 65%.

As of April 2020, the United States is currently the country with the second-highest hash rate, accounted for 7.24%; Russia, ranked third, accounted for 6.9%; Kazakhstan, Malaysia, and Iran accounted for 6.17%, 4.33%, and 3.82% respectively of the global market.

► Average monthly hash rate by country

Source: Cambridge Centre for Alternative Finance, TokenInsight



On the other hand, since September 2019, China's estimated hash rate has shown a slow downward trend, which has now dropped from 75.63% to 65.08%; while the United States has begun to increase from 4.06% to 7.24%, up by 78.33%;

Unexpectedly, Kazakhstan's current hash rate accounted for 6.17%, up 334.51% from 1.42% in September 2019.

Miner's Profit Margin

" Post halving, the older generation mining machine reached its end of the lifecycle, gradually phasing out from the Bitcoin network "

TokenInsight analyzes the miners' profit by introducing two indicators, namely **Miner's Profit Margin** and **Marginal Cost of Creation**. The formula for calculating the miner's marginal cost of creation is as follows:

$$\frac{1}{\text{Block Reward} + \text{Transaction Fees}} * \text{Hashrate} * \text{Power Efficiency} / 1000 * \text{Electricity} * 24h * (1 + \text{Operation Costs})$$

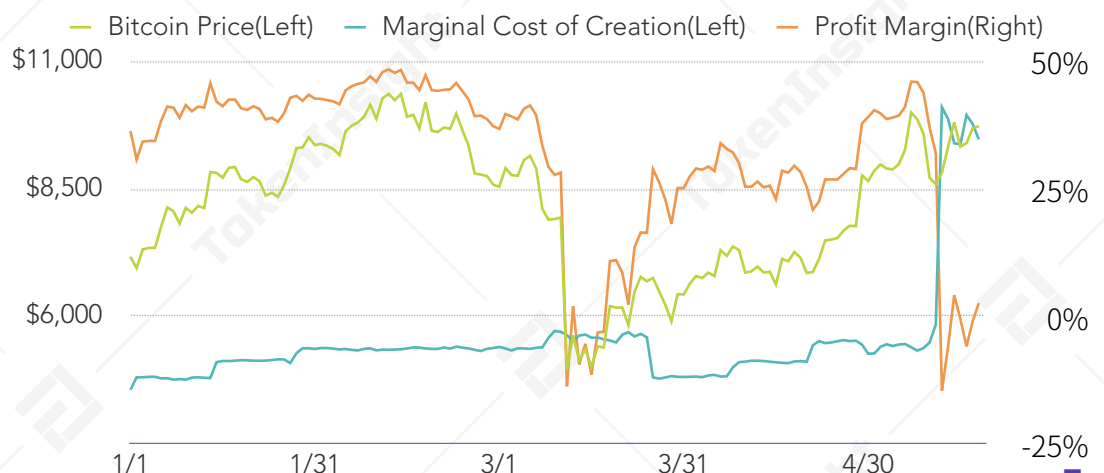
Where *Block Reward* represents the daily block reward generated by the Bitcoin network (expressed in the number of Bitcoins, before-halving: 1800, post-halving: 900, but it varies according to the actual block production time); *Transaction Fees* is the fees for daily Bitcoin network transactions; *Hashrate* is the hash power for the entire Bitcoin network. *Power Efficiency* is the power consumption; *Electricity* is the electricity price; *Operation Costs* is the operation cost. This formula shows the production cost of one Bitcoin on any particular day. The miner's profit margin is the proportion of Bitcoin price minus the cost of production.

Taking the Antminer S17 + as an example, if the electricity cost is \$ 0.08, the marginal production cost (operating cost ratio of 15%) was \$ 5,300 before halving, and rose to about \$ 9,300 post halving.

The miner's profit margin (operating cost ratio of 15%) remained at around 40% before halving. Post halving, the miner's marginal income fell to around 3%, which is basically at a non-profit state.

► Bitcoin's marginal production cost and marginal revenue (Antminer S17 +; electricity cost \$ 0.08)

Source: TokenInsight



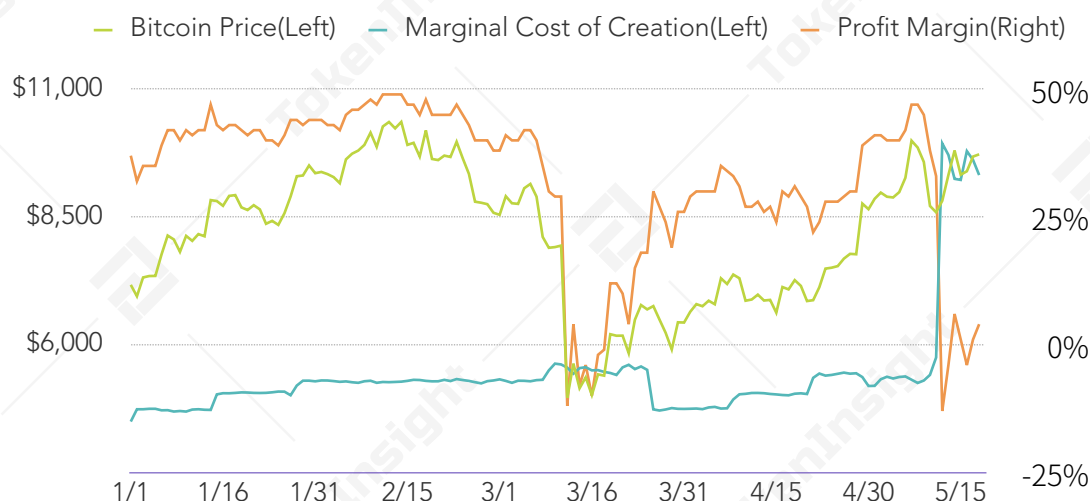
Taking the previous generation mining machine Antminer S9 series mining machine as an example. Its marginal revenue and marginal production cost are shown in the figure below.

