



# Fedcoin: A Central Bank-Issued Cryptocurrency

Companion Piece

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## Central Bank Digital Currencies

Currently there is interest from central banks to explore the issuance of digital versions of paper currency. JP Koning's fascinating Nov '16 paper "*Fedcoin: A Central Bank-Issued Cryptocurrency*" discusses Central Bank Digital Currencies (CBDCs) as a potential contender for stable electronic money. The paper discusses the implications of CBDCs to banks and society in general, and also touches on some technical and non-technical design considerations of a CBDC.

This companion piece provides the reader with R3's commentary on the subject and is intended to be read alongside JP Koning's full work.

Of interest to R3 and R3's members are some concepts which are explored in detail in the paper:

- 1) The wider population holding a claim on the central bank's balance sheet
- 2) Those assets being digital but retaining some properties of cash
- 3) The possibility of the ledger using distributed ledger technologies

Ideas from the paper are *in italics*, and R3's commentary is in roman.



*The paper acknowledges the utility of a digital asset that replicates the features of banknotes and coins, but the existing example of digital cash, Bitcoin, has a large drawback to adoption, namely the volatility of its value.*

We watch cryptocurrencies with interest as they are fascinating case studies with novel economics. Volatility is just one of the drawbacks of non-fiat digital currencies, with other question marks being around privacy, settlement finality, and legal uncertainty in the case of forks and hacks.

*The paper discusses the popular hope that bitcoin's price swings will be normalised as Bitcoin's ecosystem grows, and that there is a chicken-and-egg situation with adoption and volatility. The fact that Bitcoin's supply is not at all affected by demand also contributes to volatility which lacks the supply-side price volatility feedback loop.*

We are not fully convinced by the argument “adoption will drive stability” – for one, as volatility dampens, exchanges will create increasing leverage for traders who crave price swings, and they will be able to move the price with smaller amounts of capital. Many bitcoin owners say they want price stability (presumably so that adoption increases) but actually they just want the price to go up. What shareholder says “I just want the share price to be stable so the company can get on with their business”?

*The paper describes a couple of examples of pegged cryptocurrencies, like those backed by entities holding matching deposits in a bank account such as Tether, and those such as BitUSD and NuBits which have more elaborate mechanisms, often involving other tokens, to attempt to dampen price volatility.*

Many attempts have been made to create e-money, with price volatility being solved for by having a legal entity 'back' the value of the token with some mechanism. History demonstrates that commercially backed tokens that look and feel like money will have regulatory challenges (if it walks like a duck and quacks like a duck...).

Bitcoin, to some extent, succeeds where other commercially-backed tokens have failed because there is no-one to go after. History is peppered with failed e-money creators who have failed to understand that governments prefer their money-creators to be licensed and regulated due to their importance in the economy.

*The paper then presents historical examples of pegged currencies failing.*

What's the difference between a pegged cryptocurrency and a central bank backed digital currency? If Bitcoin or another cryptocurrency were to be pegged by a central bank, the central bank would be the bid and offer of last resort – that is they promise to buy or sell unlimited



quantities at a certain price point (eg \$1 = 1 Token). This has challenges if the market forces push the Token's value higher and the central bank has none left to sell, or if market forces push the Token's value lower and the central bank can't afford to keep buying a potentially worthless asset.

*The paper considers a flexibly-supplied Fedcoin that can be created and destroyed at will by the central bank?*

The seems to be a 'better' answer than a pegged cryptocurrency, and a central bank could offer to exchange them for existing currency, eg banknotes. The Fedcoin would sit on the central bank's balance sheet and cannabalise (partially replace) outstanding currency liabilities, but with the intriguing possibility to be interest bearing.

*The paper discusses the concept of allowing the public access to a central bank's balance sheet. Currently the only channel for this is via banknotes and coins (deposits are liabilities against commercial banks; not direct liabilities against the central bank whereas banknotes and coins are directly backed by the central bank).*

*The concept of a so-called Fedcoin where the general population can have assets directly issued by the government has precedent, including the postal savings banking systems in the 19<sup>th</sup> and 20<sup>th</sup> centuries.*

*The main question is – who should provide the public with a “medium of exchange”: The government, or the private sector?*

