



ARC RESERVE CURRENCY

## OVERVIEW OF MONEY AND CURRENCY

National currencies and digital currencies have limitations as *stores of value* and *units of measure* – two of the key elements of a desirable currency. National currencies are hamstrung by socio-economic factors. Digital currencies face challenges from speculation and volatility.

ARC Reserve Currency (“ARC”) is a digital currency with the primary purpose of acting as an effective *store of value* and *unit of measure*: stable in real terms, appreciating in nominal terms.

The paper explores the limitations of national currencies and digital currencies and introduces some of the potential benefits of ARC.

**Note:** *this is one of a series of papers that describe the nature and purpose of the ARC Reserve Currency. Please see [www.arccy.org](http://www.arccy.org) for further details, including the rationale for ARC.*

ARC is a work in progress. Please contact us at [hello@arccy.org](mailto:hello@arccy.org) for comment and suggestions.

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# 1 Overview of Money and Currency

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*The increased stability and predictability of a successful private currency will create efficiencies that will release human capital currently devoted to arbitraging the instability of government monopoly currency. - Forbes<sup>1</sup>*

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Before we consider the differences and relative merits of national currencies and digital currencies, it is helpful to understand the characteristics of money and currency.

There are three accepted measures that define money<sup>2</sup>:

1. **Medium of exchange** – for transacting goods and services, solving ‘double Coincidence of wants’ problem.
2. **Store of value** – retains purchasing power into the future.
3. **Unit of account** – a yardstick; the unit in which goods and services are priced.

*“While the terms money and currency are often used synonymously it can be useful to distinguish one from the other”<sup>3,4</sup>. Economists disagree over the most important aspect of money, but tend to agree that all three features noted above should be present. Currency, by contrast, may only exhibit one or more of these features, “although some currencies like to US dollar, [may] perform all three functions of money.” For these reasons, “while all money is currency, not all currency is money.”<sup>5</sup>*

## 1.1.1.1 Medium of Exchange (transferability)

Transferability means that the currency is easy to pass from one holder to another, and addresses the double-spend problem: it can only be used for a single transaction (purposes) at a time – you can’t use the same \$10 note to pay for two different items valued at \$10 each at the same time.

## 1.1.1.2 Store of Value

It is worth noting that “a precise and generally agreed upon definition of what constitutes a ‘store of value’ does not exist” amongst economists. A good definition is:

**A successful store of value must enable the capital owner to expect that their capital (held in the store of value) will retain its value over any period of time (short or long) in real terms (i.e. including inflation).**

As a corollary, volatility and over-speculation are just as unappealing as loss of value for a successful store of value. We note that volatility may be attractive for liquidity and adoption in the short-term. However, we are taking a longer-term view and are seeking to foster adoption through stability and consistency.

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<sup>1</sup> <https://www.forbes.com/sites/realspin/2012/08/23/private-currency-competition-is-the-monetary-answer/#7ceb7a615aac>

<sup>2</sup> Ibid

<sup>3</sup> Ibid

<sup>4</sup> For a detailed discussion of modern money and currency see (Bernstein, 1965, Ch. 4-5)

<sup>5</sup> ‘Alternative Currencies: A Historical Survey and Taxonomy’ – Dr Garrick Hileman, p 19-20.

### *1.1.1.3 Unit of Account*

A currency which is able to demonstrate lower volatility relative to other currencies, as well as avoid material shifts in value (either up or down) will serve as a meaningful Unit of Account. This will enable users to be able to expect to pay a similar amount for the same good and services from one day to the next.

## 2 A Critique of Currencies

### 2.1 National Currencies: Summary

National currencies and digital currencies generally satisfy *transferability*.

However, they have limitations as *stores of value* and *units of measure* – two of the key elements of a desirable currency. National currencies are hamstrung by socio-economic factors. Digital currencies face challenges from speculation and volatility.