If the electricity fee is \$0.035, the marginal income of miners (operating cost ratio is 15%), the marginal income of Antminer S9 series miners maintained at about 45% before the halving, but after the halving, it will fall and breakthrough 0, and will not be maintained until the market is stable. Around 4%.

The miner's marginal production cost was \$ 5,300 before the halving, and rose to about \$ 9,300 after the halving.

► Bitcoin's marginal production cost and marginal revenue (Antminer S9; electricity cost \$ 0.035)

Source:TokenInsight



Which means, if miners are mining with Antminer S17 +, they need to control electricity costs below \$ 0.08 or reduce operating costs to maintain profitability; if they are mining with Antminer S9, they need to control electricity fees below \$ 0.035 or reduce operating costs to maintain profitability.

TokenInsight believes that the profit margin falls below 0 does not mean that miners must shut down their operations immediately. Different miners have different mining machine purchase prices, electricity costs, and operation and maintenance costs.

For miners, frequent switching opportunities bring greater pressure on the mining machine and power supply system, increase the damage rate, and affect revenue. On the other hand, it will also cause greater losses in extreme market conditions.

When the profit margin falls below 0, miners are suggested to take into account the near future market outlook, and then to consider adjust the operations strategy such as to adopt liquid cooling technology, under-clock, reduce operation and maintenance costs and various other measures, thereby reducing overall production costs. In addition, to consider using financial instruments to hedge and stables mining income. 8

Mining Derivatives

" The rise of mining derivatives not only uses Bitcoin as the underlying asset, but also on hash rate

The mining industry is gradually becoming mature, and the industry is currently in the process of shifting from home miners to institutionalization. At present, the cryptocurrency market has developed various financial products to match the production cycle and meet the needs of professional miners.

Financial product

Babel Finance, Matrixport, RenrenBit are the leading financial service providers in the Chinese cryptocurrency financial services market.

► Leading Financial Service Providers

Source: TokenInsight

Name	Loan balance
Babel Finance	In March 2020, Babel Financial disclosed that its 2019 annual report revealed that its loan balance as of the end of 19 was nearly \$ 300 million. In the first quarter of 2020, this amount rushed to \$ 380 million. The annual report also shows that the proportion of miners' loans is not more than 30%, but after experiencing a sharp decline in the market on March 12, the proportion of miners' loans changed.
RenrenBit	Release of the 2020Q1 financial report (unaudited) shows that its loan balance has dropped from about 65 million USDT at the beginning of the year to 35 million USDT
Matrixport	Matrixport is a Bitmain company, and its official website shows that the loan balance reached \$ 100 million.

Hash rate Futures

Hash rate futures can be used to build various financial products for miners. Derivatives exchange FTX recently announced the launch of the Bitcoin hash rate futures contract. At present, FTX has launched three Bitcoin hash rate futures contracts, which have maturity on Q3, Q4 2020 and Q1 2021.

The launch of the Bitcoin hash rate futures contract means that the industry can also analyze the hash rate futures in different settlement periods to make reasonable predictions on future changes in hash rate and difficulty, thereby protecting its own interests through such financial products.

TokenInsight is optimistic about future cryptocurrency derivatives, especially when institutions are increasingly interested in such innovative and diversified financial products. The significance of these derivatives is not only to provide trading methods, but the most important thing is to obtain greater liquidity and improve market structure.

THE IMPACT OF HALVING ON BITCOIN MINING

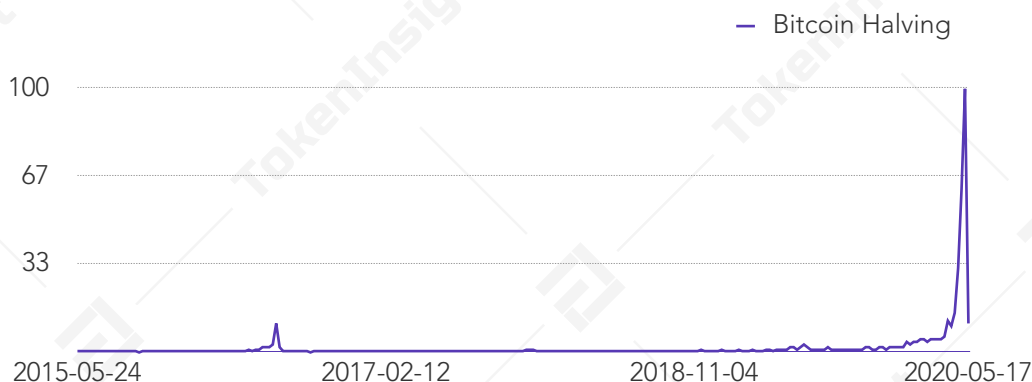
Halving Popularity

“ Google Trends shows that the popularity of the halving surged before halving, and the most search interests were based in Africa and Europe ”