*Cash has some properties that the paper explores:*

- 1) Privacy (the buyer doesn't need to supply his identity), and the limited ability to trace payments more than one degree 'back'. This is useful for criminal activity, but positively also shields consumers from malicious merchants who can clone digital information like credit card details. Legal secrets such as gifts to family are also better facilitated using identity-less and non-recorded payment mechanisms.*
- 2) Censorship resistance (the resistance to a third party from preventing a transaction from taking place)*
- 3) Cash works where digital infrastructure has not yet permeated or has been temporarily disabled*
- 4) Cash does not bear positive or negative interest*
- 5) Cash carries less credit risk than a bank deposit*



Much has been written on the advantages and disadvantages of cash vs electronic forms of money. At R3 we believe that technology does not exist in a vacuum, and there is a moral obligation to consider the societal impacts of decisions we are making today.

*Two choices for the issuance of non-tangible money are explored in detail:*

- 1) *Limitations on private issuance, for example:*
  - a. *Full reserve banking which means deposits are 100% backed by central bank money*
  - b. *The creation of a CBDC which would compete with commercial bank deposits. Five different models (three theoretical, two historical) are explored and are well worth a read.*
- 2) *A cashless world*
  - a. *There is a case for the abolition of cash – namely that it facilitates welfare-reducing criminal activity.*
  - b. *Without cash, deeply negative interest rates might be able to be implemented*

Irrespective of the issuance model, there seems to be a role and a need for CBDCs.

*Finally, the paper discusses design questions about a potential Fedcoin, all of which are relevant to the CBDC debate:*

*The distribution model: How can the public get its hands on Fedcoin?*

Distribution probably shouldn't be the central bank's responsibility; partners would need to be involved and compensated or regulated into compliance.

*The trade-offs between permissioned and permissionless blockchains*

A CBDC would probably want to be run on a permissioned network to allow prudent governance, service-level commitments, scalability, and settlement finality.

*How about interest?*

One of the benefits to central banks may be the ability to set interest rates on CBDCs as a second lever on the economy (the first being the base rate on reserves). As electronic interest rates can fall below zero, consumers might not regard that as a benefit.

*Anonymity and Censorship resistance*

Different technologies can be implemented to create ledgers with different degrees of anonymity or pseudonymity. The interesting thought experiment is that as soon as transaction censorship is possible, it can and will be used as a control mechanism, for example freezing the



bank accounts of terrorists. However control mechanisms necessarily mean transaction and identity monitoring, and this necessarily means additional costs. So you can't have an anonymous or pseudonymous system unless it is censorship resistant by design.

#### *Deposit limits and rationed anonymity*

While there is only a physical limit to how much cash you can stuff under a mattress, theoretically, you can set any arbitrary limit on an electronic wallet. There is the intriguing possibility for people to have small amounts of CBDC in wallets. However the problem of "one person one wallet" can only be solved when identity is brought into the fold. This is tricky in a pseudonymous paradigm. Perhaps there is room for a service where each individual could get the ability to open one account from a third party, but the account number is never directly linked to the person?

#### *Why distributed ledgers?*

The article sets out the argument that the more cashlike the digital currency should be, the stronger the arguments for implementing a decentralised solution. We believe that experimenting is the best way of testing hypotheses.

Chaumian e-cash is an interesting solution to peer-to-peer transaction anonymity, while giving the issuer sight into where value is moving, as accounts need to be opened with the issuer for redemption.

#### *Settlement finality and the notion of an authoritative record of ownership relates to the concept of a guarantee that an asset has switched hands.*

On a permissionless blockchain, this guarantee is probabilistic, ie there's a high chance this money is now yours (but a non-zero chance that the payment ends up having never happened in the first place). Is this acceptable? This uncertainty needs to be considered when determining the most suitable technology for a digital cash.

#### *Undoing Fedcoin*

It is important to consider having the ability to hit an undo button to roll back some unforeseen circumstances, and how easy this is to do. With a change as large as this, deep consideration must be given to rollback and compensation procedures.



## **Conclusion**

To conclude, JP's paper is a fascinating read on the theory and practicalities of a central bank issued digital currency, based on facts and historical parallels. Anyone with an interest in the issuance of digital currencies and their impact to society should enjoy reading this paper.

We are all learning, researching, and experimenting – and our viewpoints are evolving as we make new discoveries. This is what makes this such a fascinating topic.

We are at a critical stage in the transition from physical to digital. There is nothing more important than the transaction system that underpins society – money.