Bancor Opportunities and Better Options

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Introduction to Bancor

- $153m ICO
- Automated Market Maker
  - Determined by two pricing formulas:
    - What the current price is
    - What price you get in transactions
  - Continuous liquidity: You can always trade a token on the network for any other token
- Anyone can integrate the protocol into their ERC20 token
- Tokens must be backed by reserves in Bancor Network Token (BNT)

Reserves - Introduction and Problem

- Deposits held against unexpected events
  - ... such as large net withdrawals or bank runs
- Most central banks in the world have a reserve requirement.
  - 1-10% is common.
- Without reserves, banks can ”run out of money” to cover liabilities
- Bancor has doubly linked reserve ratios - resulting in a real 0.2% reserve rate
- For Bancor, this means reserves WILL NOT COVER a ”bank run” type scenario
  - Such as low volume or the crash of a token... Common with ERC20 tokens

Issues with Bancor - False Guarantees

1. Continuous Liquidity
2. No Spread
3. No Counterparty Risk
4. No Registration Required
5. Backwards Compatibility
6. Predictable Price Slippage

Bancor Prices vs. Real - EOS

Figure: Price Of EOS on Bancor & Cryptocompare

Bancor's Distributed Lag - EOS

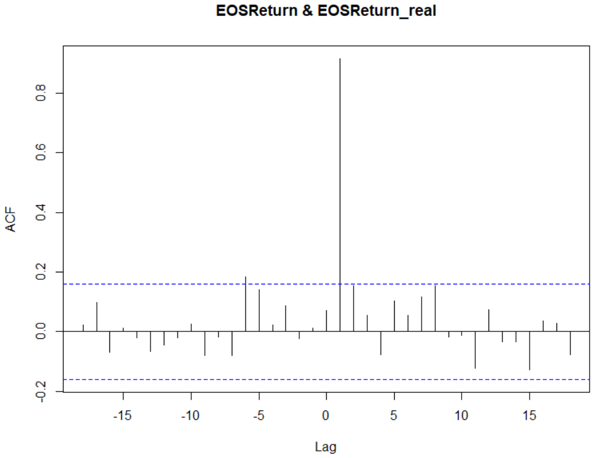

Figure: EOS Lag between Bancor & Cryptocompare

Bancor Prices vs. Real - STORM

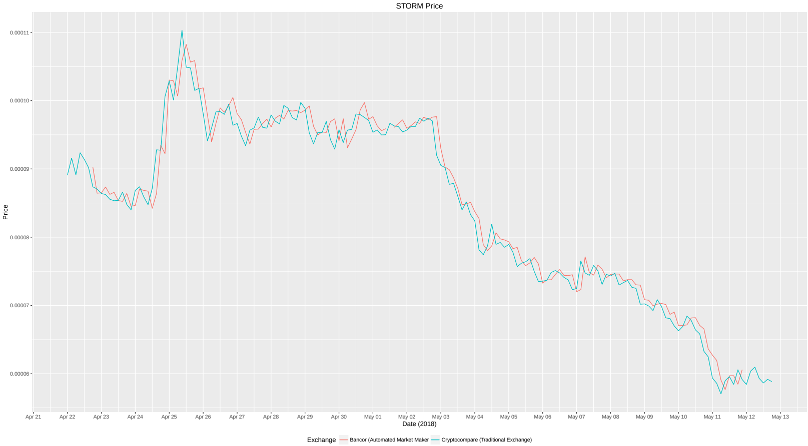

Figure: Price Of STORM on Bancor & Cryptocompare

Bancor's Distributed Lag - STORM

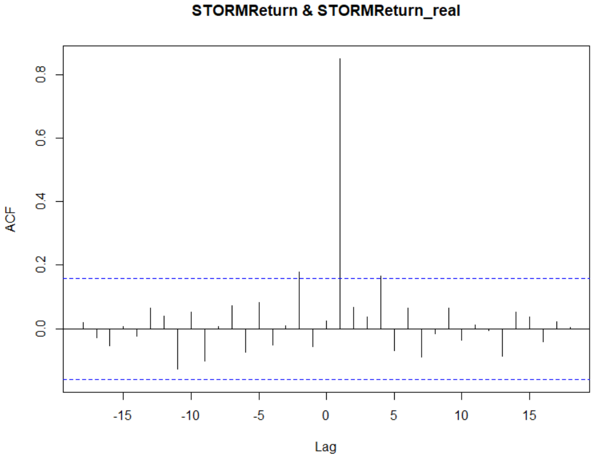

Figure: STORM lag between Bancor & Cryptocompare

Issues with Bancor - Bad Math

1. No Volatility
2. No Price Shocks

Bancor's Main Formulas

- Bancor's formulas are built off of two main assumptions: a constant reserve ratio and static price setting to maintain it.
- Model Variables
  - $R_t =$ reserve at time t of the parent coin (Bancor or ETH)
  - $N_t =$ date t supply of the connected coins (child coins),
  - P_t the date t price of the child coin in terms of the parent coin
  - $F_t = \dfrac{R_t}{S_t P_t}$ be the reserve ratio. In what follows, we impose $F_t = F$, a constant.

Bancor's Main Formulas

- Bancor's AMM makes decisions, at each time t, in isolation from the past or expectations of the future. They proceed as follows.
  - Consider a buyer who wants to purchase T total tokens.
  - Break this order up into infinitesimal pieces and price each piece given it's quantity impact on prices.
