



POLITECNICO
MILANO 1863

Hayek Money

The Cryptocurrency Price Stability Solution

<http://ssrn.com/abstract=2425270>

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Money As A Social Relation Instrument

1. Human beings are born into a gift economy
2. Enlarged relationship circle requires exchange economy
3. Barter economy: coincidence of wants
4. Trade economy: money as medium of exchange
5. Global information economy: supranational digital money

Trade Economy

From gold standard to fiat money

- Gold: the commodity money standard
 - resistance to corrosion and oxidation
 - high malleability
 - relative easiness of purity assessment
 - Pleasant color
- Gold purity certification
- Representative money
- Fractional receipt money
- *Fiat* money and legal tender

The Global Information Economy



- Data is transferred with zero marginal cost
- Why pay a fee to move bytes representing wealth?
- Why only 9-5, Monday-Friday?
- Who (and when) will gift humanity with a global instantaneous free p2p payment network?



<https://bitcoin.org/en/>

- Decentralized digital currency
- Not backed by any government or organization
- Instantaneous peer-to-peer transactions
- No need for trusted third party
- Cryptographic security
- Low-cost banking for everybody everywhere

<https://bitcoin.org/en/faq>

<http://www.coindesk.com/information/>



- Decentralized: no authority
- Permissionless: no regulator
- Censorship resistant: no frozen funds
- Open-access: no discrimination, no amount limits, 24/7, 365 days
- Free: negligible transaction costs
- Borderless: no geographic limits
- Transnational: no specific jurisdiction applies
- Secure: non falsifiable, non repudiable transactions
- Resilient: nothing has been able to stop it or break it

Friedrich August von Hayek

Denationalisation of Money

- history of coinage is an almost uninterrupted story of debasements; history is largely a history of inflation engineered by governments for their gain
- why government monopoly of the provision of money is regarded as indispensable? It deprived public of the opportunity to discover and use a better reliable money

Blessed will be the day when it will no longer be from the benevolence of the government that we expect good money but from the regard of the banks for their own interest

A Free-Market Monetary System, Gold and Monetary Conference, New Orleans, Nov. 1977, <https://mises.org/daily/3204>
Hayek, F. A., Denationalisation of Money, The Institute of Economic Affairs, <http://www.mises.org/books/denationalisation.pdf>

Permissionless Innovation

Fast and Effective

- No centralized security mechanism, no barrier to enter, no editorial control
 - Email has not been designed by a consortium of postal agencies
 - Internet has not been developed by a consortium of telcos
- Will a decentralized transactional economy be shaped by a consortium of banks?