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*With regards to bitcoin not being backed by governments or gold, sceptics often overlook that a large majority of the world does not have a reliable, stable currency.*<sup>6</sup> - Dr Garrick Hileman

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### 2.2 National Currencies: The Theory

For thousands of years, gold was the currency of the land, and many of gold's qualities have allowed it to stand the test of time. As civilization developed and industrialized, ruling bodies learned that printing a government's own currency, called fiat, was a more convenient and easier method of distributing wealth in society. However, government-backed money has not stood the test of time; the average life of fiat currency is only 27 years<sup>7</sup> (and perhaps shorter if you take into consideration currency regime changes e.g. death of Bretton Woods).

*"The value of fiat currency is not determined by the material it is made of, rather it is the economic laws of supply and demand that dictate its value"*<sup>8</sup>. Notwithstanding that National currencies may meet all the criteria to be a successful form of money over the short run, it is socio-economic factors which tend to undermine a currency's ability to continue to meet all three objectives that define a successful form of money over time.

National currencies (government currencies) are subject to *"economic sentiment concerns"*<sup>9</sup>- the vagaries of the government and banking institutions that run those countries, such as quantitative easing (e.g. US) and capital controls (e.g. China), inflation (e.g. Zimbabwe), employment levels, growth and high national debt levels. These concerns arise from inconsistencies in governing policies and philosophies, which may not be in the best interests of the holders of each country's currency. These actions tend to undermine the success of National currencies.

There are seven main socio-economic factors that undermine National currencies (and drive demand for digital currencies)<sup>10</sup>. For illustration, we've selected three of these factors, each of which has historical precedent, to highlight some of the challenges:

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<sup>6</sup> 'Alternative Currencies: A Historical Survey and Taxonomy' – Dr Garrick Hileman.

<sup>7</sup> Bitcoin: A 21<sup>st</sup> Century Currency Explained by a Wall Street Veteran, Jason Leibowitz  
<https://www.coindesk.com/bitcoin-explained-global-currency-wall-street-veteran/>.

<sup>8</sup> *ibid*

<sup>9</sup> 'Alternative Currencies: A Historical Survey and Taxonomy' – Dr. Garrick Hileman.

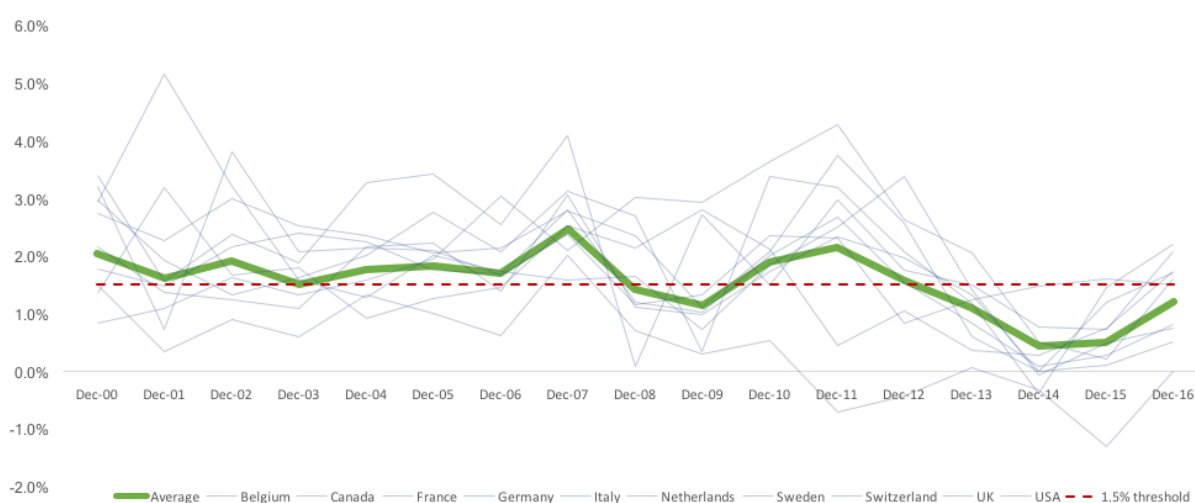
<sup>10</sup> P29-31

- **Economic sentiment:** e.g. quantitative easing, inflation
- **Inefficiencies:** e.g. slow and expensive financial system; inaccessibility
- **Financial repression:** e.g. growing use of capital controls (e.g. Eurozone, Argentina, China etc.)