  - Then quote a price which is the sum (integral) total of the price of each piece.
- Price is determined by formulating changes in reserves brought about by the infinitesimal purchase in two different ways and equating them
  - **Buyer perspective**: buyer pays $P_t dN_t$ in terms of the parent coin and this amount is added to the reserve of the child coin
  - **Bancor's (AMM's) perspective**: $dR_t = d(FP_tN_t) = Fd(P_tN_t)$
  - It's important to note that the notation d does not mean changes wrt t but instead N.

Bancor Main Formulas

$$
\begin{aligned}
conn\ tokens\ rec &= R_0 \left(\sqrt[F]{\left(1 + \frac{T}{S_0}\right)} - 1 \right) \times \\
&= balance \left(\sqrt[CW]{\left(1 + \frac{tokens\ issued}{supply}\right)} - 1 \right) \equiv E
\end{aligned}
$$

$$
\begin{aligned}
tokens\ issued &= S_0 \left(\left(1 + \frac{E}{R_0}\right)^{F} - 1 \right) \\
&= supply \left(\left(1 + \frac{conn\ tokens\ paid}{balance}\right)^{CW} - 1 \right)
\end{aligned}
$$

Bancor Fixes

- We consider a dynamic stochastic model of prices and supply:

$$\frac{dN_t}{N_t} = \mu_{N,t}dt + \sigma_{N,t}dW_t$$
$$\frac{dP_t}{P_t} = \mu_{P,t}dt + \sigma_{P,t}dW_t \tag{1}$$

- Price is still determined by the equilibrium condition

$$P_t dN_t = Fd(P_t N_t) \tag{2}$$

- We impose the condition that $\sigma_{N,t} = \gamma\sigma_{P,t}$ for some constant γ
- After some stochastic calculus, we get pricing implications that are similar to Bancor's, but with an added term reflecting accumulated volatility.

Bancor Adjusted Formulas

$$conn\ tokens\ rec = R_0 \left(\sqrt[F]{\left(1 + \frac{T}{S_0}\right)} - 1 \right)$$

$$\times \exp\left\{ \frac{1}{2} \int_0^t \sigma_{P,t}^2 \underbrace{\left(1 - 2\gamma - \alpha\gamma^2\right)}_{\eta} dt \right\} \equiv \tilde{E}$$

$$tokens\ issued = S_0 \left(\left(1 + \frac{\tilde{E}}{R_0}\right)^F - 1 \right)$$

- where $\alpha = \frac{1}{F} - 1$
- $\eta > 0$ when $\gamma < \frac{\sqrt{F} - 1}{1 - F}$

BOBO Summary

We managed to:

- Measure and compare Bancor to traditional exchanges
- Identify issues with Bancor's guarantees and pricing
- Create a solution to some of Bancor's pricing issues

In the future:

- Look more into the reserve problem
- Refine pricing solutions & improve or compete with Bancor
- Quantitatively analyze volume and gas to research high fees compared to traditional exchanges
- Gather data required to model our improvements