Explain Money To An Alien

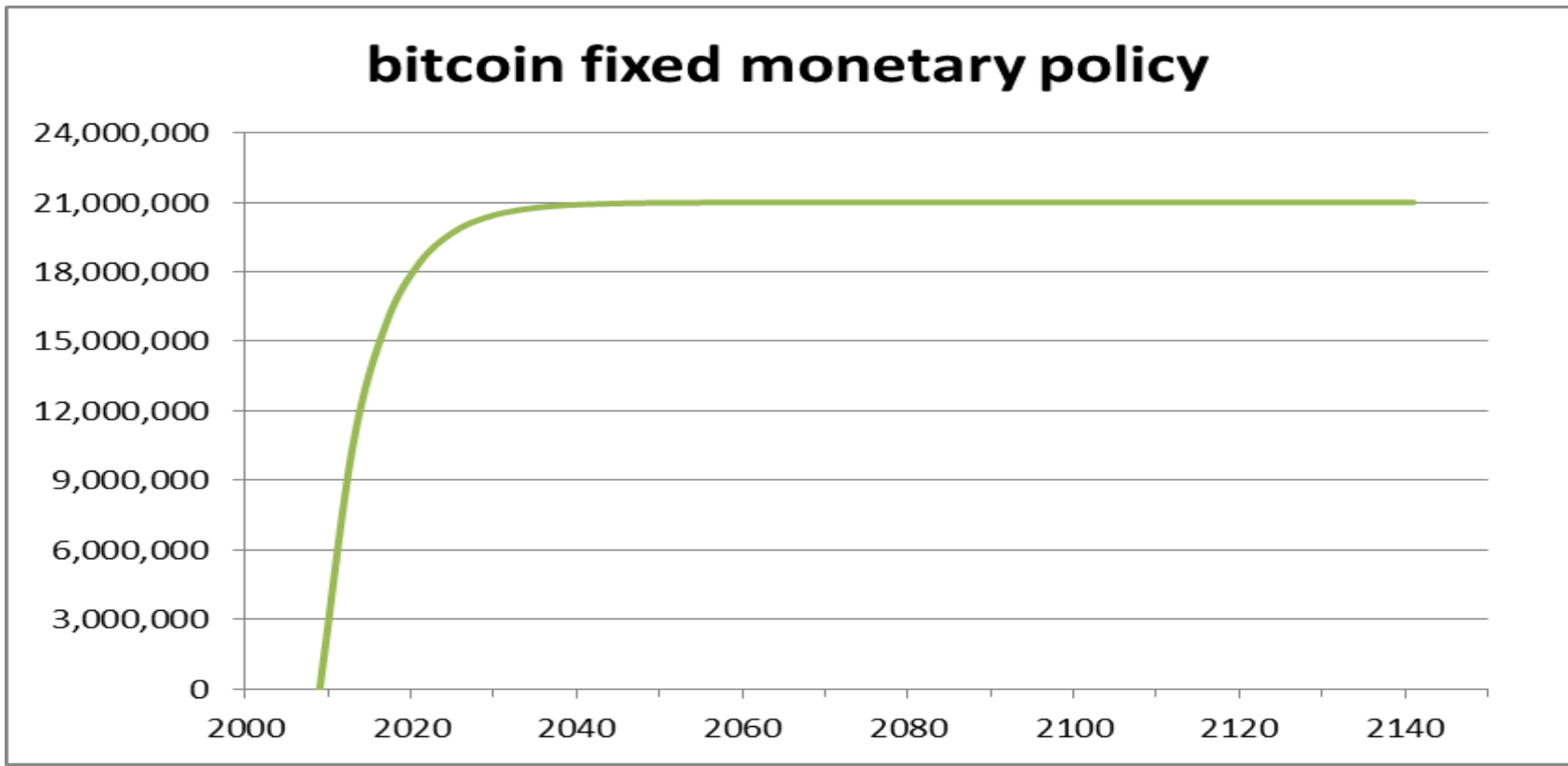
fiat money

- No intrinsic value (legal tender, social contract)
- Currency based on paper/ink security
- Discretionary governance
- Wicksellian interest-rate approach

bitcoin

- No intrinsic value (digital gold)
- Currency based on math/cryptographic security
- Algorithmic governance
- Deterministic supply

Bitcoin **Inelastic** Supply: Deterministic Decreasing Rate



Bitcoin as (Digital) Gold in the History of (Crypto) Money

gold

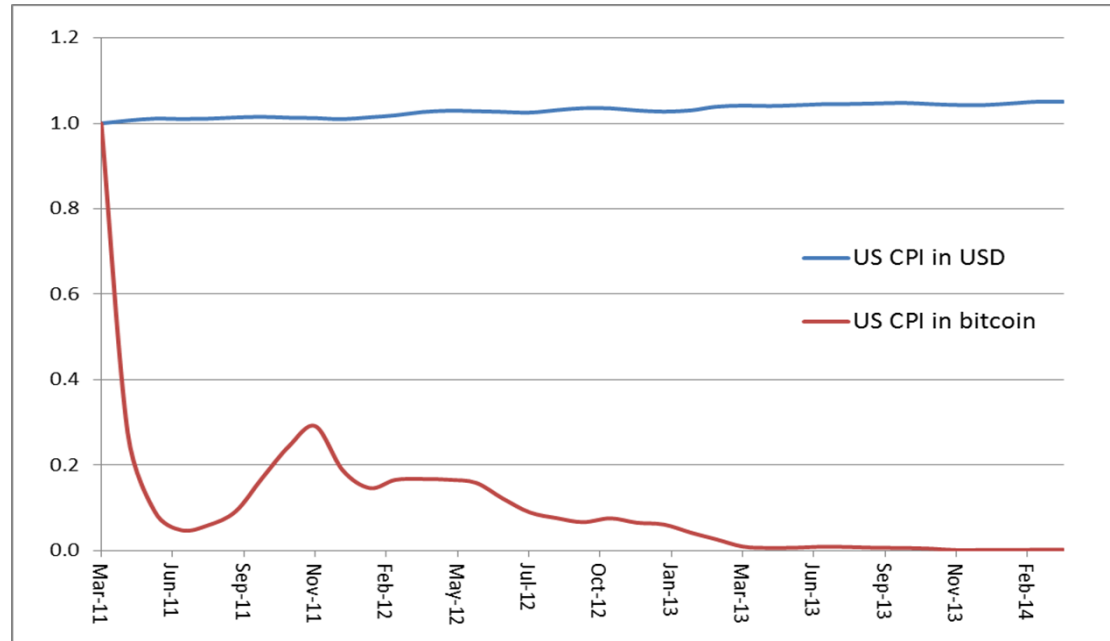
- Its adoption was not centrally planned
- For centuries it has been the most successful form of money
- It has bootstrapped all monetary systems we know of
- It has been surpassed by other kind of money without becoming obsolete