These are further pronounced if the local currency is subject to inflationary or political challenges. The reasons for *high inflation rates are complicated and they vary from country to country*, [and may include some of the socio-economic factors noted above] *but a common theme is that these rates are only found in government-backed fiat currencies.*<sup>11</sup>

*“As a barometer of healthy money, the world’s best economies have average annual inflation rates below 1.5%. In economic terms, low to zero inflation is a sign of healthy money because the value of the currency does not fluctuate significantly and is therefore reliable”*<sup>12</sup>. Yet most of the G10 currencies struggle to keep inflation below 1.5% at all times:

**Figure 1: Inflation for G10 countries: 2000-2017**



As a consequence, governments tend to adopt inflation management approaches to setting base rates, a priori, national currencies are poor stores of value as they are not long-run appreciating assets in real terms.

## 2.2.1 National Currencies: The Evidence

### 2.2.1.1 Medium of Exchange (transferability)

National currencies tend to serve as a good methodology to exchange money. There are transaction costs involved with moving money – for example from one bank to another – but nonetheless, national currencies are preferable to almost every other commodity to transfer wealth (possibly excluding digital currencies).

Therefore, national currencies generally satisfy *transferability*. But there is evidence<sup>13</sup> to demonstrate that national currencies can reintroduce some friction when conducting digital transactions through the blockchain – for example, transferring to and from a digital exchange to a traditional bank.

<sup>11</sup> Bitcoin: A 21st Century Currency Explained by a Wall Street Veteran, Jason Leibowitz <https://www.coindesk.com/bitcoin-explained-global-currency-wall-street-veteran/>

<sup>12</sup> Bitcoin: A 21st Century Currency Explained by a Wall Street Veteran, Jason Leibowitz <https://www.coindesk.com/bitcoin-explained-global-currency-wall-street-veteran/>

<sup>13</sup> Consider the existence and relative success of Tether (USDT) as an indicator that USD has limitations when interacting with other digital currencies, likely arising from fiat currency banking practices and ecosystems.

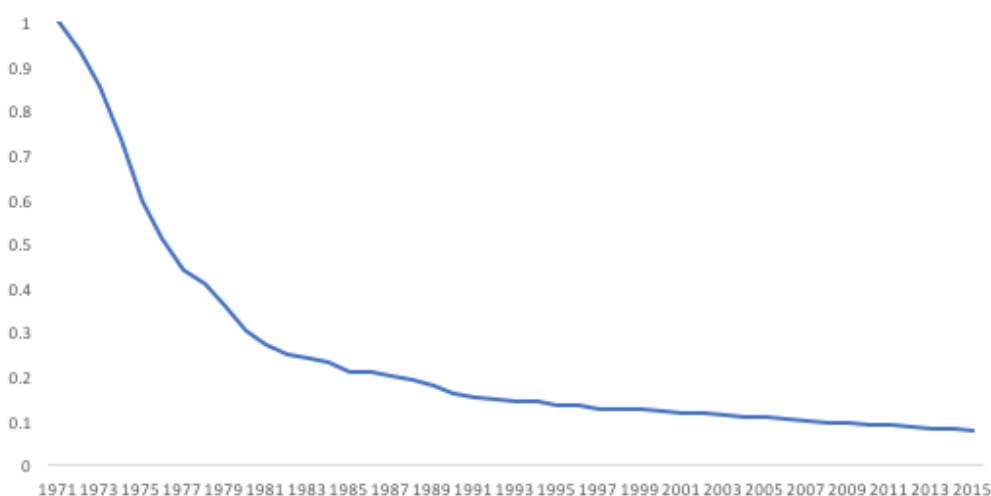
### 2.2.1.2 Unit of Measure

National currencies can also serve as good *units of measure*, particularly over the short term and when compared to the existing set of digital currencies.