According to Google Trends data, the search volume of Bitcoin Halving has reached a peak of 100 within a week of halving, and the search volume exceeds more than 9 times of the previous halving (July 3-6, 2016)

► Bitcoin Halving Search Interest

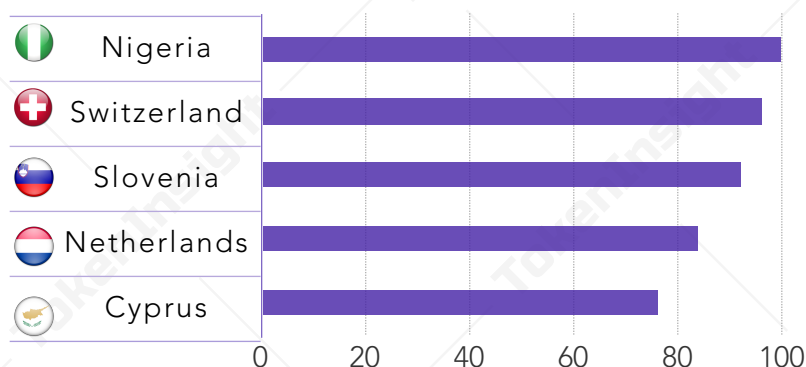
Source: Google Trends



On the other hand, as of May 30, Google Trends for the past 30 days showed that Africa and Europe are the regions that have the most search interest on Bitcoin halving. Among the top 5 search areas in the past 30 days, Nigeria has the highest searching interest, followed by Switzerland and Slovenia.

► Bitcoin halving countries/regions search interest

Source: Google Trends



TokenInsight believes that Europe's attitude towards cryptocurrency has always been relatively open. Nigeria, the largest economy in Africa, has serious national currency inflation, loose regulation, and a sufficient young audience to drive the development of cryptocurrency in Africa.

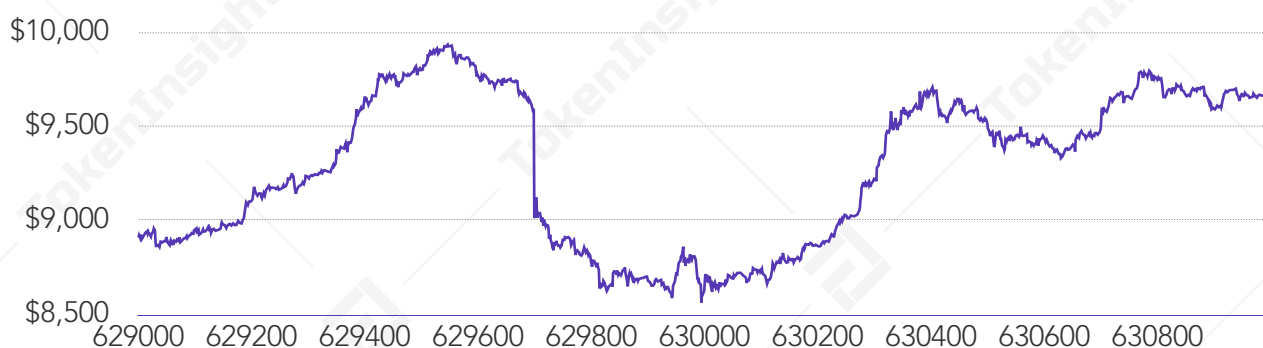
Bitcoin Price

Prices rebound, and market sentiment is relatively optimistic post halving

As can be seen from the figure below, in the 2,000 blocks before and after Bitcoin's halving, its price fluctuated violently, reaching a peak near the block height of 629,950, but then it fell sharply. After the halving, the Bitcoin price rose slowly, completely recovering the previous decline, and trying to hit the \$ 10,000 major price level again.

► Bitcoin price block by block

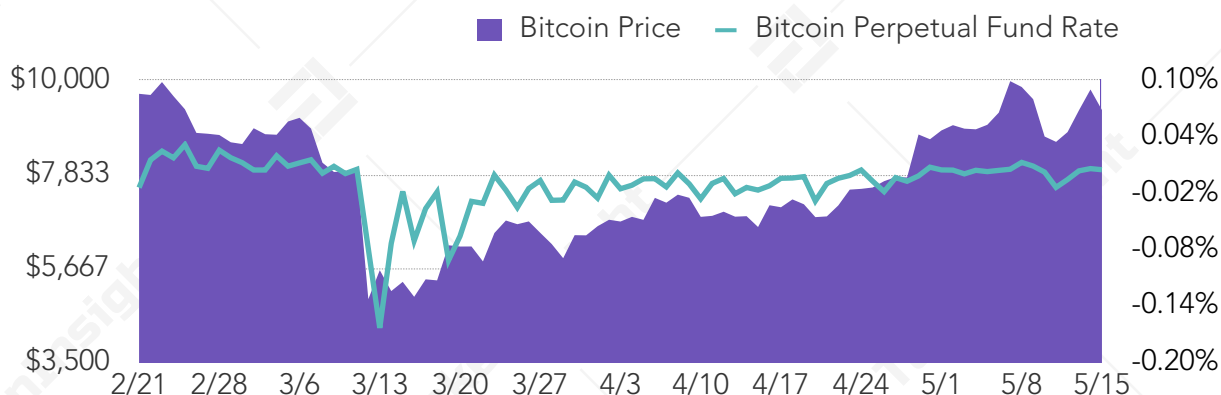
Source: ByteTree, TokenInsight



TokenInsight believes that the closer the halving moment, the more unstable the investor sentiment and the more drastic the price fluctuation. Market participants have high expectations for the halving, and after the market has recovered and stabilized, investor confidence has strengthened again, further promoting the positivity in the market.