bitcoin

- Its adoption has not been centrally planned
- It is the most successful form of cryptocurrency
- It will bootstrap new monetary systems
- It might be surpassed by more advanced type of cryptocurrencies without becoming obsolete

Statement of the bitcoin problem

- successful at getting rid of a centralized monetary authority, it has given up the flexibility of an elastic supply of money
- no salaries, no mortgages, no stable purchasing power



Money Comparison

	Medium of Exchange	<u>Store</u> of Constant Value	Unit of Account
Live cattle	★	★	★
Diamonds	★	★ ★ ★ ★	★ ★ ★
Gold	★ ★ ★	★ ★ ★ ★	★ ★ ★
<i>Fiat</i> coins and notes	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★ ★
Bitcoin	★ ★ ★ ★ ★	★ ★ ★ ★ 🌀	★ ★

- swappable
- fungible
- portable
- divisible
- recognizable
- resistant to counterfeiting

- reliably saved, stored, and retrieved
- retain usefulness over time
- Maintain its storage properties
- non-perishable or with low preservation cost

- relative worth unit of measure
- stable value for stable price comparison
- supply must be controlled in some way

Unit of Account: Money as numeraire

- Money is the unit of account against which the value of every other good is measured
- The price system measures the value of goods relative to the value of money

Good money should provide stable prices to best perform its role as unit of account

The Holy Grail of Stable Prices

- Gold standard, bimetallism, symmetallism
- Fixed value of bullion (Aneurin Williams 1892)
- Compensated dollar (1911-20 Irving Fisher)
- Commodity Reserve Currency (1932 J. Goudriaan, 1937-44 B. Graham, 1942 F. Graham, 1951 M. Friedman)
- ANCAP basket (1982 Robert Hall)
- Futures contracts (1984 Miles, 1989-95 Sumner)
- Quasi-futures contract (1994 Kevin Dowd)
- Price index option (2000 Kevin Dowd)

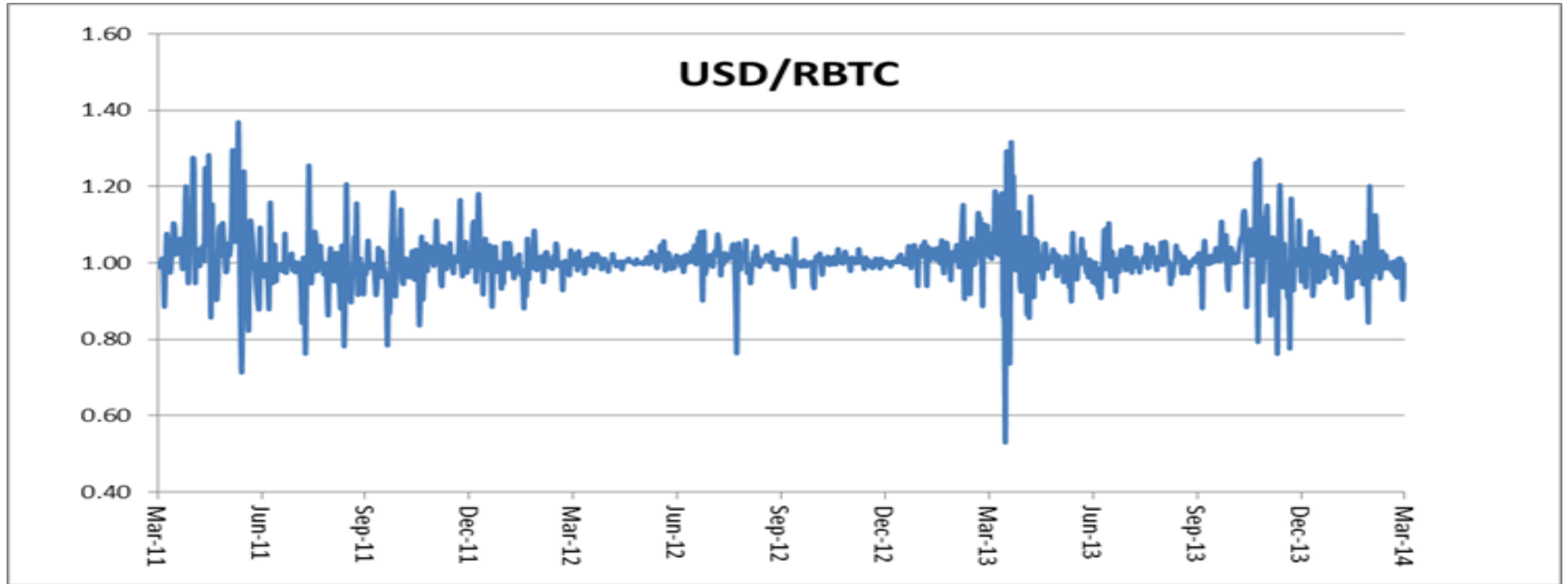
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- The cryptocurrency monetary standard of **elastic non-discretionary** supply
- Price stability paradigm with respect to a reference basket
- Concurrent cryptocurrencies will compete in monetary policy definition and reference basket choices