For example, the price of a McDonalds burger is reasonably consistent from year to year, when expressed in most developed country national currencies e.g. USD. Although the currencies of countries with higher inflation tend to not act as good units of measure. For example, Zimbabwe in the 1990s and 2000s.

However, over the longer term it can be seen that developed country currencies may not be such good *units of measure*, as inflation plays a bigger role. For example, consider the buying power of £1 over the last 30 years which has fallen significantly<sup>14</sup>:

**Figure 2: Buying power of one British pound compared to 1971 GBP**



### 2.2.1.3 Store of Value

From January 1999 until December 2016, the average foreign currency return has been about zero (-0.26%), but the volatility has been 6.50%<sup>15</sup>. The limitation of this return-risk trade-off is self-evident.

Looking at individual currencies in turn doesn't present a better outcome. Many view the US dollar as the go-to global currency. Not least because many global commodities, such as oil, are priced in US dollars – a consequence following on from Bretton Woods. However, the data show that the US dollar has limitations: *“the significant decline in the U.S. dollar’s purchasing power over time due to inflation makes it a poor store of value”*.<sup>16</sup>

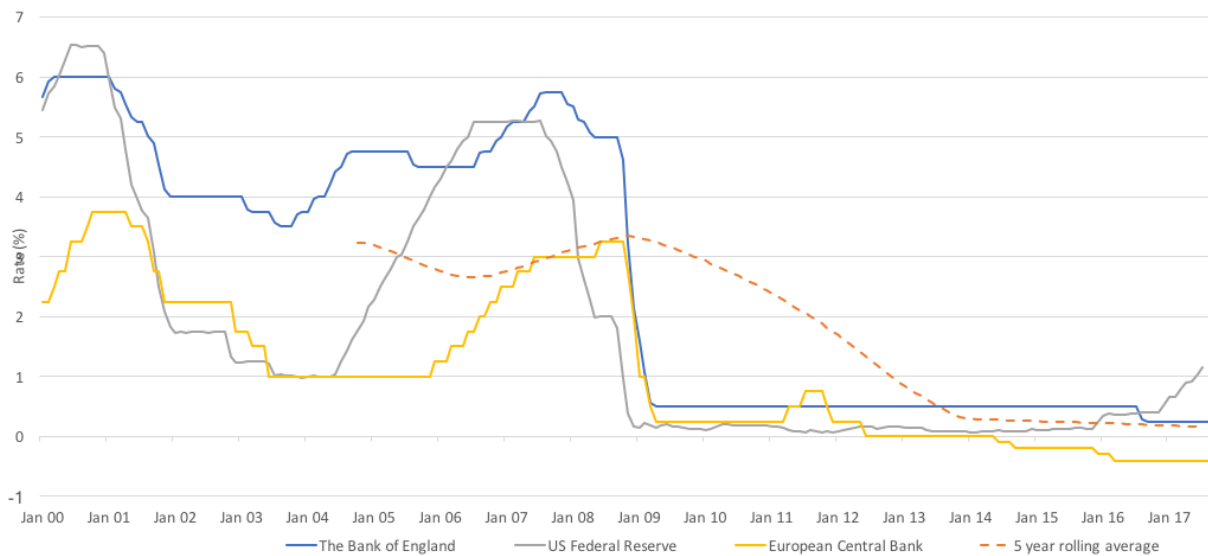
In recent times, most Governments across the developed world have undertaken periods of quantitative easing – printing money and issuing government debt to support their weakening economies. These weak economies, allied with quantitative easing, has put pressure on keeping base rates low – the rates that government and central bank offer their currency holders – to seek to stimulate growth, and to enable governments to finance the cost of their debt mountains. These base-rates are unlikely to rise materially for the foreseeable future:

<sup>14</sup> [https://en.m.wikipedia.org/wiki/Pound\\_sterling](https://en.m.wikipedia.org/wiki/Pound_sterling)

<sup>15</sup> Foreign Currency Hedging: Passive, Active or Do Nothing, BNP Paribas, 11 April 2017 (<http://institutional.bnpparibas-am.com/foreign-currency-hedging-passive-active-nothing/#acceptLicense>)

<sup>16</sup> 'Alternative Currencies: A Historical Survey and Taxonomy' – Dr. Garrick Hileman.