► Bitcoin Perpetual Funding Rate

Source: ByteTree, TokenInsight



Perpetual funding rates also demonstrates a positive sentiment in the market. Before Bitcoin halving, the perpetual funding rate ended its negative trend for two months and rose to the positive territory. Despite subsequent slight changes due to price fluctuations, it maintained positive values post halving.

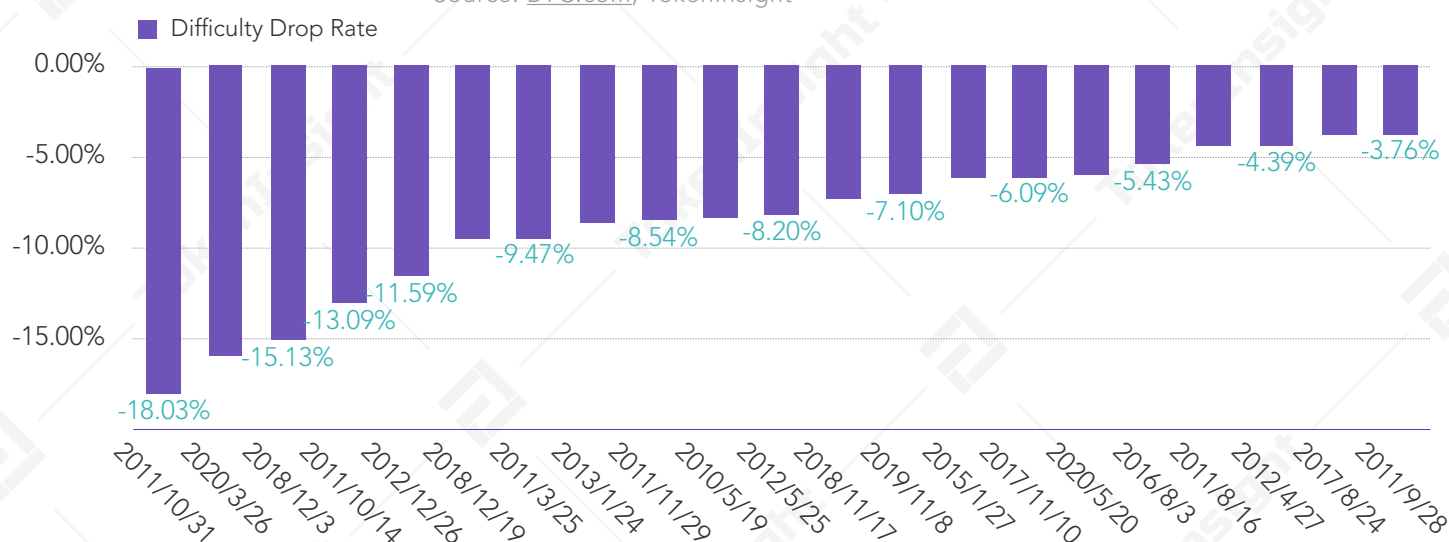
Bitcoin Network Difficulty

" After halving the mining difficulty decreased by 6%, the 16th largest decline in history

On May 20, the difficulty of Bitcoin mining was adjusted for the first time post halving. The difficulty decreased by 6%, making it the 16th largest adjustment in the Bitcoin network history.

► Top 20 difficulty downward adjustment in the Bitcoin history

Source: [BTC.com](https://btc.com), TokenInsight

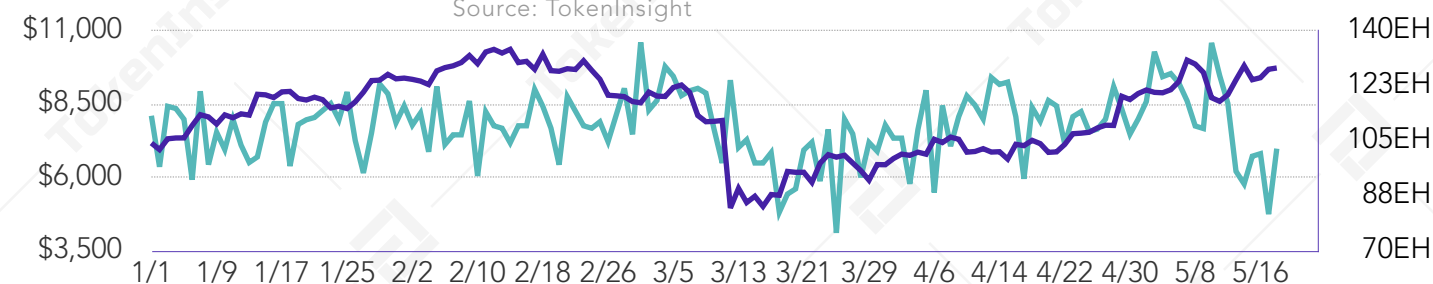


The network hash rate fluctuated at around 100EH / s before and after halving, and at its low reached 81.65EH / s post halving, briefly touched sub 80EH/s at one point.