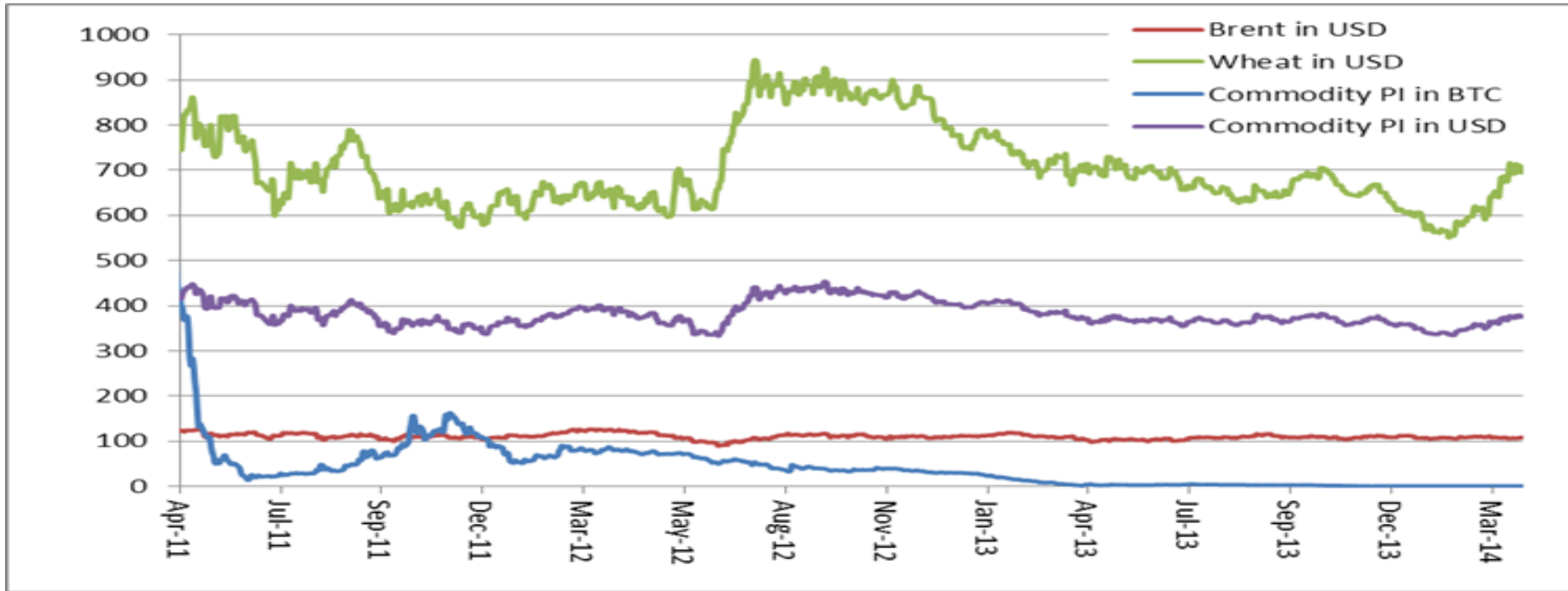
Fixed USD Exchange Rate

- USD/BTC: 15-Apr-11 1.0, 29-Mar-14 500.0
- x500 increase for BTC demand relative to USD
- 29-March-14: 12.5M bitcoins in circulation
- Inflate their number 500 times to 6250M
- On 29-Mar-14 it would have been equivalent
 - to own BTC1 worth \$500
 - or (rebased) RBTC500 each worth \$1