Figure 3: Central Bank Policy Rates<sup>17</sup>



Low interest rates lead to a relative devaluation of a currency. However, as most economies were in a similar position – no single currency clearly benefitted from the shift of currency speculators capital.

Therefore, national currencies have demonstrated that they are poor stores of value (of course, many economists argue this is desirable for society as a whole) and this trend is likely to continue for the foreseeable future, with many national currencies not expected to appreciate in value (or hold their value in real terms) over the coming years.

<sup>17</sup> Source for base rate data: GBP: <http://www.bankofengland.co.uk/boeapps/iadb/Repo.asp>; USD: <https://fred.stlouisfed.org/series/FEDFUNDS>; EUR: <https://sdw.ecb.europa.eu/>



## 2.3 Digital Currencies

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*One of the main problems cited about cryptocurrency is the fact that it's volatile; although many users and merchants may want the security and convenience of dealing with cryptographic assets, they may not wish to face the prospect of losing 23% of the value of their funds in a single day. – Vitalik Buterin*

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### 2.3.1 Blockchain and Bitcoin – an Introduction

Before we consider digital currencies, we will introduce its underlying framework –the blockchain and its synonymous currency: Bitcoin. There are many helpful primers introducing the concepts of blockchain and Bitcoin, we do not intend to create another appraisal here. For those interested, please refer to the footnotes in this section for helpful guides and further reading in the Appendix to this white paper. As a concise overview:

- Blockchain technology is able to serve as a tool for achieving and maintaining the integrity in purely distributed peer-to-peer systems, for example a distributed ledger<sup>18</sup>.
- Blockchains are “records, or ledgers of electronic transactions...which are maintained by a shared or ‘distributed’ network of participants... [facilitated by] the extensive use of cryptography.”<sup>19</sup> The benefit of this structure is that a blockchain is immutable, and can be read by everyone.
- These peer-to-peer systems can facilitate disintermediation which can change the shape of entire industries that currently rely upon a centralised ledger (as an example of peer-to-peer disruption, consider how Napster utilised the internet and a peer-to-peer network to disrupt the music industry).
- Bitcoin is [an application built on the blockchain] that is a digital currency that uniquely allows users to transact without the need for a middleman or central authority (Leibowitz)
- Currencies and tokens, with different use-cases to Bitcoin can be created utilising the same underlying technology and principles of blockchain.

### 2.3.2 Digital Currencies and Their Suitability as a Stablecoin

Digital currencies such as Bitcoin and Ethereum are increasingly successful in their adoption, but, as a currency they are a victim of their own speculation: their prices have risen significantly as supply of coin is through simple and deterministic coin growth<sup>20</sup>, resulting in a high degree of volatility. The corollary of which is that they are increasingly weak as a *store of value* or *unit of measure*.

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<sup>18</sup>“Blockchain Basics”, Dr. Daniel Drescher, p24.

<sup>19</sup> “The Distributed Ledger Technology Applied to Securities Markets”, 7 February 2017, ESMA, page 4.

<sup>20</sup>“A Note on Cryptocurrency Stabilisation: Seigniorage Shares”, Robert Sams 2014.

### 2.3.2.1 Medium of Exchange (transferability)

Digital currencies generally satisfy *transferability*, and it can be argued, that any digital currency with a meaningful volume of users has the potential to become better at transferability than most national currencies.