As of May 21st, Bitcoin's entire network has maintained hash rate of about 94.37 EH / s and a mining difficulty of 15.14T. The second difficulty adjustment post halving saw a decrease of roughly 9.3% in difficulty to 13.73 T. As the network tries to rebalance itself, the mining sector has seen some older generation miners such as S9s switching back on due to 2 conservative downward adjustments in difficulty and providing sufficient relief to the miners.

► Bitcoin price and network hash rate

Source: TokenInsight



Average Block Time

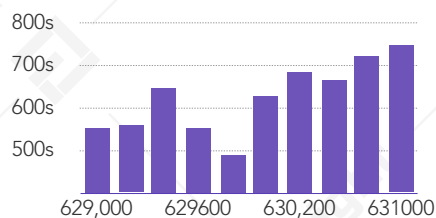
Post halving, the average block time dropped by about 20%, and the network hash rate saw a short term decline but will be revert back up again in the mid-term.

The Bitcoin average block time in 2020 fluctuated at around 600 seconds before March; after March, the average block time showed a large increase, reaching 800 seconds after the sharp decline in March; with the follow-up positive action on the Bitcoin price, the block time returns to the interval of about 500 seconds, and post halving, it dropped again to around 800 seconds.

Change in average block time before and after halving

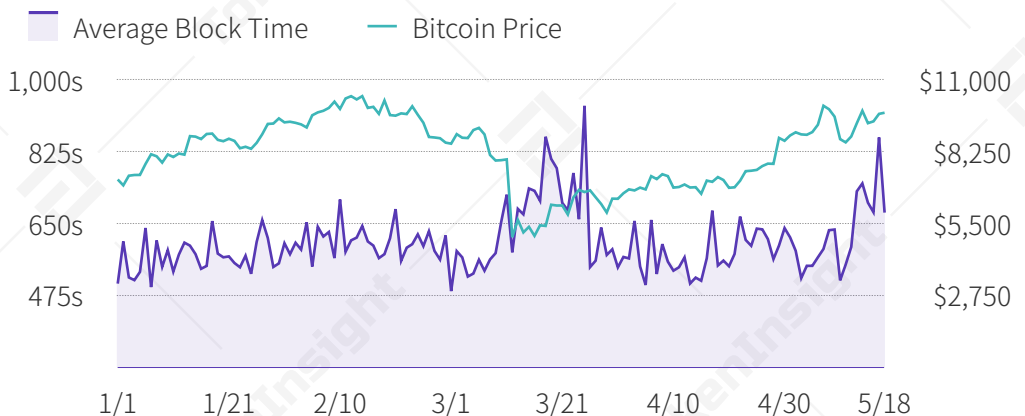
Source: ByteTree, TokenInsight

Average Block Time of Each 200 Blocks



Average block time

Source: Glassnode, TokenInsight



Although the price returned to the same level in March 2020, during the halving, Bitcoin's block production time was greatly affected.

TokenInsight recognises that the current hash rate of the entire network cannot be directly observed, but it can be calculated from the average block time and difficulty. According to the average block time analysis, the hash rate of Bitcoin's entire network has experienced a significant decline post halving.

The average block generation time of the first 1000 blocks (about one week) was 560 seconds, and the first block was 689 seconds after the halving, an increase of about 20%, indicating that about 20% of the network gradually disappeared.

If Bitcoin's price remains unchanged and the wet season arrived, the network hash rate could see a rise in the mid-term.

Miner's Income

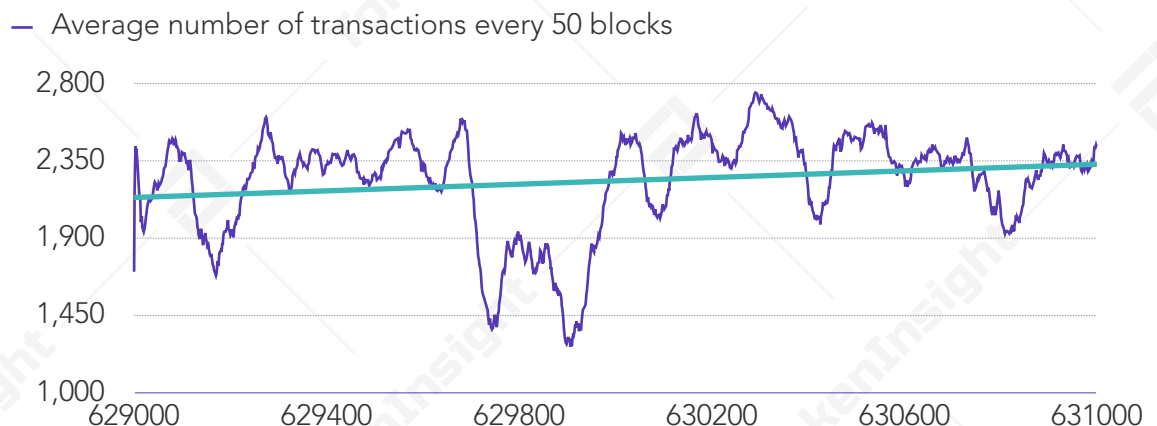
" The number of on-chain transactions has risen steadily, and investor sentiment is overall optimistic

From the perspective of the number of transactions on chain, although the number of on-chain transactions fluctuated greatly immediate pre and post halving, the overall trend shows a slow rise.

