Estimating Profitability of Alternative Cryptocurrencies

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Paper link: https://cs.princeton.edu/~yuxingh/altcoin-report/
Bitcoin alternatives

1,400+ Altcoins

- Bitcoin
  - market cap: $10 B
- Litecoin
  - market cap: $200 M
- Dogecoin
  - market cap: $22 M
- Auroracoin
  - market cap: $2 M
- WBB Coin
  - market cap: $75 K
- ...

Data as of July 2016
Most altcoins are volatile

<table>
<thead>
<tr>
<th>Currency</th>
<th>Relative Stdev of Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>(USD/EUR)</td>
<td>2.5%</td>
</tr>
<tr>
<td>(GOOG)</td>
<td>6.8%</td>
</tr>
<tr>
<td>Bitcoin</td>
<td>106%</td>
</tr>
<tr>
<td>Litecoin</td>
<td>116%</td>
</tr>
<tr>
<td>Dogecoin</td>
<td>126%</td>
</tr>
<tr>
<td>Auroracoin</td>
<td>534%</td>
</tr>
</tbody>
</table>

Data as of July 2016
Use of altcoins

Few altcoins are used in commerce
... unlike Bitcoin

Potentially used as investment vehicles
Investing in altcoins

Developer
- Fork code from Bitcoin
- Release

Miner
- Mine
- Sell
- Profit?

Speculator
- Buy/sell

Market formation

Time
Methodology for estimating profitability

Profit = Revenue - Cost

Estimate Cost of Mining
- Gather historical trade data (CryptoCoinCharts)
- Gather historical blockchain data (18 altcoins)
- Compute opportunity cost

Estimate Revenue of Mining
- Simulate a rational miner using historical data
Estimating Cost of Mining
Opportunity cost of altcoin mining
= Revenue from doing the same work in mining bitcoins

**Mining Bitcoin**
(bigger market, less volatile)
Compute $N$ hashes
Mined bitcoins; sold at $X$ dollars today
Rational; $X \geq \text{all cost}$

**Mining Altcoin**
(smaller market, more volatile)
Compute same $N$ hashes
Mined altcoins; sold at $Y$ dollars today
Rational; $Y \geq X = \text{Opp Cost}$
Calculating opportunity cost

Opportunity cost of altcoin mining = Revenue from doing the same work in mining bitcoins

Opp cost of mining 1 altcoin

\[
\text{# of hashes to mine 1 altcoin} = \frac{\text{daily } \sum \text{ difficulty}}{\text{daily # coins mined}} \times \text{bitcoin price}
\]
Example of opportunity cost of mining

Total Opp Cost (wrt Litecoin): $61,000
Opp cost correlated with price

Market data

Potential profit

Blockchain data
Estimating Profitability with Simulation
Estimating profit with simulation

Start mining on random day

Invest $1 of opp cost per day

Sell on same day

Continue for some duration, $d$

Obtain total revenue, $v$

Daily rate of return: $d(1 + r)^d = v$

Compute expected rate of return: $E[r]$
<table>
<thead>
<tr>
<th></th>
<th>7 days</th>
<th>30 days</th>
<th>Capital Invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPC</td>
<td>-1.1%</td>
<td>-0.3%</td>
<td>$4.1M</td>
</tr>
<tr>
<td>AUR</td>
<td>0.6%</td>
<td>0.1%</td>
<td>$1.4M</td>
</tr>
<tr>
<td>WBB</td>
<td>6.6%</td>
<td>1.5%</td>
<td>$61.2K</td>
</tr>
<tr>
<td>DOT</td>
<td>18.3%</td>
<td>4.9%</td>
<td>$3.2K</td>
</tr>
</tbody>
</table>
Daily returns for mining a random altcoin

1. Pick a random altcoin from 18 altcoins.
2. Mine the coin on Day 0. Sell by end of day.
3. Mine same coin on Day 1. Sell by end of day.
4. ...
6. Compute expected daily return.
Daily returns for mining a random altcoin
Summary
Summary

Using opp cost to estimate mining cost
Using simulation to estimate profit
Early start correlated with high returns

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