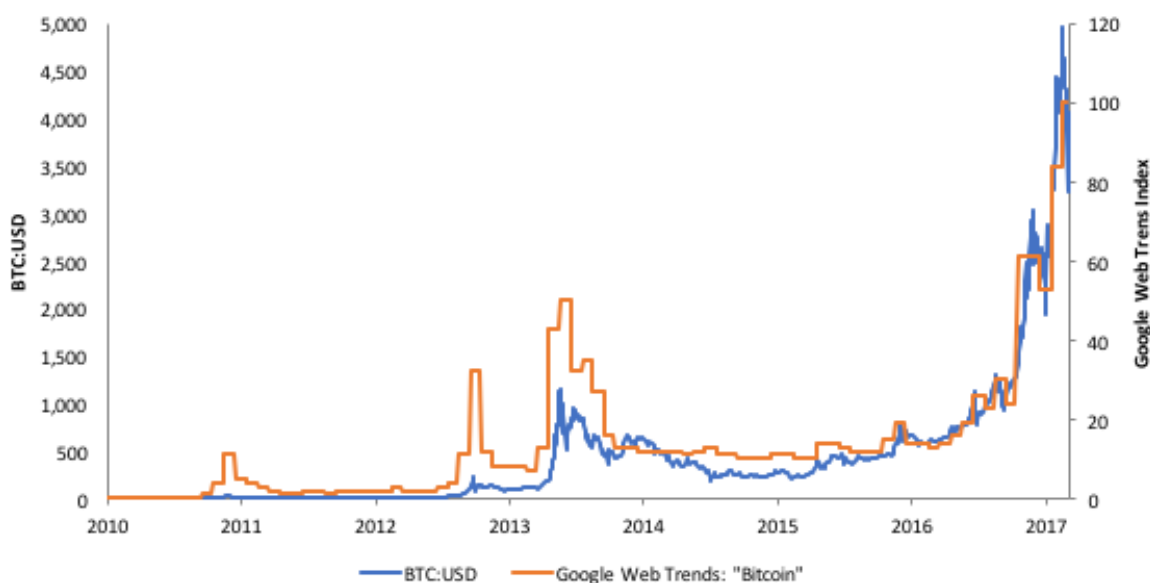
### 2.3.2.2 Unit of Measure

Digital Currencies - including Bitcoin as the original and best known crypto-currency – are typically limited in supply and their valuations tend to be sentiment driven rather than fundamentals driven – often viewed as the indicator of success for blockchain as a movement or a specific underlying project, rather than its intrinsic value as a currency.

For example, there is an impressive correlation between the value of Bitcoin (BTC) (expressed in USD) and the volume of Google searches for “Bitcoin”, suggesting that the value of BTC is driven (or correlated to) speculation.

We must be careful with respect to drawing conclusions about correlations in multivariate analysis, but anecdotally this chart seems to provide some evidence that BTC is subject to speculative price rises and falls:

**Figure 4: Comparing BTC:USD and the volume of Google searches for “Bitcoin”**



*“Bitcoin faces many challenges, one of which is the volatility of its exchange rate against national currencies like the U.S. dollar. It is unlikely that many people feel comfortable holding such a volatile store of value for certain uses, such as for monthly rent or other similarly important payments. Unless bitcoin’s volatility stabilizes it is unlikely that it will ever become a widely used unit of account” or a store of value.*<sup>21</sup>

One of the first transactions of BTC was on 22 May 2010 when Laszlo Hanyecz purchased two pizzas for 10,000 BTC. In 2017 the equivalent value of 10,000 BTC has been as high as \$59M<sup>22</sup>. Rapid appreciation in value is as undesirable as underappreciation, as it undermines the currency’s ability to serve as an effective unit of measure – and can lead to similar stagnation effects during periods of deflation (e.g. Japan in 1990s-2000s).

<sup>21</sup> ‘Alternative Currencies: A Historical Survey and Taxonomy’ – Dr Garrick Hileman.

<sup>22</sup> Bitcoin exchange rate on 22 October 2017.

If we consider a hypothetical digital project – which started in September 2015 and over the next two years grows from an intrinsic value of 100 to 200. Many would consider this a success. However, when priced relative to BTC it would show the project slumping from 1.0BTC at launch to 0.12 BTC today, hardly are representative unit of measure for that project:

**Figure 5: A successful digital project priced in BTC**



### 2.3.2.3 Store of Value

Despite the limitations of digital currencies as a Unit of Measure, many investors are already allocating funds into Bitcoin and other crypto-currencies as a hedge to domestic and global instabilities.