Since Bitcoin did not experience a strong downward trend post halving based on the, after digesting the halving information, investors in the market that were originally in a wait-and-see state are gradually entering the market, and the overall market sentiment is optimistic.

► Number of on-chain transactions

Source: ByteTree, TokenInsight



The transaction fee increased as expected after halving, but it is still a long way go for miners to heavily rely on transaction fees for mining revenue.

The income of miners is still heavily based on block rewards rather than transaction fees. As the hash rate of the entire Bitcoin network continues to rise, mining rewards are getting lower, so transaction fees needed to be higher, in order to make up for the loss of income caused by the halving to some extent.

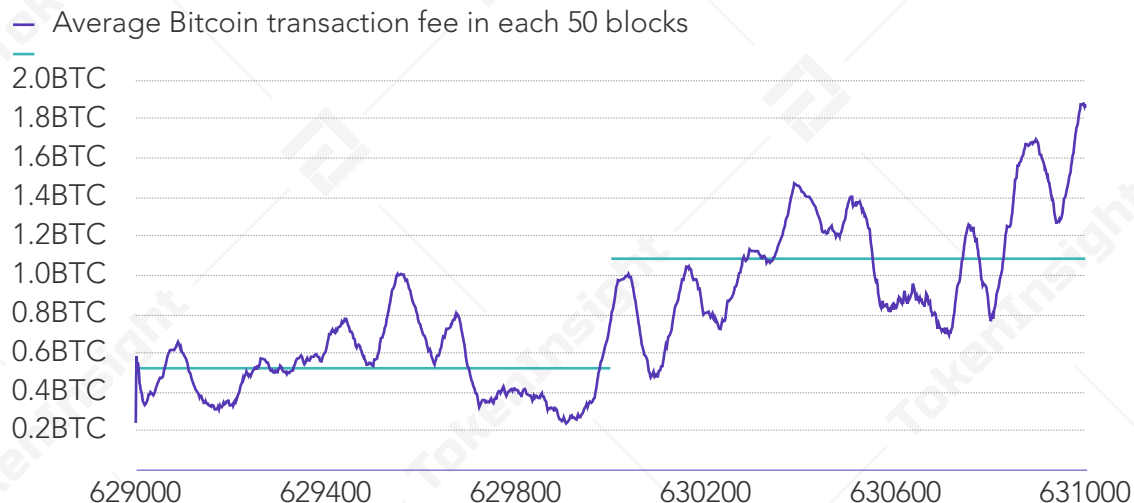
The figure below shows the transaction fees of the Bitcoin network before and after halving, and the average fee for each transaction and the proportion of transaction fee.

It can be seen from the figure, before and after the halving, within an interval of 50 blocks before and after the halving, Bitcoin transaction fees have risen significantly. Around block height of 630,050, the total transaction fee has dropped to a low point, but then it has maintained an upward trend after that.

When the block height reaches 631,000, the transaction fee for the Bitcoin network reached a local top, and the fee for that single block exceeds 1.8 BTC.

► Bitcoin transaction fees

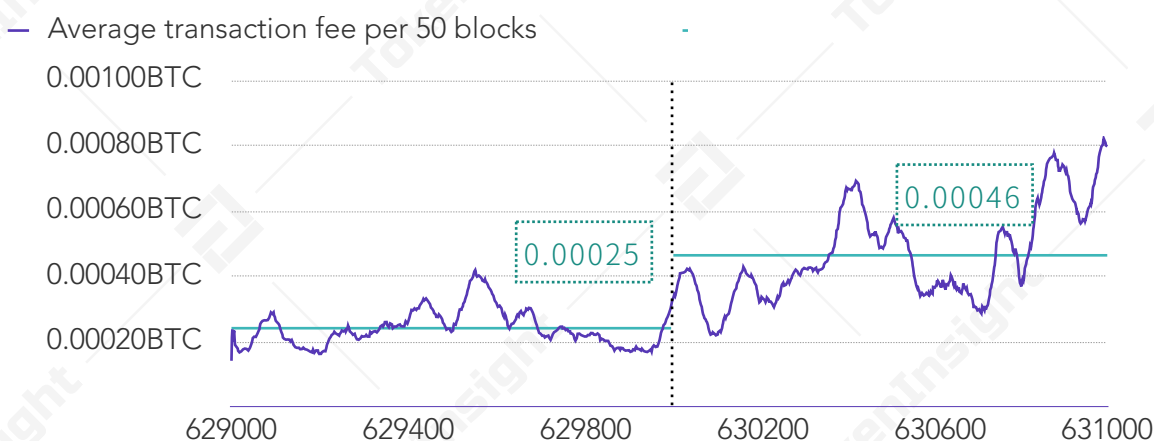
Source: ByteTree, TokenInsight



Overall, post halving, the total Bitcoin transaction fees in terms of the percentage of the miners' income, in line with the TokenInsight expectation. The increase in transaction fees not only shows that market participants are willing to pay a premium for transactions to be prioritized, but also proves that the current market activity is trending.