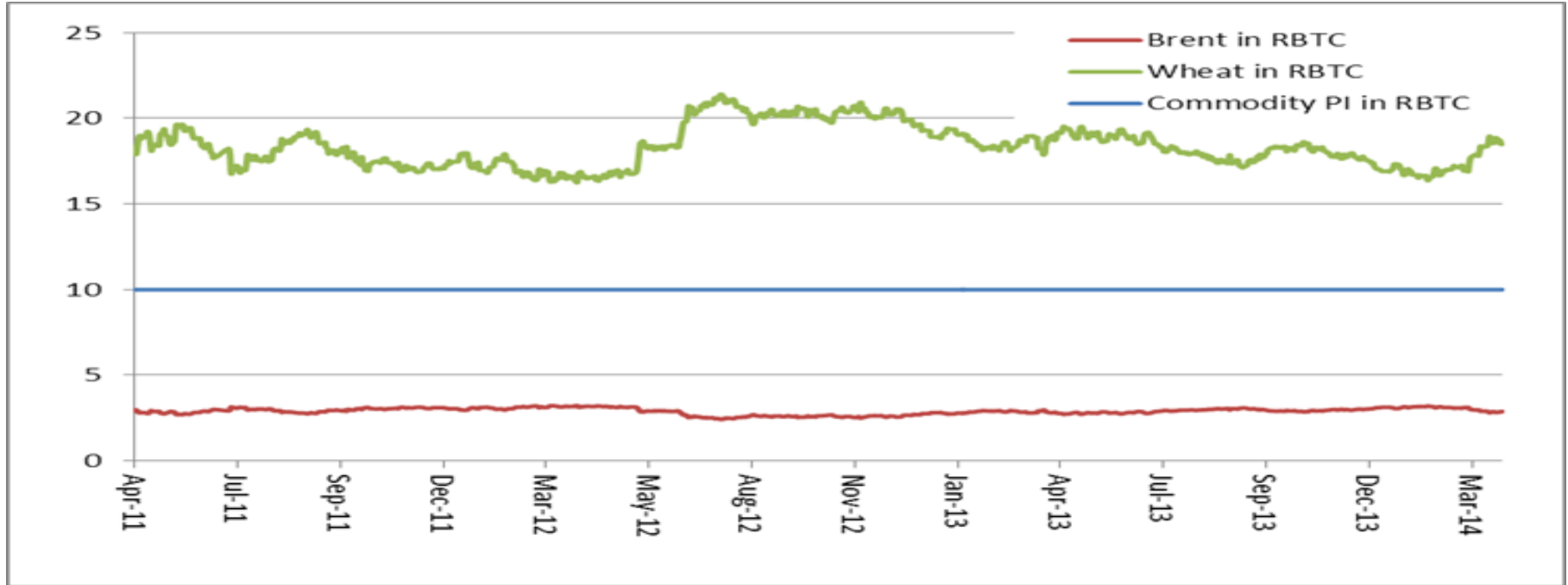
USD-Parity Rebased Bitcoin



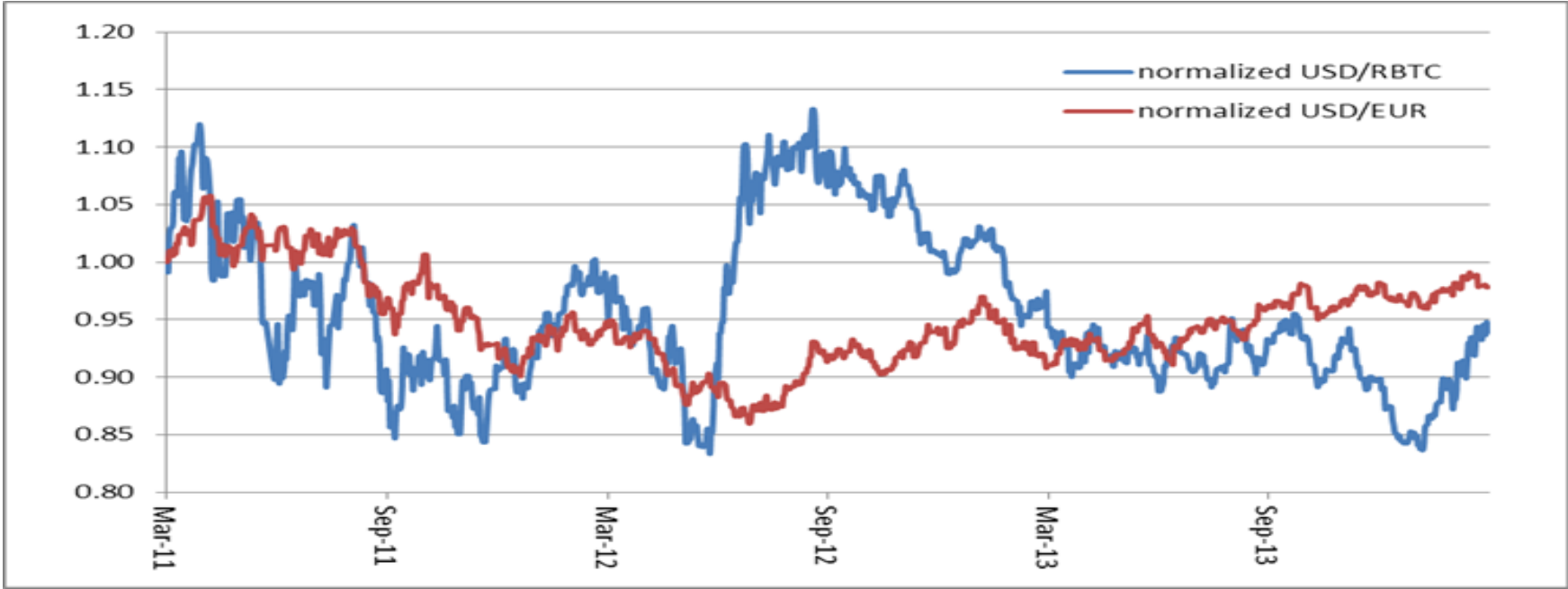
Brent-Wheat Commodity Price Index



Brent-Wheat Commodity Price Index Rebased Bitcoin



Brent-Wheat Commodity Price Index



Rebasing Bitcoin?

No, not really!

- Use bitcoin for the sake of discussion, basically to leverage its historic price series
- Bitcoin is good as it is: more of a cryptocommodity than a cryptocurrency, bitcoin is digital cryptogold

Observation of Commodity Prices

Without A Central Authority

- Miners are the agents of the transaction history consensus algorithm
- Miners can also be the agents of the reference price consensus algorithm
- Shelling points: unbiased market prices are focal prices for the average consensus process



- Miners as (black market) brokers

Commodity Price Index Maintenance

- Commodities' importance changes, traded volume, relative price stability and sensitivity, and competitive markets might suggest Commodity Price Index alterations
- The Commodity Price Index is composed of technically unconstrained numbers
- Nothing could stop the majority of miners from changing the Commodity Price Index definition
- Proof-of-stake is crucial: the prerogative to change the Price Index is not oligopolistic power abuse, but the proper right of the majority to rule about its own money

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This First Simplistic Implementation

- Results:
 - Price stability
 - Salaries, mortgages, forward payments are now possible
- Problems:
 - Number of coins in a wallet changes without direct in/out flows
 - Purchasing power of a given wallet is not stable
 - Miners are in charge of reference basket maintenance
 - ***Coins still have speculative investment appeal and so enjoy limited transaction usage***

Hayek Money

Further Research

- Split *transactional* and *speculative* money demand with two non-fungible assets: coins and shares
 - see Sams (2014) A Note on Cryptocurrency Stabilisation: Seigniorage Shares
<https://github.com/rmsams/stablecoins/blob/master/paper.pdf>
- Leverage bitcoin as reserve asset
 - see Ametrano (2016) Price Stability Using Bitcoin as Reserve Asset
<http://ssrn.com/abstract=2508296>