Correct Cryptocurrency ASIC Pricing

Are Miners Overpaying?

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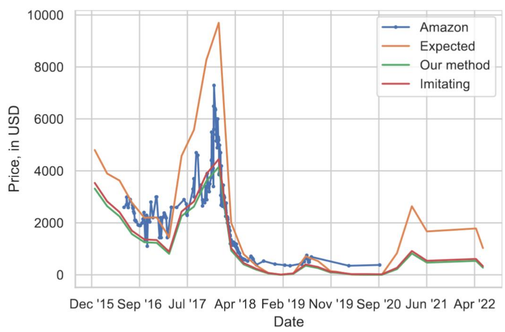
Overview. How should one **evaluate future profits from mining?** Previous works and the top "mining calculators" do not take Bitcoin's exchange-rate volatility into account, at best usually only considering its expected value. We prove that in an efficient market, such considerations are, in fact, flawed.

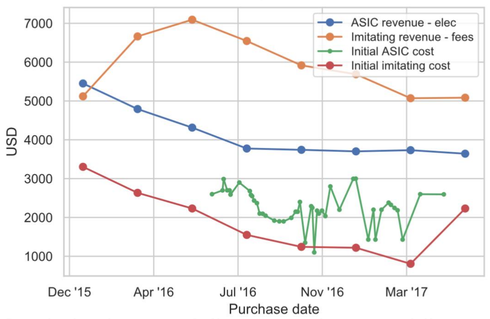
Theorems 1&2 (informal). Mining hardware has a **correct** price (which we calculate), in the sense that any other price results in riskless arbitrage opportunities.

Theorem 3 (informal). **Mining hardware can be imitated** by a portfolio which consists of tokens & bonds, where the accuracy of the imitation depends on the frequency at which the portfolio is adjusted and trading fees.

Empirical results.



Our method produces lower hardware prices than both official and "expected" ones.



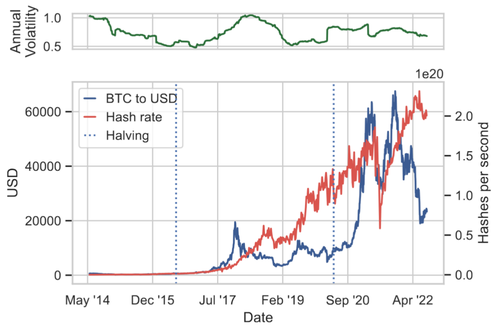
Our imitating portfolios earned more while costing less, meaning ASICs are **overpriced**.

Mining Proof-of-Work cryptocurrencies is a **financial option**.

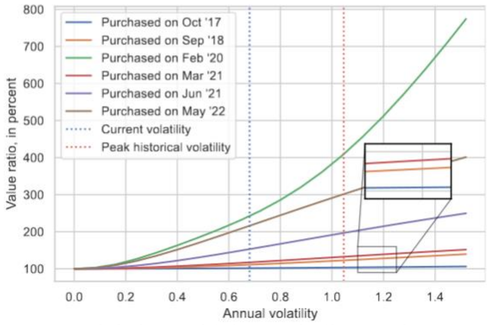
Mining hardware can be **imitated** by buying and selling tokens & bonds.

The value of hardware **increases** when the mined token is **more volatile**.

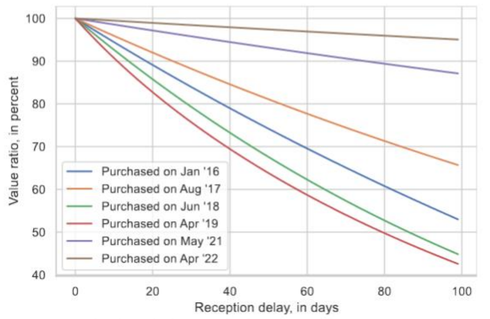
https://arxiv.org/abs/2002.11064



Bitcoin's exchange-rate is very **volatile**.



Our model shows higher volatility in the mined token **increases** mining hardware value.



Even a slight delay until receiving mining hardware can starkly **decrease** its value.

Algorithm 1: MiningOpportunityValue

Input : t - the mining opportunity to evaluate.
k - the turn to evaluate relative to.
c_k - coin's exchange-rate at turn k.
Output: value of t-th opportunity at turn k.

for $c_t \in \{\Delta^{t-k} \cdot c_k, \Delta^{t-k-1} \cdot \delta \cdot c_k, \ldots, \delta^{t-k} \cdot c_k\}$ **do**
  $V(t, t, c_t) \leftarrow h \cdot \max\left(\frac{R_t \cdot c_t}{H(t)+h} - \varphi \cdot e_t, 0\right)$
end
for $\tau \in t-1, \ldots, k$ **do**
  for $c_\tau \in \{\Delta^\tau c_k, \Delta^{\tau-1}\delta c_k, \ldots, \Delta\delta^{\tau-1}c_k, \delta^\tau c_k\}$ **do**
    $a_\tau \leftarrow \frac{V(t,\tau+1,\Lambda\cdot c_\tau) - V(t,\tau+1,\delta\cdot c_\tau)}{c_\tau \cdot (\Delta-\delta)}$
    $\Phi(\tau+1) \leftarrow V(t, \tau+1, \Delta \cdot c_\tau) - a_\tau \cdot \Delta \cdot c_\tau$
    $V(t, \tau, c_\tau) \leftarrow a_\tau \cdot c_\tau + \frac{\Phi(\tau+1)}{r}$
  end
end
return $V(t, k, c_k)$

Δ, δ:multiplicative BTC factors, V:value of HW.

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