► Average transaction fee per 50 blocks

Source: ByteTree, TokenInsight



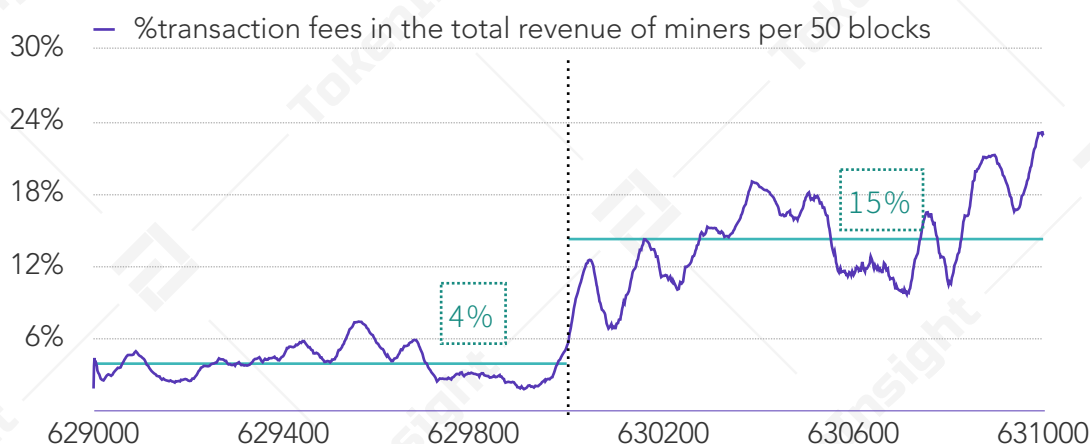
From the view of average transaction fee per 50 blocks, in the 2,000 blocks before and after the halving, the transaction fee for Bitcoin rose from an average of 0.00025 BTC to 0.00046 BTC, an increase of 84%.

According to TokenInsight statistics, in the Q1 2020, the proportion of transaction fee in total miners' income (block reward + transaction fee) remained at 1.5%, but during March it jumped to 5.5%, and fell back to a lower level in April.

The following figure can be seen from the proportion of the transaction fees of 2000 blocks before and after halving. After the halving, the miners' mining revenue decreases, but the transaction fee income increases by 200% immediate post halving. With the stable operation of the Bitcoin network after the halving, the average transaction fees of miners rose from 4% before the halving to about 15%.

► Proportion of transaction fees in the total income of miners

Source: ByteTree, TokenInsight



With the passage of time, the transactions on the Bitcoin network have been gradually adjusted to a more balanced state, but they have been oscillating within the range of 18% -24%.

Overall, post halving, the total Bitcoin transaction fees as expected rose significantly. But if the industry wants Bitcoin to develop according to the Satoshi Nakamoto's vision, that is, the main income of miners will change from block rewards to transaction fees, it is still a long way to go.

FUTURE TRENDS OF BITCOIN MINING

Global Trends and Changes in Mining Policy

" North America gradually supports cryptocurrency mining, and non-Chinese mining activities are expected to grow at a faster pace

From the perspective of the updated regulatory policies of governments from 2019 to 2020, government-level support has begun to appear, and the policy is biased towards supporting the healthy development of the industry, including the issuance of licenses and scale supervision.

Stable political situation, low electricity bills, a legal framework with reasonable structure, relatively mature financial market, and climatic conditions are the main factors for the development of cryptocurrency mining.

China: On November 6, 2019, cryptocurrency mining was eliminated by the National Development and Reform Commission of the industry market. On April 21, 2020, Sichuan announced the first batch of "Hydropower Consumption Demonstration Enterprises", and among the 99 entered enterprises, multiple mines were listed.

United States: The Missoula County Council of Montana added green regulations for cryptocurrency miners. The regulations require that mines can only be located in light industrial areas and heavy industrial sectors. After review and approval, mining rights can be extended to April 2021. 3rd.

Canada: Continue to take measures to support the development of cryptocurrency mining business in the country. Quebec Hydropower agreed to reserve one-fifth of the electrical energy (about 300 megawatts) for miners.

Georgia: In June 2019, the government of Abkhazia in the Autonomous Republic of Georgia relaxed the requirements for domestic cryptocurrency mining activities and drafted a regulatory law that only requires mining to hold a license.

Iran: In July 2019, the Central Bank of Iran recognized the cryptocurrency mining industry and promised to implement a legal license procedure.

Belarus: Belarus plans to fully support the development of cryptocurrency and the digital economy. President Lukashenko said that he proposed to set up a large data center near the local nuclear power plant for cryptocurrency mining.

Ukraine: The Ukrainian Ministry of Digital Transformation plans to legalize cryptocurrency mining within two to three years. The corresponding regulatory authorities also stated that mining does not require government supervision or intervention, and the consensus rules are sufficient to regulate on-chain activities.

Uzbekistan: On January 16, 2020, Uzbekistan announced the establishment of a "national mining pool".

On the macro level, regions such as North America are starting structuring strategies and guide funds and institutions with professional operation and risk control capabilities to enter the market.