However, Bitcoin demonstrates high volatility – it is approximately 16 times more volatile than the USD or EUR.<sup>23</sup> A 32% movement in BTC (up or down) is as likely as a 2% movement in USD over an equivalent time period.

The combination of wide-ranging return expectations and volatility in every digital currency to date, makes them poor as a stable store of value.

### 2.3.3 Other Attempts to Create a Stable Digital Currency (Stablecoin)

Others have recognised the limitations of Bitcoin as a currency, and sought to address some or all of these limitations. But each effort falls short (with respect, and in our opinion) in one of more aspects when considering what constitutes a successful currency. The common issues with each attempt are one or more of the following<sup>24</sup>:

- focus on stability (either in absolute terms or relative to the USD) and do not address the importance of stability in real terms (appreciation in nominal terms) over the long term;
- friction in issuing new coins when scaling:

<sup>23</sup> Source: Bloomberg. USD vs. a trade-weighted basket is 5.7%, USDEUR has a daily volatility of 7.4%; whereas BTCUSD is 89% and BTCEUR is 90% (data as at 4 September 2017).

<sup>24</sup> Our analysis published in this white paper isn't exhaustive. We respect the efforts made by other teams in seeking to solve the stablecoin problem, and do not intend to pick holes or highlight flaws that those teams may be working on in the background. The purpose of ARC is to introduce a strong, stablecoin proposition to enable the blockchain ecosystem to make another step forward.

- coins issuances aren't instantaneous to match demand;
- supply is limited,
- there is possible dilution in value-per-coin with each subsequent coin issue; and
- may be subject to regulatory constraints

There are two different types of approach to creating stablecoins when considering how *value* is determined per coin:

- **Scarcity-value approaches:** limitations are imposed which makes coins limited in supply or scarce, to establish some scarcity value.
- **Intrinsic-value approaches:** the currency has some association with an underlying asset (e.g. USD) or pool of assets, to give the coin holders confidence over the value per coin.

### 2.3.3.1 Scarcity-Value Approaches

We have not seen any attempts based on scarcity value approaches which are sufficiently well progressed (i.e. close to launch, or launched) to warrant critiquing.

Three of the main concerns that appear as yet unresolved in these attempts:

- Instantaneous and non-dilutive issuance of new coins to match supply (or destruction to match lack of supply);
- Governance and centralisation concerns: addressing the “51% problem” or concerns over the issuing of coins at a discount to related and affiliated parties of the currency creator(s) for their own benefit; and
- Implicit (or explicit) reliance on the efficient market hypothesis (and perfect information assumptions) as well as immediate and friction-free adoption for the currency itself – it remains to be seen how these currencies can cope in a practical context.

### 2.3.3.2 Intrinsic-Value Approaches (e.g. asset-backed)

“Up until now, the most commonly proposed solution has been issuer-backed assets; the idea is that an issuer creates a sub-currency in which they have the right to issue and revoke units, and provide one unit of the currency to anyone who provides them (offline) with one unit of a specified underlying asset (e.g. gold, USD). The issuer then promises to provide one unit of the underlying asset to anyone who sends back one unit of the crypto-asset. This mechanism allows any non-cryptographic asset to be “uplifted” into a cryptographic asset, provided that the issuer can be trusted.”<sup>25</sup>

Numerous practical challenges are thrown up by the fact that the “most commonly proposed solution” described in the Ethereum white paper requires a direct link and potential for exchange between the digital currency (crypto-asset) and an underlying (offline) asset.

For example, the holders and issuer of the currency must be prepared ultimately to exchange the currency for the offline asset which may itself be subject to periods of high volatility (e.g. gold and

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<sup>25</sup>[http://www.the-blockchain.com/docs/Ethereum\\_white\\_paper-a\\_next\\_generation\\_smart\\_contract\\_and\\_decentralized\\_application\\_platform-vitalik-buterin.pdf](http://www.the-blockchain.com/docs/Ethereum_white_paper-a_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf) pp 20-21.

other commodities<sup>26</sup>), loss, destruction or misappropriation; and/or the issuer/custodian may no longer be in business.

Regulations concerning the currency (such as being defined as a security), the commodity or the method for exchanging them (such as anti-money laundering controls) may also impact the ability for the holder to redeem the crypto-asset against the offline asset. Ironically, such risks associated with the method intended to remove volatility themselves tend to undermine the stability of the crypto-asset.

The common approach to intrinsic-value stablecoins have been a one-to-one peg to an underlying asset (e.g. gold, USD or digital assets).

The best known Stablecoin which is active is Tether (USDT). Tether is a one-to-one peg to the USD. This will perform, at best, as well as the USD – however, because of non-zero transactions costs associated with creating the peg<sup>27</sup>, USDT will either need to be propped up (funded) by a third-party organisation, or it will perform less well as a *store of value* than USD over the long run. And as set out in section 2.2.1.3 above, the USD has itself proven to be a poor *store of value*.

However, we would like to highlight that Tether does have positive attributes such as simplicity, instantaneous and non-dilutive new coin issues, and a large scope for growth given the size of the underlying asset class.

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<sup>26</sup> Gold is more volatile than equities or bonds (for example, see <https://seekingalpha.com/article/4084753-golds-role-portfolio>); and should not be assumed to stable because of its physical nature.

<sup>27</sup> This limitation is true for any ‘peg’ approach: there will be non-zero transaction costs to maintain the peg which will either need to be funded by the operator, or the currency holders.

### 3 Benefits of ARC (relative to other attempted stablecoins)

ARC is an *intrinsic-value approach* that seeks to address the limitations of other attempted stablecoins, through its financial features and represents a practical approach to a stablecoin with fewer limitations than any other proposed or live approach.

We are not presenting ARC as a perfect stablecoin today, but we feel it is a significant improvement on any other proposed solution, and with further improvements as the ecosystem develops, it has the potential to be a meaningful stablecoin currency<sup>28</sup>.

In contrast to other attempts at stablecoins (proposed or actual), the ARC construct has the following main benefits:

- **Infinite, instantaneous and non-dilutive:** ARC can meet demand immediately by issuing further coin without diluting existing holders, as new coins can only be issued at the current NAV per coin.
- **Asset-backed (intrinsic value) and transparent:** users can retain confidence in the value of the coin relative to a basket of assets held by a ring-fenced SPV, which is transparent and disclosed. Although coin holders don't have a direct ownership over the SPV, or direct interest in the underlying assets (including loan investments), they are able to benefit from the known pricing control actions of the SPV with respect to issuing and buying back ARC coin.
- **Back-tested:** the model has been back-tested using historical data, and can also create trusted reference data to enable ARC to be adopted as a benchmark for projects that are already live.
- **Global:** the construct is not tied to a single country and has a global outlook, enabling cross-border adoption from the outset, subject to legal and regulatory constraints.
- **Regulatory clarity:** ARC has been established in conjunction with regulators, including a detailed legal review, which provides comfort that it will be difficult for a single country (or group of countries) to impact its success in the future through regulatory overreach.
- **No leakage from the SPV:** as an intrinsic—value stablecoin, it is important that there is no leakage of value from the SPV (the underlying pool of assets). ARC has been established in a way that seeks to minimise any value leakage from the SPV, and with transparency to demonstrate this.
- **Practical:** some of the alternative approaches rely upon the effectiveness of the efficient market hypothesis (with perfect information assumptions); or that the coins in question will be highly liquid and rapidly adopted, instantaneously. Whereas the actual reality may be significantly different.

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<sup>28</sup> There are various gold-peg approaches, a list of some can be found here: <http://www.newsbtc.com/2017/10/12/overview-stable-crypto-tokens/amp/>