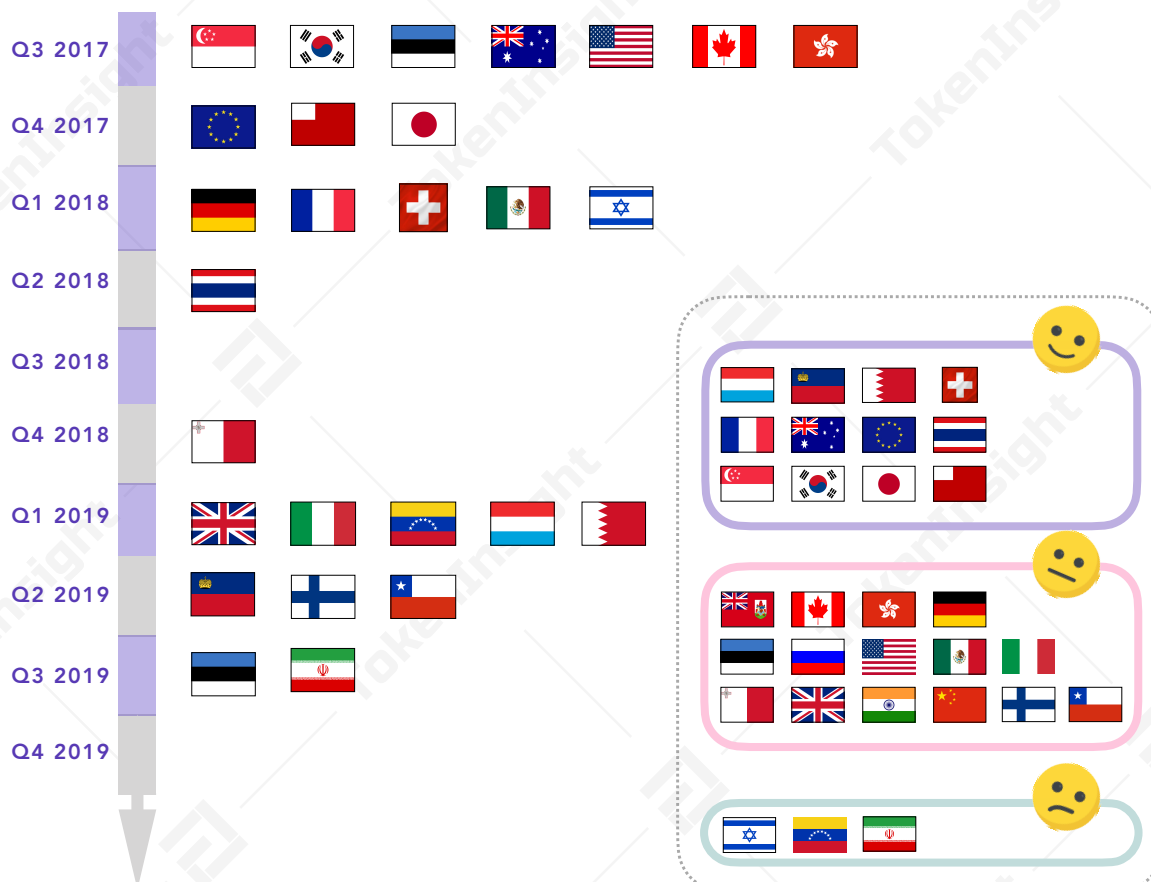
At the same time, China's regulatory attitude towards Bitcoin mining is also changing, especially because of the advent of the flood season, Sichuan and other places have more obvious support for bitcoin mining. However, due to the sensitivity of cryptocurrency, there are still uncertainties on the policies in the future.

TokenInsight believes the development of the mining farms outside of China is expected to continue at a faster pace in 2020 due to

1. Demand from traditional investors to gain indirect exposure to the cryptocurrency market.
2. Structured and progressive legal framework.
3. Increasing awareness of Bitcoin and cryptocurrency outside of China on the national level.
4. Interests to leverage Bitcoin mining farms to smooth out the electricity grid fluctuation or to support the off-peak electricity demand in order to support the wholesale electricity price.

► Regulatory Perspectives on Cryptocurrency

Source: TokenInsight



Future Development and Evolution of Mining

" It is time to say goodbye to unstructured mining operations, 2020 is a key year for the progressive transformation of mining

CoinShares pointed out in its "Bitcoin Mining Network" report that China's mining scale currently accounts for 65% of the world's total, and Sichuan alone accounts for 54% of the world's total. The remaining 35% is distributed in North America such as Washington, New York, British Columbia, Alberta, Quebec, and Europe such as Iceland and Norway.

Although China occupies the absolute dominant position of the Bitcoin network, with the advantages in further developing the cryptocurrency mining and related policy support, more and more traditional financial capital and secondary market financial service providers will enter the industry at home and abroad.

TokenInsight believes that with the conclusion of the Bitcoin third halving, there would be a sell-off of old mining machines in the market. Therefore, 2020 will be a key year for the progressive transformation of the mining industry, and the unstructured mining operation will be gradually replaced by efficient, professional and structured management strategies.

" The upstream and downstream of the mining industry are facing a reshuffle, and the industry chain will spawn more sub-sectors

In the medium to long term view, the opportunities for cryptocurrency mining development outweigh the challenges, and the release of market forces has boosted mining development. But in the next one to two years after the halving, the upstream and downstream of the mining industry will face a reshuffle:

1. The mining farm will continue to improve automation and refined management, and enhance the overall operating capabilities,
2. Without a relatively complete layout and risk management strategies pre halving, small-scale mining miners, farms or pools would face great risks, and competition in the top tier mining pools will become more intense.
3. Mining machine manufacturers will invest significant resources in the production and development of 5nm chips and other differentiated products. In addition, under the influence of Canaan's successful IPO in the States, there will be an increasing number of mining related companies try to be publicly listed in the future.
4. Financialization is also a key step in the mining iteration. Hash rate or ASIC hardware can be capitalized and financialized in the future to lower the industry threshold.

In the future, the industrial chain around cryptocurrency mining will spawn more sub-sectors and further expand the scope of services.

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